

PART TWO:

CALIFORNIA'S WORKFORCE EDUCATION AND TRAINING INFRASTRUCTURE

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CHAPTER FIVE:

5. CALIFORNIA'S WORKFORCE DEVELOPMENT INFRASTRUCTURE

California's workforce development infrastructure is made up of a complex web of institutions providing skills development, job matching and other workforce development activities. These institutions are funded by a variety of state and federal programs and sources, including, but not limited to, private employers, student fees, and charitable contributions. Part Two of this report analyzes the institutions and training programs in California that are most relevant to the economic sectors and occupations impacted by energy efficiency policies and programs.

The purpose of Part Two is to understand the role of each type of institution, document how they collectively fit together, and surface any gaps, redundancies, or other problems that need to be addressed. Ultimately the objectives of this analysis are to assess the extent to which these programs:

- help employers recruit qualified workers or upgrade the skills of incumbent workers in furtherance of our energy policy goals, and
- help workers, including those from low income and disadvantaged backgrounds, develop good careers in energy efficiency.

Though this study is not able to evaluate the effectiveness of each program, nor identify the specific skill needs of each employer, it can paint a broad brush picture of the way training, education, and other workforce strategies are currently functioning, the challenges of the current situation, and the opportunities for improvement.

This chapter provides an introductory context and framework for the analysis of our survey and interviews on the workforce development infrastructure that is directly relevant to the sectors and occupations under the scope of this study. It first gives an overview of California's workforce development system and its parts and then talks about the sector approach to training for middle skill jobs, which is endorsed both at the state level and by the Obama administration as a major thrust of reform for workforce training and education. It then addresses the importance of credentialing and certification, and discusses the major venues for workforce coordination and planning in the energy efficiency arena. Finally, we summarize the methodology used in the survey of training and education programs, to set the stage for the documentation of our findings on the seven main education and training institutions that are included in the survey, as well as separate analyses of K-12 programs, employment information systems, and pathways into good jobs for disadvantaged workers.

5.1 CALIFORNIA'S WORKFORCE SYSTEM

Before turning to a discussion of the specific institutions and programs that are relevant here, it is useful to first present an overview of California's workforce development system for all sectors and occupations.

California's workforce system is composed of many parts, but the key components are the state's workforce investment act (WIA) programs—funded by the federal Department of Labor—and California's post-secondary education system, which consists of universities, colleges, community colleges and the state department of education. These latter institutions are funded largely by the state, with specific funding streams from the federal Department of Education.

The WIA system is composed of 49 local workforce investment boards (WIBs) and 259 One-Stop Centers, as well as a state WIB that administers the Governor's 15 percent WIA discretionary funds. The national WIA system is a "work first" system, geared to helping individuals get jobs by providing job matching services through its One-Stop system. The system also funds training for workers who are unemployed, dislocated, or have barriers to employment, through limited individual training vouchers.

California's post-secondary education system includes 112 community colleges, 285 adult schools, and 74 Regional Occupational Centers and Programs, as well as the 23 campuses of the California State University System and the 10 campuses of the University of California. The post-secondary system also includes private colleges and universities, as well as some for-profit training institutions. Unlike the WIA system, which is geared towards rapid job acquisition, the education system is built on the premise that students will forgo earnings for significant periods of education, in the expectation of future returns. As shown in Chapter 2, the returns to a four-year degree are substantial, due to both a significant wage premium and much lower unemployment rates for college graduates, compared to those with lower educational levels. Another significant workforce development program is the Employment Training Panel (ETP), California's incumbent worker training program, funded by the payroll training tax, whose main purpose is to bolster California businesses that face out of state competition. Finally, although less prominent in many other sectors, the California state-certified apprenticeship program is by far the largest state-regulated—but mostly privately funded—training program for construction.

For the higher educational institutions, the California Master Plan for Higher Education, set up in 1960, continues to provide a coherent system for post-secondary education. This plan defined specific roles for the UC, CSU, and the California Community Colleges systems. No such coordination exists for the "middle skills occupations," that is jobs which require more than a high school degree but less than a four-year degree. Yet it is in the middle skills occupations, and the training and education programs that target them, where the real problems lie. Fewer than half of all Californians age 25 or older have a post-secondary degree. More than 70 percent of California's community college students have below-college level math skills and more than 40 percent require remedial English classes.¹ This basic skills crisis, combined with the state's severe fiscal woes, puts tremendous constraints on California's ability to prepare workers for good jobs and careers in our changing economy. To quote a recent California Budget Projects report, "Currently, goals are largely uncoordinated across programs, and use of the state's discretionary funds rarely reflects an overarching strategy.... The state will fail to maximize the effectiveness of its resource unless it takes a systematic and statewide approach."²

At the same time, there are important efforts to use our limited resources more efficiently. There is considerable support for stronger alignment of the various tools in our workforce development tool chest, and the new Brown administration, at the time of this writing, is deliberating various strategies to move toward this goal. Changing regulations and direction from the US DOL are encouraging new directions in the use of federal workforce dollars that flow to the state and local WIBs, including support for sector initiatives, and a stronger emphasis on requiring training programs to result in educational credentials and/or industry recognized certifications, as described in Section 5.3. Breaking from the previous emphasis on "work first" job matching services and individual training accounts, the DOL is encouraging collaboration between the WIA system and the community college and apprenticeship systems. This change in direction is likely to be greatly strengthened if the WIA is reauthorized, as expected. In addition, President Obama's efforts to promote career technical education and to encourage the development of portable and stackable credentials are in concert with WIA reform.

¹ California Budget Projects (2009). *Mapping California's Workforce Development System*. Retrieved from: http://cbp.org/pdfs/2009/090401_Workforce_Presentation.pdf.

² California Budget Projects, 2009.

5.2 SECTOR STRATEGIES

Over the past two decades, innovative approaches to workforce development known as *sectoral employment strategies* (or *sector strategies*) have emerged as the most effective method for training, placing, retaining, and creating career ladders for workers in middle skills jobs, as well as for meeting the needs of employers for skilled workers.³ Sector strategies are,

*"...regional partnerships of employers, educators, workforce developers and other stakeholders that address the skills needs of critical industries in a region. They are focused on a single industry; led by a strategic partner who coordinates dialogue and action; and result in customized solutions to the workforce needs of employers in the industry."*⁴

Their dual customer focus emphasizes both the needs of workers for good jobs and the needs of employers for skilled workers. Because of their emphasis on partnering with a variety of organizations to coordinate recruitment, training and services, sector strategies have also been successful in creating pipelines for disadvantaged workers to move into skilled employment.

Around the country, sectoral programs are being implemented by an array of institutions, including community colleges, WIBs, state agencies, employer associations, and labor–management partnerships, with funding from both public and private sources.⁵ As Maureen Conway and her colleagues at the Aspen institute describe in their 2007 report, the approaches that fall under the name sectoral employment can vary widely, but usually include:

- Skills training programs that provide participants with the skills to enter a particular industry sector or occupation;
- Industry partnerships that identify training needs of incumbent workers in specific industries; and
- Organizations focused on systems change, such as efforts to improve wages and working conditions for target industries or occupations.

A key feature of sectoral programs is their designation of a workforce intermediary to function as a coordinating body. Successful intermediaries are quite varied and can include community colleges, labor–management partnerships, city economic development departments, employer consortiums, and community-based organizations. The intermediary organization brings together the partners necessary to address both employer and worker needs. An organization serving in this intermediary role facilitates, coordinates, organizes, and drives the work being done by all the other organizations involved, including those representing training and education, workforce development, industry, employers, unions, and community-based organizations.

In any sector strategy, business must be at the table to identify specific skill and training needs, and to commit to training their incumbent workers or new hires. For pre-employment training, employers commit to giving specific consideration to training graduates as job openings occur. Sector intermediaries develop close relationships with employers in a particular sector to help negotiate the exact nature of the commitments by employers, particularly around sharing the costs of training, wage ladders or promotion opportunities for workers with upgraded skills,

³ Conway, M. et al. (2009). *Job Training That Works: Findings from the Sectoral Employment Impact Study*. Public/Private Ventures. Retrieved from: http://www.ppv.org/ppv/publications/assets/294_publication.pdf.

⁴ State Sector Strategies (2008). *Accelerating the Adoption of State Sector Strategies Knowledge Exchange*. Retrieved from: <http://sectorstrategies.org>.

⁵ Conway, M., A. Kays Blair, S. L. Dawson, L. Dworak-Munoz (2007). *Sectoral Strategies for Low-Income Workers: Lessons from the Field*. Washington, DC: Aspen Institute.

and other key mechanisms to assure sustainability and benefits for both employers and workers. These relationships also serve to identify skill shortages and workforce and training needs, develop agreements on appropriate certifications and credentials, and design or modify occupation specific skills trainings to meet employer needs. A critical function of sector intermediaries is developing funding proposals for public training funds, so that WIA and other state and federal resources for workforce development can be brought into play. They also serve to connect job seekers with employers and with additional services that might increase their success in the labor market.

These relationships sometimes provide opportunities for programs to influence the quality of jobs within the sector, by engaging with employers directly to improve working conditions, access, career ladders and wages in the target occupation. A 2006 report by MDRC found that employers have responded positively to efforts by workforce development organizations to collaborate on identifying advancement opportunities in high-demand occupations and new routes to participation in career advancement activities.⁶

In addition to direct engagement with employers and workers, sector program intermediaries also facilitate partnerships with other organizations to supplement the services they provide. For instance, a program may engage a local community college to provide technical skills training, a community-based organization to assist in recruiting applicants for training, or a human services provider to enhance the supportive services available to participants.⁷ Sector programs often partner with relevant pre-apprenticeship and apprenticeship programs to open opportunities for the job seekers they serve. Recent research from the Aspen Institute has shown that programs that prepare workers to enter apprenticeships can significantly increase their participants' success in the labor market, particularly programs that train workers to enter the construction trades. Programs partner with union apprenticeships to design training that is specifically geared towards enhancing participants' skills to improve their chances of successfully completing often rigorous apprenticeship programs.

Though sector strategies take different forms depending on the sector and the region of the country where they are implemented, they are all industry-specific initiatives designed to help ensure a smooth progression from recruiting participants with inadequate skills to assuring their placement and retention in living wage jobs with career advancement opportunities. They all require industry-specific expertise and deep engagement with multiple employers in a given sector and they usually involve multiple partners with a lead intermediary that brings together stakeholders and coordinates all the various elements, activities, and funding. This gathering of expertise and employer input allows sector strategies to develop training programs that make business sense, create clear pipelines into employment or advancement for trained workers, and link economic development to workforce development. At the same time, sector initiatives require deep engagement with job seekers, workers, and organizations.

5.3 CREDENTIALING AND CERTIFICATIONS

A means to signal individual mastery of desired skills and competencies is an essential component of a well-functioning workforce education and training system. As stated by White, Dresser, and Rogers,

“most advanced economies have far more elaborate, nationally recognized skill standards and credentialing systems than the United States... To reintroduce regular upward mobility

⁶ Anderson, J., L. Yuriko Kato, J. A. Riccio, S. Blank (2006). *A New Approach to Low-Wage Workers and Employers: Launching the Work Advancement and Support Center Demonstration*. New York: MDRC.

⁷ Conway et al. 2007.

paths, connect disadvantaged workers to the labor market and get them reward within it, reduce per capita training costs, show effects of training (particularly among cash strapped public training providers), or, most ambitiously, drive skills-based upgrading among firms, some standard way of measuring what workers know, that is accepted and used by employers, is now generally seen as a social good.”⁸

A credentialing system helps employers reduce search and transaction costs in hiring and promotions, helps government regulators and program implementers guarantee a standard quality of work, helps training institutions know what skills to train for, helps trainees gain clear signposts that can help guide their decisions, and benefits workers who often receive higher compensation as a reward for their proven skills and education and gain greater mobility within the labor market. It is important that credentials be *portable*, meaning they are equally valuable in another firm or another location and *stackable*, meaning they can be built upon through further training and more advanced credentials.

However, not all credentials are created equal. Both post-secondary educational degrees and industry-recognized certifications have internationally recognized best practices and standards. Educational institutions must be accredited by appropriate bodies, and specific programs that confer degrees must be accredited by the state. For industry-recognized certifications, the ANSI Standard for Personnel Certification, approved by the federal government, delineates a process for developing certifications. This process starts from a technical standards reference guide to develop a job task analysis, which helps identify the essential knowledge, skills and abilities that workers must have. These essential skills are the basis for the ultimate development of a skills certification and associated training. Such a certification must, in turn, be issued by an accredited third-party certification entity to individuals trained in accredited training programs.

In California, at this time, training programs for traditional and emerging energy efficiency related occupations offer an incredible variety of types of credentials (and words to describe them), not all of which are of equal value. Although they are frequently confounded or conflated in the marketplace, it is particularly important to distinguish between *certifications* that are industry-recognized, test for competency, and are verified by a third party, versus *certificates* that do not make an assessment of competency, but rather show completion of a particular training program.⁹ Because certifications verify that a worker's skills meet an industry standard, they are more valuable to workers, employers, and to government agencies concerned with work quality, although for slightly different reasons.

Based on the data collected from training institutions, we have categorized worker credentials into the following types:

5.3.1 PROFESSIONAL LICENSES

Professional licenses are legally required to practice particular occupations. These are based on general professional competency and are usually issued by a third party, such as a state agency or state-sanctioned professional association. Licenses are advanced credentials and often have a significant education and work experience requirements, rigorous competency examinations, and continuing education and relicensing requirements, which ensure that licensed workers are continually maintaining and upgrading their skills. Examples

⁸ White, S., L. Dresser, J. Rogers (2010). *Greener Skills: How Credentials Create Value in the Clean Energy Economy*. Center on Wisconsin Strategies, (p.4).

⁹ American National Standards Institute. (2011). Accreditation Services: Frequently Asked Questions. Retrieved from: <https://www.ansica.org/wwwversion2/outside/PERfaq.asp?menuID=2>.

of mandatory licenses include the Professional Engineer (P.E.), the Registered Architect (R.A.) and the Electrician license. In the building trades, Electricians are unique in their licensing requirements. In other trades, only contractors must be licensed, which does not ensure worker competency. Because professional licenses are held to a high standard and are legally required, the return on investment for earning a professional degree and license is usually high in terms of compensation and employment opportunities.

5.3.2 OCCUPATIONAL CERTIFICATION

Occupational certification indicates broad occupational competency in a particular trade, but unlike licensure, is voluntary. These certifications are based on nationally recognized skills standards and, whether offered by a trade association, government agency, or a non-profit certifying body, the certification is accredited by a third party organization, such as the American National Standards Institute (ANSI) or the International Organization for Standardization (ISO). Such third party accreditation helps a certification to gain wide recognition and value in the industry, making it highly portable for workers moving between jobs or between regions. Like licensure, these certifications are usually not entry level credentials, but may require multiple years of experience and advanced knowledge of the trade. Certifications, such as those offered by North American Technician Excellence (NATE) in HVAC, and the North American Board of Certified Energy Practitioners (NABCEP) for solar installers are most commonly earned after at least a year of work experience. Some certifying bodies, such as NABCEP, have developed entry level examinations. However, these carry much less weight than full certification.

5.3.3 JOURNEY CARD

A journey card is a credential that is specific to apprenticeship training, but it combines features of both occupational certification and a post-secondary educational degree. A journey card takes three to five years to complete and is issued by the state to certify completion of an apprenticeship training program. Because apprenticeship training is standardized and regulated by the state, a journey card is also recognized by employers as certifying the achievement of broad occupational competency and advanced technical skills in a particular trade. Journey level workers receive considerably higher compensation than un-credentialed workers in the same trade. In addition, completion of an apprenticeship program entitles workers to continual upgrade training throughout their career, which allows them to continue to advance their skills, earn further credentials, and stay up to date with the latest technologies.

5.3.4 EDUCATIONAL DEGREES

An educational degree indicates fulfillment of the requirements of an accredited educational program. These can range from high school diplomas to doctoral degrees. Because degrees and educational programs are standardized, the difference between them is well understood by employers. Some professions, such as engineering and architecture, require a four-year university degree, or higher. For most middle skill jobs an associate's degree from a community college may be helpful when seeking employment, but is rarely required. In general, workers with bachelor's degrees and higher receive higher compensation and experience less unemployment than their less educated counterparts.

5.3.5 EDUCATIONAL CERTIFICATES

An educational certificate certifies the completion of an accredited educational program that does not lead to a degree. These programs are most commonly offered by community colleges as an alternative to traditional degree programs or sometimes by four-year colleges as supplemental programs. The community college certificate system suits incumbent or entry-level workers who are seeking skills training but do not care to fulfill general education requirements. Usually completed in a single year, an educational certificate program still provides college credit that can be transferred or built upon through further education and training. In some cases certificate programs are developed as trial programs for emerging occupations or technologies. Some educational certificate programs also prepare students to take competency exams to earn skills or occupational certifications.

5.3.6 SKILLS CERTIFICATES

Skills certificates indicate knowledge of specific technical skills or safety practices, such as welding or driving a forklift. Specific skills certificates may be issued by a training provider, a third party, or a manufacturer of particular equipment. In fact, many skills certificates are nested within more comprehensive training programs, such as apprenticeships. In the case of new technology, however, a manufacturer may be the only available provider of training and certification. As in the case of occupational certification, third party accreditation to ensure that the credential meets a national or international standard makes it more valuable and more widely recognized. The skills category encompasses a number of safety and environmental hazard certificates that are required by law for some occupations. For example, the U.S. Environmental Protection Agency requires verification that HVAC workers have been trained in handling refrigerants. Carpenters or others working with paint must complete training in Lead Abatement practices. These safety and environmental certificates, which are required by law, are by far the most commonly trained-for skills certificates in the respective trades.

5.3.7 SELF-DEFINED CERTIFICATES

Most training programs offer a certificate of completion, whether the training lasts one day or one year. Thus, the value of such a certificate depends on how well-recognized the training program is. This may vary depending on the perspective of an individual employer, but there are not usually clear signals for workers to indicate which certificates are the most valuable. Examples of self-defined certificates include certificates of completion from CBOs or private training institutions as well as skills certificates that are not tied to a national standard or do not require a competency test. These un-standardized certificates may not signal competency to an employer and are, therefore, much less valuable for workers, irrespective of the quality of training received.

As described in Chapter 13, which focuses on how training institutions fit together, this bewildering array of credentials makes alignment of training programs difficult and reflects a lack of statewide agreement on skill standards needed to accomplish the work related to achieving our energy efficiency goals.

5.4 THE SPECIFIC VENUES FOR WORKFORCE PLANNING AND SECTOR STRATEGIES IN THE ENERGY EFFICIENCY SECTORS

There is general recognition of the importance of collaboration within the state's workforce agencies and in the agencies driving energy efficiency investments and many efforts to promote it. However, the rush towards green as the state's new economic driver has not allowed the planning and coordination needed to economize on resources and avoid redundancy and competition. Deep funding cuts to the community colleges have undermined long-term program development, undermined collaboration with apprenticeship programs and led colleges to seek short-term grants as a major funding source.¹⁰ The speed at which ARRA funds were dispersed has exacerbated this tendency to chase dollars.

Despite these significant challenges, there are also forces that create the opportunity for system reform leading to more effective workforce development. In fact, the opportunity of green, including but not limited to the infusion of ARRA funds, has propelled experimentation, collaboration and significant success in overcoming silos.

The propitious creation of the Green Collar Jobs Council (GCJC), authored by then-Speaker Nuñez, occurred before ARRA. As part of the California WIB, the major economic development and workforce development agencies sit on it, along with representatives from industry and labor, and agencies with environmental and energy responsibilities, including the CPUC, CEC, and CARB. The Council is tasked with "understanding the current and future workforce needs of the Green/Clean economy, developing a comprehensive strategy to prepare California's workforce to meet the needs of businesses and to ensure that efforts aimed at improving worker's skills are coordinated and effective."¹¹ While it has no legislative mandate to align funding streams, the GCJC has spawned cross-agency collaborations to a much greater degree than occurred in the past, and its vision is to "serve as a catalyst for the creation of sustainable regional sector strategies."

The GCJC became an important coordinating body for the expenditure of ARRA funds. The California Energy Commission was the agency receiving the ARRA investments in the clean energy arena and partnered with the CWIB and the ETP to create the Clean Energy Workforce Training Partnership program (CEWTP), which dispersed over 31 million dollars to 48 training programs, as well as the state and local WIBs. Forty of these training programs are serving the sectors under study here, and intend to deliver short-term trainings to approximately 7,780 workers for green building, solar, water efficiency, and wind.¹² The competitive solicitations incorporated some of the best practices in workforce development, starting, of course, from the sector approach, but also encouraging the use of certifications and the development of partnerships between the WIBs and the community colleges. The end results of these programs are not in, and it will be critical to evaluate their effectiveness in the very near future. An evaluation of these CEC administered programs is currently underway, although it is focusing primarily on the energy savings produced, with less emphasis on the workforce outcomes. Other grant programs also tried to encourage data-driven planning and industry partnerships; these also should be evaluated to assess their effectiveness

Since the ARRA funds were allocated, and with the change in administration, the mission of the GCJC is unclear. It could potentially be a convening body for a series of sector partnerships in the clean energy sectors. The skills panels in Washington State or the industry councils in Pennsylvania provide models for how this could work. In

¹⁰ The Montoya funds, which were the state's dedicated funding stream to community colleges for the support of supplemental and related instruction tied to apprenticeship programs, were recently changed so that they can now be used as discretionary funds. This has dealt a severe blow to collaboration between apprenticeship programs and the community colleges.

¹¹ California Workforce Investment Board (2007). Green Collar Jobs Council. Retrieved from: http://www.cwib.ca.gov/special_committees/green_collar_jobs_council.

¹² California Energy Commission (2011). Clean Energy Workforce Organizations. Retrieved from: <http://www.energy.ca.gov/cleanenergyjobs/resources.html>.

both those states, the workforce agency convened business and labor within narrow sectors (e.g., the utility sector, or the long-term care sector); chose and funded an intermediary to lead a sector planning process, which included building industry consensus around skills certification; and funded the training initiatives that emerged from that process. In Washington State, the community college Centers of Excellence play the intermediary role for the utility and energy efficiency sectors, and have helped both create new certifications (e.g., wind) and choose between competing ones when needed.

At the present time, there are a number of relevant initiatives that closely resemble sector strategies, in the sense that they are linking economic development planning with workforce development in a specific sector. Several of these are described in Chapter 4, in our case study analysis. The first is Energy Upgrade California, the state's major residential retrofit program. The CEC and the CPUC are now coordinating this program statewide, though the process is also being planned and implemented by local planning bodies such as ABAG, the utilities, and their implementation subcontractors. Though mostly oriented towards the economic development and investment side of the initiative, important workforce strategy decisions are being made, warranting coordination of workforce training dollars and programs. The CEC is working with its CEWTP grantees, who have received both CEC and WIA funds, to do this coordination.

The Western Performance HVAC alliance is also a de facto economic development sector initiative, which includes a newly formed workforce committee. This is a broad industry, utility, CEC and CPUC effort to upgrade the HVAC industry and close off the low road through enforcement of laws and regulations. Embedding the workforce planning within this process is essential to ensure training investments are geared towards supporting the high road segments of the industry. Setting standards and certifications is likely to be the subject of some of the work of this alliance and the challenge may be to get a wide range of employers to commit to agreed upon standards. Coordination with the state WIB could potentially help secure WIA funds as training plans develop.

The CALCTP program is also a sector initiative. This industry partnership identified workforce issues as a key impediment to industry expansion in the advanced lighting controls sector. This effort led to a new certificate, structured as advanced training for licensed electricians, and workforce planning to coordinate among apprenticeship, community colleges, and the utility training program. Its narrow focus cleared the way for quick development of strategic partnerships, building on the current state infrastructure that supports long-term pipelines into highly skilled work. As this industry expands, it can open up new apprenticeship slots for entry level electricians, connecting with pre-apprenticeship programs that can prepare people from low-income communities who are not college bound.

Though they would not name themselves sector strategies, these are all examples of types of sector-based initiatives because they are efforts—in various stages of development and some too new to evaluate—to organize economic development, address workforce and skill issues, and coordinate among training institutions within a specific industry sector. The only one tapping into WIA funds (through the more flexible ARRA WIA funds) is Energy Upgrade California, due to the key coordinating role of the GCJC around ARRA funds.

The variety of initiatives shows that a “one-size-fits-all” solution is not realistic. However, it does point to the key role of the CPUC, the CEC, and the utilities in helping to drive sector initiatives. It suggests that the initiatives should be analyzed to see if they are incorporating the best practices of sector initiatives, such as building industry consensus to promote widespread adoption of specific skill certifications, creating an intermediary to coordinate among the state's main workforce and education institutions, filling in gaps before creating new programs, and getting employer commitments to hire workers meeting skills and certification standards. In addition, it suggests tapping into all the funding sources—particularly from WIA and from DOE—that might be available to support

them.¹³ Finally, it suggests a common framework for assessment of effectiveness, which includes impacts on both energy savings and workforce outcomes.

5.5 SURVEY OF TRAINING AND EDUCATION PROGRAMS

The following chapters in Part Two describe what we learned about California's workforce development infrastructure relevant to the energy efficiency sectors. Much of this is based on our inventory and survey of training programs in the seven main institutions and includes our analysis of this data to explain how they all fit together. In addition, we separately analyze the utility programs, K-12 programs, employment information systems, and strategies for the inclusion of low-income, minority and disadvantaged Californians. When possible we include more detailed data from the utility programs.

The detailed inventory and survey methodology is presented in Appendix G; here we present a brief summary as an introduction to the following chapters. The institutions included in the inventory and survey are:

- Four-year colleges and universities
- Community colleges
- Apprenticeships
- Private industry training programs
- Community-based organizations (CBOs)
- Regional Occupational Programs (ROPs)
- Utility training programs (although these must be treated differently)

There were two criteria for inclusion in the inventory (and the sample we drew from it): First, we include training and education programs that train for the most prominent occupations from our job projections, eliminating the general occupations (e.g., accountant). Second, we include training programs that self-identify as training for skills in these sectors. Therefore, we capture both the traditional occupations that are involved in implementing energy efficiency work, as well as the new “specialty” occupations focusing solely on a particular set of energy-related skills. The inventory compiled basic information on training programs, such as the location, length, and skills emphasis of each program, gathered from administrative data and web searches, while the survey entailed in-depth interviews with a sample of training providers across the state.

We were able to identify about 1,080 training programs in California, among four-year, community colleges, apprenticeships, CBOs, private training organizations, and ROPs. A training program refers to a department at a particular college or ROP, an apprenticeship committee,¹⁴ an IOU Energy Center, or a distinct community-based or private organization. Quite a few of these training programs have multiple degree tracks or occupational tracks (in particular colleges and apprenticeships). Therefore, the total number of distinct program tracks is quite a bit higher, around 1,545. These individual tracks are the relevant unit of analysis for Part Two because they lead to different career pathways and employment outcomes. For example, someone with a master's degree in engineering typically will be eligible for different jobs than someone with bachelor's degree in engineering.

¹³ The US DOE is also making major investments in workforce preparation for the clean energy economy. It is funding credentialing and accreditation in energy efficiency and self-generation, and is engaged in efforts to encourage the adoption of skills standards with robust third-party verification in these sectors as a way to assure appropriate quality of work in order to successfully develop these industries. It is using a variety of funding opportunities, such as the E-RIC process, to link development of the clean energy economy with workforce development. DOE's recognition of the importance of skill standards converges well with the interests of the workforce training and education leaders at the state and federal level, because industry recognition of stackable and portable credentials is critical.

¹⁴ Some committees are highly consolidated and have multiple locations that are overseen by one labor-management committee, most notably laborers and carpenters.

Of these program tracks we interviewed 492. We used a cluster-sampling method to produce a random sample of programs to interview by phone, and we oversampled the ones that trained in the most prevalent occupations in our job projections.¹⁵ The sampling strategy focused on established institutions rather than new grant-funded initiatives such as the ARRA-funded programs. Table 5.1 shows the number of program tracks interviewed for each type of institution, and the total number of tracks identified (all of which is listed in the inventory).¹⁶ Each track leads to a specific type of credential or outcome.

Table 5.1 Number of Program Tracks Interviewed

Institution	Program Tracks Interviewed	Total Number of Program Tracks ¹⁵
4-Year Colleges and Universities	38	212
Apprenticeships (Joint)	89	218
Apprenticeships (Unilateral)	5	47
Community Colleges	102	607
Community-Based Organizations	31	39
Private Training Organizations	147	204
Regional Occupational Programs	73	211
IOU Energy Training Centers	7	7
Total	492	1,545

The in-depth phone survey was designed to achieve our main objective of analyzing the workforce development infrastructure in California as a whole, considering the linkages and overlap between major types of training institutions. The interview protocol was based on our combined knowledge of workforce development best practices, and energy efficiency related job skills and training types. It includes both qualitative and quantitative questions. Each type of institution had a tailored version of the protocol, but all interview formats collected information on program structure, content, and connection to career pathways, as well as data on enrollment, graduation, participant demographics and other characteristics.

¹⁵ As a result, programs that train for a specific energy efficiency skill but do not train for a high-demand occupation based on the job projections were not over-sampled as “priority.” While it may seem counter-intuitive to not consider a specific “solar” training program as high-priority in a study like this, our intent here was to study training programs based on the labor demand analysis and not hand-pick occupations to study that seem like they would be in high demand because of energy efficiency policy, because they are targeted on specific skills in those areas.

¹⁶ 11 program tracks in adult education are also included in the inventory, although we did not include these in our survey sample.

CHAPTER SIX:

6. FOUR-YEAR COLLEGES AND UNIVERSITIES

6.1 OVERVIEW

Professionals and managers constitute about 20 percent of the national, direct energy efficiency services workforce and about 17 percent of our study group. Workers in these occupations, which include architecture, engineering, and construction management professions, play a critical role in designing buildings, understanding energy use in buildings, and in crafting the policies that support energy efficiency and renewable energy.¹ These efforts provide the framework within which the remaining 80 percent of the workforce for the energy efficiency and related sectors operate.

Typically, these workers have at least an associate's degree, or more commonly a bachelor's or graduate-level degree from a university or college. In addition, some of these professions, particularly those involved in systems design and specification, require specialized licenses in order to practice in a position of responsibility. This chapter describes the type of degrees available and the most relevant degree programs, discusses certification and licenses for energy efficiency related professional occupations, and concludes with a discussion about equity and access to the degree programs leading to these types of jobs.

6.2 DESCRIPTION OF PROGRAMS AND INCORPORATION OF ENERGY EFFICIENCY

Most energy efficiency oriented professionals have a bachelor's, master's, or a Ph.D. degree. A bachelor's degree curriculum generally takes about four years to complete and includes foundational knowledge that prepares students for entry into a professional occupation. Foundational knowledge includes general writing and communication skills as well as topical knowledge in a specific area such as engineering or business. A bachelor's degree demonstrates the minimum skill set needed to attain a professional occupation. With a bachelor's degree an individual may further their education with a master's, Ph.D., or, combined with practical experience, pursue professional certification or licensure. Graduate degrees offer students the opportunity to achieve mastery of their field and pursue more in-depth research or professional training.²

There are four primary types of university programs associated with the major professional occupations for energy efficiency related sectors: (1) multidisciplinary programs with an energy emphasis; (2) engineering (civil and mechanical); (3) architecture; and (4) construction management. Table 6.1 provides an overview of the number of these programs in California colleges and universities.

¹ Confirmed by this study, and Goldman, C., M. Fuller, E. Stuart, J. Peters, M. McRae, N. Albers, S. Lutzenhiser, M. Spahic (2010, Sept.) *Energy Efficiency Services Sector: Workforce Size and Expectations for Growth*. Lawrence Berkeley National Laboratories; Research Into Action, Inc.

² A master's degree generally takes two to three years to complete, during which time students often complete small independent research projects relevant to their field. The Ph.D. is typically a longer-term degree program (five to seven years) in which students focus on independent research, demonstrating an ability to synthesize complex topics and contribute to the body of knowledge of their discipline. Graduate students usually pay for the degree using their own funds, university assistantships, fellowships, or employer contributions.

Table 6.1 Relevant University Programs in California and Representatives Interviewed, by Type

Departments and Programs	Number of Programs ¹	Number Interviewed	Average Number of Graduates Per Year Per Program	Number of Graduates, 2009
Multidisciplinary Energy and Energy Efficiency Specific Programs	16	11	37	592
Engineering Programs ²				
Civil Engineering	45	8	49	2,212
Mechanical Engineering	58	3	46	2,651
Electrical Engineering	54	0	56	3,049
Architecture ³	24	7	58	1,402
Construction Management	15	9	22	330
Total	212	38	45	10,236

¹Note that B.A.s, M.A.s, Ph.D.s, and certificates are counted as separate program tracks, because they lead to different employment outcomes.

²American Society for Engineering Education (2009). College Profiles. Retrieved from: <http://www.asee.org/papers-and-publications/publications/college-profiles>.

³National Center for Education Statistics, U.S. Dept of Education - Institute of Education Sciences. Retrieved from: <http://nces.ed.gov/collegenavigator/?s=CA&p=04.0201&l=5&ic=1>.

6.2.1 MULTIDISCIPLINARY ENERGY AND ENERGY-EFFICIENCY SPECIFIC PROGRAMS

A few multidisciplinary programs provide an academic home to students with a specific interest in energy efficiency and related studies. Although their origins and funding vary substantially, most of these programs are fairly new, with five of them emerging after 2004. Table 6.2 provides an overview of the seven multidisciplinary programs in California that focus on energy topics. Only one of these programs, the Energy Management and Design program at Sonoma State, focuses on undergraduate students, while the remaining programs are associated with graduate-level degrees or research centers.

In addition to being limited in number, these programs tend to train a very small number of students, producing fewer than 100 graduates per year. However, most of these programs are planning for increased enrollment and expanded offerings in the coming years. For instance, the Energy Efficiency Center at University of California–Davis (UC Davis) has a five- to ten-year plan to expand from a few targeted energy efficiency classes to offering a master's degree or certificate for master's students. As of 2010, the two oldest programs are the only ones offering degrees: a bachelor's program at Sonoma State, and both a master's and Ph.D. program at University of California–Berkeley's (UC Berkeley) Energy and Resources Group.

Table 6.2 Universities with Energy Efficiency and/or Renewable Energy Focus

University	Center / Department	Inception Date	Program Type	Description
Stanford	Precourt Center on Energy Efficiency	2006	Research	Engineering students and faculty conduct research associated with energy efficiency technologies.
UC Berkeley	Energy and Resources Group	1973	Graduate	Approximately half the students enrolled in this program take classes and conduct research pertinent to energy policy and the use of renewable energy.
UC Davis	Energy Efficiency Center	2006	Graduate	Students from disciplines such as engineering and business take classes specific to energy efficiency technologies, measures, and policies.
Sonoma State	Energy Management and Design	c.1985	Bachelor's	Students learn about energy efficiency and renewable energy technologies in addition to the policies and procedures that support energy efficiency and renewable energy in California.
UC Berkeley	School of Law – Center for Law, Energy and the Environment	2005	Graduate	Law students can take energy specific course(s) and earn a certificate in Energy and Clean Technology Law. Students from other programs such as business can also take earn this certificate.
University of San Diego	School of Law – Energy Policy Initiatives Center	2005	Graduate	Law students can take energy law and policy courses and clinics that teach students about California specific energy laws and policies.
UC Los Angeles	School of Law – Emmet Center on Climate Change and the Environment	2008	Graduate	The Center conducts and promotes research on climate change policies in California.

One obstacle to the expansion of these energy-specific programs is the lack of qualified teaching professionals. All respondents reported some difficulties in finding qualified instructors for their programs. The programs currently rely on existing or retired industry professionals as instructors, but most report that they lack a sufficient number of people with industry experience and a willingness to teach.

6.2.2 ENGINEERING PROGRAMS

Engineering encompasses a variety of sub-fields that are relevant to energy efficiency related work, including mechanical, electrical, and civil engineering. In 2009, engineering programs in California graduated over 15,000 engineers, a little over half of them in the civil, mechanical, or electrical engineering.

Across all engineering disciplines about 80 percent of the curriculum is designed to follow the approved curriculum criteria established by the Accreditation Board for Engineering and Technology (ABET). ABET approves of programs that supply students with foundational knowledge in physics, math, chemistry and the basic concepts needed in engineering's subdisciplines. Table 6.3 displays ABET's description of what constitutes an approved curriculum in civil and mechanical engineering.

Professor, student, or departmental interest in a topic defines the remaining 20 percent of the curriculum. Currently, energy efficiency and renewable energy-specific topics are not part of the ABET defined curriculum and

will only become part of the curriculum if student, faculty, or departmental interest pushes in that direction. This can occur in the portion of the curriculum dealing with application, but energy efficiency-related topics compete with all other potential topics a student, professor, or department may devise, including such as topics as microelectronics, nanotechnologies, aeronautics, etc.

Table 6.3 BET-Approved Curriculum Definitions

Degree	ABET Approved Curriculum*
Civil Engineering	"The program must demonstrate that graduates can: apply knowledge of mathematics through differential equations, calculus-based physics, chemistry, and at least one additional area of science, consistent with the program educational objectives; apply knowledge of four technical areas appropriate to civil engineering: conduct civil engineering experiments and analyze and interpret the resulting data; design a system, component, or process in more than one civil engineering context; explain basic concepts in management, business, public policy, and leadership; and explain the importance of professional licensure."
Mechanical Engineering	"The program must demonstrate that graduates have the ability to: apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyze, design, and realize physical systems, components or processes; and work professionally in both thermal and mechanical systems areas."
Electrical Engineering	"The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives. Programs ... must also demonstrate that graduates have knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics."

* Accreditation Board for Engineering and Technology (2009). Criteria for Accrediting Engineering Programs: Effective for Evaluations During the 2010-2011 Accreditation Cycle. Retrieved from: <http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/E001%2010-11%20EAC%20Criteria%201-27-10.pdf>.

We identified a total of 75 bachelor's degree, 57 master's degree, and 25 Ph.D. programs in civil, mechanical, and electrical engineering statewide. However, we were able to interview only a small sample of these programs. The following sections describe the findings from these interviews for each sub-field.

6.2.2.1 CIVIL ENGINEERING

Civil engineers design, construct, and maintain physical and natural structures, including dams, transportation infrastructure, and, most relevant to this report, buildings and the physical site on which buildings are built. We contacted 18 civil engineering departments, representing over 35 degree programs. However, representatives from at least nine of these programs declined the opportunity to participate in the study because they did not think the description of our research applied to their program. Five more representatives declined without reason or did not respond to our query, leaving us with the opportunity to interview only four departments (eight programs in total). Although it is difficult to draw conclusions from non-respondents, this lack of interest in participating in the study may indicate that a majority of civil engineering programs do not see a relationship between civil engineering and energy efficiency related industries.

Respondents from both University of Southern California (USC) and the University of Santa Clara suggested that the emergence of energy efficiency in their curriculums has been due largely to an interest in multidisciplinary topics across all the engineering subdisciplines. For instance, the study of systems design moves beyond traditional disciplinary boundaries to incorporate elements of different engineering and science fields. One respondent described how energy efficiency is starting to become part of the civil engineering curriculum this way:

"Traditionally the energy use concentration [in engineering] has been in HVAC and that has had its home in mechanical engineering and architecture. Civil engineering [focuses on the] building of structure, [but now] we have to think about the energy efficiency of buildings in addition to things like seismic strength if we want the system to use minimum levels of energy and have minimum impact on the environment."

At times, energy topics may be integrated into the civil engineering curriculum serendipitously. At USC, for example, energy efficiency entered the curriculum in part because of a chance encounter between a civil engineering professor and an architecture professor who became interested in each other's work and began collaborating on research on earthquake resistant and energy efficient structures. In other cases, universities or individual departments are intentionally seeking out opportunities to incorporate energy efficiency or other green practices across disciplines. Santa Clara University emphasizes sustainability across campus with a variety of initiatives, including a collaboration of civil engineering students and other disciplines to design a home for the U.S. Department of Energy's Solar Decathlon competition.

Civil engineering programs select faculty to complement the focus of the degrees offered. For instance, at the undergraduate level, civil engineering schools largely employ tenure-track faculty to teach courses. At the master's level with a professional focus, departments rely more on industry professionals for instruction. A typical civil engineering program prepares students already employed in the construction field for careers as construction engineering managers. An expansion into energy efficiency will likely depend on access to instructors with professional experience in these areas.

Figure 6.1 shows all civil engineering schools in California by the number of graduates in 2009.

6.2.2.2 MECHANICAL ENGINEERING

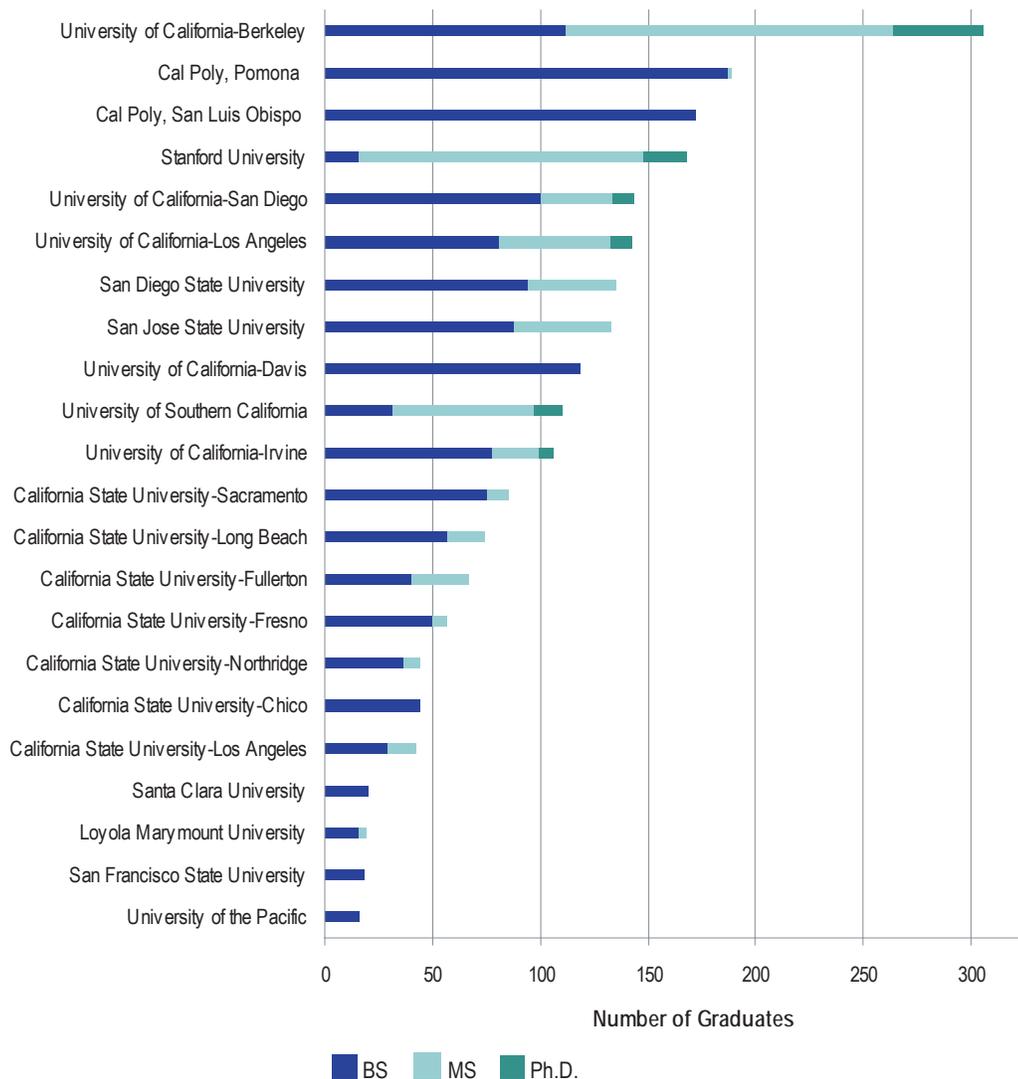
Mechanical engineers apply the principles of physics to help design, manufacture and maintain mechanical systems such as heating, ventilation, and air conditioning (HVAC) units. As noted above, the national workforce needs assessment found strong demand for mechanical engineers in the energy efficiency services workforce. Figure 6.2 displays the total number of 2009 graduates from mechanical engineering departments in California.

We spoke with one representative from a mechanical engineering department at California State University (CSU)–Chico. He reported that his department does address energy issues and is currently working on reviving a course, initially offered in the 1980s and early 1990s, which lay dormant during a low-point in funding for energy efficiency between 1995 and 2005. This course will directly addresses energy efficiency and mechanical engineering issues.

Engineering programs at San Diego State (SDSU) and San Francisco State Universities (SFSU) host Industrial Assessment Centers (IACs), funded by the U.S. Department of Energy since 1976.³ The IACs throughout the U.S. provide the opportunity for engineering students to conduct free energy assessments for medium-sized manufacturers, which helps manufacturers identify energy savings while providing students with valuable practical experience under the tutelage of an experienced professional. Until 2007, in addition to those at SDSU and SFSU, a third IAC was operated at Loyola University in Los Angeles but this center closed after repeated budget cuts. The directors of the two remaining California-based IACs are mechanical engineers, and while they draw students from all engineering disciplines, the majority of students involved in IAC activities are from mechanical engineering.

³ Goldman, C., J. Peters, N. Albers, E. Stuart, M. Fuller (2010, March). *Energy Efficiency Services Sector: Workforce Education and Training Needs*. Lawrence Berkeley National Laboratories; Research Into Action, Inc.

Figure 6.1 Civil Engineering Programs by Degree Type Graduates, 2009



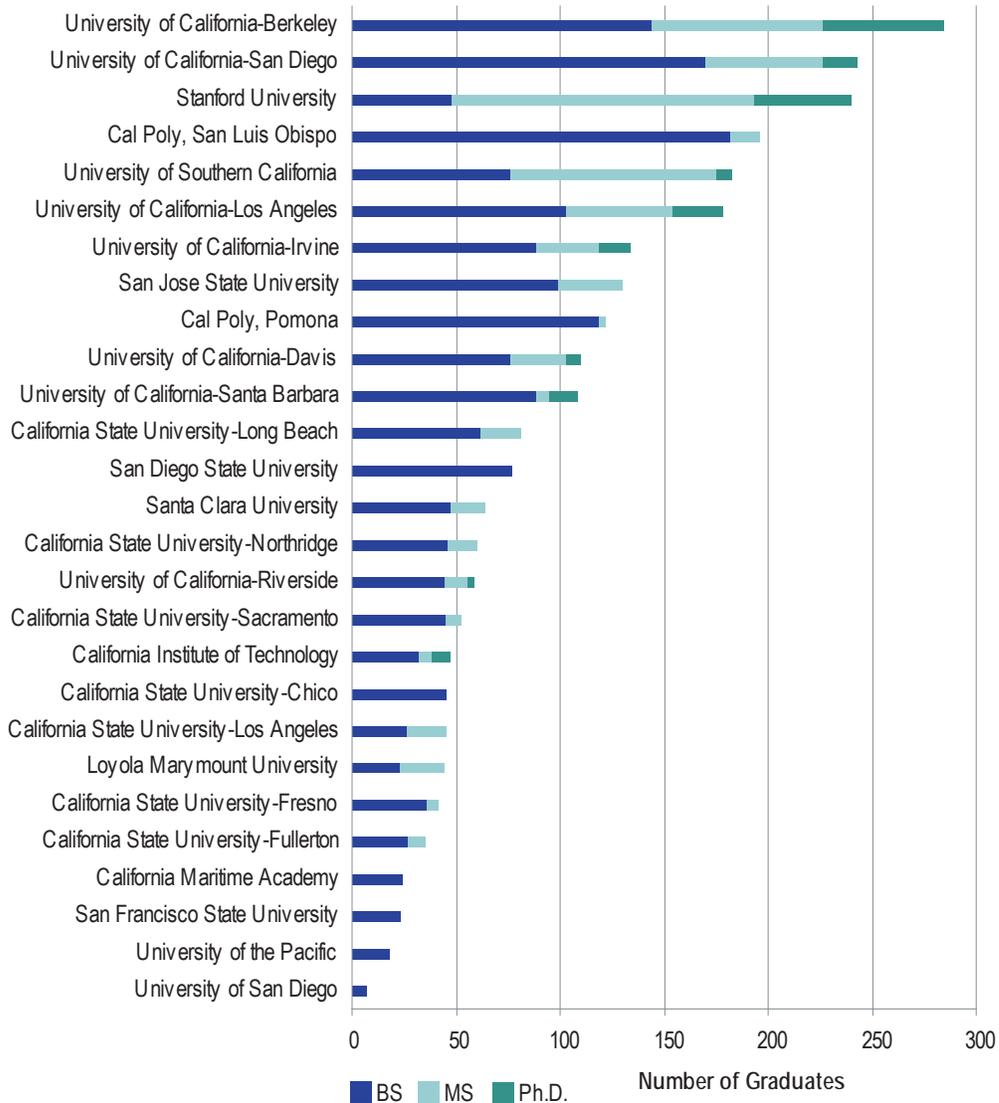
6.2.3 ARCHITECTURE

Architecture is the art and science of designing and erecting buildings and other physical structures. There are ten architecture programs in California. These programs graduated 885 bachelor's students, 500 master's students, and 12 Ph.D. students in 2009 (Figure 6.3).

Unlike engineering departments, architecture departments report embracing "green" topics, including energy efficiency and building-integrated distributed generation. For example, the Southern California Institute of Architecture and the California College of the Arts (CCA) integrate topics such as energy efficiency and sustainable design into their curriculum. They aim to showcase the most recent energy efficiency technologies, sustainable materials, and relevant policies throughout their curriculum. Southern California Institute of

Architecture participates in the National Solar Decathlon where students compete against other universities to design an energy efficient and solar powered house that uses little to no energy. Additionally, Southern California Institute of Architecture offers coursework about designing buildings that do not require traditional air conditioning systems for cooling.

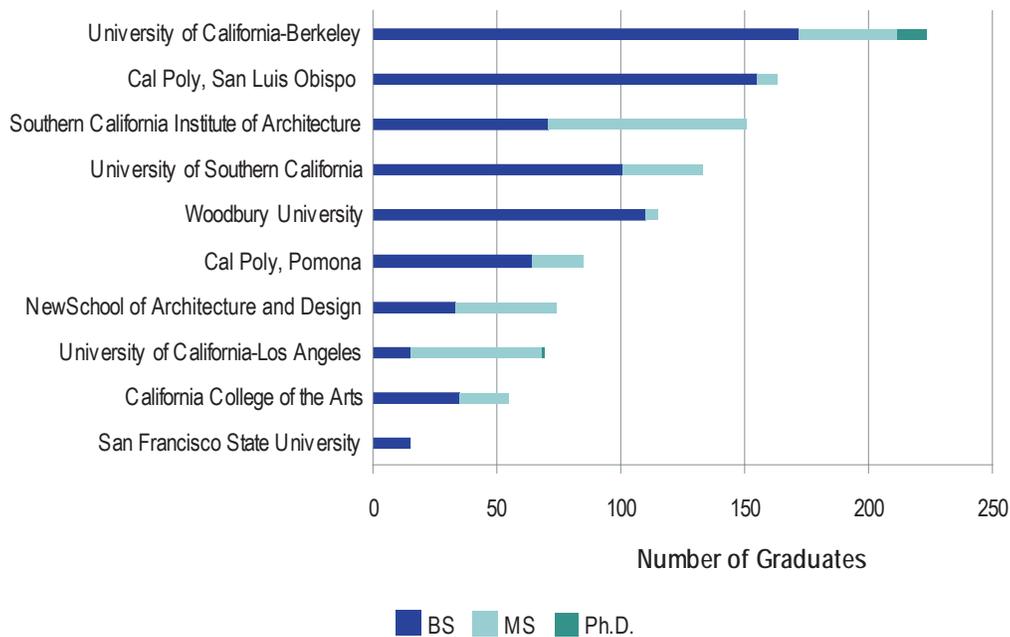
Figure 6.2 Mechanical Engineering Programs by Degree Type Graduate, 2009



CCA offers classes such as Building Energy and Green Building that stress “an integrated approach to sustainable development through the design of higher performance buildings that are regenerative, healthy, durable, and cost-effective over the long term.” These architecture programs report also integrating energy efficiency topics into the curriculum organically by examining related topics such as day-lighting, sustainable building design, ventilation, and building modeling. An examination of the largest architecture program websites also tells us that energy topics are

at a minimum part of the standard bachelor's degree curriculum.⁴ For instance the two largest architecture programs in California, UC Berkeley and California State Polytechnic University (Cal Poly)–San Luis Obispo, offer coursework and minors that cover energy topics. Additionally, USC requires students to take a course related to passive solar systems and mechanical systems.

Figure 6.3 California Architecture Program Graduates by Degree Type, 2009



Architecture programs largely rely on industry professionals as instructors. For instance, about 75 percent of CCA teachers are industry professionals, who teach part time, while the remaining 25 percent are full-time instructors. Architecture programs also emphasize the practical application of the principles they teach. Therefore, architecture instructors are expected to be specialists within their sub-field and are expected to be implementing what they teach in their own practice. Architecture students are also expected to put their knowledge into practice through studio classes and design-build workshops.

While students do receive exposure to energy efficiency, we received feedback from one professional involved in continuing education to architects that architecture schools do not adequately prepare students in fields such as energy efficiency and distributed generation. Architecture students do not receive the deep practical experience in these topics comparable to the experience students obtain through design studio classes. He stated that “their exposure to these topics is episodic and occurs outside of design studio. Students emerge from architecture programs with a vague awareness that energy efficiency matters, but with very little idea of how to actually achieve it in their careers and incorporate it into the firm’s projects.” Furthermore, since this addition of “green” topics to architecture curriculums is relatively recent, many practicing architects have not been exposed sufficiently to energy efficiency related advances. To respond to this lack of concrete skills and practical experience, this respondent suggests the CPUC partner with the California Architects Board, the licensing board for this field, to require continuing education for architects on energy efficiency and renewable energy topics as part of their

⁴ The four largest architecture programs in California based on number of 2009 graduates are 1) University of California – Berkeley, 2) California Polytechnic State University – San Luis Obispo, 3) Southern California Institute of Architecture, and 4) the University of Southern California.

license renewal. American Institute of Architects (AIA) California Council supports such a requirement. In addition, this respondent suggests that the CPUC should also work to institute an energy efficiency and renewable energy component in the licensing exam for architects. Currently the licensing exam does not require proficiency on these topics. Such a requirement could stimulate architecture schools to more deeply address and integrate energy efficiency and renewable energy into their curricula.

6.2.4 CONSTRUCTION MANAGEMENT

Construction managers provide the overall planning, coordination and controls of construction projects, focusing on key engineering and business principles. While some construction managers obtain degrees, others obtain certification through their professional association and professional experience. Ten colleges or universities offer construction management programs in California. Only one of these offers a master's degree, while the rest offer bachelor's degree programs.

We spoke with representatives of four of these construction management programs:

- University of Southern California
- California State University–Fresno
- Westwood College
- Cal Poly–San Luis Obispo

The representative from USC represented the only master's degree program in the state, and the remaining respondents represented bachelor's degree programs.

Westwood College's program is a stand-alone program focused largely on the business of construction. This program relies mostly on industry professionals that teach part time to implement the curriculum. The programs at Cal Poly and CSU, Fresno have a more technical focus and rely on tenure-track faculty for the majority of instruction. The master's program at USC caters to students currently working in the construction field who are interested in management positions.

In addition to their primary focus, these programs also offer courses that specifically cover some energy efficiency related topics. For instance CSU–Fresno offers courses such as electrical and mechanical systems, Leadership in Energy and Environmental Design (LEED) applications, and residential green building. Furthermore, because students have expressed an interest, next year this program will start offering instruction on how to conduct an energy audit.

The USC respondent also indicated that energy topics are becoming more common in the construction management curriculum as energy becomes a greater focus in the construction marketplace. This respondent noted that every grant he had recently applied for had an energy efficiency component. At Cal Poly–San Luis Obispo, mechanical, electrical, and plumbing classes all incorporate efficiency into the coursework. They are also launching a new sustainable topics class that will incorporate instruction on what a construction manager should know about LEED certification.

6.3 OUTCOMES

In 2009, California engineering programs graduated almost 8,000 civil, mechanical, and electrical engineers. These three fields represent a little over half of all graduating engineers in 2009, as shown in Table 6.4.

Table 6.4 Engineering Programs in California

Engineering Type	Bachelor's		Master's		Ph.D.		Total
	Count of Programs	2009 Graduates	Count of Programs	2009 Graduates	Count of Programs	2009 Graduates	2009 Graduates
Civil Engineer	22	1,481	16	564	6	102	2,147
Mechanical Engineer	27	1,777	21	673	10	201	2,651
Electrical Engineer	26	1,336	19	1,459	9	254	3,049
Other Engineering Programs	31	3,826	21	2,797	11	671	7,294
Total		8,420		5,558		1,228	15,206

Source: American Society for Engineering Education (2009). College Profiles. Retrieved from: <http://www.asee.org/papers-and-publications/publications/college-profiles>.

These new engineers, and the 77,500 incumbent engineers in California's workforce, work in a variety of fields from computer programming to designing roads.⁵ Approximately 1,500, or two percent of all engineers in California, work in the energy efficiency field.⁶ Assuming that two percent of all graduating engineers go to work in the energy efficiency field in California, approximately 300 new engineers enter the energy efficiency workforce each year.

The four civil engineering programs interviewed represent eight civil engineering degree programs, each with approximately 50 graduates per year. Upon graduation, these students primarily go to work for construction, engineering, and architecture firms. Graduates from bachelor's degree programs get jobs as entry-level engineers. Master's students often enroll in the degree program while already employed, in hopes that the extra education will enable them to move into a management position. Respondents did not know how many students from their programs went to work for organizations that focus on energy efficiency. One respondent from the USC estimated that more master's students were likely to work in energy efficiency than bachelor's students, but he expects that will change as the undergraduate program shifts to focusing on energy topics.

Civil engineers are the largest engineering field in the emerging energy efficiency workforce. However, engineers of all types successfully work in the energy efficiency industry, and the national assessment of the energy efficiency services industry found that mechanical engineers and electrical engineers are in particular demand among energy efficiency firms.⁷ Nevertheless, because of the reluctance of many engineering programs to actively incorporate energy efficiency related topics into their regular curricula, many of these engineers receive the majority of their energy efficiency training on the job.

⁵ Bureau of Labor Statistics (2010). Occupational Employment Statistics. Retrieved from: <http://www.bls.gov/oes/>.

⁶ These 1,500 engineers work for utilities in energy efficiency departments, program implementation contractors, and Energy Service Companies (ESCOs). Goldman, C., et al. (2010, Sept.) *Energy Efficiency Services Sector: Workforce Size and Expectations for Growth*. Lawrence Berkeley National Laboratories; Research Into Action, Inc.

⁷ Ibid.

Data for employment outcomes in the other professional fields are less abundant. In the architecture field, the top five programs—the CCA, Southern California Institute of Architecture, USC, UC Berkeley, and Cal Poly–San Luis Obispo—produced more than two-thirds of California’s architecture graduates in 2009. Assuming the curriculum of these programs is similar to the remaining California architecture programs, the approximately 1,100 architecture students that graduate each year in the state receive exposure to energy efficiency and related design topics. Although programs neither collect nor maintain detailed employment data on graduates, it is likely that most of these graduates go to work for architecture firms, bringing their energy efficiency related knowledge with them.

Construction management programs have a curriculum that prepares students to work for general contractors, primarily in large residential, commercial, or industrial projects. One respondent estimated that 75 to 80 percent of his undergraduate students go to work for general contractors.

Finally, respondents from multidisciplinary programs report that graduates are typically successful in finding positions to design and implement the technologies and policies that support energy efficiency related investments. These positions are with utilities, municipal governments, law firms, renewable energy companies, and implementation firms that specialize in energy efficiency and other demand-side management activities. However, none of the respondents for these professional programs maintain any records of their graduates’ achievements, nor do they know how many of their graduating students stay in California.

Table 6.5 displays 2009 California wage data for these key professional categories. There is substantial competition for entry-level professionals, which affects the ability of demand-side energy management sectors to recruit workers.⁸ Wage data for graduates of multidisciplinary programs is not available as these graduates go on to work in a wide variety of occupations.

Table 6.5 Wage Data for Professional Fields

Occupational Category	Number Employed in CA May 2009	Hourly Wages in 2010 Dollars	
		First 10th Percentile (Entry Level)	Median Wage
Civil Engineer	38,430	\$28.51	\$43.49
Mechanical Engineer	21,420	\$25.62	\$41.53
Electrical Engineer	17,650	\$28.60	\$45.49
Architect	11,260	\$24.82	\$39.04
Construction Manager	20,850	\$32.77	\$49.88

Source: Bureau of Labor Statistics (2010). Occupational Employment Statistics. Retrieved from: <http://www.bls.gov/oes/>.

⁸ Ibid.

6.4 LICENSES AND CERTIFICATION IN THE PROFESSIONAL ENERGY EFFICIENCY WORKFORCE

A bachelor's degree is an entry-level credential in the architecture and engineering fields. Graduates of such programs can move into the workforce directly, or they may choose to pursue additional education in the form of continuing education courses or a graduate degree. An architect or engineer must earn a professional license before moving into a responsible position, in which they can make decisions without the supervision of another licensed professional. In addition, workers with a bachelor's or master's degree in any of these fields may choose to pursue voluntary third-party certifications or additional professional training, in order to provide evidence to employers that their skills and knowledge are up to date. This section describes the steps needed to become a licensed engineer or architect, as well as presenting some key energy-related certifications available to professionals.

6.4.1 ENGINEERS

In order to become a licensed engineer in California, a candidate must take the following steps:

- Earn a degree from an ABET accredited engineering program.
- Pass the Fundamentals in Engineering (F.E.) exam provided by the National Council of Examiners for Engineering and Surveying (NCEES). This test is usually taken around the time of bachelor's degree completion and is offered in all 50 states.
- Meet a work experience requirement. This usually takes four years and is done under the supervision of a Professional Engineer (P.E.). During this time the candidate may be referred to as an Engineer in Training (EIT).
- Pass the P.E. exam provided by NCEES in an appropriate engineering discipline (for instance, Civil Engineering: Construction or Mechanical Engineering: HVAC and refrigeration).
- Register their license with the California Board for Professional Engineers and Land Surveyors.
- Licensed engineers must also renew their license biannually by paying a \$125 renewal fee.⁹ In most states renewal is also contingent upon completing a mandated quota of continuing education courses, although California currently does not have this requirement.¹⁰

A P.E. designation allows an engineer to approve of engineering drawings, be in charge of a private engineering practice, and serve as an expert witness. While a P.E. is not required to work in the engineering field, it is a mark of distinction and it provides professional opportunities because it is sought after in the marketplace and required for some engineering activities.

In addition to professional licensure, professional engineers in the energy efficiency field can pursue certification to enhance their credentials. Two of the primary organizations that offer certification are the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) and the Association of Energy Engineers (AEE). These certifications usually require a P.E. license and two years of relevant experience, or some equivalent combination of education and experience.

⁹ National Council of Examiners for Engineering and Surveying (2010). Licensure for engineers. Retrieved from: http://www.ncees.org/Licensure/Licensure_for_engineers.php.

¹⁰ Professional Associations in California have considered pushing for legislation to change this. See Al-Kazily, J. (2010, July) *Concept Paper for Legislation to Require Continuing Education for Re-licensing as a Professional Engineer*. American Society of Civil Engineers Region 9.

6.4.1.1 AEE CERTIFICATIONS

The most widely-earned certification AEE offers is The Certified Energy Manger (CEM).¹¹ The CEM accounts for about half of all AEE certifications in California and is used by government agencies and energy service companies to distinguish people knowledgeable about energy management. Table 6.6 shows the five AEE certifications with the largest number of certified professionals in California.

Table 6.6 AEE Certifications Relevant to Energy Efficiency

Certification	AEE Description	Certified Professionals in California, December 2010
Certified Energy Manager (CEM)	The CEM is used as a measure of professional accomplishment within the energy management field. It has gained industry-wide use as the standard for qualifying energy professionals both in the United States and abroad. It is recognized by the U.S. Department of Energy, the Office of Federal Energy Management Programs (FEMP), and the U.S. Agency for International Development, as well as by numerous state energy offices, major utilities, corporations and energy service companies.	718
Certified Energy Auditor (CEA)	The CEA certification identifies professionals as having the required knowledge and experience needed to succeed in the field of energy auditing.	100
Green Building Engineer (GBE)	The Green Building Engineer (GBE™) program awards special recognition to those green building, design and construction engineering professionals who have demonstrated a high level of competence and ethical fitness for green building related disciplines, as well as laws governing and affecting green building professionals.	60
Certified Sustainable Development Professional (CSDP)	The designation CSDP identifies individuals who have demonstrated high levels of technical expertise in energy management and environmental practices.	59
Certified Building Commissioning Professional (CBCP)	The CBCP is available to licensed engineers and architects, or facilities management professionals with significant experience in building science. The examination is offered in conjunction with two short-term trainings on commissioning and covers “concepts and experiences basic to the building commissioning process.”	51

Source: Association of Energy Engineers. Certifications. Retrieved from: <https://www.aeecenter.org/i4a/pages/index.cfm?pageID=3330>.

6.4.1.2 ASHRAE

ASHRAE offers five certifications relevant to energy efficiency and related skills. Table 6.7 shows each certification, a brief description of the certification, and how many certified engineers exist in California. The relatively low numbers of ASHRAE certified engineers is due in part to the recent development and specificity of the certifications. Currently, only 52 California-based engineers are certified.

¹¹ Goldman, C., J. Peters, N. Albers, E. Stuart, M. Fuller (2010, March). *Energy Efficiency Services Sector: Workforce Education and Training Needs*. Lawrence Berkeley National Laboratories; Research Into Action, Inc.

Table 6.7 ASHRAE Certifications Relevant to Energy Efficiency

Certification	Description	Certification Start Date	Certified Engineers in California, December 2010
Building Energy Modeling Professional (BEMP)	The purpose of this program is to certify individuals' ability to evaluate, choose, use, calibrate, and interpret the results of energy modeling software when applied to building and systems energy performance and economics and to certify individuals' competence to model new and existing buildings and systems with their full range of physics.	2010	14
Commissioning Process Management Professional (CPMP)	The CPMP is designed to train professionals to oversee and coordinate the whole building commissioning process, by acting as an intermediary between the building owner and commissioning provider.	2009	24
High Performance Building Design Professional (HBDP)	Candidates who earn the HBDP certification will have demonstrated a well-rounded understanding and knowledge of how HVAC&R design is integrated into high performing buildings to achieve the overall goal of producing a sustainable HVAC/R design.	2008	13
Operations & Performance Management Professional (OPMP)	OPMP certification requires demonstration a well-rounded understanding and knowledge of the management of facility operations and maintenance and their impact on HVAC/R systems' performance.	2009	1
Building Energy Assessment Professional (BEAP)	The purpose of this program is to certify individuals' ability to audit and analyze residential, commercial, and industrial buildings including determining project scope, collecting data, analyzing building performance, interpreting results, evaluating alternatives, submitting recommendations for energy conservation measures, and assisting with the implementation of these recommendations.	2011	0

Source: American Society of Heating, Refrigeration and Air Conditioning Engineers. Certification. Retrieved from: <http://www.ashrae.org/certification/>.

6.4.2 ARCHITECTS

Becoming a licensed architect requires the following steps in California:

- Complete eight years of post-secondary education and/or work experience, as evaluated by the California Architects Board (including at least one year of work experience under the direct supervision of an architect licensed in the U.S.).
- Complete the Comprehensive Intern Development Program (CIDP) and the Intern Development Program (IDP). The CIDP and IDP are programs that document a student's experience mastering the field of architecture.

- Pass the Architect Registration Examination (ARE). This national exam tests the candidate's knowledge, skills and ability to design and construct buildings.
- Pass the California Supplemental Examination (CSE). The CSE tests the candidate's knowledge and skills of California-specific building requirements including building codes and standards.¹²

Once licensed by the California Architects Board, an architect must renew their license biannually by completing five hours of continuing education coursework on disability access requirements, completing the renewal application, and paying the \$300 renewal fee. Specific energy efficiency related knowledge is not currently part of the licensure process.

While not required as part of initial licensure, the AIA offers continuing education credits on a variety of topics including the following:

- Building science and performance
- Design and design services
- Legal issues in architecture
- Methods and materials
- Practice
- Project management
- Project types
- Sustainable design

A review of the California Council of the AIA shows only three online courses about energy efficiency.¹³ Other entities such as the Pacific Energy Center in San Francisco also offer energy related continuing education credits for architects but these courses do not appear on the California Council's website and are voluntary on the part of the architect.

6.4.2.1 LEED AP BUILDING DESIGN AND CONSTRUCTION

The most well-known certification relevant to architects in energy efficiency is the LEED Accredited Professional in Building Design and Construction (LEED AP-BDC) offered by the Green Building Certification Institute (GBCI). The LEED AP-BDC is designed for architects and other professionals (including construction managers and engineers) that participate in the design and construction of high performance buildings that can qualify for the United States Green Building Council's (USGBC) LEED rating.¹⁴ Currently, there are 1,321 LEED AP-BDC architects in California registered with GBCI.

6.4.3 CONSTRUCTION MANAGERS

While construction managers do not need a license like architects and engineers, they can attain a certification in the field through the Construction Management Association of America (CMAA). To be certified, one must fulfill the following requirements:

¹² California Architects Board (2011). License Requirements Process. Retrieved from: http://www.cab.ca.gov/candidates/license_requirements.shtml.

¹³ These courses are about CalGreen (Title 24) building code.

¹⁴ Only about half of the LEED rating system pertains to energy use. The other parts of the LEED system pertain to topics such as water conservation and using sustainable building materials.

- Have one of the following combinations of education and experience:
 - Possess an undergraduate or graduate degree in construction management, construction science, architecture, or engineering;
 - Possess an associate's degree or certification in construction management, construction science, architecture, or engineering and four years experience in general design and construction; OR
 - Do not have a degree but have eight years experience in general design or construction; AND
- Have four years experience as a construction manager and complete an application documenting that experience;
- Pay \$275 to take the certification exam.¹⁵

Upon successful completion, the construction manager becomes a Certified Construction Manager. Additionally, the CMAA offers webinars, conferences, and courses. A review of upcoming courses includes a webinar pertinent to LEED projects. As mentioned above, construction managers can also attain LEED AP-BDC certification which demonstrates the manager's knowledge of the LEED rating system.

6.5 EQUITY AND ACCESS IN THE PROFESSIONAL OCCUPATIONS

A small fraction of people entering professional fields such as engineering and architecture will go on to focus on energy efficiency and renewable energy in their careers. Historically, an even smaller number of these professionals will come from underrepresented groups. With data only available for engineering programs, we estimate that African Americans and Latinos make up only about five to six percent (respectively) of all engineers currently employed by utilities, energy efficiency program implementers, and ESCOs nationwide.¹⁶ Previous research shows that demand for engineers in the energy efficiency sector is growing, though again this is tempered by the fact that California has lost about 10 percent of its architect and engineer jobs during the 2008–2010 recession.¹⁷ Over time, the demand for entry-level architects, engineers and other professional will create an opportunity to increase the ranks of underrepresented groups such as African Americans and Latinos in the energy efficiency field.

The Maximizing Engineering Potential (MEP) program at Cal Poly–Pomona is one example of a program designed to increase the diversity of the engineering field. This program, the largest of its kind in California, provides support to underrepresented students who express interest in engineering by offering assistance with class scheduling, orientation courses, summer programs, peer mentoring, and other services. While programs such as MEP do not encourage energy efficiency specifically, they do expand the population of engineers from underrepresented groups. This can indirectly lead to an expansion of underrepresented groups in the professional sector of the energy efficiency field. There are numerous programs of this nature at California's four-year colleges, though many are not specific to one field of study such as engineering. These programs provide critical but limited support, as they cannot address the larger socioeconomic issues that impact the achievement gap and high school dropout rates, the increasing costs of college, and the decline in financial aid that continue to impede broad college access and college success overall for students from disadvantaged communities.

¹⁵ Construction Management Association of America. Certification Process. Retrieved from: <http://www.cmaanet.org/certification-process-0>.

¹⁶ Gibbons, M. (2009). *Engineering by the Numbers*. American Society of Engineering Education. We estimate about 1,250 engineers work in the energy efficiency field as program administrators, implementation contractors, or for ESCOs in California (Goldman, C., et al. 2010).

¹⁷ Goldman, C., M. Fuller, E. Stuart, J. Peters, M. McRae, N. Albers, S. Lutzenhiser, M. Spahic (2010, Sept.) *Energy Efficiency Services Sector: Workforce Size and Expectations for Growth*. Lawrence Berkeley National Laboratories; Research Into Action, Inc.

6.6 CONCLUSIONS

At their core, university programs provide students with foundational knowledge upon which employers in the energy efficiency and renewable energy fields can build upon through on-the-job training. Architecture departments have started to incorporate energy efficiency into their curricula, and construction management programs have recently begun to do the same. Thus far, other than mechanical engineering, engineering departments appear to incorporate energy efficiency topics into the curriculum less frequently. This difference may stem from the fact that as building designers, architects are closer to issues of energy use in buildings. Architecture students also have more opportunities to put their knowledge into practical application.

Construction management programs focus more on business practices, while civil engineering focuses on engineering principles and direct application to construction, rather than to systems. Civil engineering and construction management graduates also go into a range of fields from building roads and bridges to constructing wastewater systems, many of which have not been perceived as related to energy efficiency. Energy efficiency issues are more widely acknowledged as fundamental knowledge for new architects.

Multidisciplinary programs that focus on energy topics are the only programs that prepare students specifically for energy efficiency or renewable energy careers, with Sonoma State's program being the lone undergraduate program in the state. The other multidisciplinary programs teach and train post-baccalaureate students that have a specific interest in energy topics and are predominantly interested in energy careers.

There are only two professional energy efficiency related certifications that have over 100 California professionals associated with them: (1) The CEM for engineers and (2) The LEED AP-BDC for architects, construction managers, and engineers. The other certifications are specific to a small audience of professionals. However, there does appear to be room for integrating energy efficiency topics into the professional licensure process similar to the way disability access coursework is now required of California architects. Similar continuing education courses on energy efficiency topics could be required of professional architects and engineers as part of their biannual licensing or as part of the CMAA construction manager certification process.

Engineering programs graduate relatively small numbers of historically underrepresented groups resulting in small numbers of African American and Hispanic engineers working in California in energy efficiency related fields. However, as these sectors grow there may be an opportunity to provide good paying, professional sector jobs to these historically underrepresented groups.

CHAPTER SEVEN:

7. CERTIFIED APPRENTICESHIP PROGRAMS

7.1 OVERVIEW

Apprenticeship is a long-established “learn-while-you-earn” training model designed to provide industry with a highly skilled workforce. Apprentices usually take five years to complete their training, while working full time for an employer who pays their wages and benefits. Training combines on-the-job experience, under the supervision of a journeyman or skilled tradesperson, with highly technical classroom instruction. In many cases, classroom training is accredited by a local community college partner. The model is distinctive for being demand-driven and self-financing; for having strong partnerships between employers, government, educational institutions, and organized labor; and for providing broad-based occupational training that prepares workers for a life-long career in their trade, with wage increases as they move up the skill ladder. This long-term comprehensive training is tailored to the needs of industry and produces highly skilled workers with a broad occupational foundation. The system also enables workers to earn a number of educational and industry-recognized certificates throughout the course of their training, as well as the state-issued journey card, which is a portable, industry-recognized certification.

Although apprenticeship training dates back centuries, the system was formalized in the United States through the 1937 National Apprenticeship Act. Currently, all certified apprenticeship programs are regulated by the Employment and Training Administration Office of Apprenticeship in the U.S. Department of Labor (DOL), and/or, in California, by the state Division of Apprenticeship Standards (DAS). These agencies establish and enforce apprenticeship standards for wages, hours, working conditions, and the specific skills required for state certification as a journeyman. DAS also consults with program sponsors and monitors programs to ensure high standards for on-the-job training and supplemental classroom instruction through each program’s local educational agency (LEA). This regulatory oversight ensures consistency between programs and holds apprenticeship training to a high standard of quality.

Although a single employer or trade association can sponsor an apprenticeship program under a *Plant Standard*, or *Unilateral Apprenticeship Committee* (UAC), close to 80 percent of apprenticeships in California are sponsored by a collaborative arrangement between an employer association and a labor union, known as a *Joint Apprenticeship Committee* (JAC) or *Joint Apprenticeship and Training Committee* (JATC).¹ In the case of JAC programs, apprenticeships are self-financed through employer–worker contributions into a training trust fund. Among the programs interviewed for this study, employer–worker contributions range from \$0.15 to \$1.75 per hour worked by each journey-level employee. In some cases there are also contributions to the trust fund from apprentice compensation packages. This considerable investment provides financing for the next generation of tradespeople with little public funding. Unilateral and Plant Standard Programs, on the other hand, must collect testing fees and tuition from students or individual employers in order to maintain their programs. All state-registered program sponsors are also eligible for state-provided related supplemental instruction (RSI) funds to offset the cost of classroom instruction. Until recently, the state provided Montoya funds to pay for 20 percent of apprenticeship training, by funding each program’s LEA, but these funds were largely cut in 2010.

¹ California Department of Industrial Relations, Division of Apprenticeship Standards (2010). Program Sponsor Survey Results 2010. Retrieved from: <http://www.dir.ca.gov/das/DASSurveySummary2010.pdf>.

7.2 DESCRIPTION OF PROGRAMS

The DOL Office of Apprenticeship (OA) has a list of over 1,000 apprenticeable occupations, from which apprenticeship programs can be developed. Apprenticeship training can be found in numerous industries including aerospace, automotive, childcare, construction, cosmetology, manufacturing, and utilities.² This report focuses on apprenticeship programs that train for occupations in the energy efficiency and related sectors. These occupations are found primarily in the building trades, including electrical, sheet metal, plumbing and pipefitting, carpentry, and laborers. There are 135 relevant apprenticeship committees in the state of California and we were able to interview a sample of 43 of those committees for this study.

Table 7.1 shows the total number of apprenticeship programs interviewed in each trade and the key occupational tracks that each trade offers. Not all tracks within each trade are relevant to this study, but are listed here to accurately document the occupations trained for by these programs.

Table 7.1 Apprenticeship Programs and Training Tracks

Trade	Committees Interviewed	Occupational Tracks
Carpenter	2	Carpenter, Floorlayer, Cabinet Maker, Acoustical Installer, Plasterer, Terrazzo Worker/Finisher, Furnishing Installer, Shingler, Insulation Installer, Pile Driver, Drywall/Lather, Millwright
Cement Mason	1	Cement Mason
Electrician	12	Inside Wireman, Residential, Intelligent Transportation Systems
HVAC Service Tech & Mechanic	2	HVAC/R Mechanic, HVAC/R Service Technician
Heat and Frost Insulator	1	Heat & Frost Insulator
Laborer	1	Carpenter, Laborer, Equipment Operator
Stationary / Operating Engineer	2	Equipment Operator, Heavy Duty Repair Mechanic, Stationary Engineer
Plumber / Pipefitter / Steamfitter	8	Plumber, Pipefitter, Steamfitter
Roofer / Waterproofer	1	Roofer/Waterproofer
Sheet Metal Worker	7	Sheet Metal Worker—building trades and residential, A/C Service Tech—commercial and residential, Air Balance & Testing—commercial and residential
Sprinkler Fitter	1	Sprinkler Fitter

Although we contacted both JAC and UAC programs, we were only able to obtain interviews with three UACs, representing five apprenticeship programs.³ This includes two plumbers committees, and one program offering tracks for laborers, operating engineers, and carpenters. This insufficient sample makes it difficult to draw conclusions about UAC-sponsored programs, based on the interview data. Therefore, the majority of information provided in this report is specific to the much more numerically significant JAC programs.

Apprentices work under a collective bargaining contract that stipulates working conditions, a graduated wage scale tied to skill increases, the total number of training hours, and the technical competencies that they must master to earn recognition as a journey-level tradesperson. Total training hours vary depending on the trade, but DAS

² An apprenticeable occupation is defined as a skilled occupation that is: 1) customarily learned in a practical way, through a structured, systematic program of on-the-job supervised training; 2) is clearly identified and commonly recognized throughout an industry; 3) involves manual, mechanical or technical skills and knowledge that require a minimum of 2000 hours of on-the-job work experience; and 4) requires related instruction to supplement the on-the-job-training.

³ Fifteen percent of UAC apprenticeship programs and 67 percent of JAC programs contacted agreed to be included in the study.

standards require two to six years of training, with a yearly minimum of 2,000 hours of on-the-job training and 144 hours of RSI. Wages usually start at 40 percent of a journey worker’s wages and increase incrementally every six months, based on training hours and testing. Table 7.2 shows the average number of required on-the-job and classroom (RSI) training hours required by trade, as well as the average starting journey wage for each trade, which is what apprentices can expect to earn immediately upon completion of their training. Most journey tradespeople continue working for the same employer after completing their apprenticeship, and their wages continue to increase along a predetermined pay scale.

Table 7.2 Average Required Training Hours and Starting Wages

Trade	Average Training Hours				Starting Hourly Wages (not including benefits)			
	JAC		UAC		JAC		UAC	
	OTJ	RSI	OTJ	RSI	Apprentice	Journey	Apprentice	Journey
Carpenter	4,386	548	5,000	504	\$16.52	\$32.57	\$16.72	\$37.15
Cement Mason	4,200	432	—	—	\$18.62	\$28.65	—	—
Electrician	6,711	827	—	—	\$16.90	\$37.64	—	—
HVAC Service Tech & Mechanic	9,000	1,080	—	—	\$18.61	\$38.61	—	—
Heat and Frost Insulator	6,000	576	—	—	\$17.35	\$46.11	—	—
Maintenance Mechanic	6,640	640	—	—	\$15.00	\$30.00	—	—
Stationary / Operating Engineer	7,600	477	6,000	504	\$20.58	\$37.16	\$16.72	\$36.83
Plumber / Steamfitter / Pipefitter	7,730	1,080	7,200	688	\$18.86	\$40.54	\$10.63	\$40.00
Roofer / Waterproofor	4,000	400	—	—	\$12.97	\$30.12	—	—
Sheet Metal Worker	5,242	679	—	—	\$14.81	\$40.81	—	—
Laborer	—	—	3,000	336	—	—	\$13.71	\$25.22

Note: Missing data indicated with “—”.

Apprentices are trained through a combination of on-the-job learning and classroom lecture and hands-on lab instruction, which gives workers the ability to immediately apply the theory they are learning in the classroom to their work. Apprentices emerge from training with knowledge of safety and environmental regulations, CPR and first aid, mathematics, drafting, blueprint reading, and other technical skills connected with the trade. In addition, programs often include training related to diversity, sexual harassment issues, personal development, environmental mediation, and job site management.⁴

Upon completion of an apprenticeship program, participants receive a journey card or certificate of completion issued by the State of California or the federal Department of Labor. Throughout their training, apprentices also have the opportunity to earn a number of other industry-recognized certificates.⁵ These certificates indicate mastery of such competencies as safety, equipment operation, welding, and other trade-specific skills. Some certifications are required for completion of the program. For example, sheet metal apprentices are required to pass at least one North American Technician Excellence (NATE) certification in order to earn their journey card.⁶

⁴ California Department of Industrial Relations, Division of Apprenticeship Standards (2011). Minimum Industry Training Criteria. Retrieved from: <http://www.dir.ca.gov/das/mitc.htm>.

⁵ See Appendix H for a more complete listing of the certifications that apprentices can earn in key trades.

⁶ NATE is the nation’s largest non-profit offering independent third-party certification for technicians in the HVAC industry. The organization tests technicians in basic and specialty areas, but does not offer any training. NATE’s certifications are endorsed by most major HVAC industry organizations.

Other certifications are optional, but provide workers with industry-recognized evidence of their advanced skills. Most JACs also offer free journey upgrade trainings to teach specialized skills and introduce workers to new best practices or technologies throughout their career.

7.3 INFORMATION ON OUTCOMES

Because apprenticeship is a pathway into well-paid, middle-skill employment opportunities and the number of training slots is limited, entry into programs is highly competitive. Apprenticeship is demand-driven, with the number of program openings determined by economic projections of industry and employer need. The construction industry has been impacted profoundly by the recent economic recession, to the extent that a number of building trades apprenticeship programs have stopped accepting applications until the economy recovers. As one apprenticeship coordinator stated, “We don’t train if there’s no job.” This system guarantees that apprentices are fully employed while in training, but it means that many programs have long waiting lists.

Table 7.3 shows the annual average number of indentured apprentices in California in each trade between 2006 and 2010. The averages represent the total number of apprentices indentured in a trade in a particular year regardless what year of the apprenticeship they are in. Each indentured apprentice represents an individual who is not only enrolled in training, but also has a full-time job. Peak indentures were approximately 50 percent higher than the averages.

Despite the length and intensity of apprenticeship training, 88 percent of apprentices in the programs sampled successfully complete their training and earn a journey card within three to five years. The right-hand columns of Table 7.3 show the average number of apprentices in each trade that completed the program and obtained their journey card each year between 2005 and 2009.

The comprehensive training and certifications provided through apprenticeship programs have significant value in the marketplace. After completing their apprenticeship, most journey tradespersons continue their employment in large commercial, industrial, or infrastructure construction industries. These sectors are more highly paid and demand greater worker productivity than the residential or small commercial sectors. Net earnings gains for apprenticeship participants are far more than gains for other types of non-university training. A national study estimates that an individual who completes an apprenticeship program can expect to increase their annual earnings by approximately \$16,000, and their lifetime earnings by over \$220,000 by the time they reach 65 years of age.⁷ These earnings differentials continue to increase with additional work experience and journey upgrade training. Over the course of a career this amounts to a significant increase in earning power, as well as a high-road career path with benefits such as health care and a pension. In addition, graduates of apprenticeship programs frequently have the opportunity to continue upgrading their skills through journey upgrade training offered by JACs. These trainings are also paid for through the training trust fund and employers are reimbursed for the time workers spend in the classroom.

⁷ Lerman, R. (2010). “Expanding Apprenticeship in the U.S.” Presentation to the Ray Marshall Center, University of Texas – Austin, October 2010. Retrieved from: <http://www.utexas.edu/research/cshr/pubs/pdf/Robert%20Lerman%20-%20Expanding%20Apprenticeship%20in%20the%20US.pdf>.

Table 7.3 Annual Indentures and Journey Completions from 2005 to 2010, by Trade*

Trade	Average Indentures		Peak Indentures		Journey Completions	
	JAC	UAC	JAC	UAC	JAC	UAC
Carpenter	6,535	277	9,926	407	1,814	59
Cement Mason	139	53	223	63	39	8
Electrician	1,002	546	1,981	1038	884	230
HVAC Service Tech & Mechanic	57		83		32	
Heat and Frost Insulator	82	1	142	5	31	29
Maintenance Mechanic	25		33		12	
Stationary / Operating Engineer	266		627		245	
Plumber / Steamfitter / Pipefitter	1,040	189	1,930	272	490	52
Roofer / Waterproofer	1,247	197	1,902	261	110	20
Sheet Metal Worker	460	55	877	85	311	13
Sprinkler Fitter	87		166		40	
Laborer	1,014		1,581		424	
Total	11,955	1,317	19,471	2,131	4,433	410

* Data obtained from the DAS. Average indentures from 2006-2010, average journey completions from 2005-2009. Peak indentures are the totals from the single year with the highest reported indentures during the five year time period.

7.4 EMPLOYER INVOLVEMENT

Apprenticeship is an employer-driven system. In addition to funding the programs, employers are deeply engaged in the governance of apprenticeship programs at all levels. They serve on joint or unilateral apprenticeship committees, which are responsible for developing and making changes to curricula and determining the application process and number of training slots available each year. Employers also serve on oral interview panels during the application process; hire, train, and evaluate apprentices on the job; and introduce new products, technology, and equipment to the program. In addition, employers are often appointed to serve on State Apprenticeship Councils that establish policies, regulations, and standards for apprenticeship training.

7.5 PARTNERSHIPS

In addition to the collaboration between labor unions and employer associations that form the basis of JACs, apprenticeship programs have developed partnerships with a variety of organizations. These include educational institutions, military and government agencies, community based organizations, and other apprenticeship programs. These partnerships are primarily formed for the purposes of providing or supplementing training for apprentices and prospective applicants, or for the recruitment and support of targeted groups, such as veterans, minorities, or high school students.

7.5.1 EDUCATION AND RECRUITMENT

In order to receive RSI funds, state-certified apprenticeship programs must have a partnership with a LEA. This is usually a community college or an adult education program that provides the classroom portion of the training. The RSI funding goes directly to the LEA and is used to:

- Employ and pay training instructors;
- Approve the curriculum developed by the program sponsor or provide a pre-approved curriculum;
- Schedule classes at the discretion of the program sponsor, based on the needs of apprentices and their employers; and
- Teach classes at the program sponsor's training facility at no cost to them.

The program sponsor pays for the equipment, space, facilities, and materials used for the training. Over the years, the amount of RSI funding provided to LEAs has decreased substantially and program sponsors are now responsible for more of the cost of providing classroom instruction.

The depth of collaboration between apprenticeship programs and their LEAs varies between programs. In the best cases, it is a strategic partnership that proactively seeks external funding opportunities and collaboratively develops pre-apprenticeship and journey upgrade training, while in other cases it is little more than a nominal partnership. In some cases, articulation agreements have been developed allowing apprentices to receive college credit for RSI training hours. Motivated apprentices can build on this training by earning an associate's degree, if they are willing to fulfill the additional general education requirements. Program sponsors have developed these agreements with local colleges and also at the national level through their national training centers, as in the case of the sheet metal and electrician apprenticeship programs.

7.5.1.1 RECRUITMENT

Apprenticeship program sponsors have formal and informal working relationships for the recruitment of applicants with a large number of organizations. These include military organizations, community and faith based organizations, job training organizations, high school and community colleges and One-Stop Centers. In many instances these are long-term working relationships that span many years.

Many veterans learn mechanical, electrical, or construction skills during their tours of duty, which are applicable to the building trades when they return to civilian life. Services, such as Helmets to Hardhats (H2H), run by the Center for Military Recruitment, Assessment and Veterans' Employment, specifically help retired and transitioning active-duty members of the armed forces, and National Guard Reserve to connect with "quality career training and employment opportunities in the construction industry,"⁸ usually apprenticeship and JACs. Joint apprenticeship programs have agreed to directly accept individuals referred by H2H as long as they meet the minimum qualifications.

The United Association of Plumbers, Pipefitters and Sprinkler Fitters (UA) has developed the UA Veterans in Piping (VIP) partnership, which provides returning Marine Corps veterans with 16 weeks of accelerated welding training. Trainees are also guaranteed placement into a job or an apprenticeship program anywhere in the U.S. Efforts are currently being made to expand this partnership to include veterans of the U.S. Navy as well.

For high school graduates who are not interested in attending college, apprenticeship training in the building trades offers a pathway into middle-wage employment. However, many high school students are not familiar with the

⁸ Helmets to Hardhats (2010). Frequently Asked Questions. Retrieved from: <http://info.helmetstohardhats.org/content/faq/>.

options available to them and may not associate construction jobs with renewable energy or green careers. For this reason, apprenticeship program sponsors often partner with local schools to expose students to career options in the building trades. For example, the electrical and sheet metal JACs in San Diego have developed the Renewable Energy Leadership Institute, a two hour class offered to students in three local high schools during the regular school year. The program exposes students to careers in these two trades through both lecture and lab work focusing on the solar photovoltaic (PV) sector. Classes are taught by apprenticeship program instructors and prepare students for entry into apprenticeship programs or further technical training. Three construction charter schools in San Diego have also partnered with apprenticeship programs around curriculum development and recruitment of graduates.

Career fairs are another way that apprenticeship programs get the word out to high school students. State and Regional Apprenticeship Coordinators Associations—partnerships between apprenticeship programs—often work together to sponsor career fairs. For the past six years, the San Joaquin Area Apprenticeship Coordinators Association has partnered with 15 local high schools to promote construction apprenticeship programs to high school junior and seniors, teachers, and career counselors through the Construction Career Fair–Apprenticeship Pathway.

7.6 PIPELINES INTO APPRENTICESHIP

Because apprenticeships lead into living wage jobs, but do not require advanced education, they are often identified as a potential opportunity for building pathways out of poverty for individuals from low-income, minority, or disadvantaged backgrounds. The basic requirements for most apprenticeship programs are that applicants must be over the age of 18, have a high school diploma or equivalent level of education, and have a valid driver's license. However, employers (not the JAC) may also impose additional conditions or requirements that can create barriers for those with a criminal history or other disadvantages. For example, most employers usually require a drug test and, in some cases, a criminal background check. No post-secondary education or trade experience is technically required, but the application process usually involves a written and/or oral examination to determine aptitude, so at the very least, basic math and reading skills are necessary to pass entrance exams. Some trades, particularly electricians, sheet metal workers, plumbers/pipefitters/steamfitters, and other mechanical trades require applicants to have high school level math proficiency. In fact, many of the barriers that prevent people from finding a good job, such as former incarceration or low educational attainment, are also barriers to entering an apprenticeship program.⁹

Many of the apprenticeship coordinators interviewed also point out that apprenticeship is “still the best kept secret” in workforce development. Information about apprenticeship programs is hard to find unless you know what you're looking for. Traditionally this information has been handed down from a tradesman to his son, brother, or nephew, and “word of mouth” is still the predominant method for finding out about apprenticeship programs. Although apprenticeship programs have recently made efforts to recruit women and underrepresented minorities, as of December 2009 only 7.1 percent of active apprentices in the state were women. Although historically minorities have experienced discrimination and been underrepresented in the trades, the proportion of African Americans in apprenticeships in 2009 (6.6 percent) was roughly equivalent to their representation in the workforce as a whole (5.8 percent), and Latinos are slightly overrepresented.¹⁰ However, there are higher percentages of people of color in the lower-paid trades, such as laborers, than in higher paid trades, such as electricians.

⁹ See Chapter 16 for more information on pipelines for disadvantaged workers.

¹⁰ California Department of Industrial Relations, Division of Apprenticeship Standards (2009). *Exhibit 6: DAS Program Statistics 2009*. Statistical Report to the Legislature.

In response to the need for greater preparation in order to be accepted into and successful in an apprenticeship program, pre-apprenticeship programs have been developed to assist interested individuals in improving basic and soft skills while gaining some hands-on experience and familiarity with the skilled trades. Many pre-apprenticeship programs target low-income or minority individuals who may find it difficult to enter an apprenticeship program directly, and help these applicants improve their chances of getting into and succeeding in an apprenticeship program. Most programs of this type also provide outreach efforts and a variety of wrap-around support services.

Pre-apprenticeship programs originate in a variety of institutions, including apprenticeship program sponsors, community-based organizations, and educational institutions, such as community colleges. These organizations are primarily funded through the Workforce Investment Act (WIA) and private foundations. Cypress Mandela, Asian Neighborhood Design, Northern California Construction and Training, Prison Industry Authority, RichmondBUILD, Women In Non-Traditional Employment Roles (WINTER), American River College, and Los Angeles Trade-Technical College are just a few of the organizations that offer pre-apprenticeship training programs in California.

Although unregulated, and varying in quality, the DAS has published a list of ten best practices to guide the development of pre-apprenticeship programs.¹¹ These guidelines indicate the appropriate length, content, and teaching methods for pre-apprenticeship programs, underscoring that it is essential for a successful pre-apprenticeship program to have “an active relationship with apprenticeship programs.” These apprenticeship partners can advise pre-apprenticeship programs on how to best prepare participants for entry into apprenticeships. In some cases apprenticeship programs also have agreements guaranteeing entry to completers of particular pre-apprenticeship programs. However, this is not necessarily the norm. Although many pre-apprenticeships are focused on a single trade, the DAS recommends that programs introduce participants to multiple trades. The National Building Trades Council has recently developed a “Multi-Craft Core Curriculum,” which combines courses common to all trades and provides a general introduction to apprenticeship in the building trades. This curriculum is now being adopted in a number of states in high schools and other pre-apprenticeship programs, although it does not appear to have gained traction yet in California.

One example of a robust pre-apprenticeship program partnership is the Sacramento Region Green Building Pre-Apprenticeship Training Partnership, which is funded by the Sacramento Employment and Training Agency, American River College, Cosumnes River College, International Brotherhood of Electrical Workers–National Electrical Contractors Association (IBEW–NECA) Sacramento Area Electrical Training Center, and the Sacramento Municipal Utility District’s (SMUD) Energy and Technology Center collaborate to provide training that leads to a Certified Green Building Professional credential. The program allows students to explore careers as electricians, plumbers, sheet metal workers, and laborers in green construction, and prepares them for entry into commercial, industrial, and infrastructure construction apprenticeships in the green building industry.

7.7 INCORPORATION OF ENERGY EFFICIENCY AND RELATED SKILLS

The majority of program coordinators indicate that their apprenticeships have been teaching energy efficiency since their inception, to the extent that their training curriculum reflects changes in the industry as regulatory codes change, and new products, technologies, and equipment come into the marketplace. In the case of most JACs, national organizations develop curriculum guidelines based on industry specifications. Joint labor–

¹¹ California Department of Industrial Relations, Division of Apprenticeship Standards. “Best Practices: Preparation for Apprenticeship Training.” Retrieved from: <http://www.dir.ca.gov/das/BP-Pre-Apprenticeship.pdf> and California Employment Development Department, Labor Market Information Division. “EEO Occupational Groups by Race/Ethnicity and Sex.” Retrieved from: [http://www.calmis.ca.gov/file/demoaa/cal\\$EEO.xls](http://www.calmis.ca.gov/file/demoaa/cal$EEO.xls).

management committees adapt these guidelines to the local context in consideration of state and local codes and employer needs. Thus, apprenticeship curricula tend to be up-to-date in terms of regulations and the incorporation of green technologies and best practices that exceed code is driven primarily by employer demand.

When asked how energy efficiency is incorporated into apprenticeship training, most program coordinators indicated that this knowledge is integrated into program offerings, rather than being taught as a specialized skill set. For example, since early in the decade, all electrical apprenticeship programs have provided solar PV training to fifth-year apprentices. In addition, some trades are now applying for DAS approval for green-specific occupational tracks, such as the newly developed Home Performance Laborer Apprenticeship, and the recently approved Carpenters' Weatherization Installer/Technician Apprenticeship program.

In January of 2010 the California Apprenticeship Council (CAC) voted to require all crafts to add green components to their Minimum Industry Training Criteria (MITC).¹² In response, many apprenticeship programs have upgraded their training curricula to include new "green" training material provided through their national training institutes or statewide JACs. Other programs have more explicitly identified the "green" elements of the existing materials currently used in their apprenticeship training. Table 7.4 provides a brief description of the specific ways that key trades have been incorporating energy-efficiency related materials into their training programs.

7.8 CONCLUSIONS

- Apprenticeship is a workforce development model that has been proven to produce positive outcomes for both employers and workers. Training prepares workers to meet industry needs, but also provides them with a solid foundation in a particular trade, which can be built upon throughout their career.
- Apprentices earn industry-recognized certifications, including a journey card, which acknowledge their mastery of a variety of general and trade-specific skills.
- Apprenticeship programs continue to upgrade, refine, and enhance their foundational training based on feedback from employers and instructors. This has allowed the curriculum to develop over time to address the technological and regulatory changes in each industry.
- The main limitation the apprenticeship system encounters, in terms of incorporating energy efficiency practices, is that change must be led by the contractor community. If the contractors in a particular JAC are green innovators, the training programs will respond and integrate those innovations into their programs. However, if the contractors are only building to code, training is also less likely to go beyond this standard. In the case of IBEW-NECA, the statewide labor management partnership has led the way in educating contractors, as well as workers, in green practices. Even when national JACs introduce new curricula, California is often ahead of the nation in terms of using emerging energy technologies and practices, making contractor leadership in the state essential.
- Although the number of apprenticeships is limited by market demand, making the application process extremely selective, a number of pre-apprenticeship programs are making strides toward preparing workers from low-income, minority, and disadvantaged backgrounds to participate in these programs.

¹² California Department of Industrial Relations, Division of Apprenticeship Standards (2011). Minimum Industry Training Criteria. Retrieved from: <http://www.dir.ca.gov/das/mitc.htm>.

Table 7.4 Green Innovation in Building Trades Apprenticeship Programs

Trade	Program Description
Carpenter	The Southwest Carpenters Training Fund has trained eight instructors in the Building Performance Institute (BPI) Technical Standards for the Envelope Professional and Building Analyst Professional and is in the process of becoming a BPI affiliate trainer. A Weatherization Installer/Technician Apprenticeship track has recently been approved by DAS. Additionally they are negotiating with the solar industry to become certified solar installers and getting apprenticeship standards approved to train apprentices in this occupation. The Carpenter's International Union's Green Awareness training manual has been recognized by the U.S. Green Building Council (USGBC) and has been incorporated into the first levels of their apprenticeship training.
Electrician	IBEW-NECA has been particularly proactive in advancing best practices for energy efficiency. Electrical JACs have invested funds from their Labor Management Cooperation Committee (LMCC) to target emerging energy efficiency technologies and help their contractor members understand the new market opportunities. Newly developed training offerings include energy auditing, energy efficiency, solar PV and renewable electricity generation, smart grid infrastructure, and electric vehicle infrastructure. Journey upgrade trainings and contractor trainings are also used to incorporate new knowledge and build capacity to enter new markets. All California IBEW-NECA program sponsors are now participating in the California Advanced Lighting Controls Training Program (CALCTP),* a journey upgrade training funded by the investor-owned utilities (IOUs), the U.S. DOL and the State of California. CALCTP was developed in response to recognized quality installation issues and promises to result in major energy savings.
Plumber/ Pipefitter/ Steamfitter	The UA has developed the UA Green Systems Awareness program, which trains and certifies plumbers, pipefitters, sprinkler fitters, HVACR mechanics, and service technicians in green building education that aligns with the USGBC's Leadership in Energy and Environmental Design (LEED) training. This program has been recognized by the USGBC's Educational Provider Program. The UA Green Systems Awareness program is also being used by several unilateral plumbers committees as a journey worker upgrade training.
Sheet Metal Worker	The Sheet Metal Workers International Association (SMWIA) and the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) have developed a Green Awareness Curriculum that has been incorporated into apprenticeship training in 161 training facilities nationally, since 2009. They also train for a variety of rigorous industry-sponsored certifications including NATE, which incorporates best practice installation techniques for HVAC. The local sheet metal training programs we interviewed also offer training to building inspectors on the latest updates to Title 24, Part 6 of the California Code of Regulations, which sets energy efficiency standards in California's buildings. The northern California sheet metal workers have collaborated with the PG&E Energy Centers to integrate best practice duct sealing into the JAC curriculum.
Stationary/ Operating Engineers	The Northern California Stationary Engineers apprenticeship training has developed a LEED training curriculum in collaboration with the USGBC. This training prepares apprentices to take the examinations for obtaining LEED certification. This curriculum has also been recognized by the USGBC Educational Provider Program, meaning the courses are peer-reviewed and program attendees with an existing LEED certification can use program hours as continuing education credits to maintain their credential.
Construction Laborer	The Laborers' International Union of North America (LiUNA) has developed a residential energy efficiency training program that trains workers in weatherization and home performance. They have partnered with BPI to harmonize training with certification standards and requirements for energy efficiency professionals nationwide. The President's Economic Recovery Advisory Board and the proposed HOME STAR legislation both cite LiUNA's weatherization training as a national standard. The Laborers' Training and Retraining Trust of Southern California has submitted apprenticeship standards to DAS to provide this training to laborer apprentices.

CHAPTER EIGHT:

8. COMMUNITY COLLEGES

8.1 OVERVIEW

The California Community College System is tasked with four main objectives: supporting transfer to four-year colleges, providing basic technical skills education, aiding economic development by responding to labor market needs, and offering continuing education for incumbent workers. Sixty percent of California State University (CSU) and 30 percent of University of California (UC) graduates are community college transfers. Community colleges in California serve a wide variety of populations, ranging from recent high school graduates wishing to obtain first two years of their postsecondary education at a low cost to mid-career professionals coming back to take a few courses to upgrade their skills and knowledge within their field, or to gain skills for a career change.¹

There are 72 Community College districts in California, 112 colleges and more than 2.9 million students enrolled annually. The current budget is over \$6.5 billion.² Unlike other states where there are both technical colleges and comprehensive community colleges, each of the 112 institutions in California is a comprehensive community college that offers both academic preparation for transferring into a four-year university and career education. Roughly 1.4 million of the students are enrolled annually in career technical education (CTE) certificate and degree programs. The State Chancellor is responsible for developing and implementing policy for as well as allocating state funding to the colleges and districts.³ Additionally, each of the 72 community college districts in the state has a locally elected Board of Trustees, responsive to local community needs and charged with guiding operations of the local colleges.

8.2 DESCRIPTION OF PROGRAMS

The community colleges prepare students both for jobs in the building and construction trades, as well as in the professional and managerial occupations. Furthermore, they train for traditional occupations related to energy efficiency, distributed generation, and demand response, as well as having programs specifically targeted at specialized jobs in these sectors. Over 600 community college programs in California fall into one of these categories.⁴ Traditional programs training in energy efficiency related skills include the building and construction

¹ Because of such diversity in student population and a significant number of “returning” and part-time students, “enrollment” in a community college is not always captured based on the completion of a degree or certificate, or the transfer to a four-year institution. This affects the data that community colleges are able to collect. For example, a student may enroll only in one course within a program to update knowledge of changing regulations or new technologies. Other students may attend a degree program and almost achieve the necessary units to earn a degree, but never actually graduate because of a transfer to a four-year institution.

² The colleges are serving roughly 200,000 students for which they are receiving no State remuneration, according to the Office of the Chancellor (about seven percent of the total served). Although the 2010-11 augmentation of \$126 million for growth will fund around 60,000 of these students, \$189 million of the funding has been deferred until fiscal year 2011-12.

³ The State Chancellor is selected by the Board of Governors. The Board members are appointed by the California Governor.

⁴ The majority of these programs are for-credit. Certificate and associate’s degree tracks counted as separate programs. Since (1) there is no uniform standard for where emerging green courses and programs are placed within the State’s Taxonomy of Programs and (2) not-for-credit and non-credit green courses are not captured there, maintaining the current inventory of such programs is a challenge. The Taxonomy of Programs (TOP) is a system of codes used by community colleges at the state level to classify, collect, and report information on credit

trades, environmental sciences, architecture, and engineering. Specialized training programs include “green” construction, wind energy, and solar installation, among others.⁵

We therefore group the programs studied into two categories:

- **TRADITIONAL COMMUNITY COLLEGE PROGRAMS.** These programs provide education and training for so-called traditional occupations where skills and knowledge are relevant to energy efficiency-related industries.
- **EMERGING COMMUNITY COLLEGE PROGRAMS.** These programs provide education and training for so-called new and emerging occupations that are specific to energy efficiency related industries.

8.2.1 TRADITIONAL COMMUNITY COLLEGE PROGRAMS

These programs offer either (1) career preparation certificate and degree tracks, where securing employment is the targeted outcome, (2) transfer tracks aimed at providing students with the first two years of post-secondary education credits for a transfer to a four-year university, (3) apprenticeship tracks, in which colleges act as local educational agencies (LEAs) providing related supplemental (classroom) instruction for union apprenticeship programs, or (4) pre-apprenticeship programs designed to lead into a union apprenticeship. Out of 569 traditional, non-apprenticeship programs identified, the majority (roughly 60 percent) are employment-oriented programs, while the rest (27 percent) are transfer focused. A small number of the employment-oriented programs function as pre-apprenticeships as well. Additionally, 41 apprenticeship programs operate at community colleges in California to prepare skilled labor in a myriad of trades.

Table 8.1 identifies job training clusters of traditional community college programs (excluding apprenticeship programs). We identified these six clusters by grouping individual community college programs with a similar occupational focus.⁶ Table 8.1 also includes information on the number of certificate and associate’s degree programs in each cluster, the number of those programs that we interviewed, the average units required to earn an associate’s degree or certificate, and the total number of degrees and certificates awarded for all programs in each cluster in one year. Note that associate’s degrees and certificates are counted as separate program tracks, because they lead to different employment outcomes. The certificate programs identified include “certificate of achievement” programs that require the completion of at least 18 units and have been approved by the State Chancellor’s Office as well as those called “departmental certificates,” which vary according to the individual college.⁷

The following brief descriptions provide an overview of the training tracks available within each cluster as well as the specific types of programs offered.

programs and courses by college that have similar outcomes. Emerging occupations or unique programs are classified within one code until that occupation is widely enough recognized for its own occupational code.

⁵ Many of the programs that are specialized in new and emerging technology have not yet been approved as certificate or degree tracks, and therefore data on these programs is limited.

⁶ This is an idiosyncratic grouping for Community Colleges that does not match precisely with the occupational groups discussed in Chapter 13.

⁷ Certificates of achievement require at least 18 units of instruction. Similar to associate’s degree, they are developed in coordination with other regional community colleges and approved by the State’s Chancellor’s Office. As accredited institutions, community colleges may also offer “departmental certificates” that require less than 18 units for an award. Both types of certificates are offered in response to local employer needs and therefore recognized by local employers. Most of the certificate programs identified in Table 8.1 are certificate of achievement offerings, with only a few departmental certificate programs.

Table 8.1 Traditional Community College Programs for Energy Efficiency Related Sectors

Occupational Group/ Program Focus	Total Programs	Programs Interviewed	Average Associate Degree Units*	Total # of Degrees Awarded (08-09)**	Average Certificate Units	Total # of Certificates Awarded (08-09)**
Architecture, Architectural Technology, and Architectural Drafting	98	5	31	251	33	195
Engineering Technology and Drafting, including Civil, Mechanical, and Electrical	193	22	32	190	33	316
Engineering, General	69	7	42	208	27	26
Construction Trades (Construction Management, Construction Crafts Technology, Carpentry, Electrical, Public Works, Plumbing, and other)	138	44	30	189	36	546
Environmental Control Technology (HVAC)	71	17	37	46	37	402
Total	569	95	34.4	884	33.2	1,485

Source: California Community Colleges Chancellor's Office.

* Listed in the table are specialty unit requirements. In order to receive an associate's degree, a student will also need to obtain general education units. Total number of units (both specialty and general education) required for an associate's degree is 60. Generally, 1 unit equals 18 hours of instruction.

**The degree and certificate award data for all programs identified, not just for those interviewed.

8.2.1.1 ARCHITECTURE AND ARCHITECTURAL TECHNOLOGY CLUSTER

There are 98 community college programs identified in this cluster, including architecture, architectural technology, architectural drafting, and other architectural design certificate and degree offerings. These programs often provide both vocational and transfer tracks. As a rule, they incorporate an industry-endorsed curriculum of building fundamentals, design, drafting, computer-aided design (CAD), technical research, and model-building coursework. Most certificate programs can be completed within one year and provide enough skills for a graduate to obtain entry-level employment as an architectural drafter or drafting assistant. Students that pursue transfer tracks typically further their education at four-year universities to become architects.

8.2.1.2 ENGINEERING TECHNOLOGY AND DRAFTING CLUSTER

This is a very diverse cluster of community college offerings, with a total of 193 programs that range from general engineering and drafting technology programs to specialized drafting options, including mechanical drafting, civil drafting, and electrical drafting. The majority of these programs have a vocational focus. These programs are normally placed within a CTE division or department. A typical program in this cluster prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in a wide variety of projects and industries. The programs usually include instruction in engineering drawing, 3D modeling, geometric dimensioning, machine shop basics, drafting software (AutoCAD) and other fundamentals of engineering, coupled with some

basic math and physics coursework. Most classes incorporate laboratory exercises and other hands-on components.

8.2.1.3 GENERAL ENGINEERING CLUSTER

Unlike the engineering technology cluster, the general engineering cluster is primarily transfer oriented and is usually offered through academic departments within community colleges, such as math and science departments. With a total of 69 general engineering programs identified in the state, at least one out of two community colleges offers programs in this cluster. Only eight colleges offer a certificate option in these programs, and students rarely choose it. Thus, there were only seven certificates awarded statewide in the 2008–2009 school year. A typical general engineering program is a sequence of theoretical courses aimed at providing students with foundational knowledge in engineering. It normally incorporates coursework in math, applied calculus, general physics, and introductory engineering, including engineering basics, engineering graphics, and an understanding of materials.

8.2.1.4 CONSTRUCTION TRADES CLUSTER

The construction trades cluster includes offerings that range from an overview program in construction crafts to specialized certificate and degree options in electrical, building inspection, carpentry, public works, and plumbing, to transfer-level construction management programs. We identified 138 programs in the construction trade cluster. These programs provide preparation for a wide variety of positions in the construction field as a contractor, supervisor, building inspector, or tradesperson. Some community colleges offer pre-apprenticeship programs, as well, but they are not always clearly identified as such, so it is difficult to determine the exact number of programs. Most courses are geared toward employment, with the exception of the construction management, which provides a transfer option for those seeking four-year degrees. The majority of graduates from these programs leave holding certificates in a specialized trade. However, community college construction programs also attract large numbers of individuals who work in the industry and enroll into a program in order to upgrade their skills and learn about new technologies, practices and regulations. These students are typically less interested in receiving a certificate of completion, and more interested in taking courses in the specific skills they are seeking.

8.2.1.5 HEATING, VENTILATION, AIR CONDITIONING, AND REFRIGERATION (HVAC/R)

This occupational cluster is also known in community colleges as Environmental Controls Technology. There are 71 programs total in the state. Twenty-five colleges offer certificate and/or degree programs in this cluster. As reported in Table 8.1, the programs in this cluster serve a number of students, with 402 certificates awarded in 2008–2009 (only 46 associate's degrees in HVAC/R were awarded that year). Both certificate and degree options are designed for students who wish to obtain employment in heating and air conditioning at a technician level. As a rule, courses offered prepare students for the Environmental Protection Agency (EPA) refrigerants exam, which is required in the industry. The skills taught in a typical program include installation, troubleshooting, repair, equipment maintenance, operation monitoring, operation and control, quality control analysis, as well as critical thinking, and judgment and decision making. Many HVAC/R programs also incorporate renewable energy and energy efficiency knowledge and skill areas. Basics of solar energy (PV and thermal) and energy conservation courses are the most common.

8.2.2 APPRENTICESHIP TRAINING COMMUNITY COLLEGE PROGRAMS

Community colleges work collaboratively with unions to offer classroom instruction for apprenticeship programs. This type of partnership allows apprentices to earn credits for the related supplemental instruction (RSI) courses taken at the community college, which are then applicable toward a certificate or associate's degree. Table 8.2 lists apprenticeship programs related to the scope of this study that work with community colleges for their RSI component. We identified these programs using data available from the community colleges.⁸ The majority of apprenticeship programs offered through community colleges are those for construction trades, such as electrical, carpentry, plumbing, and drywall.⁹

Table 8.2 Some Apprenticeship Programs in Community Colleges

Apprenticeship Track	Community College
Electronics	Chabot College; Imperial Valley College
Utilities	San Diego City College; Santiago Canyon College
Maintenance Mechanics	Santiago Canyon College
HVAC	Chabot College; College of San Mateo
Operating Engineer	Bakersfield College; Rio Hondo College; Santiago Canyon College
Carpentry	American River College; Bakersfield College; Chabot College; Gavilan Hills College; Palomar College; Rio Hondo College; Santiago Canyon College
Electrical	Allan Hancock College; American River College; Bakersfield College; Chabot College; Hartnell College; Palomar College
Plumbing	Allan Hancock College; Bakersfield College; Chabot College; Foothill College; Rio Hondo College; College of San Mateo
Glazing	San Jose City College
Drywall	American River College; Chabot College; Palomar College; Santiago Canyon College
Roofing	Chabot College
Sheet Metal	American River College; Bakersfield College; Chabot College; Foothill College; Palomar College
Solar Turbines	San Diego City College

Source: California Community Colleges Chancellor's Office.

8.2.3 EMERGING GREEN COMMUNITY COLLEGE PROGRAMS

In general, community college programs that are training for specific new and emerging occupations in the energy efficiency and related sectors are clustered around the following topic areas:

- **GREEN BUILDING AND CONSTRUCTION:** focuses on architectural design and construction of "green" and energy efficient buildings.
- **ENERGY SYSTEMS TECHNOLOGY/RENEWABLE ENERGY:** solar energy is the most common area of specialization, followed by wind energy.

⁸ This list cannot be considered complete because community colleges do not consistently report the data about their apprenticeship programs.

⁹ For more information on apprenticeship programs in California see Chapter 7 of this report.

- **ENERGY EFFICIENCY:** includes energy auditing, smart meters, building controls technology, and energy regulation.
- **OTHER ENVIRONMENTAL TECHNOLOGY AND GENERAL SUSTAINABILITY:** includes some combination of the above three areas or other related topics.

These emerging programs offer both certificate and associate's degree options. They are designed to prepare students for joining the renewable energy or energy efficiency workforce as technicians, energy specialists, installers or other entry-level occupations. In some cases, these programs also prepare students for industry-recognized, third-party certification. Some of the third-party certifications mentioned include:

- North American Board of Certified Energy Practitioners (NABCEP) for solar PV and solar thermal
- EPA Certification for building trades
- Building Performance Institute (BPI) Certifications
- Home Energy Rating System (HERS) Certification
- Partnership for Air-Conditioning, Heating, Refrigeration Accreditation (PAHRA) Certificate
- Drafting Essential Skills Certificate

Table 8.3 features information about four clusters of new community college programs. It outlines the number of certificate and associate's degree programs identified, the number of programs covered by interviews, the average units required to earn certificates or associate's degrees, and the total number of awards for all certificate and degree programs in the 2008–09 academic year.

Table 8.3 New / Emerging Community College Programs Specific to Energy Efficiency Sectors

Occupational Group / Program Focus	Total Programs*	Programs Interviewed	Total # of Degrees Awarded (08-09)	Total # of Certificates Awarded (08-09)
Green Building and Construction Technology	9	0	0	0
Energy Systems Technology / Renewable Energy	9	3	0	0
Energy Efficiency	16	2	3	8
Other Environmental Technology / Sustainability	2	0	0	0
Total	36	5	3	8

Source: California Community Colleges Chancellor's Office.

*The programs identified include many that are under development. These programs do not have degree/certificate awards data. Therefore, the completion data for each occupational track might seem small compared to the number of programs.

Additionally, because many programs are also in their first or second year of operation, completion data for the 2008–09 year are not available in all cases. Note that the energy systems technology/renewable energy cluster is not limited to distributed generation programs and includes some utility-scale energy training offerings. This is primarily due to the fact that community colleges rarely distinguish between utility-scale and distributed generation renewables in their curricula, and prefer teaching both. For example, wind energy programs generally cover both utility-scale and small wind in order to provide students with a broader array of employment options upon graduation.

8.3 INFORMATION ON OUTCOMES

A total of 1,493 certificates and 887 associate's degrees were awarded to students of the identified community college programs in the 2008–2009 school year. Of the 1,493 certificates, all but eight were for traditional programs (versus emerging programs). Of the 887 associate's degrees, only 3 were awarded in emerging programs.

As shown in Table 8.1, the most certificates awarded were in construction trades programs, followed by environmental controls technology (HVAC/R). The architecture and architectural technology cluster was the leading program in the number of associate's degrees awarded statewide. General engineering was the second largest. This is hardly surprising considering that a large part of the student body in these two programs is comprised of transfer-oriented individuals who are more likely to finish credits necessary for an associate's degree than career and technical education students.

Although the number of certificates and degrees awarded in emerging programs is very small, these data do not accurately reflect the total number of individuals that community colleges train for the occupations covered by these clusters. More specifically, the certificate and degree data capture neither the incumbent workers, who enroll to upgrade or maintain specific skills and are not interested in receiving a certificate or degree, nor the students who pursue the transfer track and transfer to a four-year program before receiving an associate's degree.

Many of the programs in the emerging area that are preparing students for specific energy-efficiency and renewable energy careers do not yet have data on completion rates, as many of them have been created and approved in the last two years. For the 2008–2009 year, only eight certificates and three degrees were awarded to students in the emerging clusters (see Table 8.3). However, enrollment in these programs has grown exponentially in the last two years. This growth is due to the recent availability of American Recovery and Reinvestment Act (ARRA) funding and general interest among community colleges in green and clean technology training, rather than as a clear result of increased demand for a “green” labor pool.

8.4 EMPLOYER INVOLVEMENT

In interviews, program administrators reported that programs have strong links with employers and that partnerships between colleges and employers have been instrumental in many aspects of program planning and delivery, and connecting students to jobs. However, this information is difficult to verify and quantify. Because community colleges do not track job placement, we cannot assess how successful these programs are at helping their graduates get jobs, what the average wage levels of graduates are, or other key outcomes.

The areas of reported industry involvement range from employer participation on formal industry advisory boards to equipment donations and curriculum upgrades. Based on our interviews, the following are the most common ways in which colleges utilize their partnerships with employers:

ADVISORY BOARDS: All college CTE programs included in the survey reported utilizing the expertise and resources of advisory boards made up of industry experts. However, the level of engagement between college programs and those industry partners varies widely. Some program administrators convene advisory boards only once or twice a year, while others regularly involve their board members in field trips, curriculum development, class lectures, procurement of equipment, and other activities. Eighty-seven percent of programs interviewed reported involving employers as advisory board members. Generally, the 13 percent that do not have advisory boards are the transfer-oriented programs.

CURRICULUM DEVELOPMENT AND UPGRADE: About 70 percent of community college programs interviewed consulted employers for curriculum development and upgrading. Colleges that offer energy efficiency and renewable energy programs often work with industry associations to stay current with technology changes and new knowledge and skills requirements. Specifically, such industry groups as the American Wind Energy Association and the Solar Energy Industries Association were mentioned as partners that contribute to the curriculum development needs of certain college programs.

INSTRUCTORS FROM THE INDUSTRY: The majority of CTE programs at community colleges are taught by industry professionals. These instructors are employed in the industry and teach classes part-time. This is beneficial to the programs, as these instructors infuse industry perspective into the classroom, keep their courses up-to-date with the latest technology, and sometimes even offer employment to some students.

WORK EXPERIENCE AND JOB PLACEMENT: Partnering with local businesses to provide work experience for students is another way of engaging employers. However, these efforts are typically sporadic and not well coordinated. Colleges do not have resources dedicated to these functions, and are not charged with the task of securing or supporting students' job placement. In place of formal job placement services, instructors utilize relationships with local businesses to make students aware of potential jobs in the field. For example, an administrator from Palomar College reported that "if a firm/business requests an intern, the position is announced in class." The instructors of the Drafting/CAD program at San Barbara Community College provide job leads to students, as do some of the other programs that were interviewed.

8.5 PARTNERSHIPS

Community colleges often link their offerings and services to other important actors in the workforce training and education arena, including local businesses, workforce investment boards, community-based organizations, four-year universities, other community colleges, and middle and high schools. Some of the areas for which community colleges partner with other institutions include:

TRAINING DELIVERY: Almost one-third of all college programs reported partnerships with other organizations on training. In most cases, partnering organizations are other community colleges and universities. The ability to offer cross-training with other educational institutions can expand the course offerings without additional funding or new program development. Some community colleges are also expanding their reach to K-12 education by offering training for high school students and teachers. Training partnerships also materialize through collaborative efforts with local Workforce Investment Boards (WIBs) and non-profit organizations, with the college acting as the training partner.

STUDENT RECRUITMENT: Colleges utilize a variety of local partners to recruit students, including local high schools, WIBs, One-Stop Centers, and industry organizations. Recruitment, however, has been a low priority for the colleges recently, as most programs have far more applicants than their resources can support.

FUNDING: Over 25 percent of colleges interviewed reported partnership around funding. The majority of such partnerships are driven by state or federal grant projects that often require collaboration with other local agencies in delivering training, recruiting participants, developing curriculum, and providing case management. However, some colleges also reported receiving funding from foundations to support student achievement through scholarships.

JOB PLACEMENT: The most prominent placement partnerships involve WIBs, One-Stop Centers, businesses, industry associations, and local workforce agencies. One in five college programs is connecting with these organizations for post-training job placement.

ARTICULATION AGREEMENTS: Articulation agreements are a formalized way to allow student to receive college credit for high school courses taken and/or university credit for community college units completed. These agreements are critical in providing students with an opportunity to follow educational pathways from high school to an advanced degree. Most common articulation agreements that community colleges have are with (1) local high school CTE programs, and (2) local four-year educational institutions, primarily those that belong to CSU and UC systems.

SUPPORT SERVICES: Most community colleges offer some supportive services, such as extended opportunity programs and services (EOPS),¹⁰ childcare, and financial aid in addition to instruction, but there is no coordinated case management unless those services are through a third-party arrangement such as a WIB. The ability of students to access such services is highly reliant on the knowledge and outreach efforts of instructors and counselors. The most frequently reported form of supportive services offered was access to self-directed job search resources including up-to-date job postings on bulletin boards, access to college-wide career centers, announcements of employment opportunities in class, and assistance with computerized searches. Over 70 percent of programs interviewed indicate that they provide these types of basic job search services.

8.6 INCORPORATION OF ENERGY EFFICIENCY AND RELATED SKILLS

Among the traditional and the emerging training programs related to energy efficiency, distributed generation and demand response, community colleges are integrating new “green” skills into their training in one of three ways:

- **ADAPTING EXISTING CERTIFICATE/DEGREE PROGRAMS** to incorporate “green” components. Nearly every community college in the state has been incorporating green skills into an array of existing job training programs including construction, skilled trades, environmental sciences, engineering, and architecture. This may include improved practices or new technologies, and/or updating the curriculum so that it teaches to the standards set by state building code for energy efficiency.
- **DEVELOPING NEW CERTIFICATE/DEGREE PROGRAMS** that prepare students for specific “green” careers. Training programs have already been developed in energy efficiency, wind energy, and solar installation, among others. Many programs are aligning their curricula with industry certification requirements, such as NABCEP certification for solar.
- **OFFERING NON-CREDIT, SHORT-TERM WORKFORCE TRAINING** in energy efficiency and renewable energy topics. Many colleges have received funding from ARRA to provide training for displaced workers in new green careers. These types of programs are often driven by funding opportunities and are short term in nature.

Almost all of the 63 programs interviewed (about 94 percent) reported that they have integrated energy efficiency into their programs in some way. Most college programs (63 percent) incorporate energy efficiency throughout their existing courses in traditional engineering, architecture, construction, and other skilled trades programs,

¹⁰ EOPS program is designed to increase academic success of students from disadvantaged populations. It usually involves a mutual responsibility contract that generally states that students receive such assistance as textbooks, tutoring, counseling, and other in exchange for commitment to pursue their education.

while a few of them (14 percent) provide energy efficiency education as a separate module of instruction. Due to the budget cut backs in the 2008–09 and 2009–10 years, it has been difficult for community colleges to develop and launch entirely new programs. Additionally, most instructors in the programs interviewed are part-time faculty. This presents a challenge as the development of new curricula is typically initiated and led by faculty members. Part-time faculty often do not have hours devoted to these functions.

Developing new, stand-alone programs that self-identify as specific to energy efficiency related jobs may seem like the most obvious way of tracking and promoting training in these skills. However, our research indicates that this is not necessarily most effective approach, and in some cases may be counterproductive for putting these skills into practice. Indeed, several interviewees expressed concern that community colleges and other training organizations may be focusing too narrowly on renewable energy, because of the apparent “hype” and excitement surrounding these sectors. Others noted that graduates of specific training programs lacking foundational knowledge of the field may have difficulty finding employment, while those with a traditional occupational background will likely be more successful, especially if they have supplemental skills related to energy efficiency.

8.7 CONCLUSIONS

Community colleges have several different roles within the state’s system of workforce training and education, including preparing students for entry-level jobs, providing experienced workers with opportunities to improve their skills in their existing profession or in a new profession, and preparing students to enter four-year degree programs in engineering and other technical disciplines like architecture and construction management.

Unfortunately, most colleges do not emphasize employment outcomes as program success metrics, and therefore there is little data on job placement, wages, and career pathways for community college students. Existing data on certificate and degree completion do not reflect the scope of how students use community college services to advance in their careers, and data on students’ labor market outcomes are lacking as well.

Community colleges train for energy efficiency and related skills both with specialized training for new/emerging occupations, and by integrating new or upgraded skills into traditional curriculum. State budget cuts to community colleges have adversely affected the schools’ ability to develop curricula, particularly in the areas of emerging technologies and new occupations. However, integrating coursework on energy efficiency and related skills into traditional programs, rather than launching entirely new programs, may be a more effective way of preparing students for “green” work and meeting the changing needs of the labor market.

There are many examples of partnerships between community colleges and employers or other training organizations to provide curriculum development, support services, and job placement, although these are frequently idiosyncratic. Articulation agreements with high schools and four-year colleges, and partnerships with apprenticeships on RSI represent good models for how to systematize relationships to build career pathways. While some pre-apprenticeships exist at community colleges, this type of partnership has potential for expansion.

CHAPTER NINE:

9. PRIVATE TRAINING PROGRAMS

9.1 OVERVIEW

Private training providers are a highly heterogeneous group of programs that consists of both for-profit and non-profit organizations. The non-profit training providers that we have included in this category (instead of in the community-based training provider category) are closely associated with private industry, usually a trade association. We identified 55 unique private for-profit and non-profit organizations with one or more training locations in California. Each organization offers at least one energy efficiency or renewable energy training course or course series.¹ We interviewed 15 of these programs, which altogether offer 60 separate courses or series of courses in energy efficiency and renewable energy. This heterogeneity of the programs means that our sample is unlikely to be representative of the whole category. However, there are several broad ways of grouping these programs to examine trends in the training that they do and do not offer.

9.2 DESCRIPTION OF PROGRAMS

Private training providers prepare people to become energy raters, building analysts, weatherization technicians, solar panel installers, heating, ventilation, and air conditioning (HVAC) technicians, or similar professionals. All organizations claim to prepare students for careers or to enhance their existing careers in the energy efficiency, renewable energy, or the building trades. In most cases they provide training relevant to multiple occupations. Table 9.1 describes the organizations we interviewed and lists key occupations that they train for.

The private training programs we identified are mostly short term and target specific levels in a career pathway. Most of the programs offer short-term, basic job skills training for entry-level positions. This category of training may also include some soft skills or work readiness training, however this is less common than in community based organizations (see Chapter 10 on CBOs). Typically these programs are completed in less than a year, and are often only a few days in length. This is the most common training type in our sample.

Many of the programs provide incumbent worker technical skills upgrade, which is typically short-term training designed to help skilled workers advance their knowledge and keep abreast of new technological developments. These trainings may be optional for career advancement, or required for licensure renewal or particular kinds of jobs.

Only one of the programs we interviewed provided intermediate technical training, which prepares workers for jobs as entry-level skilled technicians. This program trains HVAC mechanics and installers, and is a six-month program providing a basic foundation in a skilled trade. This is much longer than the majority of private training programs.

¹ Note that this is a narrower definition than we used in searching for other types of programs. Specific courses in energy efficiency or renewable energy were only necessary criteria for inclusion in the case of private programs. Therefore, we do not fully capture the scope of private training programs that train for occupations related (but not specific) to energy efficiency and renewable energy.

Private training programs as a whole are not regulated by any central body. The widely variant program types within this group are a result of this; there is little accountability among these programs other than their ability to continue to attract new students.

Table 9.1 Description of Interviewed Organizations

Organization	Began	Training Type	Key Occupations
Advanced Vocational Institute (AVI)	2009	Entry Level	Energy Auditors, Insulation Workers, Cost Estimators, Construction Laborers, Solar Photovoltaic (PV) Installers, Construction And Building Inspectors
Airstreams Renewables	2003	Entry Level	Wind Turbine Service Technicians
California Building Performance Contractors Association (CBPCA)	2002	Entry Level Incumbent Worker	Construction Managers, Cost Estimators, Energy Auditors
California Home Energy Efficiency Rating Services (CHEERS)	1995	Entry Level Incumbent Worker	Construction Managers, Cost Estimators, Energy Auditors
Clean Edison	2008	Entry Level Incumbent Worker	Architects, Construction Managers, Cost Estimators, Energy Auditors, Insulation Workers, Carpenters, Electricians
Community Business College (CBC)	2004	Entry Level	HVAC/R Mechanics And Installers, Solar PV Installers, Electricians
Construction Craft Training (CCT)	2010	Entry Level	Solar PV Installers, Electricians
Everblue Energy	2007	Entry Level Incumbent Worker	Architects, Construction Managers, Cost Estimators, Energy Auditors, Insulation Workers, Carpenters, Electricians
Green Career Institute (GCI)	2008	Entry Level	Solar PV Installers, Electricians
National Association of Home Builders (NAHB)	2007	Incumbent Worker	Construction Managers, Cost Estimators, Carpenters
National Association of the Remodeling Industry (NARI)	2007	Incumbent Worker	Construction Managers, Cost Estimators, Carpenters
Refrigeration Services Engineering Society (RSES) – CARSES (Southern California Association of RSES members)	Unknown	Incumbent Worker	HVAC/R Mechanics And Installers
Specialty HVAC Products Institute	2000	Intermediate Technical Training	HVAC/R Mechanics And Installers
Train to Sustain Los Angeles (TSLA)	2010	Entry Level	Energy Auditors, Insulation Workers, Cost Estimators, Construction Laborers, Solar PV Installers, Construction And Building Inspectors
United States Green Building Council (USGBC) – Northern California Chapter	2005	Incumbent Worker	Architects, Construction Managers, Cost Estimators, Energy Auditors, Civil Engineers

As indicated in Table 9.1, most of the organizations we interviewed started offering training after 2002, with two-thirds starting their programs after 2007. All but one program formed in the past decade. The relative youth of these programs can be attributed to the recent increase in public spending to support energy efficiency related sectors. Utility incentive programs and statewide energy efficiency policies have been expanding since 2002, and the passage of the federal American Recovery and Reinvestment Act (ARRA) in 2009 has further stimulated the demand for training.

9.3 CERTIFICATIONS

Most of the training courses and series we identified are structured to prepare students for examinations for skill certifications in the building and/or energy efficiency industries.² While the pursuit of certification is often a reason for attending training, the level of industry recognition of these credentials varies. Some of the training organizations we spoke with are accredited by the most highly recognized energy efficiency and renewable energy third party certification organizations, while others lead to less recognized certifications or are merely associated with an internal certificate or exam process, which is not accredited by a third party. The organizations that accredit training programs in our sample include:

- Certifying organizations focused specifically on “green” industries, such as residential energy efficiency and solar. These include:
 - BUILDING PERFORMANCE INSTITUTE (BPI)
 - RESIDENTIAL ENERGY SERVICES NETWORK (RESNET)
 - NORTH AMERICAN BOARD OF CERTIFIED ENERGY PROFESSIONALS (NABCEP)
 - LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

- Certifying organizations that focus on traditional trades, such as HVAC, but have added energy efficiency to their curricula, to provide third party certification for energy efficiency and renewable energy occupations.³ Such organizations include:
 - NORTH AMERICAN TECHNICIAN EXCELLENCE (NATE)
 - REFRIGERATION SERVICES ENGINEERS SOCIETY (RSES)

Not all the training organizations in our sample offer preparation for these recognized industry certifications, nor are all that offer training for a particular exam accredited by the certifying organization. For some skills and occupations, no certification currently exists. For instance, NABCEP is currently working on a curriculum and certification for small wind, but until that is completed there is no national certification for the small wind sector. Table 9.2 displays the certifications targeted by the organizations we interviewed and whether the organization is accredited to offer these courses.

9.4 INFORMATION ON OUTCOMES

Each of the private organizations identified in this study prepares students for an occupation or provides new skills for someone in a related occupation, presumably in hopes that this training will increase their earnings potential. However, only a few respondents were able to report on the starting wages of individuals completing these training programs. Table 9.3 shows the estimated starting wages for the four occupations for which contacts provided wage estimates.

² Requiring third-party certification is considered a best practice in order to maintain neutrality between the training efforts and the certification efforts. See Chapter 5.

³ See Chapters 5 and 13 for a more complete discussion of certifications and accreditation.

Table 9.2 Certifications Offered by Private Training Organizations

Organization	Total Certifications	Certification Types	National Accreditation
Advanced Vocational Institute (AVI)	11	BPI, RESNET, Solar, Wind, Energy Efficiency	
Airstreams Renewables	1	Wind	X
California Building Performance Contractors Association (CBPCA)	2	BPI, RESNET	X
California Home Energy Efficiency Rating Services (CHEERS)	7	BPI, RESNET, Solar, Wind	X
Clean Edison	12	BPI, LEED, Solar	X
Community Business College (CBC)	3	EPA, Solar	
Construction Craft Training (CCT)	2	Solar, Wind	
Everblue Energy	10	BPI, RESNET, LEED	X
Green Career Institute (GCI)	4	Solar, Energy Efficiency	
National Association of Home Builders (NAHB)	3	Energy Efficiency	
National Association of the Remodeling Industry (NARI)	1	Energy Efficiency	
Refrigeration Services Engineering Society (RSES) – CARSES (Southern California Association of RSES members)	1	Energy Efficiency	X
Specialty HVAC Products Institute	1	EPA	
Train to Sustain Los Angeles (TSLA)	2	BPI, LEED	X
United States Green Buildings Council (USGBC) – Northern California Chapter	2	LEED	X

Table 9.3 Estimated Starting Hourly Wage, 2010

Occupation	Career Pathways Level	Estimated Starting Wage
Auditor / Performance Analyst (n=2)	Incumbent Worker	\$20.00
Heating Ventilation and Air Conditioning Technician (n=3)	Entry Level	\$15.00
Solar Photovoltaic Installer (n=5)	Entry Level	\$18.00
Wind Turbine Technician (n=2)	Entry Level	\$20.00

9.4.1 ENTRY-LEVEL OCCUPATIONAL TRAININGS

The entry level training programs interviewed run from one to 60 days in length and cost students from \$345 to \$10,000 per class, with the majority of programs costing students \$1,200 or more for less than one week of training. Based on average course sizes and the average number of courses offered, we estimate that these organizations will train approximately 3,000 people in 2010.

The majority of organizations providing entry-level training began within the past decade. These organizations report that they have recently started up or expanded training in response to what they perceive as an increased demand for this type of training. All these organizations report that they are able to quickly scale up or down to meet demand for courses. If training courses fill up quickly, they offer that same training again to meet demand. If they offer a course that does not meet the minimum number of enrollments, they cancel the course or combine it with another course offering. This demand is generated by *students* who pay for the training programs, rather than by employers who are trying to fill jobs. In most cases, decisions to offer particular courses are not based on consultation with employers or labor market research.

The California Employment Development Department (EDD) lists only six out of all entry-level private training organizations as eligible providers for WIA individual training accounts. This means students of these six organizations can qualify to use Workforce Investment Act (WIB) Title I-B funds to pay for all or some of the training costs. Additionally, all these organizations report offering some assistance to students looking for a job by offering online job resources, mock interview assistance, and/or resume review. However, agencies were able to provide data on neither the number of graduates who earned industry recognized certifications nor on those who found job placements upon completion of the training programs.

In summary:

- Private organizations that provide entry-level training are relatively new organizations.
- These organizations are capitalizing on a perceived market opportunity to provide training for energy efficiency and renewable energy professionals.
- They can quickly scale up or down to meet student demand, but do not calibrate their training slots to the number of job openings.
- They are publicly subsidized to the extent that their students tap into WIA funded individual training accounts.

9.4.2 INTERMEDIATE TECHNICAL TRAINING

The Specialty HVAC Products Institute training is the only privately-run, intermediate-level training program we interviewed. This program provides 6 months of training at a tuition cost of \$6,000 and trains about 40 students per year. The training does not lead towards a specific energy efficiency certification, but instead provides foundational knowledge to enter the residential and light commercial HVAC sector. Students of this program also take the Environmental Protection Agency (EPA)–Section 608 certification exam, which certifies students to responsibly handle refrigerants. This certification is required for most HVAC technicians.

Students are required to pay all fees, but WIB money is available for students that qualify. Students that attend with WIB funds also receive a caseworker and job search resources. All students, including those that attend using their own funds, can receive informal job search assistance such as alerts from school staff that are aware of job openings, or more formal assistance such as mock interviews.

The limited number of private programs providing intermediate-level training hindered our ability to draw generalizations about this type of training. However, the program we interviewed provides a relatively basic level of occupational training at a relatively high cost when compared with community college or apprenticeship programs in the same field.

9.4.3 INCUMBENT WORKER TECHNICAL SKILLS UPGRADE

Organizations in this category offer training to upgrade the skills of workers currently employed in the building and construction trades. For the organizations interviewed an estimated 1,000 to 1,600 workers have attended this type of training in the past year. These trainings are usually very short term, lasting between one and twelve days, and focus on a particular skill or certification. For example, CHEERS is authorized by the California Energy Commission to offer Home Energy Rating System (HERS) training and certification for California and targets professionals who want to focus their career on rating and assessment services consistent with Title 24. A number of organizations that specialize in energy efficiency training for entry-level workers, such as CBPCA, Everblue, and Clean Edison, also offer training targeting incumbent workers who want to achieve BPI certification.

Many incumbent worker trainings are offered by trade associations or other non-profit industry organizations. For example, RSES is a national organization that offers training to members on a variety of HVAC/R-related topics, including training that can help prepare a professional for NATE certification. Similarly, the national NAHB and NARI trade associations offer “green” training designed to help existing construction professionals learn how to make buildings more efficient and use sustainable materials. The Northern California Chapter also offers LEED training for professionals in the building field who are interested in distinguishing themselves as experts on “green” building.

Unlike the entry-level training programs we spoke with, energy efficiency and renewable energy are only one of a broader set of topics in the trainings offered by trade associations for their members. RSES trains people in quality installation of HVACR products and prepares people to sit for NATE certification. In 2010, there is one NATE Knowledge Area of Expertise certification specific to efficiency, the NATE Senior Efficiency Analyst, with only 52 people in the United States certified. None of the sites we interviewed currently offers training specific to this certification. Similarly, the NAHB, NARI, and USGBC trainings cover efficiency practice, but they also cover topics such as sustainable materials and relevant energy policies.

In summary:

- Incumbent worker training is readily available, is usually short term, and is geared towards certifications.
- Traditional construction contractor trade associations offer some limited energy efficiency training for their incumbent workers, but this has reached a limited number of workers.
- Tracking of graduation and certification is poor for these organizations.
- Assistance with career growth is poor or non-existent with most of these organizations.

9.5 CONCLUSIONS

In the last decade and, in particular, within the last three years there appears to have been a steady growth in the number of organizations offering entry-level and incumbent worker energy efficiency and renewable energy training. This growth appears to be driven by government energy efficiency investment policies such as ratepayer-funded programs, ARRA, and similar policy initiatives. However, there is a lack of measurement of worker

outcomes based on this training. Most of the programs we spoke with were unable to tell us if the training had resulted in workers getting jobs or increasing their wages.

Private programs are typically costly for students, and the value of the training for workers in the labor market is not consistent. Some programs do train for industry-recognized certifications, but many do not. In general, these programs are un-standardized and unregulated and, therefore, vary widely in terms of quality and overall benefit to students. For trainees attempting to get entry-level job training but who have little knowledge of the job market, these programs are risky because they are expensive and their value for jobs seekers is very difficult to verify.

It is not clear that trade associations or other traditional programs providing intermediate technical and incumbent worker training are successfully informing their students about energy efficiency and renewable energy. The organizations appear to understand that there is an emerging market in energy efficiency and “green” building and have begun offering specialty certifications, but uptake of these courses and certifications appears to be small. Furthermore, it is not clear how important energy efficiency training is considered to be within technical trades training.

While there are a great number of private organizations providing entry-level energy efficiency and/or renewable energy specific training, there is very little to prepare workers with a longer-term occupational foundation leading to marketable technical skills. Currently, the emphasis appears to be on attracting new people to energy efficiency specific careers such as energy auditors, rather than training HVAC installers to emphasize efficiency into their work. Ultimately, in order to realize large energy savings, energy efficiency training must be incorporated into the standard operating procedures of builders, HVAC installers, and other trades professionals.

Finally, while third-party certification is present in this market place, it is still nascent and is thus having a limited effect on training differentiation and quality assurance. Clearer requirements from policymakers regarding third party certification and training accreditation would enhance training quality.

CHAPTER TEN:

10. COMMUNITY-BASED ORGANIZATIONS

10.1 OVERVIEW

Most community-based training organizations (CBO) provide pre-employment or pre-apprenticeship training, and serve disadvantaged populations with limited occupational skills and work experience. For the most part, CBOs run the only training programs that exclusively target low-income, minority, and disadvantaged job seekers and low-wage workers. Typically, over 75 percent of participants are people of color, most being Latino or African American. These programs represent the front end of the career pipeline, enabling participants to achieve work readiness through acquisition of the “soft” and “basic” skills needed to successfully enter employment or the next level of education or training.¹ Pre-employment and pre-apprenticeship programs typically integrate both work readiness and occupational skills training into their curricula, while also providing a range of support services for participants, such as child care and flexible scheduling. Over two thirds of the CBOs we interviewed offer either entry-level pre-employment or pre-apprenticeship programs. Most of these programs are very short term.

Incumbent worker training for low-wage workers makes up a much smaller proportion of CBO programs. Approximately 20 percent of the programs interviewed offer training to workers who are already employed, and most of these also offer pre-employment training. Incumbent worker programs provide skills enhancement or retraining opportunities for workers who are employed in low-wage jobs and wish to advance into better paid positions. Improving existing skills or gaining new skills can enable workers to move up a career ladder into a job with higher skills requirements and higher wages. Most incumbent worker programs also provide support services. Many participants in CBO training programs have other work or family obligations, and support services help accommodate their needs.

Community-based organizations are non-profit entities that obtain funding from a variety of sources. They usually do not charge clients directly for their services because they serve low-income participants. Funding for these programs typically comes from foundation grants or government contracts, either from Workforce Investment Boards (WIBs) or, recently, from a variety of initiatives funded by the American Recovery and Reinvestment Act (ARRA). Most of these programs assemble financial support from several sources, in order to ensure a sustainable funding stream.

10.2 DESCRIPTION OF PROGRAMS

Categorizing CBO programs into occupational groups helps illustrate the training niches that these programs are filling. The occupational tracks identified through analysis of interview data include:

¹ “Soft skills” include such things as time management, interpersonal communication, punctuality, self-confidence, resume writing, interviewing, and problem solving, while “basic skills” refer to academic and foundational trades skills such as high school level math and reading. Both these skills sets are generally included in “work readiness.”

- **TRADITIONAL** skilled trades, including carpenters, electricians, and HVAC technicians; and
- **EMERGING** green occupations, such as solar installers, weatherization technicians and installers, and energy auditors.

As indicated in Table 10.1, a majority of programs we interviewed train participants for occupations in the traditional skilled trades and emerging occupations.² Because we were able to interview a high percentage of the relevant CBO training programs throughout the state (about 80 percent), we can assume that this information is fairly representative.³ Traditional skilled trade training programs are far more likely to be pre-apprenticeship rather than pre-employment. They tend not to teach trade-specific skills (such as training only for electrical work). Instead, they teach general construction skills that are foundational for a variety of trades and therefore prepare participants to enter any of a number of different apprenticeships. Many pre-apprenticeship programs use the “Multi-Craft Core Curriculum,” which is endorsed by the AFL-CIO Building and Construction Trades and is specifically aligned with these apprenticeships.⁴

Table 10.1 CBO Programs by Occupational Group

Occupational Group	Count	% of Total
Not specified	5	16
Administrative*	6	19
Traditional Skilled Trades	19	60
Emerging Occupations	23	72
Weatherization Installers / Technicians	14	61
Weatherization, Green Construction	1	4
Solar Photovoltaic Installers	13	57
Energy Auditors	11	48
Energy Engineers	1	4
Solar Thermal Installers / Technicians	5	22
Solar Energy Installation Managers	4	17
Solar Energy Systems Engineers	1	4
Solar Sales Reps & Assessors	3	13
Energy Specialists	1	4

*We recorded administrative tracks but only when they were within the energy efficiency related programs.

Within the emerging occupations category, training is more often occupation-specific because the programs are designed to prepare students for immediate entry-level employment, rather than for apprenticeship or another stage of training. The top three jobs that these CBOs train for are weatherization, solar installation and energy auditing.

A number of CBOs offer training in both traditional trades and emerging occupations. For example, RichmondBUILD offers pre-apprenticeship training in traditional skilled trades, but also partners with Solar

² We were not specifically seeking information on training for administrative occupations because they do not have a direct impact on energy efficiency; however we did capture this information where it appeared in our sample alongside energy-related training.

³ For more information on the complete list of programs we were able to identify and the sources for this information please see Appendix I.

⁴ The Building and Construction Trades Department, AFL-CIO. Building Trades Multi-Craft Core curriculum. Retrieved from: http://www.efficiencycities.org/wp-content/uploads/062309/BCTD%20TriFold_v6.pdf.

Richmond to train for solar installation and with Rising Sun Energy Center for weatherization and energy auditor training. This provides graduates with skills for direct employment and also prepares them to pursue apprenticeship training if desired.

10.3 INFORMATION ON OUTCOMES

Completion and job placement outcomes for participants vary depending on the occupational focus and whether the program is intended to prepare for entry-level employment or the next level of training.

As shown in Table 10.2, post-training placement rates are quite low for the emerging occupations programs we interviewed, compared to those training for traditional skilled trades. Approximately 74 percent of graduates from traditional construction programs are hired for a job or enter a paid apprenticeship each year, but only 19 percent of those from energy efficiency oriented programs are. Average starting wages for participants successfully placed in jobs are about a dollar higher per hour for traditional trades training than for emerging occupation programs, \$14 versus \$13 per hour.

Table 10.2 Estimated Statewide Enrollment, Completion, Placement, and Wage Data*

	Traditional Trades	Emerging Occupations	Total
Average Statewide Enrollment, 2006 – 2010	575	1,829	2,404
Average Statewide Graduates, 2006 – 2009	452 (79%)	1,392 (76%)	1,844 (77%)
Average Number of Participants Hired, 2006 – 2010	335	264	559
Average Starting Wages	\$14/hr	\$13/hr	

* These are estimated statewide totals based on the information from our sample.

These differences indicate a surplus of programs focusing specifically on green occupations compared with the number of available jobs, and for some, perhaps a lack of attention to career pathways and participant outcomes in the labor market as a metric of success. In contrast, CBOs offering pre-apprenticeships in the traditional skilled trades are well-connected to career pathways and emphasize the placement of students in apprenticeships. As a result, participants of these programs have better outcomes in the labor market in terms of employment, skill development and wage increases.

10.4 EMPLOYER INVOLVEMENT

The lack of attention to job placement and employer needs among CBOs training for emerging occupations indicates a lack of effective employer involvement in this type of training. This is detrimental to workers who still cannot get a job even after completing training.

Pre-apprenticeship programs in the traditional trades are often better connected to employers as a result of their ties with apprenticeship programs, which are run by joint labor–management committees and emphasize on-the-job training. Because apprenticeship is so strongly driven and shaped by labor demand, so too are most

pre-apprenticeships—at least those that are effectively articulated with apprenticeship programs.⁵ However, unlike apprenticeships, pre-apprenticeship programs are not regulated by the state Division of Apprenticeship Standards (DAS), so the degree to which these relationships are aligned and articulated can vary substantially.

In general, there are a number of ways that CBOs can involve employers in their training. Of the CBOs we interviewed, 70 percent reported that they involve employers in curriculum development and also offer opportunities for trainees to interact with employers via site visits and in-class speakers. Other ways that employers are involved in CBO programs include:

- Serving on an advisory board (48 percent)
- Serving as instructors (48 percent)
- Donating supplies and equipment (48 percent)
- Conducting mock interviews with trainees (39 percent)
- Offering mentorships or internships (30 percent)

Industry input is also essential for incorporating green technological advances to CBO programs (in both traditional and emerging occupations). Over half of the organizations that train for emerging occupations rely on industry experts to provide advice on the selection and development of new programs, or to serve as program instructors.

Even though most programs involved employers, our research shows that employer involvement does not always lead to successful job placement outcomes in good jobs with career paths. Job outcomes are a far better metric by which to judge the effectiveness of employer involvement.

10.5 PARTNERSHIPS

Community-based organizations can link with other organizations at every step of a program, beginning with recruitment, followed by training, work experience, job search assistance, job placement, and post-placement services after completion of the program. The depth and scale of these partnerships varies, but most interviewees reported partnerships in all or some of these areas.

Partner organizations most commonly include other CBOs, labor unions, trade associations, community colleges, government agencies, WIBs and One-Stop Centers, and faith-based organizations. These organizations provide a variety of supplemental services, including outreach and recruitment, training and curriculum development, supportive services, job placement, and career counseling. Although some CBOs may also partner with utilities or other private industry organizations, none of the interview respondents mentioned these organizations as primary partners for any of their major activities.

In some cases, CBOs are also part of a network that is affiliated with a national organization. For example, several of the programs interviewed for this study are affiliates of YouthBuild USA. YouthBuild programs compete for federal grants to train low-income 16- to 24-year-olds in construction skills. Participants build affordable housing in their community, while simultaneously working to earn a high school diploma or General Educational Development diploma (GED), and learning basic occupational skills. These programs are typically designed to be pre-apprenticeships.

⁵ See Chapter 7 for more information on apprenticeship.

10.6 CONCLUSIONS

Most CBO training programs specifically serve individuals from disadvantaged, low-income and minority communities, who have with limited occupational skills and work experience, at the front end of the career pipeline. Some also help low-income workers who are already employed to improve their skills and wages. These programs can be broadly defined as two types: those training for traditional skilled trades, often through pre-apprenticeship programs that offer foundational training for a number of trades; and those training for emerging occupations, such as solar installation or weatherization. Some programs provide a combination of these two types of training, and most also offer a range of work readiness training and support services.

Based on self-reported job placement estimates, programs that train exclusively for emerging occupations are not well-connected to employers and do not emphasize the labor market outcomes of their participants. Job placement rates and starting wages for graduates of these programs are typically extremely low, much worse than those for programs training for traditional skills and occupations. This is partially due to a disconnect between the policy goals of program funders and the realities of the labor market.

Pre-apprenticeship programs are an especially important type of training that can be run by CBOs or other types of organizations. Many of these programs are specifically intended to support the entry of underrepresented or disadvantaged populations into skilled trade apprenticeships, helping participants move directly into an established career pathway. Although the DAS has established a list of best practices for pre-apprenticeship programs, these programs vary in quality as they are un-standardized and are not regulated or accredited by the DAS or by any third party or government agency.

Community-based organizations are typically well-rooted in their communities, and are acutely aware of the needs of the populations they serve. One strength of CBOs is their ability to connect with underserved populations and help remove barriers to their employment. Given this rootedness, CBOs are performing a critical function for the inclusion of disadvantaged populations. However, unless they partner or perform the other functions of a sector strategy, particularly effective connections with jobs and employers, they are unlikely to help their clientele get good jobs with career pathways.

CHAPTER ELEVEN:

11. REGIONAL OCCUPATIONAL PROGRAMS

11.1 OVERVIEW

Operating through high schools across the state, Regional Occupational Centers and Programs (or Regional Occupational Programs—ROPs) offer career technical courses for high school students and some adult learners. Established in 1967, the programs “are designed to serve the state’s interests in providing quality career preparation and technical education.”¹ ROPs offer training for entry-level jobs, preparation for entry into apprenticeship, or a foundation for further training.

Regional Occupational Programs are located in school districts throughout the state. They all belong to the California Association of Regional Occupational Centers and Programs (CAROP).² In remote areas with low population density, such as the northernmost region of the state, one ROP may serve high schools from two or three counties, while more populated counties usually have multiple ROPs. For example, 13 ROPs work with high schools in Los Angeles County alone. ROPs are currently scaling back on the number of courses in each program due to state budget cuts.

Regional Occupational Program participants must be at least 16 years of age and be working to complete a high school diploma. Individual ROPs can adjust their requirements to allow younger students to register, or they may have additional enrollment conditions. Some ROPs also cater to high school graduates seeking adult education. Most students start in the Career Technical Education (CTE) track within their high school, and take the ROP courses as a capstone to their program, defining their area of interest. Students take courses at their home high school or at another school, within the area that the ROP serves, that offers the desired course.

Regional Occupational Programs train at the front end of a career pathway, attempting to provide students with the fundamental skills necessary to succeed upon entry into the workforce, higher education, or additional training programs. These programs teach both “soft” and “basic” skills.³ While soft skills, such as resume writing and interviewing, are often common across programs, the programs also integrate introductory training in the core competencies of particular occupations.

11.2 DESCRIPTION OF PROGRAMS

Training at ROPs related to energy efficiency, distributed generation, or demand-response sectors falls into the following general program tracks (each of which includes a number of specialties):

¹ California Association of Regional Occupational Centers and Programs (2010). Retrieved from: <http://www.carocp.org/>.

² Overall, the majority of the ROPs have been accredited by the Western Association of Schools and Colleges (WASC). However, the ROP itself does not need to be accredited as long as the schools in which they operate have been accredited. Among those ROPs covered through interviews, 58 of the 77 have been accredited, all of which by WASC.

³ “Soft skills” include such things as time management, interpersonal communication, punctuality, self-confidence, and problem solving, while “basic skills” refer to academic and foundational trades skills such as high school level math and reading. Both these skills sets are generally included in “work readiness.”

- Architectural Design and Drafting
- Building Trades and Construction
- Building Trades and Construction–Green Construction
- Engineering Design/Technology
- Renewable Energy/Green Technology

Table 11.1 shows how the spread of program tracks included in our sample closely matches the distribution of all ROPs training in these areas in the state. Note that individual ROP programs plan and organize courses at their own discretion. There is little uniformity in the naming or content of occupational tracks, so the above groupings are approximate based on the available data.

Table 11.1 ROP Occupational Tracks Related to Energy Efficiency and Distributed Generation

ROP Occupational Tracks	Total Programs	% of Total Programs	Programs Interviewed	% of Interviewed Programs
Architectural Design and Drafting	18	9%	5	6%
Building Trades and Construction	77	37%	29	38%
Building Trades and Construction – Green Construction	6	3%	4	5%
Engineering Design / Technology	51	24%	17	22%
Renewable Energy / Green Technology	12	6%	7	9%
Total	210		77	

The following list describes several key program tracks in detail, and Table 11.2 shows some specific examples of core competency skills taught at ROPs.⁴

BUILDING TRADES AND CONSTRUCTION: This ROP track has the greatest number of program offerings. With 77 programs, it makes up over one-third of the total programs of interest to this study. Specialty offerings in this track include residential and commercial construction, and construction technology. These programs typically focus on basic construction skills, such as plumbing, HVAC, roofing and carpentry. This track comprised 38 percent of the programs in the sample. Some of these programs lead to entry-level employment, while others are preparatory for entrance into apprenticeship in one of the skilled trades.

ENGINEERING DESIGN / TECHNOLOGY: The second largest track, engineering design/technology, includes programs such as computer-aided drafting and design (CAD) and robotics and electronics technology. As such, core competencies in this track include basic skills for CAD and engineering. These programs typically prepare for entry into a post-secondary program in engineering or drafting.

⁴ We do not emphasize agricultural construction here, as it is less relevant for energy efficiency, distributed generation, and demand response.

ARCHITECTURAL DESIGN AND DRAFTING: Programs categorized in this track include those focusing on architectural design and some CAD programs that place the emphasis on drafting skills applicable in architecture, rather than engineering. The core competencies of these programs include basic drafting and visualization skills. These programs typically prepare for entry into a post-secondary program in architecture or architectural drafting.

RENEWABLE ENERGY/GREEN TECHNOLOGY: Programs in this track are some of the newest at ROPs. Among the 12 programs in the sample, most focus on an overview of available clean and “green” technologies, such as energy and environmental technology offerings. However, some specialized programs in solar installation and wind turbine technology are also available. Core competencies for this track include basic knowledge of energy technologies, in general, as well as specific occupational skills. These programs are intended to lead to entry-level employment in an energy-specific occupation.

BUILDING TRADES AND CONSTRUCTION–GREEN CONSTRUCTION: This is the smallest of the ROP tracks, with only six green construction programs in California. These programs apply “green” technology to established construction core competencies. Some of them also emphasize energy auditing skills and techniques. These programs are designed to provide students with sufficient skills for entry-level employment in energy-specific occupations, such as weatherization installer/technician, or energy auditor.

Table 11.2 Examples of Core Competencies for ROP Occupational Tracks

ROP Occupational Tracks	Examples of Core Competencies
Architectural Design & Drafting	Basic drafting and visualization
Building Trades & Construction	Carpentry, plumbing, roofing
Building Trades & Construction – Green Construction	Energy audit skills, applying green perspectives to established construction skills
Engineering Design / Technology	Drafting, CAD
Renewable Energy / Green Technology	Solar photovoltaic cells, knowledge of energy sources

11.3 INFORMATION ON OUTCOMES

Individuals who complete ROP programs gain knowledge of entry-level skills in their chosen vocation. Graduates can then choose either (1) to enter the workforce in entry-level jobs, (2) to pursue two- or four-year college, or (3) to enter into an apprenticeship or another type of post-secondary vocational training.

Students enroll in their selected track and then take related courses to earn certificates of completion signifying their competency in particular skill areas. Based on our interviews, a typical ROP will enroll around 800 students per year in the relevant occupational training programs.⁵ The average number of graduates each year is around 600, indicating that a quarter of students typically do not complete ROP training. Table 11.3 provides an overview of the average enrollment and graduation rates across programs for each occupational track.⁶

⁵ Here we include the agricultural construction trades and manufacturing training programs at ROPs. We omitted these programs from the comparative analysis in Chapter 13 because we did not collect information on these programs at other institutions.

⁶ There is very limited data available on completions of ROP programs to verify our sample data. ROPs operate within individual high schools and information of that nature is not typically stored in one place or database. In order to accurately assess the number of students that complete ROP courses, it is necessary to speak with individual schools or teachers and aggregate the numbers to find the total.

Table 11.3 Average Enrollees and Graduates, by Occupational Track

ROP Occupational Tracks	Average Enrollees Per Year from 2006-2010 (n=77)	Average Completers Per Year from 2006-2011 (n=77)	Average Completion Rates
Architectural Design and Drafting	184	147	79.9%
Building Trades and Construction	910	628	69.0%
Building Trades and Construction – Green Construction	200	90	45.0%
Engineering Design / Technology	765	620	81.0%
Renewable Energy / Green Technology	271	148	54.6%
Total	3,517	2,656	75.5%

Most students complete ROP programs within 1 to 2 years, while a few programs are designed to take less than one year. However, Completion in ROPs is defined, not by a number of hours, units or courses completed or attended (as it is for many other training programs), but rather by whether or not a student can master a certain set of skills as measured through competency testing. Therefore, a student who already possesses some basic knowledge or skills in their field of choice can complete the program more quickly than a student who does not.

The engineering design and technology track has the highest completion rate, approximately 80 percent. The tracks with the lowest graduation rates are those directly related to energy occupations, including building trades and construction–green construction, and renewable energy technology. These low graduation rates may be attributable to the infancy of these programs, or a variety of other factors such as lack of demand in the labor market for these specific skill sets.

11.4 EMPLOYER INVOLVEMENT

Regional Occupational Programs work with local businesses and industries to design and deliver training that caters to the labor market demand in the region. They are required to have an advisory board consisting of employers in a particular sector. The following are some of the ways that ROPs engage employers with their training programs:

CURRICULUM DEVELOPMENT AND UPDATES: Forty-seven out of 77 programs responded that “feedback from employers” was a key contributor to curriculum development. Similarly, many interviewees mentioned the importance of advisory boards. Interviewees also suggested that informal conversations with industry professionals/experts are another key way for ROPs to link with employers for curriculum development.

INFLUENCING PROGRAM PLANNING: In addition to curriculum development, employers play a critical role in influencing ROP decisions about the broader question of program tracks and sectors in which they ought to provide training. Over 88 percent of respondents said that employers’ input was the leading factor in this decision-making process.

PRACTICE INTERVIEWS: Over 60 percent of ROP administrators noted employer participation in conducting practice interviews with students. Many mock interviews occur during career fair events at the high schools that host ROPs.

FIELD TRIPS/INDUSTRY SPEAKERS: Regional Occupational Program instructors are predominantly high school teachers, rather than industry professionals. Many of them invite industry speakers into their classrooms or take students on field trips to employer sites to infuse “real life” or practical application elements to their instruction. Over half of ROP programs interviewed engage employers by organizing visits to businesses and inviting industry speakers.

WORK EXPERIENCE: Some ROPs work with the industry to provide internship opportunities for students. However, our assessment of the data indicates that this effort is neither systematic nor a key objective of the ROPs at this point. Only 18 out of 77 programs reported having an internship component in their programs.

OTHER EMPLOYER INVOLVEMENT: Additional support from industry partners includes providing funding for the program, helping with the recruitment of students, and assisting with delivery of training.

11.5 PARTNERSHIPS

In addition to collaborating with employers, interviewees reported a number of other types of partnerships. Student recruitment, training delivery, and curriculum development are the three most common areas of collaboration for ROPs. Typical partners in these pursuits are local community colleges and One-Stop Centers. Community colleges and ROPs often share funding on training grant projects, which helps expand and strengthen their ties. In some instances, they also share training facilities and laboratories on a cost-recovery basis. A number of ROPs also reported establishing articulation agreements with community colleges and local four-year institutions.⁷

Many ROPs are pre-apprenticeships as well. These programs typically have a close relationship with the nearby apprenticeship committee for a particular trade. These relationships may result in collaboration on recruitment and placement, as well as curriculum development.

One-Stop Career Centers offer support services to ROP students in a variety of capacities, including job placement, case management, and assistance with their job search.⁸ The two most frequently reported forms of student support services include (1) Access to self-directed job search resources (84 percent), and (2) Job Readiness Training (71 percent). These are important services for students enrolled in these programs, as many intend to enter the workforce upon completion of ROP programs. However, the job search and placement services provided by ROPs are very minimal. In many cases, they are limited to supplying students with letters of recommendation and providing resources that require students to take initiative in their own job search.

⁷ An articulation agreement is a formal mechanism that allows student to receive college/university credit for high school courses taken and/or university credit for community college units completed. These agreements are critical in providing students with an opportunity to follow educational pathways from high school to an advanced degree.

⁸ Funded by the U.S. Department of Labor through the Workforce Investment Act of 1998 (WIA), One-Stop centers were developed to bring together employment and training services that work with all people into one place and make it easier for job seekers and employers to use these services. One-stop centers are operating in every county in California, with many counties having multiple centers. WorkWorld (2011). “One-Stop Centers - Overview.” Employment Support Institute, Virginia Commonwealth University School of Business. Retrieved from: http://www.workworld.org/wwwwebhelp/one_stop_centers_overview.htm.

11.6 INCORPORATION OF ENERGY EFFICIENCY AND RELATED SKILLS

The response to the growing importance of energy-efficiency related occupations has been inconsistent across ROPs. Some programs have integrated energy efficiency or added separate modules into energy related courses, such as those on construction and design. A less common approach is to offer courses that specifically address energy and environmental technologies, primarily targeting the energy and utilities industry sector. Although two out of the five relevant occupational tracks were identified as specific to green technology, including building trades and construction–green construction and renewable energy/green technology, programs in these two tracks make up only 14 percent of the total programs interviewed. However, data from interviews suggest that more ROPs are planning to add courses specifically addressing green and energy efficiency related fields.

Of the programs interviewed, the most common way of incorporating energy efficiency into a program is to integrate it throughout classes (88 percent). Few ROPs indicated that they emphasize energy efficiency as the main topic of learning. The least frequent way of incorporating energy efficiency into programs is through offering a separate module of instruction (3 percent). Since ROPs are subject to the timeframes and restrictions of the high schools' course planning, including an extra module on energy efficiency or renewable energy is not usually possible. Integrating energy efficiency concepts throughout the program represents a more practical approach, because it overcomes these administrative barriers and contextualizes energy efficiency training in a broader occupational skill set.

In order to integrate energy topics into their traditional offerings, ROPs will need to continue to reform and adapt their curricula. A majority (59 percent) of the respondents indicate that they have changed or are planning to change curricula in order to incorporate energy related topics. Specifically, ROPs report that they are working with their advisory committees on curriculum revisions, and purchasing new pieces of energy efficient equipment to stay relevant and up to date with the current trends and technologies.

11.7 CONCLUSIONS

Regional Occupational Programs provide students with soft skills and basic skills training designed for pathways into entry-level employment in the building and construction trades, apprenticeship programs, and two- and four-year colleges. They offer basic skill competency testing and certification applicable to a variety of occupations and career tracks, including building and construction trades, architecture, and engineering. These appear to be valuable programs to provide career awareness and basic skills training for high school students. However, data on job placement, wages, and retention or entry into further education is minimal or non-existent, so it is difficult to fully assess the effectiveness of these programs.

In general, integration of energy efficiency related training in ROP programs has been inconsistent. Regional Occupational Programs have recently begun to develop a small number of new “green” programs, while over half of the traditional programs have also been incorporating energy efficiency related topics of instruction. According to interviewees, the main reason for adding new programs was the deteriorating employment conditions in the construction and manufacturing industries, and the perception that there are more jobs available in green sectors of the economy. Based on the findings of this report, this may be a misguided perception.

CHAPTER TWELVE:

12. INVESTOR-OWNED UTILITY PROGRAMS

12.1 INTRODUCTION

This chapter examines the investor-owned utility (IOU) Workforce Education and Training (WE&T) programs, which include the Energy Training Centers (ETC), which are the largest part of the recently labeled *Centergies* programs, and the *Connections* programs, which are collaborations with educational institutions. This chapter also looks at other selected IOU investments in training and education in energy efficiency and related sectors, focusing on how the IOU WE&T programs fit within the larger network of institutions and workforce development programs that are engaged in the energy efficiency, demand response, and distributed generation sectors in California. Our analysis addresses the current role that the IOU programs are playing and their core competencies and specific assets within this larger workforce system. We also suggest avenues for deeper collaboration with other workforce funding agencies and training and education institutions.

Our recommendations are based on an assessment of how well current IOU programs match these strengths to the needs of the overall workforce development system in the energy efficiency and related sectors. Since one of the purposes of this WE&T Needs Assessment is to provide recommendations on possible changes in direction or emphasis for the IOU-funded training initiatives, we examine the utility programs in greater depth than the other training institutions. However, this assessment is not designed to replace the evaluations of the specific programs.

For the *Centergies* programs, this analysis builds on the recent impact evaluation by Opinion Dynamics.¹ As described in the final report, this evaluation analyzed the impact of the *Centergies* program on knowledge transfer and actual energy savings. The Opinion Dynamics evaluation is an extremely valuable resource and we use the large amount of data they collected whenever possible, since our data collection process was much less intensive.

For the *Connections* programs, we consulted the process evaluation conducted by Research Into Action for the 2006–2008 EARTH Education and Training Program.² This Program included three of the components of the current *Connections* programs—Green Schools, LivingWise, and Green Campus. An impact evaluation was not completed for these programs for the 2006–2008 cycle.

In addition to these two program evaluations, we interviewed key WE&T staff at each utility and analyzed WE&T documents including Program Implementation Plans (PIPs), and collaboration plans. We reviewed data supplied by utility training staff such as number of trainings, attendees, and attendee types. We interviewed a number of IOU WE&T partners to the *Centergies* and *Connections* programs. Finally, we bring to bear the knowledge we gained through our survey of community colleges, apprenticeship programs, 4 year colleges, community based and industry based training programs, and ROP and other high school programs, which helped us situate the IOU WE&T training investments in the whole workforce development universe for these sectors in California.

¹ Opinion Dynamics Corporation (2010, March). Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program. Volume I of IV: Final Report, Study ID: CPU0014.01. Prepared for the California Public Utilities Commission Energy Division.

² McRae, M.; N. Harris, J. Van Clock, and T.L. Hanson (2009, August). Process Evaluation of the 2006-2008 EARTH Education & Training Program. Research Into Action and Educational Consulting Services. Study ID: SCE0276.01 / CPUC ID: SCE 2504.

12.2 KEY WE&T PROGRAMS

The key WE&T programs operated by the IOUs of California include the Energy Training Centers and educational programs for K-12 schools, community colleges, and four-year colleges and universities. The Energy Training Centers, the key program category under the *Centergies* program, are the largest set of programs in terms of funding. They provide classes, seminars and similar activities in eight centers located throughout California, as well as some mobile training. Educational programs, currently referred to as *Connections* programs, are collaborative efforts to support education and training on energy efficiency and related activities in K-12 schools, community colleges, and four-year colleges and universities.

We also identified to the extent possible other educational and training activities that are administered by the utilities but are not part of either of these WE&T programs. Our interviews with IOU program staff identified several instances in which specific trainings were provided by the IOUs as part of specific programs and were not funded under the *Centergies* or *Connections* programs. The three cases that we identified, all at SCE, were the development of what later become known as the California Advanced Lighting Controls Training Program (CALCTP), in which SCE funded the development of the first curriculum from the emerging technology lighting program initiative; the training of building inspectors funded by the Codes and Standards program, and the training for contractor participants in the HVAC Quality Installation and Quality Maintenance (QI/QM) program. Other training programs fell outside our scope, including internal utility training programs for their own employees and scholarship and internship programs not restricted to energy efficiency. In summary, we focused our attention on the *Centergies* and *Connections* programs; our analysis does not represent a comprehensive review of all utility-funded training programs dealing with energy efficiency, demand response, and distributed generation. While needed to fully appreciate the contribution of the IOUs to workforce education and training, that more comprehensive analysis was determined to be outside the scope of this project.

This chapter first describes the eight Energy Training Centers that are part of the *Centergies* program. For each Center, we identify the primary audiences, number of trainings offered, budget, and number of attendees in 2009. We then describe the role of each Center, the direction provided by the CPUC, and the collaborations they maintain. Second, we describe and analyze the programs that constitute the *Connections* initiatives. Finally, we provide suggestions for how the training centers and the *Connections* initiatives could better position themselves to support energy efficiency and renewable energy career pathways.

12.3 CENTERGIES (ENERGY TRAINING CENTERS)

The Energy Training Centers operated by California's IOUs are designed to educate both market actors and customers on energy efficiency and related technologies and measures. Market actors include firms and employees installing energy efficiency related measures, while customers include the building owners and homeowners who pay for, maintain and operate these measures.

All of the *Centergies* programs are provided to participants at no cost. As articulated by ETC directors, classes are created to fill gaps and "prime the market" with a portfolio of programs and services that complements the services offered by other educational and training institutions. Gaps are identified through information gathered from utility staff members who manage resource programs, trade association staff members who also provide training, class participants, and other sources in the field. This flexibility to respond to need, and withdraw when the need no longer exists, is an important aspect of the programs.

The Energy Training Centers offer a variety of programs—classes, information dissemination, customized demonstrations and consultations, and equipment lending libraries. By far the most predominant activities are very short classes on specific topics related to energy efficiency and related demand-side management activities. Most classes are three to four hours in length and are designed to be self-contained “one-off” classes. In the great majority of cases, enrollment is open, there is no screening, and access is on a first-come, first-served basis. This open enrollment is not mandated by CPUC policy but is deeply ingrained in the structure and practices of the ETCs and is part of the overall strategy of maximizing the number of people taking classes. Table 12.1 summarizes key features of the seven IOU Energy Training Centers.

Table 12.1 Summary of Energy Training Centers in California

Utility	Training Center	Location	Primary Audience	Number of Sessions Offered ¹	2010-2012 Budget	Number of Attendees 2009
Pacific Gas & Electric (PG&E)	Pacific Energy Center (PEC)	San Francisco	Commercial and Industrial Professionals	164	\$34 million	7,716
	Energy Training Center (ETC)	Stockton	Residential Sector Professionals	90		8,662
	Food Service Technology Center (FSTC) ²	San Ramon	Commercial and Industrial Professionals	—		—
Southern California Edison (SCE)	Customer Technology Application Center (CTAC)	Irwindale	Commercial and Industrial Professionals	211	\$21 million	8,634
	Agricultural Technology Application Center (AgTAC)	Tulare	Agricultural and Industrial Sector Professionals	146		2,272
Southern California Gas (SCG)	Energy Resource Center (ERC) ³	Downey	Commercial and Industrial Professionals	140	\$8.8 million	9,485
San Diego Gas and Electric (SDG&E)	Energy Resource Center (ERC) ⁴	San Diego	Commercial and Industrial Professionals	84	\$12 million	6,385
	California Center for Sustainable Energy (CCSE)**	San Diego	Residential Sector Professionals	195		9,194
Total					\$75.8 million	42,863

¹ Sessions are the total number of unique sessions offered; some sessions may be repeats of the same classes.

² The FSTC operates out of San Ramon but conducts seminars at locations throughout California, including other IOU Centers.

³ The SDG&E ERC shares space with the CCSE.

⁴ The CCSE also receives funding from sources other than SDG&E and they offer training in areas outside of building efficiency such as transportation. The dollar figures referenced here are only SDG&E funds.

Most training at the ETCs is geared towards teaching existing professionals from various segments of the building and energy sectors about efficient equipment, technologies, measures, and systems. According to the 2010 Opinion Dynamics Report on the 2006–2008 program period, about 55 percent of training attendees were market

actors, 30 percent were commercial end users (building owners and managers), and 15 percent were residential end users.³

Table 12.2 shows the training by end use for 2009 and for the three-year cycle for 2006–2008. The greatest emphasis has been on HVAC training, an industry that has been beset by installation and maintenance quality shortfalls. It was hoped that improved training would increase the number of installations that are done correctly, thereby reducing energy use during the summer when load reductions are of greatest value to the state.

Table 12.2 Energy Center Training by End Use

End Use	2009 Classification of End Use		2006-2008 (3 years) Classification of End Use	
	Training Sessions	Percent Training Sessions	Training Sessions	Percent Training Sessions
HVAC	272	24%	663	26%
Other	232	20%	323	13%
Renewables	157	14%	211	8%
Green Building / Envelope	146	13%	224	9%
Lighting	101	9%	310	12%
Controls / Energy Management Systems	45	4%	74	3%
Commercial Cooking / Food Service / Refrigeration	42	4%	127	5%
Title 24	39	3%	187	7%
Motors/Pumps	32	3%	97	4%
Water	23	2%	8	0%
Commissioning	17	1%	74	3%
Financial Incentives	9	1%	101	4%
Gas	8	1%	5	0%
Compressed	7	1%	31	1%
Boilers / Furnaces / Water Heating	5	0%	119	5%
Pool	4	0%	24	1%
Total	1,139		2,578	

Source: Opinion Dynamics (2010) for 2006-2008; authors' calculations from utility data for 2009.

We examined all classes offered by the training centers in 2009 and then categorized the class by occupational skills category. We found that over 70 percent of classes offered did not match easily with any one occupation type. While the centers do promote certain skill standards for some occupation, such as the Building Operator Certification (BOC) for building managers and NATE certification for HVAC mechanics and installers, most trainings are not geared towards a specific certification or standard. The classes are open to people from a broad array of building-related occupations.

³ Opinion Dynamics, 2010.

The fact that the Energy Training Centers do not focus classes on specific occupations in part reflects the multidisciplinary systems-oriented focus of energy efficiency work. Attaining energy savings is less about training an HVAC technician to install certain types of equipment and more about training them to look at building elements traditionally not covered in their training. Furthermore, the ETCs train market actors to identify new markets that their traditional building field can serve. For instance, an architect may want to offer distributed generation services as part of their design portfolio and may therefore take the Pacific Energy Center's "Integrating Energy Efficiency and Renewables in Home Retrofits" class. However, this class is similarly relevant to construction managers, engineers, tradespeople, and others.

This lack of occupational focus also reflects the fact that these classes are mostly very short, self-contained courses and are not designed to fit into longer-term occupational trainings. Unlike workforce development organizations, the Energy Training Centers do not design their courses as part of a longer-term career development program. As a result, the Centers do not focus on issues of scope and sequencing or the development of a set of portable and stackable credential that can move a worker along a career path of increasing skills over time.

Table 12.3 shows the reach of the Energy Training Centers for various industry segments. Opinion Dynamics estimates that 43 percent of Californians working in the HVAC industry have taken at least one class at the Energy Training Centers, a substantial number that reflects a concerted effort by the utilities to improve the quality of HVAC installation and maintenance, which is a key goal of California's EE Strategic Plan. Though the data collected do not distinguish between professional workers, managers, and business owners on the one hand, and construction workers and technicians on the other, Energy Training Center staff impressions suggest that most of the participants are in the former category, i.e., HVAC industry contractors, rather than technicians.

Table 12.3 Market Actors Reached by Industry Area

Industry Area	Market Actors (Statewide)	Estimated Reach by Centers	Percent Reached (Statewide)
HVAC and Refrigeration	19,700	9,427	44%
Government Agency/Regulatory/Inspector	12,500	3,263	26%
Engineering/Architectural Design	58,200	13,053	22%
Lighting	68,300	8,339	12%
Construction	161,200	9,064	6%
Boilers/Water Heating Sales	56,000	3,263	6%
Other	55,800	2,901	5%
Motors	49,400	2,538	5%
Facility Operations and Maintenance	163,000	3,263	2%
Energy Technology Research/Consulting	N/A	5,801	N/A
Pumping/Hydraulic Equipment	N/A	2,175	N/A
Renewables	N/A	5,076	N/A
Don't Know/Refused	N/A	2,175	N/A

Source: Opinion Dynamics (2010) p. 58.

12.3.1 ENERGY CENTER COLLABORATIONS

The Energy Training Centers are actively engaging in collaborations with professional and trade associations. These collaborations expand the reach of their classes, support the development of contractor pools that can participate in utility resource programs, and bring in expertise not available within the utilities. When possible, the Energy Training Centers structure their classes to qualify for continuing education credits in relevant professional organizations such as the Association of Energy Engineers (AEE) and the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), so that class participants gain professional and industry recognition for skills acquisition.

Notably, the Energy Training Centers have worked most closely with trade and professional associations that are specialized in energy efficiency. The PG&E Centers have even helped form associations. A noteworthy example is the California Building Performance Contractors Association (CBPCA), a trade association which has gone on to be a key player in the attempts to create a specific and separate market for energy efficiency retrofits in the residential sector. The Energy Training Centers also work with some of the industry certification bodies, such as the Building Performance Institute (BPI), and although they are neither officially accredited trainers, nor issuers of certifications, the Energy Training Centers try to develop their classes to be useful to those seeking certification. In a minority of cases, the Energy Training Centers will implement a course series for a specific group of incumbent workers that does lead to a certification, such as in the case of the Building Operators and Maintenance sequence. Table 12.4 gives an overview of the various collaborations between the IOU Energy Training Centers and their many partners.

Another example of a successful collaboration is the Building Operators Certification (BOC) program licensed by the California IOUs from the Northwest Energy Efficiency Council (NEEC), who is also contracted to implement the program. The BOC training is a multi-session course series that combines classroom training, in-facility project assignments and exams to train operators of commercial and industrial buildings. This differs from most Energy Center offerings in that it is longer, has a clear occupational focus, and is based on actual projects that the students, who are building operators, bring to the class. Students may then take certification exams from NEEC for Level I and Level II certifications. A process evaluation of the BOC for 2006–2008 for the SCE territory reported that 131 courses were offered and 748 students enrolled in at least one course. Of these, 416 received Level I certification and 226 received Level II certification.⁴ The Opinion Dynamics evaluation showed higher energy savings results from this program compared with the average for all Energy Training Center classes.⁵

While the utilities clearly have many enduring and successful collaborations, there are other, yet to be developed, collaborations that would further energy savings and promote energy efficiency careers. Thus far, the existing collaborations focus heavily on early adopter organizations, professionals and business owners rather than the actual workforce, and on the non-unionized side of the building and construction industry. While appropriate when energy efficiency was a less prominent public policy objective and the state's goals were not so ambitious, this approach is no longer sufficient because it will only touch a slice of those that need to be reached. Now it is imperative to reach into the mainstream building and construction trades industry. As the utility WE&T training efforts move beyond short-term training to providing expert knowledge that can be integrated into longer-term career technical training programs, it is essential that the utilities choose partner organizations that are sustainable, of sufficient depth and breadth, and are part of the higher-road segments of their industry. High-road approaches

⁴ McLain ID Consulting and KVDR Inc. (2010) Southern California Edison PY 2006-08 ETO Process Evaluation. Study Number SCE0285. March 31, 2010.

⁵ Opinion Dynamics, 2010.

Table 12.4 IOU Energy Training Centers and Their Collaborations*

Organization	Description of Collaboration	Relevant Utility Territory	Degree of Collaboration (Developed or In Process)
Training Providers			
California Home Energy Efficiency Rating Services (CHEERS)	CHEERS is one of three organizations approved by the California Energy Commission. This non-profit organization offers training to people interested in Home Energy Rating System certification (HERS).	All	Developed
California Building Performance Contractors Association (CBPCA)	CBPCA is one of three organizations approved by the California Energy Commission. This non-profit organization offers training to people interested in Home Energy Rating System certification (HERS).	All	Developed
California Certified Energy Rating & Testing Services (CalCERTS)	CalCERTS is one of three organizations approved by the California Energy Commission. This non-profit organization offers training to people interested in Home Energy Rating System Certification (HERS).	All	Developed
Build It Green	Utilities offer their facilities to host Build it Green trainings such as Green Point Rater and BPI Building Analyst.	All	Developed
Building Industry Institute (BII)	PG&E offers their facilities to host BII trainings. BII and their subcontractor Consol offer trainings related to building energy codes in the PG&E service territory.	PG&E	Developed
Affordable Comfort	ID new trends/technologies in the field.	PG&E	Developed
Trade Associations			
Air Conditioning Contractors of America (ACCA)	All utilities adopted the standards set by ACCA for quality installation and sizing of air conditioners.	All	Developed
Institute of Heating and Air Conditioning Industries (IHACI)	IHACI provides training at the three southern California utilities that prepare students for NATE certification. This training adheres to ACCA and other standards. IHACI also connects utilities to HVAC companies.	SCE, SCG, SDG&E	Developed
American Institute of Architects (AIA)	All utilities offer training that architects can use to receive continuing education units from AIA. This collaboration enables utilities to access architects.	All	Developed
Association of Energy Engineers (AEE)	SCG offers a five-day training series in conjunction with AEE that enables participants to sit for the Certified Energy Manager (CEM) exam.	SCG	Developed
Higher Education			
Community Colleges (CC)	All utilities training centers partner with community colleges. Examples of collaboration include Laney CC students currently using PG&E's Energy Training Centers in their curriculum, to SCE partnering with College of the Canyons to pilot a program aimed at training students in energy management, retrofitting, and green design. Additionally, there is a pilot underway with San Francisco City College and Los Angeles Trade Technical College to offer weatherization training.	All	Limited in the past but expanding
Colleges/Universities	Collaboration with colleges includes the Energy Training Centers hiring university instructors to teach classes.	All	Limited

Table 12.4 (continued) Utility Training Centers and their Collaborations*

Organization	Description of Collaboration	Relevant Utility Territory	Degree of Collaboration (Developed or in process)
Certification Organizations			
North American Technician Excellence (NATE)	All utilities offer training that partially prepares participants to take NATE certification exams. NATE is seen as the HVAC/R industry standard for certification.	All	Developed
National Council on Qualifications for the Lighting Professions (NCQLP)	PG&E offers training that satisfies NCQLP's re-certification demands. Certified lighting professionals can get credit for taking applicable courses offered by PG&E.	PG&E	Developed
Building Performance Institute (BPI)	All utilities work with training organizations such as Build It Green or CBPCA that offer training that prepares attendees to take BPI certification exams.	All	Developed and Expanding
Builder Operator Certification (BOC)	All utilities offer this series of training that helps prepare building operators to run their facilities efficiently.	All	Developed
Government Agencies			
California Energy Commission	Utilities work with the CEC to offer trainings to market actors about Title 24 policies.	All	Developed
California Community Services and Development (CSD)	PG&E has worked with CSD to provide weatherization training for CSD's low-income weatherization program since the inception of the Energy Training Center in Stockton in 1978.	PG&E	Developed
California Workforce Investment Boards (WIBs)	Southern California Gas has recently started to offer training for people served by their local WIBs.	SCG	In Development
Los Angeles Steam Operators Certification	SCG offers steam operators in the Los Angeles area this training.	SCG	Developed
Union			
Apprenticeship Programs	PG&E instructors have trained JAC members in the Bay Area regarding duct sealing and PG&E lends tools such as duct blasters to Bay Area JACs.	PG&E	Limited
Other			
California Advanced Lighting Controls Training Program (CALCTP)	Utilities will offer training aimed at supporting the CALCTP initiative. The CALCTP aims to expand the use of lighting controls in commercial/industrial facilities.	All	In Development (roll out spring 2011)

* Utility Training Center staff identified these collaborations in our interviews.

focus on quality and are linked to jobs with living wages, health benefits, substantial training investment and long-term career ladders. (See Chapter 1 for additional discussion of the high-road approach.)

Our analysis of workforce education and training programs in the construction industry shows that the main broad occupational training programs for tradespeople are the state-certified apprenticeship programs. Yet the utilities' collaborations with apprenticeship programs are minimal, despite the reported need for construction trades workers, not just professionals or business owners, to be more aware of efficiency and renewable energy

technologies, measures, and systems.⁶ Only one utility reported any collaboration with union programs and that relationship was described as “limited.”

Deepening and broadening relationships with union apprenticeship programs and unionized contractor associations presents a critical opportunity for the state of California to promote a professionalized workforce that is able to incorporate best practices related to energy efficiency. As we have shown elsewhere, the advantage of working with unionized building and construction trades contractors is that these are the businesses that have developed a high-road business model based on an ongoing commitment to training a professionalized workforce. Since they pay higher wages and contribute to a training trust for each hour their employees work, they are very conscious of the investment they are making in their professional work force. Thus public or ratepayer funding would be matched by significant private funding. This high-road investment would reduce the turnover rates that appear to diminish the value of other public and ratepayer investments in training in low-wage and limited opportunity segments of the industry.

Recent experience shows the high potential of building relationships with the union programs. One of the most highly acclaimed examples of utility workforce training initiatives is the California Advanced Lighting Controls Training Program (CALCTP), described in more detail in Chapter 4, and in the next section. This type of collaboration should be fostered with all the union apprenticeship programs that work in trades that can impact energy efficiency. The utilities have reached out to the Sheet Metal Workers International Association (SMWIA), for example, PG&E sent an instructor to train apprenticeship instructors in the sheet metal apprenticeship programs in the Bay Area on advanced duct testing and sealing protocols and appropriate equipment use. However, thus far, this collaboration has not developed to the same degree as that with the International Brotherhood of Electrical Workers and National Electrical Contractors Association (IBEW–NECA). Currently, PG&E and SMWIA are working together to create a new certification for retro-commissioning. This is an important opportunity for advancing retro-commissioning in small to medium sized commercial buildings, and will hopefully follow the model of the CALCTP by creating a certification that can be used as a requirement for utility incentives in this area. Southern California Edison has also reached out to SMWIA as part of the HVAC WE&T activities, although the collaboration has not yet been fully developed.

As with any new institutional relationship, there is a learning process on both sides. The utilities need to be careful to reach out to multiple components of the unionized construction world, including both the signatory contractors associations, and the apprenticeship programs in order to reach both the contractors who may not be aware of new markets and utility incentive programs, as well as the actual training program directors. This is an opportune time to build the relationships because the down economy is forcing the unionized sectors to consider smaller markets than during the construction boom.

12.3.2 SECTOR STRATEGIES—THE CALCTP MODEL

Although not initially under the rubric of the *Centergies* programs, the ETCs are now one of the CALCTP partners. The CALCTP program is designed to overcome the poor installation of advanced lighting systems, which caused users to override them and undermined the widespread adoption of this significant energy saving technology. Collaboration between the utilities, the UC Davis Lighting Center, and the Labor–Management Cooperation Committee (LMCC) of IBEW–NECA produced a journey level upgrade training that can be taken by licensed electricians. This upgrade certification is now being integrated into the utility incentive programs that are being rolled out to encourage adoption of advanced lighting controls.

⁶ Goldman, C., J. Peters, N. Albers, E. Stuart, M. Fuller (2010, March). Energy Efficiency Services Sector: Workforce Education and Training Needs. Retrieved from: <http://eetd.lbl.gov/ea/ems/reports/lbnl-3163e.pdf>.

The CALCTP project is, in the nomenclature of the workforce development world, a sector strategy. As we have described in Chapter 5, sector strategies have been shown to be the most successful approach to workforce development in middle skill jobs. Sector strategies are based on bringing together multiple employers, labor, potential educational partners and workforce funders to develop a strategy to address workforce issues within a particular sector. Business has to be at the table to identify specific skill and training needs, and to commit to training their incumbent workers or new hires, or to consider training graduates as job openings occur. Sector strategies usually require an intermediary or task force of partners to coordinate the planning and implementation of the projects, develop agreements on skill standards and appropriate certifications, contract with training providers (such as community colleges, apprenticeship programs or others), develop or update curricula, and write and carry out other implementation tasks. The intermediary also generally helps negotiate the exact nature of the commitments by the partners, particularly around sharing the costs of training, wage ladders or promotion opportunities for workers with upgraded skills, and other key mechanisms to assure sustainability and benefits for both employers and workers. A critical function of sector intermediaries is developing funding proposals for public training funds, so that WIA and other state and federal resources for workforce development can be brought into play. In the case of the CALCTP, IBEW–NECA carried out many of the tasks of an intermediary, with very deep involvement and some funding by Southern California Edison.

12.3.3 ENTRY LEVEL TRAINING AND INCLUSION OF LOW-INCOME AND DISADVANTAGED WORKERS

In the past, there has been very little emphasis on helping unskilled or entry-level participants gain career skills at the Energy Training Centers. Utility staff members estimate that about 15 to 20 percent of all classes are entry level courses that serve as introductions to subject matter and are meant to expose both customers and prospective workers to energy efficiency and related fields. These kinds of classes should not be confused with training for entry level employment or with programs that successfully include low-income and disadvantaged workers. Recently, the Energy Training Centers have been encouraged to expand the number of classes offered at off-site locations in an effort to improve access of minority, low-income and disadvantaged communities to these classes. However, the only metrics developed so far focus on the number and location of the classes and not on the characteristics of the participants.

The PG&E Stockton Energy Training Center new-hire training for Low Income Energy Efficiency program (LIEE) contractor employees and the California Weatherization Assistance Program (WAP) contractor employees is the only program that was identified that provides training for entry-level workers. This training, which is required for new employees after they have been hired, is designed to ensure that employees can meet the quality assurance standards for LIEE and WAP programs. The program is not structured to provide the support, components and structured scope and sequencing necessary for successful career development programs.⁷ Since the 1980s, these trainings have been conducted for workers after they have been hired by participating contractors.

In the 2006–2008 funding cycle, the CPUC issued an RFP with the express purpose of creating a stronger pipeline into LIEE jobs from underserved and disadvantaged populations. This resulted in two pilot projects: one fielded between PG&E and CityBuild (a joint collaboration of San Francisco Office of Economic and Workforce Development and City College of San Francisco), and the other between Southern California Gas and Los Angeles Trade–Technical College (LATTC). Both pilot projects include collaboration with LIEE contractors in the

⁷ See the residential retrofit case study for a more complete discussion of LIEE training programs and new efforts to include greater supports for low-income trainees.

respective local areas. This RFP represents an important change in direction and its lessons are critical for designing future programs.

According to the RFP, this program was initiated in order to make sure that there were enough training opportunities for LIEE workers to meet the increased low-income retrofit goals called for in the latest utility program cycle. At the same time, the RFP explicitly referenced the goal of including workers from low-income, minority, and disadvantaged communities. LATTC and the San Francisco Office of Economic and Workforce Development applied for and were chosen to create the pilots. The amount of funding for LATTC's program was (\$175,000) and 90 percent of it was directed at wage subsidies for trainees for the first month of employment. In San Francisco, CityBuild received \$100,000 and has integrated more than half of this funding into upgrading their existing construction curriculum to establish a CCSF-designed new Residential Energy Efficiency Measure module for its students. The pilots are still in process, and evaluation reports will be written at the conclusion of each project, providing guidelines for successful LIEE training partnerships and best practices.

The pilot programs' objectives are:

- To develop a replicable model training program for low-income residents for training in weatherization, energy efficiency and LIEE program implementation;
- To train over 100 low-income residents in weatherization, outreach, and LIEE Program implementation;
- For 75 percent of students to complete the program and earn at least one of the listed certifications;
- For 60 percent of students who complete the program and on the job/field training to be employed in the weatherization/energy efficiency or related fields within six months of program completion; and
- For 40 percent of students who complete the program to enter a career ladder pathway and enroll in a related post-secondary training program.

To this end, LATTC and CityBuild have created weatherization training programs based on both the curriculum materials supplied by Richard Heath and Associates, Inc. (RHA), the contractor whose curriculum is used in the PG&E service area for LIEE new hire workers, and the colleges' own competency framework, which is used for all program development. Thus far, the two programs have trained over 300 students, far exceeding their initial goals. For LATTC, after a student has completed the course and been tested, the college gives a skill analysis of each graduate to the employer, who then conducts interviews, and chooses who to hire. The contractor receives a one month full wage subsidy for each trainee, after which the employer can choose whether or not to hire the graduate. Thus far, the contractor has offered ongoing employment to only a small percentage of trainees, perhaps as few as one in ten. The reason for this low permanent hire rate is still being explored and should be a subject of the evaluation.

Discussions with LATTC have surfaced important issues that should be explored further in the evaluation. Most importantly, developing compatibility between LATTC's mission of serving its low-income student base and the utilities' mission of expanding its LIEE workforce in a cost effective manner is challenging for a number of reasons:

First, LIEE contractors have traditionally been able to screen applicants, choosing those who already have the skills and experience necessary to do LIEE work, lacking only the very specific knowledge provided in the five- to eight-day RHA curriculum, a significant amount of which is very specific to the particular documentation needs of the utilities' programs, rather than more general weatherization skills. In contrast, LATTC and CityBuild's mission is to serve their respective communities, meaning that they seek to prepare a much broader group of students. Their use of a competency framework is meant to provide students with a solid, broad base of knowledge, skills and competencies that are needed to work in entry level jobs, but also provide a foundation for building skills to enter into one of a number of longer-term career pathways.⁸ Because of this, LATTC and CityBuild also worked hard to

⁸ See http://college.lattc.edu/wed/files/2010/05/LATTC_LIEE.pdf for a description of LATTC's competency framework.

integrate this training into the regular course work of the college, and all courses are taught by regular faculty. This provides a framework for sustainability, in contrast to the contract education model where all costs are paid by the employer or grants, and training is customized solely to the needs of employers. However, this approach also makes the training take longer, as it is less focused on the narrow needs of a specific employer and aims to prepare a wider variety of students. As the LATTC Dean articulated, the CPUC and utilities “need to talk a different language if they want to engage disadvantaged populations, because it’s not just about building a workforce for a specific IOU. We are not going to cream. We have to serve the population that comes through our doors.” As a result of this need to serve their student base, LATTC developed a four-week program, over twice the length of the PG&E new hire program.

Second, while some may argue that any employment is a chance to escape poverty, there is considerable evidence in the workforce literature that true pathways out of poverty require the existence of attainable opportunities for advancement, meaning a clear career path, with skills development linked to increasing wages. The career path model and its importance is presented in more detail in Chapters 13 and 16 of this report.⁹ The lack of clear career ladders leading up from the entry level weatherization installer job is problematic for training providers that aim to provide pathways out of poverty for their students.¹⁰ Within the industry there are few crew chief job openings, and these max out at \$14 to \$16 dollars an hour. Los Angeles Trade–Technical College is seeking ways to build a career training pathway into auditing and HVAC occupations, but they have not yet found a way to do so within the LIEE program parameters. Though the utilities have experience creating internal career ladders in their own businesses through their apprenticeship programs, they have not worked with their contractors on this issue. As argued elsewhere in this report, creating career ladders that are meaningful pathways out of poverty requires seeking real job rungs in the labor market, and if they are not there, working at the policy level or with employers to create them. Training and education institutions and funders dedicated to providing their students with better opportunities upon completion of training programs will not sustain collaborations with the utilities unless these issues are addressed.

Given that this is the first time that the CPUC has funded a program with an explicit focus on inclusion of low-income, minority and disadvantaged workers in their WE&T activities, this pilot is very important and should be watched closely; an evaluation is now being conducted. It is important to underscore that, to date, inclusion of disadvantaged, minority and low-income workers for the purposes of career development has not been an explicit goal for the utility WE&T funding. If it should become a goal, it would require substantial reorientation of funding and program design.

This project has some of the elements of a sector strategy, with LATTC and CityBuild playing the role of sector intermediary by convening employers, developing curricula, etc. LATTC has also been specifically designated by the City of Los Angeles and the Los Angeles WIB as the workforce intermediary for the energy and utility sector, and has substantial experience that could be harnessed in a broader sector strategy framework. However, the limitations of the funding, the constraints of the contract with the CPUC, and the market conditions that have limited demand for new weatherization workers have discouraged a more robust sector strategy that could convene more employers and funders. Moreover, the projects have not taken full advantage of the convening power and relationships that the utilities have with LIEE contractors.

⁹ See also Fitzgerald, J. (2006). *Moving up in the New Economy: Career Ladders for U.S. Workers*. Ithaca, NY: Cornell University Press.

¹⁰ Installation work pays about \$13.00 per hour for the employers that LA Trade Tech is working with; we have no wage information for employers connected to the CityBuild work.

12.3.4 HVAC

Building off the call in the EE Strategic Plan for a restructuring of the HVAC industry, the CPUC approved approximately 10 million dollars for HVAC WE&T activities in the 2010–2012 cycle. This is a subprogram that includes conducting a comprehensive training needs assessment and delivering a dedicated, industry-specific effort to offer education and training opportunities targeted at all levels of the HVAC value chain.¹¹ This effort is to be coordinated with the utilities WE&T activities, but is under the management of the HVAC programs at each utility. As part of the Residential and Commercial HVAC program, utilities in California have plans to spend approximately \$700,000 per year providing training targeted across the HVAC industry for the 2010–2012 program cycle. Part of this funding is expected to be used to provide a training needs assessment to identify skill gaps in the HVAC industry as well as implement trainings to close those gaps. The goal of this program is to help contractors, installers, and technicians deliver high quality efficient HVAC service to all their customers all the time.

The linking of the WE&T activities to the overall strategy to upgrade HVAC work, build the high road, and close off the low road is an extremely positive development for achieving the state's energy and workforce goals. As noted in our analysis of the HVAC sector, training alone cannot solve the problem of endemic poor quality installation and maintenance in this sector.

The HVAC WE&T program is still in development. In addition to the needs assessment that has not yet been completed, the program is targeting training for contractors, technicians, apprentices, salespeople (who are critical because they need to properly size systems), building officials (who are critical because they inspect work to see if it meets codes) and students. The program also appears to endorse a contractor accreditation program that would promote quality contractors (for example "Gold Star Contractors" who maintain a minimum percentage of NATE-certified technicians and other quality indicators. This broad view of who should be trained (not just contractors, as most of the residential programs emphasize, but also workers) as well as the clear distinction regarding what are considered minimum quality standards for contractor participation in utility training programs is critical to transforming the industry, and fits in to our recommendations about how the utilities can help promote the high road.

The implementation process for investing in training for multiple categories of workers will be critical to the success of such an initiative. As the utilities invest in collaborations with industry groups and schools that are currently training for various HVAC job categories, they should gather information about the specific outcomes of the training programs in order to ensure wise investment of funds. For incumbent worker training programs, information about employers and their labor practices (such as wages, worker retention and turnover, and other indicators of high- or low-road competitive strategies) should be gathered so that investments are not made in training for workers who leave the industry at high rates. For pre-employment training programs, information about the placement rates and type of jobs that graduates obtain should be gathered and analyzed. To support the holistic set of policies to build the high road and close off the low road in HVAC, a quality lens needs to be used, even for WE&T investments. Though it makes sense at first analysis to invest in any and all training institutions in the market place, it is critical to avoid using public resources to support training in the low-road segments of the industry, in the vain hope that they will become high-road. The emphasis on working with union apprenticeship programs in the Southern California Edison plan is an important step forward because of their documented ongoing commitment to training among unionized HVAC contractors.

The investment in HVAC training also has some of the elements of a sector strategy but these are not yet well developed. However, it is missing a critical piece: the convening of a multi-employer consortium and, specifically,

¹¹ CPUC D.09-09-047; Southern California Edison 2009-2011 Energy efficiency plans March 2, 2009, p. 643.

the commitment of these employers to train incumbent or new hire workers, or to consider a pool of applicants who have undergone pre-employment training. This commitment, and issues of scale, cost-sharing, rewards for trained workers and other implementation issues must be negotiated, but there is significant expertise and technical assistance available in California that could be brought to bear on this issue.¹² Funding training without employer commitment to use trained workers is likely not to produce intended results.

12.4 CONNECTIONS (ENERGY EFFICIENCY EDUCATIONAL PROGRAMS)

The second component of the IOU WE&T programs are the *Connections* initiatives. The *Connections* initiatives include five programs targeting K-12, college, and university student populations. These educational programs were funded at approximately \$7 million dollars in 2010 and the utilities chose in which of the five programs they want to participate (Table 12.5).

Table 12.5 *Connections* Programs by Participating Utility and Budget*

Utility	2010-2012 Program Budget	Green Campus	Living Wise	PEAK	Green Schools	Energenius Program
SCE	\$9,003,792 **	X	X	X	X	X
SCG	\$1,281,871 **		X	X		
PG&E	\$4,110,424 **	X		X		X
SDG&E	\$1,620,652 **	X		X		
Total	\$16,016,739					

* Programs previously included in EARTH.

** CPUC Energy Efficiency Groupware Application, 2010-12 Program Cycle (2010). 2010-2012 Monthly Energy Efficiency Program Report, December 2010. SCE.MN.201011.1.xls. Retrieved from: <http://eega.cpuc.ca.gov/>.

Unlike the *Centergies* programs that train construction and buildings professionals, *Connections* programs encourage conservation and energy efficiency among end users, primarily students (K-12, community college, and four-year colleges), yet also among students' schools, families, and communities. *Connections* initiatives aim to foster collaborations between utilities and educational institutions with the objectives of:

- Promoting "green" careers to K-12, community college, and university students through energy-related curricula, internships, and tie-in to relevant degrees (e.g., engineering);
- Encouraging energy efficiency and conservation behavior among students with the intention of influencing their (and their families') daily energy-related decisions; and
- Educating school, school district, college, and university staff about the benefits of adopting energy efficiency measures and policies.

The specific programs that comprise the *Connections* initiative for the 2010–2012 program cycle are summarized in Table 14.1 in Chapter 14, where K-12 programs are described in more detail. These programs relate directly to two of the state's main workforce education institutions, the community colleges and high schools.

¹² See for example the California Edge Campaign at www.californiaedgcampaign.org, the Bay Area Workforce Funding Collaborative at <http://www.sff.org/programs/community-development/bawfc>, and the National Network of Sector Partners at <http://www.insightcced.org/communities/nnsf.html>.

Of the five current *Connections* programs, only Green Campus has a career development focus in which the dollars in the program directly support interns interested in energy efficiency and/or renewable energy careers. The Green Campus program's goals are fourfold:

- Build pathways to green careers for students by offering training, mentoring, and hands-on experience doing energy efficiency work;
- Realize measureable energy savings on campuses by helping campus faculty, staff, and students identify technologies or practices that can result in savings;
- Infuse energy efficiency concepts in current curricula; and
- Educate the campus community about energy efficiency and conservation through advertising, social media, and other venues.

Green Campus interns express an interest in energy topics and receive training and financial support to conduct efficiency projects on their campus. Examples of intern projects include:

- Coordinating dorm energy saving competitions;
- Encouraging campus staff to install efficient lighting by demonstrating savings; and
- Organizing and teaching energy efficiency classes and workshops (usually non-credit).

The remaining *Connections* programs have a broader focus of educating students and their families about conservation and energy efficiency. Living Wise, PEAK, Energenius, and Green Schools all help students learn about conservation, energy, and energy efficiency with the intention of increasing awareness of these topics and changing behaviors at home. The programs also seek to tap into and increase students' interest in the energy efficiency and the environment. According to utility staff, career exploration modules have recently been added to the PEAK program, but the effectiveness and usefulness of these modules have yet to be evaluated.

12.4.1 PILOT PROGRAMS

In addition to the current *Connections* programs, there were two pilots underway in 2010; The Green Pathways program in PG&E service territory and the Green Training Collaborative in SCG territory. Both of these programs focus on career development.

12.4.1.1 GREEN PATHWAYS

This program was piloted in the PG&E service area in 2009/2010 with full implementation scheduled statewide for 2012. This is a career development program for high school students throughout California with the objective of cultivating the next generation of "green" professional and vocational careers. Under the pilot, students will work with teachers and career counselors to identify steps they need to take to attain a green career. Teachers will receive curricular and electronic resources designed to help them guide students that express an interest in a green career. Furthermore, through web-based dialogues and other network-based communications students and teachers will be able to connect with practicing and retired professionals in business and industry, professors and researchers in higher education, and local and state government. Green Pathways incorporates the fundamentals of career development planning and strategy in the context of energy and environmental education.

This program is integrated with the California Department of Education's Partnership Academies, which are three-year programs for students in grades 10 through 12 that creates a school within a school and focuses on a career theme. The goal of the New Energy Academy is to take this school-within-a-school approach and provide

participating students with an integrated academic and technical STEM-based education¹³ focused on energy and environment. Each school will receive cash grants, customized professional development workshops and webcasts, and access to education, industry and government experts. Teachers participating in the curriculum development phase will also create a plan to integrate the new curriculum into academic and career technical education courses.

The pilot schools in PG&E's territory are:

- Berkeley High School (Berkeley)—Berkeley Unified School District
- Foothill High School (Sacramento)—Twin Rivers School District
- Edison High School (Fresno)—Fresno Unified School District
- Independence High School (Bakersfield)—Kern County School District
- Venture Academy (Stockton)—San Joaquin County Office of Education; GreenIT

12.4.1.2 GREEN TRAINING COLLABORATIVE

This is a pilot program designed to involve local community education institutions and training programs in energy related career development strategy sessions. SCG will coordinate with regional implementers of such career programs to discuss projects that allow students and other potential green workforce candidates to explore energy efficiency, integrated demand-side management technologies and resource management techniques.

12.5 OTHER PROGRAMS

Other education and training programs, besides the WE&T *Centergies* and *Connections* programs that were the focus of this study, include programs designed for utility staff and training associated with specific programs.

12.5.2 POWER PATHWAYS

Power Pathways is a PG&E program that focuses on training for current utility employees and others interested in utility careers, which initially focused on pre-apprenticeship training for power line workers. Power Pathways seeks to increase the pool of workers with the engineering and craft skills needed to provide power to utility customers. PG&E does this by partnering with educational institutions, industry associations, and labor groups.

Some recent examples of Power Pathways programs are PG&E's work with California State University, East Bay to design a Power Engineering Certificate and an Integrated Energy Solutions Certificate. These stackable certificates provide skill upgrade training for electrical engineers, electrical design drafters, or other technical design workers that would like to become design engineers or work in integrated demand-side management. The certificates require completion of four courses and take about a year to complete. As this is training for incumbent workers, students often receive tuition reimbursement from an employer.

The relationships built through the Power Pathways are being used to initiate new collaborations in the energy efficiency arena as well, where the employer is not PG&E but rather contractors who may participate in PG&E utility programs.

¹³ STEM is the acronym for science, technology, engineering and mathematics.

12.6 ANALYSIS OF UTILITY WE&T PROGRAMS

The *Centergies* and *Connections* programs serve many purposes, not all of which are relevant to this analysis. Our task was to assess their role in the wider energy-efficiency related workforce development infrastructure, identify core competencies and resources, and make recommendations on how best to leverage these programs. The IOUs provide substantial, dedicated resources for workforce education and training in energy efficiency, distributed generation, and demand-side management. These resources are, in fact, the only dedicated public resources for these sectors. The majority of WE&T funding and programming consists of short-term classes for incumbent workers, mostly professional workers and business owners or managers in the Energy Training Centers. These classes are designed to provide technical knowledge that can (1) change practices for market actors doing work that impacts energy efficiency and (2) encourage the end users to make more informed decisions about investments in energy efficiency. These two goals are consistent with the objectives of the EE Strategic Plan and have been the de facto mission of the Energy Training Centers.

For the first time, the CPUC has developed specific program performance metrics that attempt to capture outcomes, rather than quantities of classes, by which to measure the effectiveness of utility WE&T programs. Below, we list the performance metrics of the 2010–2012 cycle,¹⁴ and review them (in italics) in light of the results of this needs assessment.

- Change in the percentage of *Centergies* program participants stating an interest in pursuing green careers as a result of program participation, relative to baseline.

Since our needs assessment shows a limited number of new jobs and a very large queue of unemployed experienced workers in the occupations most prominent in the energy efficiency sectors, this may not be an appropriate goal.

- Change in the percentage of *Centergies* program participants reporting utilization of knowledge and skills received from the program, relative to baseline.

This is a valuable metric to address the critical need of skills upgrading for workers already in the industries and occupations related to energy efficiency.

- Percentage of past *Centergies* participants that attribute the program as a significant reason they are currently working in a clean energy job (identify figures for low-income participants).

This has the same weakness as the first metric.

- Percentage of prior program cycle participating schools that have continued the WET *Connection* training activities without program support.

Sustainability is an important measure, but is not a measure of the success of the programs. Desired outcomes need to be clearly stated, whether they are change in behavior, career preparation, or other outcomes, and performance metrics developed to measure achievement of these outcomes.

- Percentage of California HVAC-training institutions offering courses using Quality Installation and Quality Maintenance standards.

¹⁴ Provided by CPUC staff on 10/24/2010.

As per our discussion of the HVAC training subprograms, we suggest that a more targeted metric that measures success in collaborating with training organizations, like apprenticeship programs, that have been targeted due to their position as training institutions for the high road segments of the HVAC industry.

The evidence from the Opinion Dynamics evaluation shows that the WE&T programs offered by the ETCs result in significant energy savings, comparable to many incentive programs that directly fund energy efficiency work.¹⁵ For end users who take classes, Opinion Dynamics was able to trace behavior change and extrapolate energy savings. The study found that there was significant energy savings attributable to the classes, with almost 99 percent of it due to changes made by commercial end users, and less than 1 percent from residential end users.¹⁶ For market actors, the Opinion Dynamics study was not able to quantify overall savings due to constraints on the evaluation, but given their impact on multiple buildings, it is likely to be large as well.

Until very recently, the utilities have not been explicitly directed to support career development goals for Californians interested in or involved in green careers, or to focus the resources of the ETCs on ensuring full participation of low-income, minority, and disadvantaged communities. This change in direction requires rethinking of goals, strategies and programs. Metrics of success for workforce and career development generally focus on positive outcomes for students and workers, in terms of skill acquisition leading to job placement, movement along a career path, and wage progression as skills and experience increase. The *Centergies* program is not structured to address these goals and would have to be changed significantly to do so.

The *Connections* program is developing initiatives that may better meet workforce development goals. These new programs are linked to vocational/technical training in high school and community colleges which are key components of California's workforce training and education infrastructure. This is an expansion of—and a shift in direction from—earlier programs that centered on pre-career education for students not yet in high school and was more oriented towards consumer, as opposed to career, education. If the *Connections* program is selected as the vehicle for addressing an explicit goal of improving workforce outcomes in the energy efficiency sectors for disadvantaged workers, deepening and broadening its collaboration with the career academy partnerships is the most obvious opportunity.

Until recently, CPUC performance metrics for the WE&T programs have been based on quantitative measures, such as the number of classes held and the number of attendees. In this cycle, new performance metrics have been developed that begin to address ways to capture the impact on behavior change leading to energy savings and workforce development outcomes. In addition, evaluations will take place in the 2010–2012 program cycle that seek to quantify potential energy savings as a result of both *Centergies* and *Connections* investments.

12.7 RECOMMENDATIONS

The WE&T programs are a very valuable state asset with a proven track record for contributing to energy savings. Our recommendations are meant to acknowledge and build upon those contributions. We recommend that specific objectives and metrics of success be developed for both energy savings and workforce development, building on the particular strengths and resources that the WE&T initiatives can provide. The CPUC needs to assess the competing priorities of these policy goals and be explicit about the relative weight each should have. We divide our recommendations into those that can impact energy savings and those that can contribute to the state's workforce development goals, including goals of inclusion of low-income workers. We believe these overlap

¹⁵ Opinion Dynamics, 2010, p. 96.

¹⁶ Opinion Dynamics, 2010, p. 90.

significantly, and the best workforce development meets both goals, but it is important to analytically distinguish the two policy goals in order to clarify the metrics that could measure success.

12.7.1 ENERGY CENTER RECOMMENDATIONS

Achieving energy efficiency goals is the main mission of the WE&T programs and there is widespread agreement, as well as evidence from the 2006–08 evaluation, that the Energy Training Centers are achieving these goals. Our recommendations include:

- **EXPAND CONTRACTOR AND CONTRACTOR ASSOCIATION COLLABORATIONS** to building and construction trades associations that have demonstrated a commitment to investments in ongoing workforce training, such as contributions to apprenticeship programs.

One of the functions of the Energy Training Centers is to expose market actors to new business opportunities in energy efficiency markets and to inform them of the resources available through utility incentive programs. As stated earlier, the majority of collaborations with contractor associations have thus far been with those who are focused on and already see the value of energy efficiency and integrated demand-side management. This strategy made sense when energy efficiency concerns were limited to pioneers and first adopters. However, as these issues become more mainstream, collaborations with traditional building and construction trades associations present an opportunity to integrate new practices more broadly. New criteria for selecting contractor collaborations should emphasize employer commitment to investing in a stable and trained workforce, so that the Energy Training Centers are supporting the higher quality contractors within a subsector, and ratepayer training investments are not lost due to high turnover.

- **MODIFY COURSE OFFERINGS** to expand targeted cohort-based series of classes that are longer in length, focus on a specific occupation, have a workplace-based hands-on component, clear learning objectives, and lead towards a certification.

The Building Operators Certification program, funded by the IOUs, follows this model and had higher impact on energy savings according to the 2006–08 evaluation. In addition, the Energy Training Centers' programs should continue to make sure that their classes "count" for continuing education credits or renewal of certifications for all relevant disciplines, so that the classes produce value for participants within their professions. Open enrollment should not be required for all programs because this requirement limits the ability to target course offerings.

- **ACTIVELY PARTICIPATE** in supporting curriculum review and updating, instructor professional development, and continuing education requirements associated with license renewal for the main "home institutions" that train building and construction professionals and tradespeople, including four-year colleges and graduate programs, apprenticeships and community colleges.

Many professionals, business owners, and building and construction trades workers who are in a position to promote energy efficiency through their work have established educational and training "home" institutions that provide the fundamental training for these workers. To ensure that these training programs provide accurate and up-to-date information, by utilizing the Energy Training Centers, the IOUs should continue to seek opportunities to contribute to curriculum development and update instructor professional development within these "home" institutions. As the utility WE&T training efforts move beyond one-off short workshops for early-adopter professionals to providing expert knowledge that can be integrated into longer-term career technical training programs, the utilities should select partner organizations that are sustainable, of sufficient depth and breadth, and

are part of the higher road segments of their industry. The most important opportunities for expanding this work are with the community colleges, four-year engineering programs and the state-certified apprenticeship programs. In these institutions, the programs have their own instructors and ways of incorporating curricula. The utilities need to work on developing relationships to ascertain if and how IOU expertise could contribute.

Rather than teaching technical skills to those already sold on the importance of saving energy, this new approach requires expanding outreach and education to leadership in the main home institutions who may be less interested or converted. Though this process undoubtedly would differ by specific field or trade, it requires finding arenas in which to present information both about the state's mandates to save energy and the resources available to help do so. This entails developing ways to help these organizations see their own self-interest in changing and updating curricula to integrate the most advanced skills and knowledge about energy savings.

- **STRENGTHENING TRACKING OF PARTICIPANTS AND OUTCOMES:** The Opinion Dynamics evaluation makes a number of suggestions for tracking participants in the Energy Centers programs. We endorse these and add the following:
 - The current job held by participant, including occupation and industry (based on SOC and NAICS), as well as sector (residential, commercial, etc.)
 - Demographic data of participants including gender, age, race/ethnicity, educational attainment, household income. This is important for several reasons, including, to assess to what degree the programs serve disadvantaged, low-income and minority communities, to better grasp what jobs these skill upgrades can influence, and what role the programs play in the career development of participants.

12.7.2 CONNECTIONS PROGRAM RECOMMENDATIONS

- **STRENGTHEN AND EXPAND COLLABORATIONS** with career Academies, Regional Occupational Programs (ROPs) and community colleges.

Career development is a very new area for WE&T programming, and efforts both to set goals and develop strategies are only now emerging. The Energy Training Centers are not set up for this purpose, though some individual participants cobble together many classes for their career development. The *Connections* programs thus far have been more oriented towards collaborations with educational institutions on consumer awareness and institutional energy savings. Since they have a set of relationships with educational institutions, these may be leveraged to focus on partnerships with career technical programs at high school and community colleges. The key assets the IOUs bring are deep knowledge of new technologies (and associated skills needs) that are likely to be deployed in the market place, and financial resources. Focusing on high school and community college career technical education, apprenticeships, and four-year colleges has the benefit of leading to more targeted career development results.

- Continue to **SUPPORT AND EXPAND CAREER AWARENESS AND EXPLORATION** in K-12 programs.

As indicated in our K-12 key findings report, the IOUs have recently added career awareness and career exploration modules to the K-8 programs: Living Wise, PEAK, Green Schools, and Energenius. In this way, the K-8 programs, which, until recently, have mostly focused on how students and their families can save energy, will also contribute to the career development policy goal. These career development modules should be evaluated using appropriate performance metrics.

12.7.3 GENERAL RECOMMENDATIONS FOR WE&T PROGRAMS

- **SUPPORT SECTOR STRATEGIES**

Using the CALCTP as a model, utilities should initiate, help fund, or partner with other organizations to develop robust sector strategies in key sectors such as HVAC, building operators, , and other emerging sectors such as new energy storage, integrated demand-side management and commercial building benchmarking (as well as LIEE, described in the next bullet). Sector strategies based on industry partnerships are a more effective way of making sure skills upgrading is actually used in the marketplace, compared to training that are not tied directly to employers. Sector strategies also allow the utilities to bring their greatest asset—the role as hubs of best practices and emerging technologies and their associated skill standards—to support larger partnerships with the major training and education institutions in the state. Finally, they allow co-funding arrangements so that the sector strategies can tap into public training dollars through the WIA system, the California Employment Training Panel, and other private and public sources.

- **SERVE LOW-INCOME COMMUNITIES** through a Sector Strategy Approach to LIEE Programs

The IOUs have the opportunity to reshape the LIEE training and investment programs to contribute to career development for members of low-income communities who can be hired by LIEE contractors. Such an effort should align training requirements with the DOE weatherization skills standards that are being developed (see residential case study in Chapter 4) and build on the lessons being learned from the current pilots between LATTC and Southern California Gas LIEE contractors and CityBuild and PG&E contractors. Given the lack of information about job quality in LIEE employment and anecdotal evidence about low wages and lack of career ladders, we caution that revisions to the LIEE program, not just the training activities, are probably also necessary to achieve positive outcomes for LIEE contractor employees. Unless LIEE jobs have a decent starting wage and a career ladder, investments in training will be insufficient to create pathways out of poverty for members of disadvantaged communities. Careful consideration must be taken to balance policy goals in these programs. Changing the direction of LIEE programs to focus on serving the needs of low income communities through workforce development, as well as home energy savings, may require a shift in budget priorities.

However, improving job quality can also result in a more stable work force with the skills needed to move from a widget based approach to a whole house approach that can deepen energy savings. Given that current practices of subcontracting in some of the IOU LIEE programs do not seem to result in optimal energy savings, it may be possible to better meet both energy savings and workforce goals. At the very least, information should be collected on wages, turnover, and workforce characteristics to determine relationships between workforce practices and energy savings. Pilots that test alternative program design elements regarding the workforce, including sector strategies that incorporate the new DOE skill certifications and programs that are built on high road agreements, should be funded (see Chapter 4).

CHAPTER THIRTEEN:

13. ANALYSIS OF WORKFORCE EDUCATION AND TRAINING SURVEY

This chapter synthesizes the information gathered about all the training and education programs described in depth in the preceding chapters, allowing us to better understand the component parts of California's workforce development infrastructure, their role in the workforce development system, and how they fit together. The purpose of this analysis is to identify strengths and weaknesses in this infrastructure, as well as opportunities for more effective leveraging of its component parts.

This analysis has revealed a robust and complex workforce training infrastructure that is delivering training at many levels, and in a variety of occupational specialties. In fact, our investigation identified over 1,500 distinct programs providing training relevant to energy efficiency, renewable energy and related occupations. Clearly there is no shortage of training opportunities available, but the value and effectiveness of this training, the coordination between training institutions, the credentials provided or trained for, and, ultimately, the outcomes for workers and for the achievement of California's energy policy goals vary widely.

Although we are unable to evaluate the effectiveness of individual training programs in preparing workers for energy efficiency related jobs, we use a variety of program characteristics that enable us to generalize based on institutional type. This helps create a picture of how different types of institutions prepare new and incumbent workers, and how they approach skill development for energy efficiency and related sectors.

Specifically, the chapter analyzes the following characteristics:

- The relative length and depth of the training;
- The main occupations and skills each institution trains for, including whether they focus on traditional occupations or specialized energy efficiency related training;
- The kinds of certifications and credentials programs train for;
- Training program completion data;
- The role each program plays along the continuum of pre-employment to incumbent worker training, and the range of skills from basic, to skilled trades, to professional; and
- The training pathways and articulation between institutions in key sectors.

In-depth occupational training leads to industry-recognized credentials, has effective mechanisms to connect workers with jobs, and is linked to an ongoing system of continuing education and skills upgrade training. The established workforce development literature, as well as our own analysis, makes it clear that this is the most effective way of ensuring that workers will be well prepared to do high quality, professional work, and will be linked in to a long-term career pathway that provides a level of compensation consistent with training investment. Of the institutions surveyed, four-year colleges and state-certified apprenticeship programs are the key institutions providing this type of training, and these institutions focus primarily on traditional occupational categories. Other institutions serve important functions, but these result in the best outcomes for workers when they are articulated with apprenticeship training or four-year college. There are also one to two-year certificate and degree programs in community colleges in specialty occupations, such as heating, ventilation, and air conditioning (HVAC) and building inspection, which prepare workers for entry-level technician jobs. However, it is not unusual for shorter

and often narrower programs to be disconnected from more comprehensive training, which limits their capacity to help students, workers, and job seekers to obtain jobs with adequate wage floors and career paths.

The reader should be aware that the lack of data on job placements and job trajectories after graduation impedes rigorous analysis of training outcomes. We use a variety of indicators and information to infer the effectiveness of training institutions and programs.

13.1 OVERVIEW OF WORKFORCE TRAINING AND EDUCATION INSTITUTIONS

Table 13.1 provides a brief overview of the main characteristics of each institution.¹ These seven institutional types differ widely in their purpose, function, and organization, even when training in the same field. Some programs, including most community colleges, apprenticeships, and four-year universities, are standardized and regulated by the state, or are accredited by a recognized national organization. These institutions provide students with credentials and certifications that are widely recognized by employers. Others, particularly those run by community-based organizations (CBOs) and private training organizations, are more heterogeneous and do not necessarily conform to any specific standards.

As Table 13.1 illustrates, the length and depth of the training programs and scope of skills taught vary substantially between these institutions, ranging from a few hours to several years. Universities and apprenticeships offer the longest, most in-depth training programs, serving to bring workers from a novice level to competence and mastery of their field. Individuals who complete apprenticeship programs are also tied into a system of ongoing incumbent worker training, which is available throughout a tradesperson's career. Other training programs provide much shorter-term training for both entry-level workers and incumbent workers. Very short-term training, particularly that offered by the Energy Training Centers at the utilities, focuses on incumbent workers and is often one day or less.

13.2 OCCUPATIONAL PROFILE AND SCOPE OF TRAINING INSTITUTIONS

Each training program is designed to impart a set of skills to a worker or student that are useful for one or more occupations. Table 13.2 provides a summary of the occupational specialties of the programs identified in the Inventory (Appendix I). This shows the number of programs training for each major occupation, within each institutional type.

Identifying the primary occupation associated with a program is complex because of the variation in the breadth and depth of skills taught and the different ways training programs are organized. The intermediate- and long-term training institutions, such as apprenticeship or educational degree programs, use the federal government's standard occupational codes to categorize their programs, but in other training programs, this is not done.

¹ More detailed information on each type of institution is presented in Chapters 6-12. Appendix I is the complete inventory of California WE&T Programs in the energy efficiency sectors, and includes information from the survey as well as additional research. Chapter 5 presents a brief description of the data used in this analysis and Appendix G describes our inventory and survey methodology in greater detail.

Table 13.1 Institutional Overview

Institution	Description	Average Length of Training
Four-Year Colleges and Universities	<ul style="list-style-type: none"> • Training for qualified high school graduates and community-college transfer students • Long-term pre-employment education for professional or managerial jobs that are linked to professional licenses and continuing education 	4 years
Apprenticeships	<ul style="list-style-type: none"> • Long-term training in the building and mechanical trades • Apprentices typically start with little or no experience, and learn to be experts in their trade while working full-time for an employer and receiving classroom instruction • Wages increase with skill level • Most joint apprenticeships offer skills upgrade training for journey workers to update or enhance their skills* 	3 to 5 years
Community Colleges	<ul style="list-style-type: none"> • Post-secondary education that is open to those with limited resources and low basic skill levels • Students may obtain an associate's degree after two full-time years of study, and/or receive a vocational certificate in a shorter amount of time, usually one year • There are multiple pathways, including into apprenticeship, transfer to four-year, or stand-alone training for entry-level, semi-skilled jobs** • Incumbent workers also access community college classes, primarily for re-skilling or skills upgrade training 	6 months to 2 years (some custom programs as short as 4 weeks)
Community-Based Training Organizations (CBOs)	<ul style="list-style-type: none"> • Serve disadvantaged, minority, and low-income populations with limited occupational skills and work experience at the front end of the career pathway • Most provide work readiness and pre-employment skills training, and may offer pre-apprenticeship • Typically short-term 	3 days to 3 months
Private Industry Training Organizations	<ul style="list-style-type: none"> • Can be private for-profit organizations, non-profits, or trade associations • Offer pre-employment or incumbent worker training in the energy efficiency, renewable energy, or the building trades • Training is typically very short-term with longer programs for some specialty trades • Programs are often costly compared to other institutions, but receive some public Workforce Investment Act (WIA) funds when trainees can use WIA individual training accounts to pay for training 	1 day to 6 months
Regional Occupational Programs (ROPs)	<ul style="list-style-type: none"> • Offer career and technical education courses at high schools • Help provide students with the skills needed for entry-level positions within the career track of their choice, or for entry into additional vocational or post-secondary training 	6 months to 2 years
IOU Energy Training Centers	<ul style="list-style-type: none"> • Energy Training Centers primarily provide short-term classes and seminars • Although open to anyone, many classes are targeted toward experienced incumbent contractors and professionals looking to acquire specific skills in energy efficiency and related topics • Main goal is to provide knowledge that will help save energy 	1 to 5 days

* We did not capture complete information on journey upgrade courses in our inventory of training programs, although they are a critical part of continuing education for journeypersons which were mentioned in almost all apprenticeship interviews.

** We did not capture complete information on contract education in our analysis because we were focused on community college programs that lead to a certificate or a degree.

Table 13.2 Number of Program Tracks by Primary Occupation, 2010

Main Trade Or Skill Set	Four-Year and Graduate	Community College	Private	Apprenticeship—Joint	Apprenticeship—Unilateral	ROP	CBO	TOTAL
Professional / Managerial								
Architecture	24	70	1					95
Civil Engineering	45	5						50
Construction Management	11	31	17					59
Electrical Engineering								0
Engineering, General	54	123	3			26		206
Engineering and Architecture (Drafting / Design)		162				44		206
Law/Policy	2	1						3
Management	3							3
Mechanical Engineering	63							63
Total for Professional / Managerial	202	392	21	0	0	70	0	685
Traditional Trades								
Boilermaker				1				1
Bricklayer				3	1			4
Carpenter		13		20	5			38
Cement Mason				1	1			2
Construction Inspector		41	5					46
Electrician		24	4	42	13			83
Elevator Constructor				2	1			3
General Construction Worker		29				117	17	163
Glazier				3				3
Heat and Frost Insulator				2	1			3
HVAC/R Worker ¹	2	64	11	15	4			96
Laborer				10	3			13
Operating Engineer ²				9	3			12
Plasterer				5				5
Plumber, Pipefitter, and Steamfitter		2		58	7			67
Roofer / Waterproofor				8	2			10
Sheet Metal Worker ¹		5		33	4			42
Sprinkler Fitter				5	3			8
Total for Traditional Trades	2	178	20	217	48	117	17	599
New and Emerging Trades								
Auditing and/or Inspection		11	107					118
Renewable Energy and Energy-Efficiency Specific ³		25	56		2	24	22	129
Total for New and Emerging Trades	0	36	163	0	2	24	22	247
Total	204	606	204	217	50	211	39	1,531

Note: We did not include information for utility Energy Training Centers here because data by occupation is not collected according to primary occupation. See Chapter 12 for information on training areas.

Table 13.2 (continued) Number of Program Tracks by Primary Occupation, 2010

¹ Most HVAC/R training tracks for apprenticeship are incorporated in the committees for plumbers, pipefitters, and steamfitters. Others are refrigeration-specific committees. Sheet metal workers work with HVAC systems as well.

² Including stationary engineers as well.

³ Many emerging occupational training programs teach a variety of skills for energy efficiency and renewable energy so we use a broad category here. Auditing and/or inspection refers to programs specializing only in audit and/or inspection. Some renewable energy and energy-specific programs may also teach some aspects of auditing or inspection in addition to other skills.

In Table 13.2, the department name for four-year and community colleges indicates the main occupation, while in apprenticeship occupation is indicated by the trade. Short-term, entry-level programs are classified within a broad category (e.g., “general construction”), because they train in very basic and general occupational skills. Short-term, advanced incumbent training programs are classified according to the category of the specialty skill (e.g., “architecture” for Leadership in Energy and Environmental Design courses), but the reader should note that the participants might be employed in a variety of occupations.²

As expected, four-year universities train almost exclusively for professional or managerial jobs, while apprenticeship training is entirely focused on the traditional construction trades. Relevant trades include both the basic crafts that mostly focus on building envelopes, and the electrical and mechanical crafts, that focus on building systems. Community colleges span both professional/managerial and trades occupations, as they offer transfer programs to four-year universities, as well as pre-apprenticeship and certificates in HVAC, construction inspection and some new specialized categories like renewable energy and energy efficiency. ROPs and CBOs focus on basic, introductory job skills for more general job categories, although there are a significant number of recently developed CBO programs that focus specifically on renewable energy and energy efficiency related occupations. Private industry programs provide some entry-level training and also specific technical upgrade skills for a variety of occupations. Utility programs offer the greatest number of short-term skills and knowledge upgrade courses, mostly geared towards contractors, distributors, engineers, and other professionals.

The greatest degree of occupational overlap is in the construction trades. For these occupations, different institutions offer training for the same occupations, but at different levels and with varying skill sets. Consider a carpenter—such a worker may have received any of the following levels of training:

- Four to five years of an apprenticeship program, possibly with an additional pre-apprenticeship;
- One or two years of instruction at a community college program in construction crafts;
- Less than one year of entry-level training in general construction at a CBO, ROP, or private training organization; or
- Only work experience, with no formal training.

Often, training programs are geared to either the residential or the commercial/public sector. For example, workers who have been through a certified apprenticeship program are more likely to work in the commercial sector, while those graduating from shorter training programs are more likely to work in the residential sector. However, in some cases workers with vastly different preparation compete directly for the same set of jobs. For example, some non-union construction firms in the commercial sector do not hire journey-level tradespeople. In

² The occupational variable shown in table 13.2 is an aggregation of the idiosyncratic classifications that are listed, along with each individual program, in the inventory. The inventory also includes the broader skills category (such as electrical systems or building envelope) for each program.

this case, if training for the non-union sector is publicly subsidized, but of less breadth and depth than apprenticeship training (which is paid for by employers and workers), public investment in training can actually exacerbate cost-oriented competition, devalue long-term training, and lead to lower skill standards and wages throughout the industry.

13.2.1 EMERGING VS. TRADITIONAL OCCUPATIONS

Many training programs teach skills that are applicable to several occupations, in addition to their primary focus. This is particularly true for the traditional trades that have incorporated (or upgraded) energy efficiency skills into their training. Our labor demand forecast in Chapter 3 suggests that these traditional jobs with expanded skill sets will be in much greater demand than emerging occupations that specialize in energy efficiency. Demand for the latter type could still grow, however; this will partly depend on policy decisions that encourage specific skill certifications and/or invest in either incorporating energy efficiency into existing traditional occupations or in narrower energy-efficiency skills training.

In an effort to capture the range of skills taught, we asked interviewees to identify additional skills and occupations that they include their training, and also to specifically describe how energy efficiency knowledge and skills have been included. We used this self-reported information to determine to what extent training programs for “traditional” occupations are incorporating new energy efficiency-specific skills and which skills are prioritized. For programs that have an energy efficiency or renewable energy focus, we were able to determine which specialties are included in the curriculum and what other skills they may teach.³

The incorporation of emerging skills into existing training programs has been intentional and widespread in some institutions or programs, but not in others. Apprenticeships and many community college programs report upgrading their curriculum regularly to keep pace with changes in building code related to energy efficiency (Title 24). Beginning in 2011, the Division of Apprenticeship Standards (DAS) requires all building trade apprenticeships to explicitly identify energy efficiency and green construction practices in their Minimum Industry Training Criteria.⁴ Beyond code, apprenticeship programs that are linked to employers who are at the cutting edge of energy efficiency practices have an immediate mechanism to update curricula regularly, through the joint labor–management apprenticeship committees (JACs), though if the employers in the committee are not aware of best practices, updating curricula may not occur. In contrast, at other institutions like ROPs or four-year universities, the incorporation of enhanced energy efficiency skills training in traditional occupational training has not been coordinated or consistent. Some individual programs have made significant advances in this area, usually due to faculty interest, while others have made no changes at all.

Long-term intermediate and advanced training programs frequently teach energy efficiency, among other skills that could be taught as stand-alone training for less-skilled occupations, as components nested within broader traditional occupational training programs. For example, apprenticeship training for electricians also includes solar photovoltaic (PV) installation, but in other institutions, it is taught as a narrow skill set existing as stand-alone job training. Training for energy auditing also exists as both short-term courses at private organizations that prepare workers for employment as energy auditors, and as a unit within sheet metal apprenticeship and journey upgrade

³ Appendix I shows the skills emphases that we were able to identify among training programs. We note traditional skills categories (i.e., engineering, building envelope, mechanical systems, etc.), as well as specialty energy efficiency skills.

⁴ California Department of Industrial Relations, Division of Apprenticeship Standards (2011). Minimum Industry Training Criteria. Retrieved from: <http://www.dir.ca.gov/das/mitc.htm>.

courses, so that sheet metal journey-persons are prepared to do energy audits in addition to their traditional tasks.⁵

When it comes to training specifically for energy efficiency or renewable energy occupations, the majority of programs are offered by private organizations and the utilities. In many cases these are skills upgrade training courses that are undertaken by professional workers in more traditional occupational classifications who have already undergone long-term occupational training. Skills upgrade training offered by utility energy centers is generally focused on a particular end use and provides supplemental skill or knowledge for experienced professionals or contractors, who may be employed in a variety of related (but distinct) occupations.

There are also entry-level courses that prepare workers for a specific energy efficiency-related task, such as solar PV installation, without the broad occupational background of a traditional trade. Private organizations, CBOs, and community colleges have all developed new training programs specifically targeted at one skill (or set of skills) related to energy efficiency. While we did not specifically interview American Recovery and Reinvestment Act (ARRA)-funded training programs, short-term training in narrowly-focused, energy efficiency-specific occupations was the norm here as well.

Although some entry-level, energy efficiency-specific training programs may perceive themselves (or be perceived) as the only trainers responding to new market demand, in fact many of the skills for these “new” occupations already exist, or are being incorporated into comprehensive training in traditional trades and professions.⁶ This is one reason for the low projected demand for energy efficiency-specific training in Chapter 3. One community college program in the area of energy efficiency and renewable energy expressed concern is that there is a lot of “hype” around renewable energy, and that they may be oversupplying the market with people who lack “solid training in the main field.” For example, the program representative reported that “we don't see many solar hot water installer jobs out there, but there are jobs for electricians with solar systems knowledge.” In response to these circumstances, they have downplayed the solar certificate in their program. The trainer indicated that there are other programs with stronger training in electrical work, and that these programs should be the ones integrating the solar certificates.

Job placement rates reported by CBOs also support the conclusion that employers prefer workers with broader skills training, as programs training for energy efficiency specific occupations have very low job placement rates compared with those training in more traditional skills. The programs we interviewed reported that approximately 74 percent of graduates from traditional construction programs are hired for a job or enter a paid apprenticeship each year, but only 19 percent of those from energy-efficiency oriented programs are. The lack of job placement data in other private, ROP, and community college programs training in these same skills means that comparisons are not possible.

Narrowly-focused training in energy efficiency skills plays an important role in skills upgrading for incumbent workers in the residential sector, where most workers learn on the job because there is very little long-term advanced skills training. Short-term, narrow training in energy efficiency skills for entry-level work is problematic, however, and policymakers should be wary of supporting or promoting this type of training in the cases where another option exists. Our research and interviews indicate strongly that the outcomes in terms of placement rates, quality of work, worker safety, compensation, and career advancement are better in the cases where energy efficiency skills are integrated into long-term, comprehensive training for a traditional occupation. Not only is the

⁵ Other examples of emerging occupations that we found included in the curriculum for one or more apprenticeable trades included solar installer, energy raters and inspectors, weatherization installers and technicians, and wind technicians.

⁶ Dierdorff, E., J. Norton, D. Drewes, C. Kroustalis, D. Rivkin, P. Lewis (February 2009). Greening the World of Work: Implications for O*NET-SOC and New and Emerging Occupations. North Carolina State University and the National Center for O*NET Development. Retrieved from: <http://www.onetcenter.org/reports/Green.html>.

training linked to related skills, but the worker obtains more broadly applicable skills and is linked in to a more established career pathway. We project that these types of jobs will be in greater demand into the future as well, due to their more dynamic and comprehensive skill set.

13.3 SKILLS AND CREDENTIALS

Because of the great number of training programs in the state and the lack of clearly recognized skills standards in many sectors, this study is unable to make a thorough evaluation of the quality of skills training provided by any given training program or institution. However, one of the best available indicators for assessing training quality is the list of certifications and credentials that a program offers or trains for.

As described in Chapter 5, industry-recognized worker credentials are a critical tool for ensuring both work quality and job quality by verifying that a worker's skills meet a particular standard. In some industries and occupations, such as engineering, training standards and credentialing requirements are clear. However, in general, training programs for traditional and emerging energy efficiency related occupations offer a bewildering array of credentials. In sectors such as residential construction, there is a great deal of confusion about what the basic standard for training should be and which credentials workers should be aiming for in order to improve their standing in the job market. A number of instructors in community colleges and CBOs who train for residential work, expressed this common sentiment: "just tell me the standard so I know what to train for."

In order to get a handle on the credentialing landscape in energy efficiency sectors, we gathered information from each of the training programs interviewed about what credentials their students typically earn. We also used information from key informant interviews and our qualitative research for the sector case studies (chapter 4), to help us get a sense of which certifications have real value in the industry from the perspective of employers, and also which certifications are being favored in policy design and implementation related to energy efficiency. Appendix H provides a list of the credentials mentioned by the training programs we interviewed within each type of institution. The list is organized by building system, including electrical, HVAC, and building envelope-related credentials, in order to give a sense of the most prominent credentials within each area of energy efficiency, as well as which types of institutions are best preparing workers to do the energy efficiency related work in these fields. In the HVAC sector, for example, North American Technician Excellence (NATE) is an American National Standards Institute (ANSI)-approved, industry-recognized certification that signifies competency in critical skills for systems installation that ensures efficiency and safety. NATE certification is typically obtained as part of a sheet metal worker apprenticeship, and is now required in the investor-owned utilities (IOU) incentive programs for HVAC.

The transparency of specific credentials' value varies by sector and by type of occupation. Credentialing pathways are well-established in the universe of professional occupations. Engineers and architects, for example, are expected to earn both educational degrees, which indicate a particular level of training, and licenses, which certify competency. Licenses are mandated by the state, and an individual must earn one in order to be allowed, under state law, to practice in a particular profession. In most cases, professional licenses require a four-year degree, several years of work experience, and the successful completion of a series of rigorous examinations. Thus, the educational degree is an entry-level credential that opens the door to employment and advancement in these fields. In addition, licensing maintenance requirements tie professionals in to a system of continuing education and professional development.

In the commercial sector building trades, apprenticeship training and state-issued journey cards are widely accepted as the industry-recognized occupational certification. Within the electrical field, there are also state licensing requirements, with continuing education and relicensing components that are very similar to professional

licensing requirements. Other specialty trades do not require a license for workers, and licenses for contractors do not always rigorously test for competency, as is the case in HVAC.

In the residential side of the construction industry, and within training programs that are less comprehensive than apprenticeship, credentialing is much less clearly defined. A number of certifications in HVAC and home performance, in particular, compete for top recognition. Although nearly every program offering HVAC training mentioned that students earn the required Environmental Protection Agency (EPA) certifications for handling refrigerants, in terms of occupational certification, some programs train for NATE, while others use the standard set by HVAC Excellence. In the specialized home performance industry, Building Performance Institute (BPI) certifications have recently been gaining traction, but some argue that these are competing with the Home Energy Rating System (HERS) certifications developed by the California Energy Commission (CEC), which are specifically tailored to California's building codes. In these industries, utility incentive programs and government requirements have a role to play in determining what the training standard will be. The recent adoption of BPI as the certification standard for Energy Upgrade California, and NATE as the standard for participation in IOU quality HVAC installation incentive programs has given a boost to those certifications and may induce more employers or workers to invest in them.

Significant on-the-job training or work experience is a central element of many licenses and professional certifications, as well as apprenticeships. This is not the case with some of the new specialized energy efficiency certificates, such as BPI. Several program implementers, employers, and trainers that we interviewed see this as a weakness because while certified building analysts, for example, could pinpoint envelope leakage, those without sufficient construction experience would not understand the underlying construction work that caused the problem or what was needed to fix it.

This analysis also shows that some types of institutions offer a larger number and greater variety of certifications than others. This corresponds, as might be expected, to the length and comprehensiveness of the training programs offered within a particular institution. As mentioned above, apprenticeship programs train workers in core occupational knowledge, as well as in a wide array of technical and safety skills. Thus, in addition to leaving with a journey card that is a state-certification, apprentices have the opportunity to earn a large number of trade-relevant, industry-recognized skills certifications. Private organizations, on the other hand, tend to offer only self-defined certificates, or one key certification, around which the entire training is focused.

Community colleges, in keeping with their educational mission, offer primarily two-year educational degrees that enable students to transfer credits to a four-year program, or one-year certificates designed to help workers enter directly into employment. Our research suggests that these community college certificates often are not linked to the main industry-based certificates in the corresponding occupation, thus limiting their economic power. This is in contrast to community college programs in the health professions, where licensing and certification requirements are more common even at the lower skill levels, and community college training programs are much more geared towards preparing students to acquire them.

Community-based organizations almost all offer self-defined certificates, including "Certificate of Completion," "Work Readiness" and "Environmental Literacy." However, some programs, particularly pre-apprenticeship programs, use industry-recognized curricula such as the multi-craft core curriculum, which enable students to get portable skills and occupational certifications. Private organizations are more heterogeneous—some were created to offer state-approved certificates like HERS, while other self-certify. Since few gather data on the outcomes for their trainees, we were not able to assess the value of these certificates.

13.3.1 TRAINING INSTITUTION GRADUATION LEVELS

To evaluate outcomes for these training programs, it is necessary to analyze enrollment, graduation, and job placement rates. Many programs do not gather reliable data on enrollment and graduation, and, with the exception of CBOs, data on job placement is mostly non-existent, making it difficult to monitor the real outcomes of any program. However, based on interviews and available administrative data, we have developed statewide estimates for the average number of students completing training programs per year at each institution.⁷ When interpreting these numbers, keep in mind the difference between long-term occupational training and short-term training discussed above. Table 13.3 shows these completion estimates broken down by the primary occupation of the training.

These estimates underline several key points about the scale of the training institutions and their main types of training:

- Joint apprenticeship programs train the majority of students in the traditional construction trades, providing long-term comprehensive training.⁸
- Community colleges have a multifaceted role in the construction trades occupations, but they produce relatively small numbers of graduates, especially given their very large number of training programs. For sheet metal, plumbing and electrical occupations, they mostly serve as a pipeline into apprenticeship. In other cases, like the construction inspection occupation, they train for the more white-collar parts of the field. HVAC is more varied—at Laney College there is a one-year residential HVAC program, and a two-year commercial HVAC program. In the latter, some graduates are able to join apprenticeship programs at a more advanced level that gives them credit for their community college work.
- Community-based organizations and ROPs each train several hundred people per year in basic skills for general construction, some of which is pre-apprenticeship training and some of which is entry-level, mostly into the residential sector.
- Community colleges, ROPs, private organizations and CBOs have all developed short-term, energy-specific programs that train for direct employment in jobs such as building performance inspector or renewable energy technician/installer, whereas this is not the case in either the four-year college or the apprenticeship programs.
- A very small number of people complete energy-specific training at community colleges, in spite of efforts to expand programming in this area. This point is reinforced in Appendix I, which shows a number of existing programs in this area with zero graduates in the last year. While this may change in the future since many programs are new, it does indicate slow uptake and a lack of calibration of these programs with industry demand.
- Private organizations and CBOs appear to have developed a niche in new programs for energy-specific trades or skills.⁹

⁷ These figures are weighted estimates based on the responses from our sample or supplemental data gathered on the completion rates for the programs interviewed. In some cases our sample size for a particular occupation was very small, so these statewide estimates have a large margin of error. These numbers differ from those in Appendix I, because they are institutional averages. Appendix I only reports verified data from interviews or administrative sources.

⁸ Unilateral apprenticeship programs are excluded here because the high non-response rate means that our sample size was too small to draw reliable conclusions.

⁹ Note that the programs counted as “architecture,” for example, include LEED training, which is open to many different occupations.

- Private organizations and utilities train a very high volume of people each year, typically in short-term sessions that are either very introductory or specialized in supplemental skills for incumbent workers. A small percentage of private training is entry or intermediate skill level in the trades, and is occasionally up to six months in length.

13.4 CAREER PATHWAYS AND TRAINING

We have already introduced the idea that training programs and institutions train people at different levels, from entry-level training at ROPs and CBOs, to long-term advanced training at apprenticeships and four-year universities, to incumbent worker skills upgrade training. The training completion rates just described are better understood within training pathways, because they represent different training levels and possible links between one level and the next.

In this section we describe these levels in greater detail, and discuss the ways in which they can coordinate to build stronger career pathways. As it has become clear that “green” work may be done more effectively and efficiently by “greening” traditional occupations rather than developing new ones, it follows that traditional career pathways in these sectors can be “greened” as well. There is a significant body of work describing best practices for career pathways, and how to integrate and emphasize “green” skills.¹⁰ One of the important lessons of these studies is not to “reinvent the wheel” of good workforce development, and instead try to build and strengthen traditional career pathways in ways that incorporate training for energy efficiency and related skills.

Along a career pathway, an individual can advance to higher skill and wage levels through additional education and training, through work experience, or through a combination of the two. A well-developed pathway, such as those in the professional/managerial occupations or the commercial construction sector, has a clear progression for advancement from entry-level to advanced skills, and is supported by industry-recognized credentials at each level of training.

The following series of diagrams (Figures 13.1–13.3) illustrate three distinct career pathways within the scope of our study. It is important to note that these show potential levels of training and typical options for how to progress from one level to the next. In reality, people’s career trajectories take on many idiosyncratic variations. However, these diagrams do represent the major levels and progressions for the occupations and sectors within the scope of our study. We also include the estimated annual graduates by institution and occupation (also in Table 13.3), in order to illustrate the scale of each type of training within the state.

¹⁰ White, S. & J. Walsh (2008). *Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy*. Center on Wisconsin Strategy, The Workforce Alliance, The Apollo Alliance. Retrieved from: <http://www.cows.org/pdf/rp-greenerpathways.pdf>. See also: White, S. and K. Gordon (2009, Jan.). *Mapping Green Career Pathways*. San Francisco, CA: The Apollo Alliance. Retrieved from: <http://apolloalliance.org/reports/>.

Table 13.3 Estimated Annual Program Completions by Primary Trade Statewide, 2005 to 2010

Main Trade Or Skill Set	Long-Term Intermediate Or Advanced				Short-Term Entry Level		Short-Term Incumbent Worker		Total
	Apprenticeship—Joint ¹	Apprenticeship—Unilateral ¹	4-Year and Graduate ²	Community college ³	ROP ⁴	CBO ⁴	Utility Energy Centers ⁵	Private ⁶	
Professional / Managerial									
Architecture			1,402	301				***	1,703
Civil Engineering			2,212	1					2,213
Construction Management			330	86				***	416
Electrical Engineering			3,049	52					3,101
Engineering, General				247	620			***	867
Engineering and Architecture (Drafting / Design)				571	147				718
Law / Policy			78	**					78
Management			60						60
Mechanical Engineering			2,729	10					2,739
Total for Professional / Managerial	0	0	9,860	1,268	767	0	42,863	***	54,758
Traditional Trades									
Boilermaker	11								11
Bricklayer	37	4							41
Carpenter	1,814	47		58					1,919
Cement Mason	39	8							47
Construction Inspector				205				***	205
Electrical	886	230		271				***	1,387
Elevator Constructor	146								146
General Construction Worker				115	799	452			1,366
Glazier	65								65
Heat and Frost Insulator	31	29							60
HVAC/R Worker ⁷	84	10		413				***	507
Laborer	424	38							462
Operating Engineer ⁸	245	5							250
Plasterer	48								48
Plumber, Pipefitter and Steamfitter	403	29		23					455
Roofer/Waterproofer	110	19							129
Sheet Metal Worker ⁷	311	13		12					336
Sprinkler Fitter	75	13							88
Total for Traditional Trades	4,729	445	0	1,097	799	452	0	***	7,522
New and Emerging Trades									
Auditing and/or Inspection				11				1,628	1,639
Renewable Energy and Energy-Efficiency Specific ⁹			356	**	238	1,392		3,256	5,242
Total for New and Emerging Trades	0	0	356	11	238	1,392	0	4,884	6,881
Total	4,729	445	10,216	2,376	1,804	1,844	42,863	4,884	69,161

Table 13.3 (continued) Estimated Annual Program Completions by Primary Trade Statewide, 2005 to 2010

** Data unavailable; new program.

*** Missing data.

¹ Apprenticeship: completion for apprenticeship refers to journeying out. Data is from the Division of Apprenticeship Standards and is an annual average from 2005-2009.

² Four-year college: graduation information for engineering programs is from the American Society for Engineering Education and the architecture program data is from National Center for Education Statistics. Reported data represents 2009.

³ Community college: completion data is from 2009, and represents both transfer programs and terminal certificates for intermediate-skill positions. We estimate that approximately half of completions are of each type. Data is from the California Community Colleges Chancellor's Office.

⁴ ROP and CBO: Because of very small sample size, we based these figures on our average responses weighed by the number of tracks we estimate to be in the population.

⁵ Utilities: data represents attendees at the Energy Training Centers in 2009. The centers do not track the occupations of their attendees, but our interviews confirmed that the majority are architects, engineers, and contractors. See chapter 12 for more information.

⁶ Private: some private training is short-term, entry-level as well. We only collected completion data from the training for new and emerging occupations.

⁷ Most HVAC/R training tracks for apprenticeship are incorporated in the committees for plumbers, pipefitters, and steamfitters. Others are refrigeration-specific committees. Sheet metal workers work with HVAC systems as well.

⁸ Including stationary engineers as well.

⁹ Many emerging occupational training programs teach a variety of skills for energy efficiency and renewable energy so we use a broad category here. Auditing and/or inspection refers to programs specializing only in audit and/or inspection. Some renewable energy and energy-specific programs may also teach some aspects of auditing or inspection in addition to other skills.

13.4.1 PROFESSIONAL AND MANAGERIAL PATHWAYS

Figure 13.1 shows pathways in the professional and managerial occupations related to energy efficiency, distributed generation, and demand response. The primary occupational areas we identified are architecture, engineering, and construction management. Career pathways in these professional occupations and others requiring a four-year degree are, for the most part, clearly defined: a student may start at a community college and transfer into a four-year school, or enter directly into a four-year program; the student then can elect to continue on for graduate education.¹¹ For professional degrees like engineering and architecture, education prepares students for employment and, after testing and required work experience is completed, for licensure.

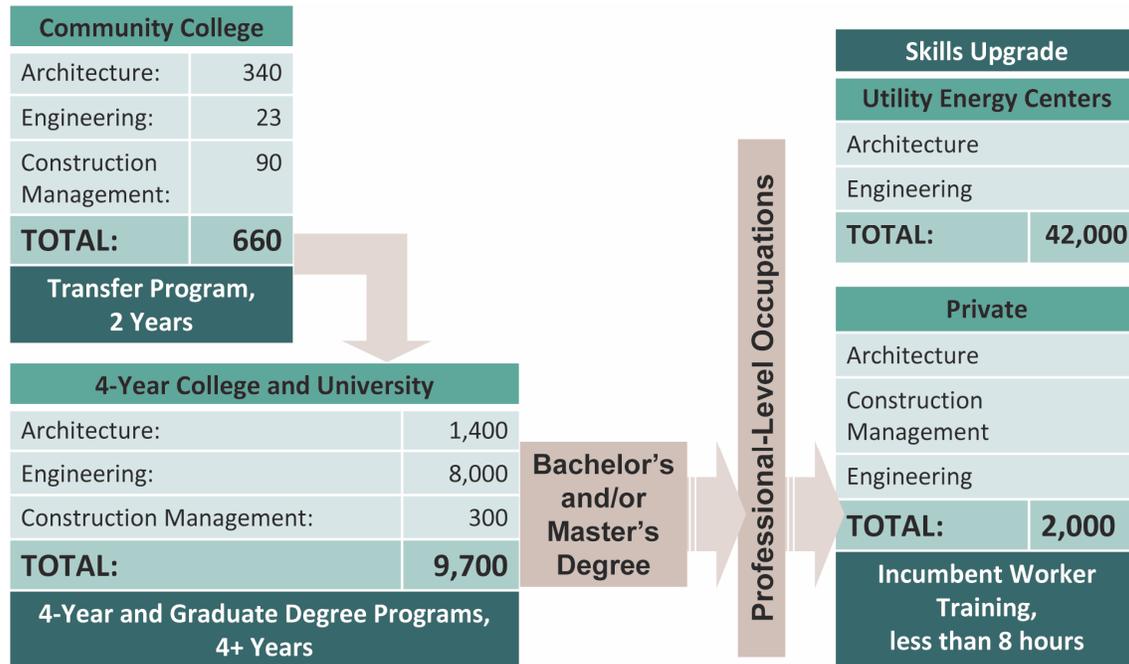
Four-year universities and colleges are the site of long-term, advanced training, graduating about 4,300 people per year with bachelor's degrees or higher. Community colleges offer two-year transfer programs in these areas, which help expand access to four-year and graduate degree programs. Strong articulation between community college and four-year programs help increase many disadvantaged workers' opportunities to enter higher-paying white-collar jobs, although many barriers still exist, so expanding recruitment pipelines and college preparation in underserved communities remains a critical task.

There are about 660 transfer graduates for the relevant subject areas each year. In addition, several thousand people attend skills upgrading training sessions at utilities' Energy Training Centers and private training programs each year. These short-term, high-volume trainings focus on a particular skill and are generally open and applicable

¹¹ Both four-year and graduate degree programs are considered under the "four-year university" category of institution for this study.

to many different but related occupations. For example, the U.S. Green Building Council (USGBC) offers training in the LEED system, which is often attended by architects, engineers, real estate developers, construction managers, and others.

Figure 13.1 Pathways: Professional and Managerial Occupations, Estimated Annual Graduates Statewide



13.4.2 COMMERCIAL AND PUBLIC SECTOR CONSTRUCTION PATHWAYS

Figure 13.2 shows pathways in the commercial and public sectors for construction trades and energy specialty trades. The primary occupations are in the traditional building trades, with energy-specific training included. Like professional occupations requiring a four-year degree, apprenticeships in the commercial construction sector also represent a clear career pathway. Jobs in the highly-unionized commercial and public construction sectors typically have long-term technical training through apprenticeship, more rigorous certification requirements, and clearer sequences for career advancement than their residential sector counterparts.

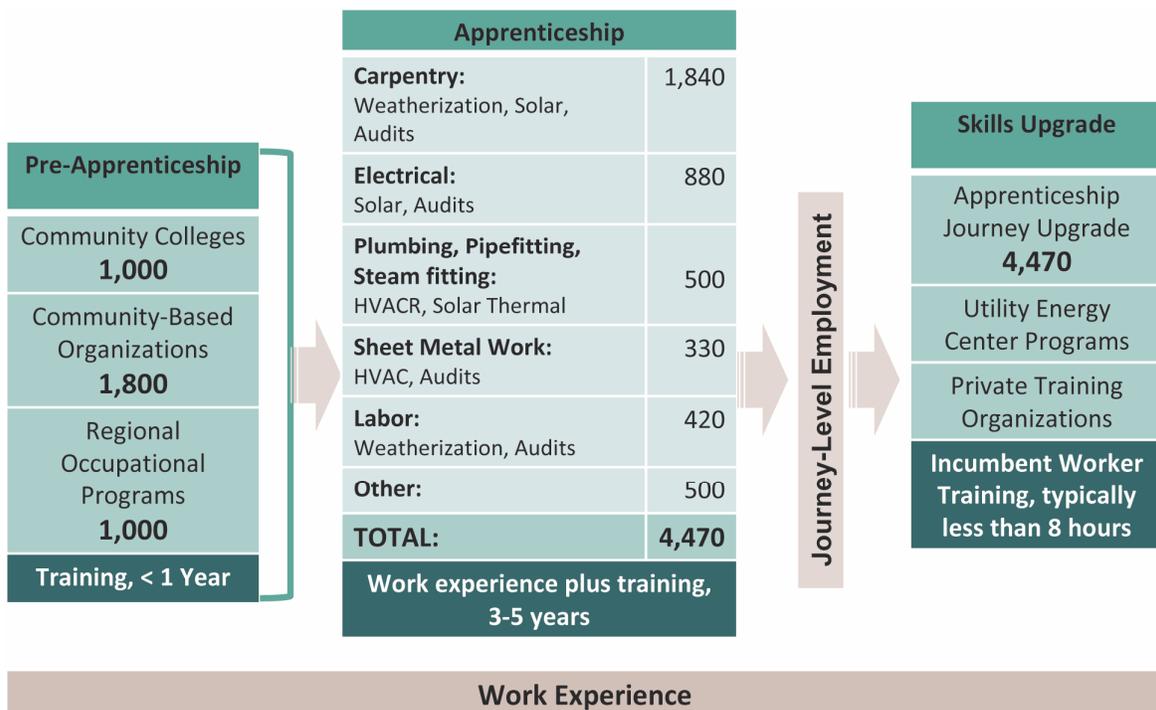
Apprenticeship is the main site of long-term, advanced training for these jobs, with about 4,470 graduates per year. Although apprenticeship has few entry requirements, other than testing, there are many applicants for few slots, so disadvantaged workers often face barriers to entry. Pre-apprenticeships help increase access to apprenticeship by offering short-term training in basic job skills and preparation for the entrance exams. Some of these exist at CBOs, community colleges, or ROPs, but they only represent a small portion of the total number of estimated graduates in these programs.

After completion of an apprenticeship, these programs continue to offer skills upgrading for journey workers to help them learn new technology and practices, giving them the chance to gain skills to advance in their careers.

Utility energy centers and private training programs also provide advanced skills upgrading for incumbent workers in this sector.

A journey card is not required to work in the construction trades, and some individuals go straight to work for non-union employers without participating in apprenticeship training. However, the relatively high union density in the commercial and public sectors means the apprenticeship system is more common and overall training standards are higher.

Figure 13.2 Pathways: Commercial and Public Sectors, Construction Trades and Energy Specialties, Estimated Annual Graduates Statewide



13.4.3 RESIDENTIAL AND SMALL COMMERCIAL SECTOR CONSTRUCTION PATHWAYS

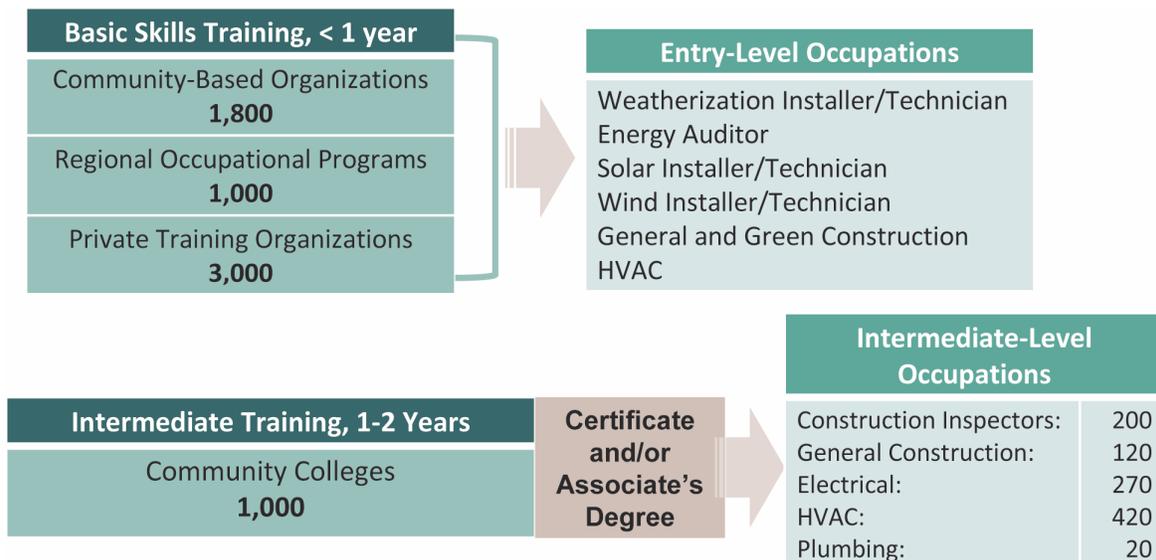
In the residential construction sector career pathways become more muddled and levels are not linked. Most workers learn on the job and have no formal training. In California, many are immigrants and have less than a high school education. The training programs that exist are very basic job readiness and entry-level occupational training like solar installer, specialty trades training like HVAC, white-collar training like building inspector, or training for specialized certifications for contractors. We found no evidence of training programs that have successfully linked these into a training pathway for students, though several are attempting to do so. The best programs attempt to provide multiple pathways for students *out* of residential construction and into higher education or apprenticeship.

Figure 13.3 also shows pathways in the construction trades and energy specialty trades, but in the residential and small commercial sectors. This draws a sharp contrast to the equivalent pathways in the large scale commercial

and public sectors, which has a basis of long-term, advanced skills training via apprenticeship. In the residential sector most programs are short-term, entry-level, or short-term technical skills upgrading. There is very little long-term, advanced skills training apart from a small number of residential tracks in apprenticeship programs. As a result, workers gain skills primarily through work experience, based on the particular needs of the employer.

Training programs that do exist are more general, and target either entry-level general construction jobs or entry-level, energy-specific jobs like weatherization technicians. Community Based Organizations, ROPs, and Private training programs all offer short-term training for entry-level construction or energy-specific jobs. Each type of institution trains about 1,000 people per year in these programs. Community colleges also graduate about 1,000 per year with certificates or two-year degrees in the trades, and some have started new energy-related programs, like training for solar technicians. A significant, though uncounted, number of workers also enter the residential construction industry with no formal training and learn the trade on the job.

Figure 13.3 Pathways: Residential and Small Commercial Sectors, Construction Trades and Energy Specialties, Estimated Annual Graduates Statewide



13.5 SUMMARY AND CONCLUSIONS

California has a substantial training and education infrastructure available to meet changing work requirements of the transition to a clean energy economy. Our analysis has revealed that each institution has a role to play, but the depth and scope of training and connections to career pathways differ, impacting worker outcomes and skill availability for employers:

- Apprenticeships and four-year universities both offer long-term training that leads inexperienced individuals to acquire advanced skills and recognized credentials in trades and professional/managerial occupations, respectively. These career paths offer the greatest potential for standardized quality of work and positive long-term workforce outcomes.

- Community colleges provide a variety of intermediate-level occupational training for transfer to four-year universities, pre-apprenticeship, and direct employment, presenting the most varied array of training in multiple pathways. These programs are particularly useful in filling gaps in the workforce system by creating bridges between other programs, or career stages, and pipelines into longer term apprenticeship or further higher education.
- Community colleges are less effective in training for terminal certificates and degrees in energy efficiency occupations than they are in training for traditional trades and professions, at least in terms of number of graduates. This is probably because of the lack of widespread industry-recognized standards in energy efficiency, particularly for the residential sector, as well as the relative lack of demand for these specialized occupations.
- Community-based organizations, ROPs, and private organizations offer short-term basic job skills training and job readiness preparation in the construction trades and energy-specific occupations. While some CBOs and ROPs are pre-apprenticeships with strong linkages to apprenticeship, recognized training curricula, and a number of skills certifications, the remaining short-term, entry-level programs that lack connections to clear career pathways can leave workers trained but unemployed, or stuck in low-paying jobs with little opportunity for advancement.
- Private organizations and the IOU Energy Training Centers provide short-term technical skills upgrading for incumbent workers. Apprenticeships also offer this training through their journey-upgrade courses. These courses are crucial for keeping up with changing technological requirements and also enable workers to advance within their field over time, but they do not substitute for the long-term broad occupational training that apprenticeships and bachelor's and above provide. Private programs are expensive compared with other programs and, in many cases, receive public subsidies.
- Career pathways and the skills required to advance to the next level of training tend to be more clearly defined at the professional/managerial level than in other types of occupations. Credentialing and skills standards play an important role in defining and these skills and training requirements. In the building and construction trades, the standard for credentialing and training is less well defined, and therefore the range of skills and types of training associated with these occupations varies widely.

This portrait of the training system provides important policy direction. Given the relatively few new jobs, and the high unemployment amongst experienced workers, particularly in the construction trades, there is currently an oversupply of pre-employment training programs, rather than a gap. Some, like the apprenticeship programs, simply stop taking new entrants until there are real jobs; others do not have good mechanisms to calibrate training slots to jobs.

Incumbent worker training is clearly an area for emphasis. There are usually many times the number of incumbent workers compared to new entrants, and this is exacerbated in the current period. Thus, integrating new energy efficiency practices into continuing education and licensing requirements for engineers and architects, and journey upgrade training for the trades, marks a clear opportunity for improving practice.

In the long run, the workforce infrastructure will be called upon to provide new cohorts of workers in both the professions and the trades. Again, integrating energy efficiency and related principles, skills, and knowledge into the core long-term training institutions is essential, especially since achieving our energy goals largely requires changes in process, not new products. While a market that is specialized and dedicated to energy retrofits may develop, it is likely that it will continue to be embedded in remodeling and equipment change-out work that requires broader construction skills. This also supports the emphasis on greening traditional occupational programs rather than creating new specialized programs.

In the commercial sector, it is clear that state-certified apprenticeship programs are the key training institution that policymakers concerned about both high quality work and solid career pathways should support. Community colleges are important partners to apprenticeship but they do not substitute for it, because community college programs are shorter term, lower level, and not tied to jobs and careers. Policymakers should therefore support community college and apprenticeship collaboration to take advantage of the comparative strengths of these institutions. This kind of collaboration can be encouraged for all levels of training: for journey upgrade training, for classroom supplemental instruction during the apprenticeship period, and especially as pipelines for workers from disadvantaged communities who need additional basic skills and job readiness training in order to be successful applicants and apprentices. Pipelines into apprenticeship from other institutions, like CBOs and ROPS, should also be supported. Links and collaboration between apprenticeship and community colleges already exist to some degree, but can clearly benefit from more systematic and intentional statewide and local collaboration.

The residential construction sector presents the greatest challenge and biggest quandary for policymakers because there is no long-term training institution that prepares unskilled workers to gain mastery of their craft, so there is no training program into which energy efficiency knowledge and skills can be easily integrated. Though some apprenticeships have residential tracks, the reality is that the residential sector is predominantly non-union and there are very few jobs available to apprentices in this sector. There are training programs for entry-level jobs in residential construction, but job placement rates and wages are generally low unless there are local hire or other high-road agreements, like in the City of Richmond.¹² Most workers learn on the job and wages are too low to warrant investments in training by jobseekers. Many community colleges and WIBs are reluctant to train their students and clients for these low-wage jobs.

If the residential retrofit market expands dramatically, training in specialized residential retrofit may produce better placement rates, but there is no clear reason to expect this since there is already an experienced incumbent (mostly immigrant and trained on the job) workforce in residential construction. The current strategy in Energy Upgrade California is to focus certification requirements and training investments on contractors, not on workers. As discussed in Chapter 4, this model may produce the quality of work needed, but probably won't create good green jobs or a professionalized workforce. The other strategies discussed in the chapter highlight that training is not in and of itself a solution but rather needs to be embedded in other strategies that change the nature of the jobs.

Policymakers designing programs that hire workers in the trades have a choice: whether to set standards that support robust career pathways with advanced, comprehensive training, and certifications that require continuing education, or whether to leave the option open for minimal training that may result in dead-end jobs. This choice is even more pronounced in decisions about energy efficiency policy, where sectors are not yet so clearly defined and training is critical for success. On the one hand, minimal skills training focused on energy efficiency-specific jobs has the potential to be time and cost-effective, if the training is well coordinated with labor market demand and quality assurance is well enforced. On the other hand, long-term training in the traditional trades that incorporates energy efficiency skills provides workers with a comprehensive skill set that gives them the ability to perform at a higher level, adapt to changing technologies and demand, and advance in their own careers. In the commercial sector, where training costs and higher wages are already incorporated into a sufficient portion of the contractor community and a high-road business model already exists, the clear choice is to invest in the existing apprenticeship system and those that collaborate with it. In the residential sector, where a high-road model is not established, the choices and strategies are less clear. Here, they will require experimentation, openness to new approaches, and new collaborations.

¹² The City of Richmond's local hire policy and linkages with the Richmond BUILD pre-apprenticeship program are described as an example of best practice in Chapter 16.

CHAPTER FOURTEEN:

14. K-12 EDUCATION AND TRAINING

14.1 INTRODUCTION

While Part Two of this report primarily focuses on education and training for adults in the workforce, kindergarten through 12th grade education on energy science, practices, and careers also plays an important role in preparing the next generation of the clean energy workforce and energy consumers. This chapter examines the efforts of public and private stakeholders to educate K-12 students about clean energy and potential career opportunities. Specifically, this chapter provides the following:

- A description of existing programs, curriculum resources, and delivery models that address K-12 education and training related to clean energy, including both energy awareness and career development (see Appendix L for the complete inventory of programs);
- Discussion of the challenges and issues in educating K-12 students about clean energy and careers in the clean energy field;
- Identification and documentation of the best practices in energy awareness education; and
- Identification of the best practices in career education for K-12 students, particularly as these relate to the clean energy field.

The growing number of green career training programs and the variety of practices in energy-related education create opportunities for a coordinated and strategic approach in this area.

14.2 METHODOLOGY

The research team developed an inventory of K-12 energy education programs drawn from interviews with subject matter experts and an online literature review, as well as a review of California's IOU Program Implementation Plan (PIP) filings and Research Into Action's evaluation of the 2006–2008 EARTH Education and Training Program administered by the IOUs. This database contains 106 programs, including those focusing on clean energy awareness and career development. The database includes examples of various types of programs, including programs limited to California, as well as programs offered in other states and throughout the U.S. With the exception of including all of the energy efficiency education programs offered by the California IOUs for K-12 students, the database is not intended to be comprehensive, but instead to provide examples of various types of programs. Special attention was given to identifying programs that illustrate best practices. The research team applied a maximum variation sampling strategy to select programs to be interviewed. The objective of the interviews was to identify the diverse approaches that various K-12 programs utilize.

An in-depth, largely qualitative interview approach was selected for data collection. In total, administrators of 38 programs were contacted and invited to participate. Of those 38, administrators for 22 programs were interviewed, roughly a 58 percent response rate.¹ The 22 programs that were administered by those interviewed

¹ Twenty individuals were interviewed for a total of 22 programs, because some administrators oversee multiple programs.

varied by a number of characteristics, including funding source, service area, years in operation, target audience, grade level, and intended impact. The description of these programs is based on information gathered in interviews with subject matter experts, in developing the resource inventory, and from interviews with program administrators.

We also interviewed subject matter experts and administrators for each of the K-12 educational programs of the four major California investor-owned utilities. Interviews were conducted with administrators and program experts at Pacific Gas and Electric (PG&E) and Southern California Edison (SCE).² Additionally, evaluations of utility education programs were reviewed to gain insight into the variety of programs funded by the IOUs. The information in these evaluations aligned with and supported information gathered through interviews.

14.3 OVERVIEW OF PROGRAMS

In order to be considered for this study, the objectives of a program had to include: (1) clean energy awareness; or (2) career awareness, exploration and preparation. Some programs addressed both program objectives. These two program objectives are described in more detail in subsequent sections of this report. Of the 22 programs interviewed, 15 were focused on energy awareness and seven were focused on career development.

14.3.1 CLEAN ENERGY AWARENESS PROGRAMS

The primary focus of programs categorized as ‘clean energy awareness’ is on educating youth, their families, teachers, and/or the community in general about the foundational issues relating to energy efficiency, energy conservation, renewable energy, and non-renewable energy. These programs provide a broad spectrum of offerings ranging from specific curriculum resources, hands-on lab kits, and teacher workshops to multi-year in-school and after-school programs. The inventory also includes programs that target all levels: elementary, middle, and high school.

Clean energy awareness programs fell into one of two categories based upon funding sources: (1) ratepayer-funded programs and (2) government and privately-funded programs.

14.3.1.1 RATEPAYER-FUNDED PROGRAMS

Programs funded by ratepayers were identified throughout the U.S. The ratepayer-funded programs interviewed were located both in California and in other states. All of the in-state programs included in the interview sample were IOU programs and under the purview of the California Public Utilities Commission (CPUC). No programs offered by California POU were interviewed. As a consequence, all of the in-state programs funded by ratepayers are guided by the set of principles and goals found in California’s Long Term Energy Efficiency Strategic Plan (EE Strategic Plan) adopted by the CPUC in 2008.

The programs offered by California’s IOUs are designed to educate students at all grade levels about the science-based clean energy concepts and their application in the social and economic aspects of life. These programs are designed and have been found to encourage energy saving practices among parents and schools. Although these

² During our research, we did not interview representatives from Southern California Gas or San Diego Gas and Electric. We believe we captured the relevant programs funded through these utilities through our interviews with the representatives from PG&E and SCE. Table 14.1 identifies these programs.

programs focus primarily on consumer education, in early 2010, a career exploration component was added to at least one of the K-8 programs. Teacher and student response to this new career exploration module has not yet been evaluated. The California IOU programs, which are also addressed in Chapter 12, are described in Table 14.1, along with a brief overview of the out-of-state ratepayer-funded programs.

In total, we identified ten programs funded by ratepayers, and conducted interviews with administrators of eight. These programs receive the majority, if not all, of their funding from ratepayers. Some of these programs are implemented by third-party providers, such as the Alliance to Save Energy (Green Schools) and the Energy Coalition (PEAK).

Table 14.1 Ratepayer-Funded Programs Interviewed

Program	Description	Sponsoring Utility	Program Location	Years in Operation	Grade Level	Target Audience	Scale (yearly average)
IOU Funded Programs In California							
PEAK	A hands-on, standards-based energy science program that incorporates action-based learning. The program aims to expose students to green careers and inspire students to take action.	PG&E, SCE, SCG, SDGE	Service area of sponsoring utilities	12	3-7	Students	20,000 students
Energenius	An interactive series that includes lessons plans, take-home materials and student activity books.	PG&E	Service area of sponsoring utility	20	K-8	Teachers & Students	2,000 teachers, 55,000 students
Green Pathways	A virtual web-based / social media learning community, connecting teachers, career counselors and practicing professionals with high school students so that they may be able to make more informed choices about education and careers in the green economy.	PG&E	Service area of sponsoring utility	< 1	9-12	Students	(Piloting)
Green Schools	Students and teachers learn to track the energy usage and savings of their school using equipment provided by the program.	SCE	Service area of sponsoring utility	14	K-12	Teachers & students	65 individual schools
Living Wise/ Energy Wise	Classroom materials and take-home kits of efficiency measures and supplies for each student. Students use the kits to conduct home audit and retrofit activities with their families. Supplementary materials promote careers in energy, resources, and conservation.	SCE, SCG	Service area of sponsoring utility	17	6	Teachers & Students	100,000 Households
Ratepayer Programs In Other States							
KEEP			Wisconsin	15	K-12	Teachers & Students	350 teachers, 5,000 students
NYSERDA			New York	6	K-12	Teachers & non-formal educators	1,109 teachers

14.3.1.2 GOVERNMENT AND PRIVATELY-FUNDED PROGRAMS

The second category consists of programs that receive funding from a variety of other sources, including federal and state-level grants, private donations and grants from private foundations. Fifty-seven programs were identified and included in the program inventory. Programs interviewed in this study that fall within this classification vary in their target audience, grade level focus, service area and years in operation (see Table 14.2).

Table 14.2 Government and Privately-Funded Programs Interviewed

Program	Program Location	Years in Operation	Grade Level	Target Audience	Impact (yearly average)
Green Learning Adventure	California	2	5-8	Students	225 teachers; 5,650 students
Infrastructure Academy	California	2	9-12	Teachers, Students	14 teachers, 320 students
Protect Your Climate	California	5	K-8	Teacher	85 to 110 teachers; 2,550 to 3,300 students
Florida Solar Energy Center	Florida	20	K-12		150 to 200
CEWD: Credential Program	National	< 1	9-12	Teachers & Students	In progress
National Energy Education Development Project (NEED)*	National	30	K-12	Students, Teachers, Parents	Unavailable
Kid Wind	National	7	6-12	Teachers	1,000 to 1,5000

*NEED applies to CEWD as well.

14.3.2 CAREER AWARENESS, EXPLORATION, AND PREPARATION PROGRAMS

An important aspect of the K-12 system is the extent to which these programs contribute to career development. The purpose of K-12 career development programs is to inform students about the careers available to them and provide them with the necessary occupational skills and/or knowledge for entering into these careers, and/or moving into a post-secondary education on a selected career track.

Research suggests that K-12 career development programs, including programs focused on energy careers, are most effective when they follow a progressive sequence that includes: (1) career awareness, (2) career exploration, and (3) career preparation (see Figure 14.1). This sequence, or a similar variation, has been adopted by several states including Wisconsin,³ New Jersey,⁴ Colorado,⁵ and Georgia.⁶ For example, career awareness is typically targeted towards K-5, which serves as the foundation for career exploration around grades 6 through 8, and that, in turn, gets students ready for career preparation in high school. Since this sequence has been adopted by several states, the programs interviewed were analyzed using this framework. In practice, we found that programs may differ in how they implement this sequence and how early they start to follow it.

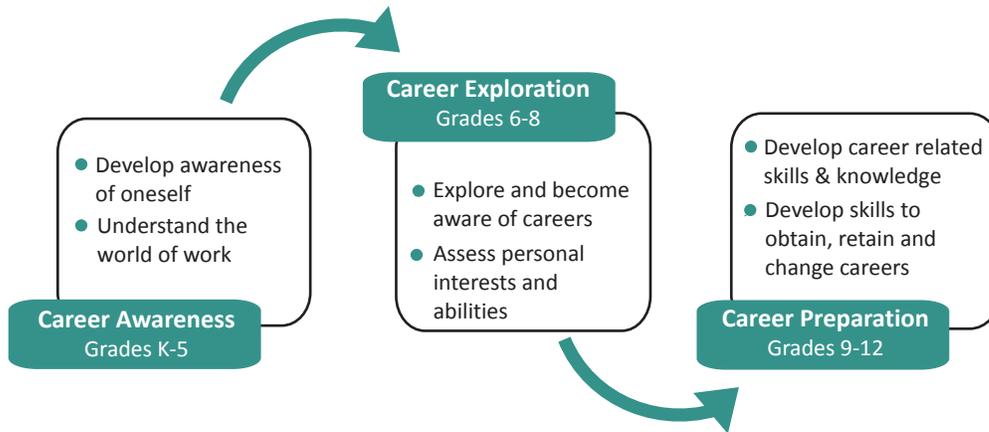
³ Wisconsin Department of Public Instruction, <http://dpi.wi.gov/cte/pdf/k12comcd.pdf>.

⁴ New Jersey Department of Education, https://www13.state.nj.us/NJCCCS/ContentAreaView_21st.aspx.

⁵ Colorado Department of Education, http://www.cde.state.co.us/cdesped/download/pdf/TK_CareerDevelopment.pdf.

⁶ Georgia Department of Education, http://www.doe.k12.ga.us/ci_cta.aspx?PageReq=CICTACareerRelatedEd.

Figure 14.1 Career Education Sequence



Although many energy awareness K-12 programs incorporate some degree of career awareness and exploration, most do not identify career-related learning outcomes as their main focus. We found only two career exploration programs, the High School Sustainability and EnergyVenture Camp, that focus on career related learning outcomes.⁷ Our interviews suggest that the majority of K-12 programs dedicated to career education focus on the last two stages of the sequence, career exploration and career preparation for high school students, primarily through career technical education (CTE).

14.3.3 CAREER TECHNICAL EDUCATION PROGRAMS

The majority of California's high school career preparation programs are found in grades 10 through 12 and are guided by specific CTE foundation standards mandated by the California Department of Education. The primary goal of CTE courses in high schools is to educate students about the career options available to them and provide them with occupational skills and knowledge. The majority of clean energy programs are found in such career programs as Regional Occupational Centers/Programs (ROPs) and California Partnership Academies (CPAs).

ROPs strive to prepare students for entering the workforce by providing occupation-specific pathways training that aligns with industry sectors. The primary objective of these programs is to prepare participants with entry-level skills, creating a foundation for a career. It is assumed that once completing the program, participants will be better prepared to enter the workforce in an entry-level position or pursue more training or education to further develop their skills. Fifty-nine of the 74 ROPs in California offer energy-related courses. More detailed information and analysis related to ROPs is provided in Chapter 11 of this report.

CPAs focus on educating students through career-oriented classes within industry pathways, as well as by providing career guidance. Funded by the state budget through competitive grants, these CPAs offer career preparation to students in grades 10 through 12 and in many cases are required to focus on underperforming student populations. Unlike ROPs, CPAs do not focus on employment as the main outcome for students, but rather try to engage students into thinking about career pathways and setting individual career goals. CPAs focus on supporting

⁷ PG&E has recently launched a pilot program "Green Pathways" that is focused on career awareness and exploration. Since the pilot has just started, it could not be included into the study. However, it is important to recognize that California IOUs are devoting more attention and resources in this area.

underperforming and at-risk students, in particular, and aim to reduce dropout rates. In order to assist in the transition to additional education, many CPAs (and ROPs) have articulation agreements with local community colleges. These agreements allow students to receive course credit at their next institution for the work completed during their time at the CPA or ROP.

Located in 464 high schools across the state, CPAs create a smaller, more specialized education community within their school of operation. Ninety-nine of the 464 CPAs in California are related to the broad occupational categories within the scope of this study, such as architecture, engineering, and general construction. Of those 99 programs, 39 trained students for occupations that are considered to be specifically green careers, such as green construction, alternative/renewable energy generation, and green technology. (Figure 14.2 provides a map of locations of CPA Programs.)

Recent legislation, known as the Green and Clean Technology Initiative (AB 519, Budget Item 6110-166-001), is providing the foundational resources and funding needed to make these “Green” CPAs (or “Green Academies”) a success. Funding for this legislation is provided from the Public Interest Energy Research (PIER), Development and Demonstration Fund for the 2009–2010, 2010–2011 and 2011–2012 school years.⁸ In order to be eligible for the Green and Clean funding, CPAs must “focus on clean technology and energy businesses and provide skilled workforces for the products and services for energy or water conservation, or both, renewable energy, pollution reduction, or other technologies that improve the environment in furtherance of state environmental laws.”⁹ It is important to note that during a time marked by budget cuts throughout California, special grants have been available to promote these programs. It is clear that there are high expectations for the Green and Clean CPAs and for the potential impact the programs will have for California.

In-depth interviews were conducted with five CPAs that focus on energy efficiency related occupations. Most were in their first year of operation, having completed planning grants and teacher training prior to implementation. Table 14.3 gives an overview of the career oriented high school programs interviewed for this study.

The first of the CPAs interviewed was the Alternative Energy Academy, located in Desert Hot Springs. The primary focus of this CPA is Renewable Energy and Alternative Learning (REAL), which includes topics such as solar power generation, wind turbines and other green technologies. Alternative Energy Academy also has formed a partnership with Southern California Edison, and hopes to create articulation agreements with local community colleges by the time the first cohort of students graduates.

The second CPA interviewed, the Efficient Use of Water and Energy Green Academy, has been in operation since 2009. Through hands-on activities, students study topics such as electricity, power generation, energy sources, water treatment and soil. In addition to a high school degree, students in the program also receive an energy auditing certificate. Similar to other CPAs, this program has formed a relationship with the local investor-owned utility, PG&E. While all of the CPAs are geared towards at-risk students, this program also caters to students that show interest within the general student population (outside of at-risk groups). Students are also encouraged to be involved in environmental efforts and community projects outside of the classroom by participating in the school environmental club and a school-wide environmental awareness day.

Environmental Technology Academy in San Diego is the third CPA interviewed. This program has a heavy focus on the use of technology, such as Geographic Information Systems (GIS) mapping software, and also teaches about green research and careers. One of the smaller CPAs, in terms of enrollment, this Academy primarily focuses on

⁸ California Department of Education (2009). Report on the Budget Act of 2009. Retrieved from: <http://www.cde.ca.gov/fg/fr/eb/documents/br09reviseaug2010.pdf>.

⁹ California Department of Education. Green CPA Program. Retrieved from: <http://www.cde.ca.gov/fg/fo/profile.asp?id=1882>.

GIS and the environment. An administrator of this program indicated that the plan was to add more classes, such as underwater robotics and solar panel installation.

Figure 14.2 Map of Locations of California Partnership Academies



Created by Center of Excellence, California Community Colleges. Software and data provided by ESRI.

Table 14.3 Career Related Programs Interviewed

Program	Service Area	Years	Grade Level	Target Audience	Impact (yearly average)
Career Awareness / Exploration					
High School Sustainability	Marin County, California	5	11-12	Teachers	50 to 100 teachers
Energy Venture Camp	Texas	2	8	Students	280 students
Career Preparation					
Alternative Energy Academy	Desert Hot Springs, California		10-12	Students	
Efficient Use of Water & Energy Green Academy	Woodside, California	1	10-12	Students	
Environmental Technology Academy	San Diego, California	1	10-12	Students	70
Green Energy Academy	Hayward, California	<1	10-12	Students	102
Renewable Energy Academy	Oakland, California	< 1	10-12	Students	65

The fourth CPA interviewed, Green Energy Academy, located in Hayward, California, is in its first year. Energy-specific courses offered include Alternative Energy Sources, Science and Technology Internships, and Green Marketing. This CPA aims to help prepare students to work in multicultural environments by including courses in ethnic studies. The Green Energy Academy also encourages students to be involved outside of the classroom. Specifically, the staff organizes two camping retreats per year and maintains an organic garden that students work in at least 30 hours during the academic year. Teachers within the Academy have built connections with other energy education partners such as the National Energy Education Development program, PG&E and other local organizations in the Bay Area.

The fifth and final CPA interviewed was the Renewable Energy Academy, located in Oakland. Approximately half of the students participating in this program are considered to be at-risk. In addition to following a classroom curriculum, the Academy explores renewable energy and energy efficiency through the use of field trips and guest speakers. The Renewable Energy Academy has established connections with local organizations such as Save the Bay, Earth Team and private companies for mentor programs and internships for students in the 11th and 12th grades.

14.4 ESTABLISHING AND FUNDING K-12 ENERGY PROGRAMS

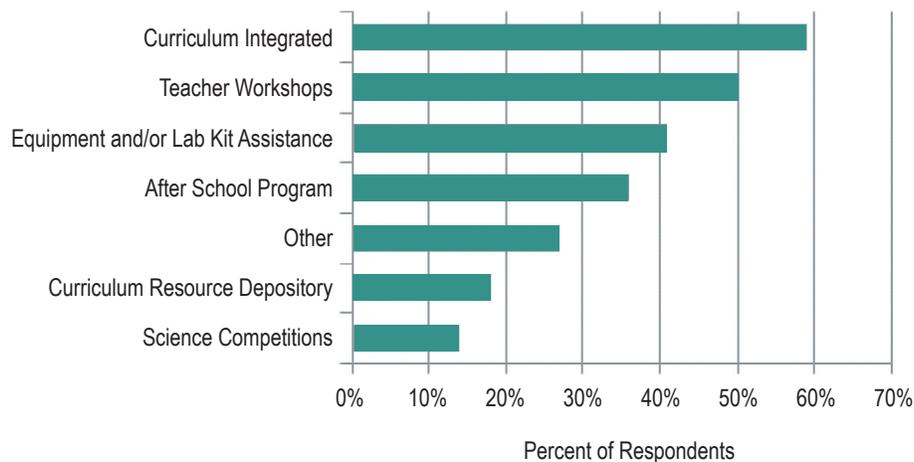
The availability of public funding and regulatory direction has contributed to the growth of K-12 energy awareness programs in California. The current ratepayer-funded programs are intended to focus on energy awareness, although recent direction has introduced career development as an additional emphasis as well. The programs are designed to contribute to the energy savings goal by equipping K-12 teachers to educate their students in order to influence their future behavior as consumers as well as the current behavior of their families. The more established programs have not systematically focused on career development until recently. The Green Schools program is one of the exceptions, because the career development sequence is used as a key benchmark of the program. Based on information gathered through the interviews, career awareness components are being included in several programs for the 2010–2012 energy efficiency program cycle, as well as in a recently implemented pilot program.

The availability of state funding has been an important factor in launching the Green Academies. Of the five interviews with administrators of these programs, all stated that their start-up and continued existence were highly dependent on targeted funding, given the past and ongoing budget cuts to public education. The funding provided has allowed the schools to focus on at-risk students, with the intent of reducing their likelihood of dropping out of high school, and putting them on a college-bound track. Teacher participation is voluntary, and faculty from math, sciences, English, and history are among the teachers participating.

14.5 K-12 PROGRAM DELIVERY

In general, integrating clean energy education into the main course of study was the most utilized program delivery format (n=13), followed by teacher workshops (n=11). Many programs create standards-based curricula so that teachers can easily integrate the material into their classes. These programs typically, but not always, utilize teacher workshops to assist with the integration process. Other programs provide workshops for professional development, aimed at increasing teacher's personal knowledge of energy. Other program delivery mechanisms included after-school programming, lab kits, science fairs, student film competitions, web-based/social media delivery, campus-wide environmental awareness days, field trips, and summer camps. Figure 14.3 provides a visual of identified methods of program delivery from the interviews conducted.

Figure 14.3 Methods of Program Delivery



The results indicate that both the focus on teacher engagement and the ability to integrate a program into state-approved, science-based curricula are practices for K-12 programs that may contribute to program success, in that they work in concert with school goals and requirements. This may in turn lead to program sustainability. These factors are also interconnected. Teachers tend to be more interested in the programs that meet state standards for a given grade level, and therefore are willing to devote necessary attention to the energy-related modules in their classrooms. As one of the interviewees stated, it is important “not to add to the existing instruction, but rather replace it with newer material that has real life application for students.” The programs that were able to engage teachers, either through providing them with lesson plans or through organizing professional development workshops, were found to produce greater impact (reach more students and teachers) and be more sustainable in terms of teacher engagement. In many cases, successful teacher engagement ensured that teachers would continue using the program in the classroom beyond the program performance period.

14.6 CURRICULUM DEVELOPMENT

Both energy awareness and energy career related programs have developed their curricula internally, using experts in an advisory capacity. According to the respondents, such an approach ensures that “agenda-free” content and effective instruction approaches are incorporated. For example, the National Energy Education Development Project (NEED) stated that they would not ask the solar community to develop solar lessons, but rather would seek their input on curriculum improvements.

For ratepayer-funded energy awareness programs in California, those interviewed reported using a similar approach to develop and improve their curricula. Those interviewed also suggested that these programs have tended to use a curriculum development process involving: (1) identification of learning goals; (2) review of a curriculum/program by experts in field; and (3) feedback from target audience. While these steps are not uncommon, it is worth noting that all ratepayer-funded programs explicitly indicated use of this curriculum development process. Almost all programs in California, and elsewhere, ensure that their instruction aligns with state curriculum standards. This is especially true of the Career Academies, recently established in California, which are required to comply with the California Career Technical Education (CTE) standards. The energy awareness programs, on the other hand, are not bound by such requirements. Yet, many of these programs attempt to align with the state standards to make adoption of their curricula more appealing to teachers.

14.6.1 SKILLS AND KNOWLEDGE FOCUS

Energy awareness education programs stress the importance of a strong comprehension of the basic and foundational information regarding forms of energy. This assertion was addressed by both the subject matter experts prior to data collection and by the 22 programs interviewed. Furthermore, most administrators for energy awareness programs mentioned that they wanted students to know the difference between renewable energy and non-renewable energy sources in order to expand understanding of the ways in which these sources affect daily life. Across renewable energy programs, solar was mentioned most often as being a core aspect of the program, followed by wind energy.

Career awareness and education programs focus on providing students with (1) knowledge regarding possible careers in the energy efficiency and related sectors; (2) information on further education/training available within a career track; and (3) basic skills required in a specific career. California Partnership Academies, specifically, focus on providing hands-on skills related to a chosen career pathway, including pathways for various construction trades. Additionally, these CPAs stress the importance of soft career development skills. For example, they offer training for the students in such job readiness areas as interviewing, communication, self-awareness, and networking.

Energy audits proved to be the most common topic of instruction regardless of whether a program focuses on energy awareness or career development. It is reasonable to believe that this crossover is due to the fact that energy audit skills provide both foundational and applicable knowledge.¹⁰ Many programs that we interviewed reported that hands-on energy audit exercises get students interested in the topic of energy efficiency because they can help relate the science to real life.

¹⁰ Energy audits can be considered foundational knowledge being that it is a core competency taught throughout K-12 programs. Energy auditing can also be a part of the skill set requirements in any energy efficiency occupations, and therefore can be considered an applicable knowledge area.

14.7 PROGRAM EVALUATION

The objectives and approaches used for evaluation of most K-12 programs in both energy awareness and career education vary substantially. Of the programs that conduct evaluations, the most common method evaluation cited by those interviewed is a standard pre- and post-test for students and teachers. This approach typically addresses one or both of the following: (1) knowledge learned and retained; and (2) opinions about the program. These formative objectives are relatively straightforward to assess through tests and interviews, without extensive post-program evaluation. Furthermore, pre- and post-tests allow for statistical analyses to determine the effectiveness of the program for achieving the specific objectives, while controlling for other variables that may contribute to changing behaviors (such as a popular ad campaign for energy efficiency).

There are of course limits to how these types of evaluations can be used, however. For example it is difficult to isolate energy awareness education as a causal factor in reducing energy consumption. The standard pre- and post-test designs also have weak external validity, which is the ability to generalize results to populations outside of participants. As a result, a program may be considered successful at one site or with certain participants, but this result cannot predict whether it will be a success elsewhere.

Other forms of evaluation practices noted in our interviews were teacher activity logs and focus group sessions during faculty retreats. Additionally, a handful of programs asked for comments from parents. Only two programs reported using objective impact measures such as measuring the energy usage and costs for schools and households as a form of program evaluation. The Green Schools program, for example, incorporates energy tracking into the program by “establishing a baseline for energy use, and tracking the savings from the student-initiated behavior and operations changes.”¹¹ Although the importance of impact evaluation is widely recognized among all programs, many have limited resources and choose to use their resources for program delivery as opposed to evaluations.

Based on recently completed evaluation studies and interview results, many energy awareness programs appear to be meeting their goals of increasing awareness among students on energy savings.¹² However, the deeper impact of such learning outcomes on changes in household and community practices has not been tracked systematically, and therefore no conclusion about such impacts can be made. Additionally, no long-term evaluation of career education programs exists, because these are so new. Improved program evaluation for career education could produce a better understanding of the effects of career development education throughout grades K-12. Long-term evaluations of these programs could then help track whether career development education affects the career choices students make when entering the job market.

14.7.1 PROGRAM SUCCESSES

Across various types of K-12 programs, the most popular self-reported success is the noticeable improvement in student and teacher knowledge and skills. A variety of different program-specific successes were reported by interviewees, such as:

¹¹ Green Schools (2010), flyer received via email from program administrator.

¹² Some evaluation studies reviewed included: McRae, M.; N. Harris, J. Van Clock, and T.L. Hanson (2009, August). Process Evaluation of the 2006-2008 EARTH Education & Training Program. Research Into Action and Educational Consulting Services. Study ID: SCE0276.01 / CPUC ID: SCE 2504., and Skumatz Economic Research Associates (2008). *Evaluation of Indirect Effects of Four Student-Oriented “Green” GHG-Reduction Programs.* for Strategic Energy Innovations.

- Program completers (for programs serving grades 9 through 12) are actively engaging with educating their communities; for example, students are speaking to small business owners about energy efficiency.
- Programs are being recognized with awards at both the national and regional levels.
- Savings in school energy costs and usage are achieved as a result of a program.
- Ratepayer-funded programs within California identified program sustainability, measured by teachers continuing to order the program each year, as a major indicator of success.

Green Career Partnership Academies note increased student engagement, as evidenced by a noticeable shift in student behavior as it relates to learning. As interviews suggest, Green Academies students, many of whom were at risk or underperforming prior to enrolling in the Academy, show more respect for teachers, improved communication and teamwork skills, and a greater understanding of energy issues and career options available to them. While CPAs aim to significantly reduce dropout rates of at-risk youths, the programs interviewed have not been operating long enough to determine these outcomes. Because these programs are very new (some were in their first few months of operation), there is little if any outcome data or independent evaluations yet available, though an evaluation is currently being carried out. Thus, for outcomes, we are limited to these positive but potentially biased reports from program administrators.

14.7.2 PROGRAM CHALLENGES

One of the major challenges faced by K-12 energy education in California is the lack of a systematic, organized effort to institutionalize these concepts and programs. The K-12 Science Content Standards for California Public Schools, for example, only briefly touches upon energy education stating that high school students should “know the relative amount of incoming solar energy compared with Earth’s internal energy and the energy used by society.”¹³ In order to begin the process of integrating energy education into K-12 schooling, the Department of Education and other educational agencies would need to increase collaborative efforts with energy and environmental education programs and sponsors.

The California Environmental Protection Agency (EPA) is attempting to make an improvement in this domain by establishing the Education and the Environment Initiative (EEI). The EEI curriculum, tested and developed in collaboration with the California Regional Environmental Education Community Network (CREEC), hopes to help California integrate environmental literacy into core curriculum by aligning units with state-approved standards.¹⁴ This may provide an opportunity to insert energy education into a broader effort to integrate environmental education into the state approved standards. While the EEI curriculum has support from governing boards, such as the California Department of Education, its implementation is optional for schools and teachers and, therefore, requires significant teacher engagement and effort across the state. Continued support for an initiative of this kind may help to make programs of this nature more common throughout the state. The efforts of EEI, however, are primarily focused on environmental literacy, focusing on changing behavior much like the energy awareness programs. This initiative would benefit from developing and incorporating career awareness, exploration, and preparation into programs. While the EEI curriculum is considered complete and is unlikely to be changed, the IOUs and other program sponsors can work with the organization as a reference when developing new programs. The IOUs in California are well positioned to collaborate with the EEI on these efforts, since utility programs have recently started incorporating career awareness into their current cycle of programming.

¹³ California State Board of Education (1998, October). Science Content Standards for California Public Schools Grades K-12. Retrieved from: <http://www.cde.ca.gov/be/st/ss/documents/sciencestnd.pdf>.

¹⁴ California Environmental Protection Agency (2011). Education and the Environment Initiative Home Page. Retrieved from: <http://www.calepa.ca.gov/education/eei/>.

Almost every program interviewed, both within California and out, reported lack of funding or inconsistent funding as the single largest challenge in program implementation. Limited and sporadic funding is usually a barrier to enrollment growth. Many programs report that they are unable to serve all students and teachers who demand their services due to budget constraints. For example, while considered successful and oversubscribed, the Infrastructure Academy in Los Angeles County is not currently running its program, as there are no funds available.

Connected to the funding issue are the restrictions (or understood restrictions) on applicable use of ratepayer funds. One long-running program that raises awareness among middle school students about broader climate change topics reported that the program was not able to access ratepayer funding, as this funding source is restricted to energy savings education only.

Another key challenge faced by K-12 programs is that of recruiting teachers to participate. This issue is closely related to the recent economic downturn and educational budget cuts. As one program stated, the statewide budget cutback has impacted the grades with which a teacher works: when a teacher is moved to a new grade, he/she may be required to use any discretionary time to develop standard classroom materials and may not have the time to take on more projects, such as an energy curriculum or program.

Finally, the ever-changing workforce landscape, including the introduction of new maintenance practices and new technologies, provides another challenge faced by programs. Energy awareness programs must be structured in such a way that allows for them to be able to adapt quickly to the changing technological environment and workforce needs. Since the rate of change, especially with regards to advancing technologies, is so quick, staying current with and having access to new equipment is difficult and expensive for many programs.

14.8 MODEL PROGRAMS AND BEST PRACTICES

In order to identify promising practices, the research team utilized a range of approaches. First, we reviewed recent evaluation reports of several energy education programs, as well as published studies on career development education. Second, we conducted interviews with subject matter experts on energy education, K-12 career development education, and evaluation of utility-sponsored programs. It is important to note that practices identified through interviews were derived from program self-reporting rather than an evaluative process. Through this process we developed an initial list of best practices for both clean energy awareness and career development education, which can be found below in Table 14.4. Third, we asked the administrators for the 22 programs in the interviews about whether or not they incorporate these practices and, if yes, how. Through the answers they provided and the information we gathered through the previously mentioned research, the following elements were identified as the promising practices of K-12 programs:

- Effective energy-related curriculum, program planning, and pedagogy;
- Integration of career awareness, exploration and preparation;
- Tailoring program to regional needs in energy efficiency and renewable energy;
- Focus on teacher engagement; and
- Industry partnerships.

Table 14.4 Best Practices

Clean Energy Awareness Education	Career Development Education
<ul style="list-style-type: none"> • Develop and/or follow a program plan that describes learning objectives and expected outcomes related to energy awareness • Develop energy awareness curriculum using input from industry and/or other technical experts • Integrate energy awareness into established state-approved curricula • Define and target desired behavioral changes related to energy awareness • Integrate energy efficiency building/facility components into learning to provide students with hands-on experiences • Provide problem-solving exercises that students can easily relate to their own lives • Identify the key success indicators early in the program development process • Emphasize personal responsibility in regards to energy • Provide materials that enable students to increase energy awareness at home and/or in the community 	<ul style="list-style-type: none"> • Integrate energy-related career education throughout existing classes • Provide activities in which students research a variety of careers and present findings to peers. • Monitor the industry needs to ensure that training is relevant to the demands of the marketplace • Deliver career education in three stages that follow each other: 1) career awareness, 2) career exploration, 3) career preparation • Engage students in games that encourage the recognition of energy related careers and skills needed • Work with higher education segments to prepare students to enter college programs • Include knowledge professionals, parents, and community in career planning • Provide activities that allow students to explore their own self concept in relation to occupations • Have articulation agreements with colleges or universities • Have input from an advisory board that includes energy industry representatives • Provide students the opportunity to visit companies specializing in renewable energy/ energy efficiency • Use a structured student advising program to provide career guidance • Evaluate career education outcomes • Include skill preparation course(s) for energy related careers

The majority of K-12 programs (at least three in four among those interviewed) incorporate all key promising practices related to energy curriculum, program planning, and delivery. In contrast, many practices regarding career awareness, exploration, and preparation are fragmented among the programs studied. Although a few programs do integrate strong career awareness and education modules into their curricula, there is no systematic approach to the continuum of career awareness, exploration, and preparation components. As a rule, career awareness components are more common at all grade levels than those of career exploration and preparation. This is especially true for ratepayer-funded programs, which demonstrate strong energy savings educational outcomes and incorporate some career awareness components, but largely overlook the development of career exploration and preparation. In the career education group, practices related to industry connections are among the most widespread. These include having functional industry advisory boards, organizing field trips to energy efficiency/renewable energy companies, and seeking input from the industry professionals on the curriculum. The other practices that were common among the respondents are classroom activities related to career education in general and specific to the exploration of energy/clean energy occupations. Only one out of 22 programs interviewed reported having a systematic student advising function. Only a few of the programs evaluate career-related outcomes. This might be explained by the fact that the sample included many ratepayer-funded programs that have not included career preparation components, for which student advising and evaluation of career outcomes is crucial.

The analysis of best practices has been done to draw comparisons between the three grade levels: elementary, middle, and high school. Since no significant differences were identified between the promising practices for

elementary and middle school programs, we have combined our observations into one group of K-8. Table 14.5 shows the list of best practices that are critical for each group.

Table 14.5 Best Practice Comparisons for K-8 and 9-12 Grade Levels

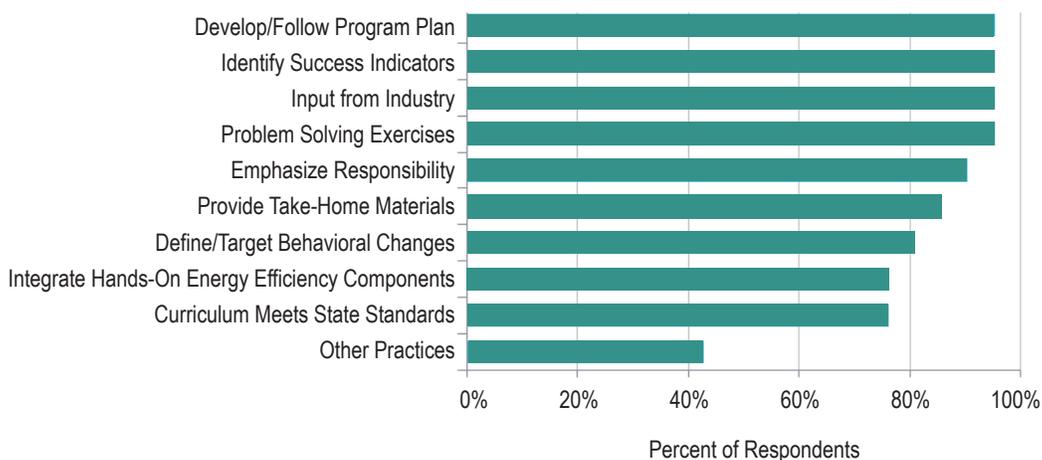
Best Practices for K-8	Best Practices for 9-12
<ul style="list-style-type: none"> • Effective energy-related curriculum, program planning, and pedagogy • Integration of career awareness and exploration into curriculum • Strong career awareness components • Strong career exploration components (for middle school) • Tailoring program to regional needs • Teacher engagement • Industry partnerships 	<ul style="list-style-type: none"> • Effective energy-related curriculum, program planning, and pedagogy • Integration of career awareness, exploration, and preparation into curriculum • Sequence of awareness/exploration/ preparation is important • Strong career exploration and preparation components • Tailoring program to regional needs • Teacher engagement • Industry partnerships • Connection to higher educational segments and articulation agreements

Each of these elements is elaborated on and analyzed based on training program interviews in the sections to follow.

14.8.1 EFFECTIVE ENERGY-RELATED CURRICULUM, PROGRAM PLANNING, AND PEDAGOGY

A myriad of program planning and teaching approaches can be found in best practice K-12 programs. Figure 14.4 provides an overview of the reported use of each practice for each of the programs interviewed, including the proportion of programs that use “other” practices, such as holistic curricula and specialized program evaluations.

Figure 14.4 Practices in Clean Energy Awareness K-12 Programs



During interviews, respondents were asked to describe how they implemented each practice. Based on these responses, we synthesized the common patterns into the following groups:

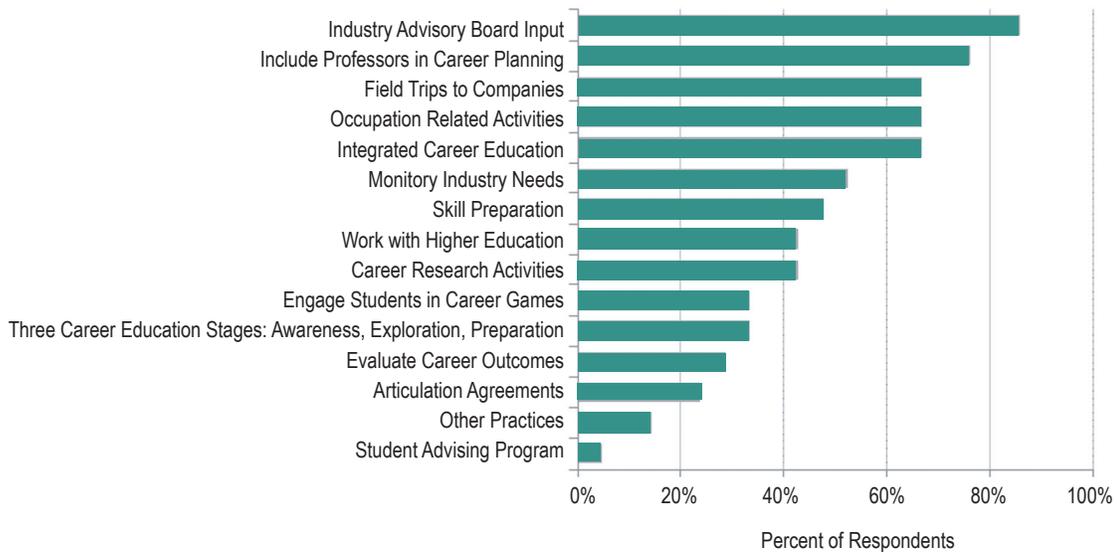
- **EFFECTIVE PROGRAM PLANNING:** Ninety-five percent of programs interviewed reported that they developed and followed a comprehensive program plan with clearly defined learning objectives and targeted energy awareness outcomes. Many also identify the key success indicators early in the program development process.
- **INDUSTRY INPUT** is sought and incorporated into energy awareness curricula.
- **REAL-LIFE APPLICATION:** Curricula that are built upon real-life application of energy-related science-based concepts result in higher interest to the program among both students and teachers. The methods that programs use to incorporate contextualized learning into curricula vary from integrated hands-on exercises using real energy auditing or renewable energy technologies on campus to problem-solving exercises in classroom setting and take-home kits that enable students to increase energy awareness at home and/or in the community.
- **MEETING STATE CURRICULUM STANDARDS:** Integration of energy awareness lessons into established state-approved curricula ensures higher levels of participation among teachers.
- **HOLISTIC CURRICULUM** that includes not just energy awareness but broader implications of greenhouse gas emissions, climate change, and understanding how energy use impacts these broader environmental issues. Teachers tend to be more interested in bringing such holistic topics into their classrooms. Increased collaboration between and within ratepayer-funded programs and environmental agencies may help to develop such curriculum.
- **PROGRAM EVALUATION:** For energy awareness programs, tracking energy savings is a challenging task that most programs have not attempted. Pre- and post-tests that gauge the knowledge imparted and participants' reaction to a program are fairly common, however.

14.8.2 INTEGRATION OF CAREER AWARENESS, EXPLORATION, AND PREPARATION

Programs that systematically integrate energy career awareness and education throughout existing classes appear to play a crucial role in promoting energy related careers and building pathways for students. Figure 14.5 provides an overview of the reported use of each career-related practice by the programs we interviewed. Although the delivery of career education in three stages (career awareness, exploration, and preparation) was only reported by one-third of the programs interviewed, the leading programs that engage students and teachers at all grade levels, i.e., K-12, tend to use this approach successfully. This sequence is especially crucial for the programs targeting high school students, as it provides students with multiple career options upon graduation and equips them with information to make those decisions. Two Green Academies that incorporate all three elements (career awareness, exploration and preparation) into their curricula are able to demonstrate “real-life” application of knowledge they receive and thus an increase in students' motivation to graduate. Depending on the grade level, programs use various teaching approaches to incorporate career-related education, such as:

- Providing activities in which students research a variety of careers and present findings to peers;
- Engaging students in games that encourage the recognition of energy related careers and skills needed;
- Providing activities that allow students to explore their own self concept in relation to occupations; and
- Including skill preparation course(s) for energy related careers.

Figure 14.5 Practices in Career Related K-12 Programs



Connection to industry and community is another important component in providing effective energy career education. Most programs report engaging career education professionals, parents, and community in student career planning, as well as seeking input from an advisory board comprised of energy industry representatives, and providing students with opportunities to visit companies specializing in renewable energy or energy efficiency.

For career technical education, devoting attention to energy-related career pathways and strong relationships with higher education segments are crucial elements. Green Academies are especially successful in building partnerships with post-secondary institutions in both informal and formal (through articulation agreements) ways.

14.8.3 TAILORING PROGRAM TO REGIONAL NEEDS IN ENERGY EFFICIENCY AND RENEWABLE ENERGY

Based on the information collected through the interviews, organizations that work collaboratively with the local/regional industries and communities and tailor programs to their needs are better able to provide the education and training that is relevant to the marketplace and appealing to the community. The effect of such approach is twofold: (1) contextualized learning provides immediate relevance of the material to the students, and (2) strong partnerships with community and industry are secured.

14.8.4 FOCUS ON TEACHER ENGAGEMENT

Programs that focus on providing teachers with resources and training and engaging them in energy awareness education tend to produce broader impact. For example, NYSERDA (New York State Energy Research and Development Authority) has extensive experience in providing energy awareness education to K-12 segments in the state of New York. NYSERDA's efforts are focused almost exclusively on professional development activities

for teachers and non-formal educators, as this delivery method allows them to educate larger numbers of students at all grade levels about energy efficiency and conservation. Engaged teachers also contribute to the long-term sustainability of a program, as they are more likely to continue the program even if or when the funding expires. In addition to professional development workshops, best practice programs engage teachers by providing them with kits and materials for hand-on exercises, as well as connecting them with industry professionals, and organizing field trips for students.

14.8.5 INDUSTRY PARTNERSHIPS

There is a consensus among K-12 program and curriculum providers that strong partnerships with the industry are critical. The research shows that program providers involve industry representatives in many stages of program development and implementation process. Many programs interviewed report that they have functioning industry advisory boards. Industry partnerships are recognized as an important factor of success as they help the programs in the following areas:

- Developing and upgrading curriculum that is relevant to the marketplace;
- Securing funding for the program;
- Organizing field trips and industry presentations for the students;
- Providing internship opportunities for students and externship opportunities for teachers; and
- Donating equipment and materials.

14.9 STUDY LIMITATIONS

The data collected come with limitations that should be noted. The following are two factors that may have influenced the findings of this study and should be taken into consideration.

- First, collecting data through interviews allows the potential of biased answers. It is possible that program administrators embellished on the positive aspects while withholding negative features.
- Second, the sample size (n=22) is relatively small, so the results based on these interviews may not be representative of other programs.

14.10 RECOMMENDATIONS

- **INCREASE COLLABORATION AMONG VARIOUS STAKEHOLDERS AND ENTITIES** in the K-12 education community within California. These partnerships should focus on developing a systematic, organized effort to institutionalize energy awareness and career awareness education programs, and align them with California Content Standards. This could begin by exploring key partners' willingness to establish an ad hoc committee to support these priorities/goals and partnerships. The Career Awareness Committee within the Florida Energy Workforce Consortium is a possible model that could be explored. They successfully integrate utilities and state educational community to work towards common goals.

Partnerships should include organizations and programs that have *an explicit focus on serving disadvantaged communities and lowering school dropout rates*, like the Career Academies. The following is a list of possible entities to be included in the collaboration: California Department of Education, California Partnership

Academies, investor-owned utilities, publicly-owned utilities, California Energy Commission, California Public Utilities Commission, California Environmental Protection Agency, organizations providing after-school educational programming, and high-performing K-12 energy education programs (representative of all funding sources). Collaborative efforts could also extend outside of California to compare ideas and stay current on developing technologies and approaches with such agencies and organizations as NYSERDA, the Wisconsin K-12 Energy Education Program (KEEP), and the Florida Energy Workforce Consortium (FEWC). National programs, such as the Environmental Protection Agency's Education and the Environment Initiative of the Education and the Environment Initiative may be strong resources with which to work and/or support on a statewide level, if they are found to align with identified key goals.

- **COORDINATE, LEVERAGE AND MAXIMIZE IMPACTS OF FUNDING:** Identify and consider how best to coordinate multiple sources of funding with multiple objectives of funders, for the purpose of determining how to best leverage these funds. Programs should also consider and identify ways to reduce budgets without sacrificing program elements, for example, by utilizing reusable materials). During application processes, funding agencies should require programs to explicitly indicate how they will incorporate and address the best practices identified in this report. For example, the programs that incorporate teacher engagement activities could be scored higher on their applications. Also, when considering programs to fund, utilities should identify successful, oversubscribed programs that lack the funds and resources necessary to be sustainable.
- **PLACE MORE EMPHASIS ON CAREER AWARENESS AND CAREER RESOURCES:** This includes increasing the emphasis on all three stages of career awareness, exploration, and career preparation topics in programs addressing energy awareness and could include developing grade-level appropriate career resource guides that explicitly outline what is to be covered in career awareness, exploration and preparation education. Such guides could include links to career development websites, job descriptions, companies that offer on-site field trips, etc. These resource guides could be utilized by K-12 teachers and students throughout the state to better enhance career development education.
- **DEFINE AND DETERMINE ADDITIONAL IMPACT METRICS** that are realistic and measurable for future program evaluations and recognize the distinct objectives and restrictions of the collaborators.

14.11 SUGGESTIONS FOR FUTURE RESEARCH

- **EXPLORE THE DEVELOPMENT AND INCORPORATION OF STANDARDIZED METRICS** for K-12 programs. Such metrics should be measurable and should take into account the distinct objectives and restrictions of program collaborators. Our research indicates that most energy awareness programs used pre- and post-tests to evaluate changes in awareness; relatively few programs track the energy consumption changes in individual households and schools. For career awareness, very little tracking is done of how career awareness programs influence future career paths of students. The development and the inclusion of affordable metrics would help to provide objective measures of program impact. Conduct research and/or acquire data that illustrates program success in terms of job placement, especially for the grades 9 through 12 programs. Completer data helps to provide a better understanding of how programs continue to affect students once they have graduated.
- **CONTINUE AND EXPAND RESEARCH OF THE GREEN CALIFORNIA PARTNERSHIP ACADEMIES:** Since these programs are relatively new (some only in operation a couple of months at the time of interviews), no outcomes data are available. Additional research is needed in order to determine the effectiveness of these programs and should be done as the green CPAs are become more established.

- **DETERMINE DATA AND COLLECTION METHODS** necessary to measure the effectiveness of K-12 programs. Key data should be collected to determine the ways in which programs affect the ongoing education and training of California's students and future workforce, but more research is necessary to determine the most important information and what data programs should be required to collect and maintain. For example, tracking outcomes over time would allow for observation of the behavioral and career impacts of programs, but would require considerable coordination.
- **CONDUCT FORMAL EVALUATIONS OF PROGRAMS TO DETERMINE TRUE BEST PRACTICES:** The practices outlined in this report are based on self-report from interviewed programs, expert interviews and relevant and recent literature. Program evaluations would provide a better understanding of effective practices and the impact they have on program participants.
- **EXPLORE ENERGY-RELATED SERVICE LEARNING ACTIVITIES FOR STUDENTS:** Service-learning activities may increase student and teacher buy-in with the program.

CHAPTER FIFTEEN:

15. EMPLOYMENT INFORMATION SYSTEMS

15.1 INTRODUCTION

This chapter provides a review of “employment information systems” relevant to employers and job seekers in the energy efficiency labor markets. Employment information systems (or “EIS”) include job banks, job matching systems, and other Internet-based information systems designed to connect workers with employers.

The purpose of this chapter of the Needs Assessment is to provide a more thorough understanding of where, how, and how effectively EIS contribute to matching labor demand with supply in the relevant markets. This information is intended to offer guidance on decision-making and future investment for a WE&T web portal, which was proposed as a near-term strategy in the California Energy Efficiency Long Term Strategic Plan, adopted by the Commission in September 2008. As described in the EE Strategic Plan:

The web portal will include links to various demand-side management (DSM) related training programs and will allow for a single point of communication. The portal will also serve as a repository for all demand-side management and energy efficiency training, educational conferences, and career opportunities. This portal will be created and funded in collaboration with other appropriate entities, and linked to the statewide energy efficiency web portal.

To better inform the development of the web portal, this chapter provides an overview of existing Internet-related job matching systems and an exploration of the various types and functions. It also assesses effectiveness of EIS in job matching, and identifies major challenges for EIS providers as well as nationwide best practices. Based on this information, and the findings of the Needs Assessment as a whole, we offer our recommendations on the development of an EIS for energy efficiency in California and possible next steps.

The analysis we present here is based on a variety of strategies used to gather information on Internet-based EIS, including a literature review, conversations with subject-matter experts, web research, and qualitative one-on-one interviews with EIS providers. More detail on the methodological approach of this research can be found in Appendix J.

15.2 BASIC FUNCTION OF EIS

EIS can play an important intermediary role in labor markets by facilitating the exchange of information between job seekers and employers. For both job seekers and employers, lowering the costs (both time-related and financial) of obtaining information makes finding a job and hiring the right employee more efficient. Job seekers benefit from increased awareness of employment opportunities, training requirements, and options for training and education programs. Employers benefit from advertising job opportunities to potential employees, and accessing a pool of job applicants.

Anthony Dais of the U.S. Department of Labor's (DOL) Employment and Training Administration (ETA) characterizes the two sides to an EIS as the "labor market exchange" and "labor market information."¹ Here we concentrate on the labor market exchange component of these systems. EIS generally include job postings, as well as news and information useful for a job search by workers and an employee search by employers.² The synthesis of job postings and information is the common purpose of all EIS, and the basis for the working definition we use:

An Employment Information System is any service that exists to facilitate labor market exchange between employers and jobseekers. At minimum, EIS should include job bank components (primarily defined as listings of job postings) but may also include comprehensive search algorithms, resume banks, career information, training opportunities, educational programs, social networking capability, etc.

15.3 TYPES OF EIS

The federal government runs the largest and most comprehensive EIS for all sectors and workers through its One-Stop Career Center system, coordinated by the DOL ETA.³ The "One-Stop" system is the central component of the federal Workforce Investment Act (WIA), passed in 1998. In California, there are 259 One-Stop Career Centers spread throughout the state. One-Stops are designed to provide a full range of assistance to job seekers under one roof. The centers offer training referrals, career counseling, job listings, and similar employment-related services. Individuals can visit a center in person or connect to the center's information through a personal computer or a remote access kiosk. One-Stops are operated by a variety of entities, including local Workforce Investment Boards (WIBs) and county agencies, as well as non-profit organizations that are contracted to provide all or some of these services. All are supported by federal funding, and frequently One-Stops offer access to wrap-around or support services for specific populations such as youth and dislocated workers.

The private sector has also established a variety of EIS. In contrast to the broad audience that is served by One-Stops for no fee, most private systems are narrowly focused job listings that serve a targeted, paying clientele. Over the past ten years, systems for sharing job information, particularly those using electronic systems, have grown in volume and variety from electronic "help wanted" ads to full-featured services encompassing employment sections on corporate websites, online application forms, searchable resume databanks, "spidering" systems that compile information from multiple sites, and (less frequently) links to training and career exploration. The most comprehensive list of the various types of EIS that are relevant to a green industry focus is offered by Jim Cassio in his *Green Careers Resource Guide*. He outlines the following types of EIS:

- General purpose employment websites or job boards (e.g., Monster.com)
- State job banks (e.g., CalJobs, EmployFlorida)
- Local/regional employment websites (e.g., Craigslist)
- Local/regional newspaper online classified ads (e.g., Los Angeles Times)
- Niche employment websites serving specific industries or professions (e.g., Energy Central Jobs, CleanTechies.com)
- Employer websites (e.g., Target, Wells Fargo)

¹ EIS labor market information refers to the government data collection system of labor market data. In California this is the Labor Market Information Division, which though useful to workers and employers, has a much broader function.

² Cassio, J. (2009). *Green Careers Resource Guide*, Green Capital Alliance. Retrieved from: [http://www.greencapitalalliance.org/docs/GreenCareersResourceGuide\(Fall09\).pdf](http://www.greencapitalalliance.org/docs/GreenCareersResourceGuide(Fall09).pdf).

³ For more information, visit the Employment and Training Administration (ETA) website at <http://www.doleta.gov>.

- Job Search engines (e.g., Simplyhired.com, Indeed.com)
- Networking websites (e.g., LinkedIn, Facebook)
- Offline networking (e.g., Internships, networking groups)

Most of the EIS identified by Cassio are represented in Appendix K, the inventory of EIS compiled for this report. Some programs fall into multiple categories. The inventory includes four non-governmental, general purpose employment websites, four state employment websites and job boards, nine local One-Stop Center systems, one networking site for workforce professionals, seven career exploration resource sites, and 45 niche job boards and websites, among which many can also be classified as job search engines, spidering systems, or employer job boards. There is a noticeable concentration of niche (“green”) job boards in the inventory, as the aim of this study was to identify features and characteristics of EIS that would benefit the energy efficiency related sectors. Green job boards are a new and emerging type of job board, and as such, general job boards were contacted and interviewed to contribute to the forming of best practices for Employment Information Systems. In addition, the EIS inventory includes organizations which primarily focus on providing pre-employment services to the job seekers, such as career and industry information. These service providers were not interviewed but can be a valuable resource for the workforce arena.

In order to capture the full scope of offerings of EIS, this study identified two distinct groups: (1) job boards, primarily in green related sectors, and (2) full-service EIS. Most job boards are private sector, and most—but not all—full-service EIS are connected to the One-Stop Career Center System.

15.3.1 JOB BOARDS

Job boards are Internet-based job search websites that serve both general and niche job markets. The job boards serving the green and energy efficiency labor markets are primarily privately funded with either commercial or non-profit goals. A niche job board focuses employment matching efforts on a specific industry or cluster of industries, while a general job board supports labor exchange in all industries. Our study specifically focused on green and energy efficiency related niche job boards in order to gain a better understanding of what services are offered specifically to job seekers and employers in these sectors.

Through web search and literature reviews, we identified 47 green-related and general job boards for this study. The majority of them (87 percent) have an industry or occupational specialization in energy (traditional, renewable, wind, solar, etc.), energy efficiency, general green, environmental health and safety, or non-profit fields. The remaining job boards are general-purpose employment websites and spidering systems. Among the market leaders in the commercial job matching industry, Monster.com and Careerbuilder.com were included in the inventory. However, administrators of these EIS did not respond to our requests for an interview.

Of the 47 job boards, 12 can be categorized as more than one type of EIS, including general and niche job boards, spider search engines, employer websites, etc. Spider search engines account for six of the job boards in the inventory. Spider search engines supply job seekers with job vacancies pulled from a variety of employer, recruiter, and job board websites. Job boards typically do not have a physical location; their services are offered only online. In addition to job postings and related job information, job boards generally contain a resume board and resume search function and have incorporated social networking and blogs into their menu of services. Nearly all job boards are open access systems for job seekers, with only one (Net Impact: Career Center) requiring a for-fee registration. As a general rule, green job boards do not restrict their postings to one local or state area, and instead are open nationwide.

We attempted to contact the sponsors of all 47 boards for an interview; providers of 11 job boards agreed to participate, yielding a 23 percent response rate. Table 15.1 shows the list of job boards and job matching websites that responded to the survey. The table incorporates the name of the job board, the duration of its existence, its industry focus (if any), an indicator of the size of the employment matching operation (in number of postings or other reported metric), geographic service area, and the targeted job seeker profile.

A brief description of the 11 niche job boards interviewed follows:

- **CLEAN TECHIES:** A niche job board dedicated to jobs in clean technology. Clean Techies incorporates blogs and related career resources into their services for job seekers.
- **EFFICIENCY FIRST JOB BOARD:** A niche job board dedicated to jobs in the home performance industry. The parent organization, Efficiency First, is a national, membership-based non-profit trade association for the home performance workforce.
- **ENVIRONMENT, HEALTH, AND SAFETY (EHS) CAREERS:** A niche job board with a focus on the postings related to environmental regulations, occupational health, and safety occupations.
- **ENERGY CENTRAL JOBS (ECJ):** A niche job board portion of parent company, Energy Central. ECJ targets mid-level professionals in the energy sectors.
- **ENERGY JOBS PORTAL:** A self-described niche job bulletin for occupations related to energy and utilities sectors. It is based on the West Coast.
- **GREEN CAREER CENTRAL:** A niche job board that provides educational information about green careers as well as job matching services related to broadly-defined green jobs.
- **GREEN JOBS:** An information center that hosts job postings from employers in the field of renewable energy, such as wind, solar, and geothermal. Although it has global representation, the majority of the postings are from firms in North America.
- **GREEN JOBS SPIDER:** A spidering job search engine that generates job postings from several green-related job boards.
- **IDEALIST.ORG:** A niche job board that has an emphasis on social and environmental responsibility and caters to job seekers looking for employment with non-profit organizations or government agencies.
- **JOB CENTRAL:** A general job board/web portal that provides direct links to employer websites. This is an employer membership-based service.
- **SUSTAINABLE BUSINESS.COM – GREEN DREAM JOBS:** An informational portal that hosts green job postings, as well as providing information on a variety of topics, such as investing in green industries and technologies and building a green business.

Table 15.1 Characteristics of Green Job Boards Interviewed

Name	Years in Existence	Industry	Size (postings)	Geographic Service Area	Target Audience
Clean Techies www.cleantechies.com	2	Clean/Green Technology	80 per month	U.S.	White collar professionals, career changers, unemployed
Efficiency First jobs.energyliberty.org	<1 (2 weeks at the time of interview)	Home Building Performance	44 (after 2 weeks of operation)	U.S.	Anyone involved in the home performance industry
Environmental, Health, Safety (EHS) Careers www.ehscareers.com	7	Environmental, Health, Safety	450 per month (avg.)	Global	Workers with 2-3 years of experience to professionals
Energy Central Jobs www.energycentraljobs.com	13	Energy and Utilities	35,000 unique users	U.S., Canada, and some international presence	Mid-level professionals with 4-7 years of experience
Energy Jobs Portal www.energyjobsportal.com	8	Energy and Utilities	201 (at time of interview)	Contiguous U.S.	All job seekers
Green Career Central www.greencareercentral.com	3	Green	No response	U.S. and some international presence	Job seekers and educators
Green Jobs www.greenjobs.com	6	Renewable Energy/Energy Efficiency	250	U.S. with some international presence	All job seekers
Green Job Spider www.greenjobspider.com	10	Green, Renewable Energy and Energy Efficiency	12,500 per month (avg.)	U.S.	College students, professionals, anyone looking for a green job
Idealist.org www.idealist.org	10	Non-profit organizations or government agencies	5,670 (at time of interview)	Global	All levels of skill and education
Job Central www.jobcentral.com	9	None	750,000 per day	U.S.	Recent graduates
Sustainable Business: Green Dream Jobs www.sustainablebusiness.com	16	Green industries	No response	U.S.	Anyone looking for a green job

The skill, education, and professional level of the target audience vary across job boards. Seven of the 11 respondents indicated that their audience is job seekers of all backgrounds. However, when asked about average skill level and educational attainment of the job seekers that they serve, most green job boards reported middle- or higher-skilled professionals and job seekers with college degrees. Interviews and the analysis of the current postings showed that these green job boards provide very limited services and resources to low-skilled, less educated populations.

According to the data collected from the interviews, all job boards offer an opportunity for job seekers to search a database of available job openings, but very few provide additional information and services not directly related to the job matching function. Among the most commonly offered additional features or functionalities included on green job board websites are:

- Posting of resumes (Efficiency First, EHS Careers, ECJ, Job Central)
- Resume writing services that are usually offered for an additional fee (Clean Techies, Job Central)
- Industry related information or blogs (Clean Techies, EHS Careers, Green Career Central, idealist.org, Green Jobs, Green Jobs Spider, Job Central)
- Connection to networking sites, such as LinkedIn and Facebook (Clean Techies, ECJ, Green Career Central, Green Jobs Spider, Job Central)
- Automated notification services (EHS Careers, idealist.org, Job Central)

Hosting of an information exchange and/or blogging about industry trends and careers seems to be a prevalent additional service provided by green job boards to their users. Seven of the 11 job boards interviewed cited the availability of such feature on their sites. The inclusion of networking tools for a more enhanced search experience is reported as one of the important trends of where the industry is going. This feature is normally added in connection with such social media websites as LinkedIn and Facebook. Five job boards explicitly stated that they currently operate a page or an account on these sites and/or utilize professional networks created there.

15.3.2 FULL-SERVICE EIS

Full-service EIS include any workforce agency, banner center, or One-Stop Center.⁴ Funding for full-service EIS is typically provided by governmental agencies directly or indirectly through contracts. A full-service EIS provides access to job boards and other Internet-based systems but also provides on-site services (e.g., interview practice sessions).

To inform the study and analyze best practices, we compiled a list of 22 full-service EIS through online searching and peer referrals. These full-service EIS include five One-Stop Career Centers in California (out of 259),⁵ four One-Stop Career Centers in other states, including New York and Florida, four comprehensive statewide labor market and employment websites in California and three other states,⁶ one local green career site (privately funded), and eight career information and employment resource websites. The state employment website in California is represented by the Employment Development Department–Labor Market Information Division portal. It includes a variety of related content as well as extensive resources for employment matching. One full-service EIS with a specific focus on energy, Minnesota’s ISEEK Energy website, is also included in the inventory.

Of the 22 full-service EIS, nine have a physical location in addition to a website, and many offer employee screening. Access to full-service EIS is usually unrestricted for job seekers. These full-service EIS tend to service a local and/or regional population and provide extensive services to disadvantaged populations. The majority (17 out of 22) of the systems and services identified have a general industry focus; the other five EIS are energy or green career specific sites. Generally, full-service EIS have not incorporated a social network component to their service offerings and do not operate blogs.

Out of the 22 full-service EIS contacted, seven administrators agreed to participate in the study. A set of basic characteristics about these seven are presented in Table 15.2. The table includes the name of each EIS provider,

⁴ A banner center is a physical location that provides resources and services with a focus on education and training for the workforce. Banner centers rely on partnerships with workforce, education, industry, and economic development entities to supply their services.

⁵ These five One-Stop Career Centers were included in the inventory for one or more of the following reasons: their successes related to job matching, operating a comprehensive online labor exchange system, and focusing on clean energy or green careers and jobs.

⁶ The states’ employment service is an integral part of the One-Stop delivery system that provides universal access to an integrated array of labor exchange and Workforce Investment Act services delivered through the statewide One-Stop Career Center system. These services are available to all job seekers in a given state. Although they provide connection to One-Stop system services, they often utilize additional public and private funds to develop additional services and informational resources.

the duration of their existence (in number of years), the industry focus, the geographic area they serve, and the target audience for their services.

The following is the short description of each full-service EIS covered in the interviews:

- **GREEN CAREER NETWORK (GCN):** A local job matching site that is a service of the Center for Sustainable Energy, a private non-profit agency located in San Diego County. This EIS combines information about green careers, and connects local residents to job opportunities in clean energy sectors.
- **LOS ANGELES URBAN LEAGUE (LAUL):** A local network of workforce and One-Stop Centers with a focus on education, training, and employment placement. The LAUL serves the population in South Los Angeles.
- **NORTH VALLEY JOB TRAINING CONSORTIUM (NOVA):** A local One-Stop Center that provides customer-focused workforce development services as well as employment matching services. NOVA works with a variety of sectors. However, its administrators are devoting special attention to renewable energy and energy efficiency sectors.
- **SACRAMENTO EMPLOYMENT TRAINING AGENCY (SETA):** A workforce agency and One-Stop Center agency of the City and County of Sacramento. It provides multiple services to displaced workers and profiles local green-related industries on its employment website.
- **EMPLOY FLORIDA MARKETPLACE (EFM):** A state employment website with a connection to case management through the Florida One-Stop system.
- **ISEEK ENERGY:** A career information and employment website for job seekers in Minnesota that focuses on energy and incorporates such elements as career assessment, labor market information and job search. It is an industry specific part of a general career and employment website "ISEEK."
- **WORKFORCE FLORIDA:** A non-profit organization that administers and oversees workforce development policies, programs, and services in Florida.

We found that full-service EIS were, in general, older and more established than the green job boards that we interviewed. Most full-service EIS interviewed (five out of seven) have been in existence for more than 10 years. The geographic service area of full-service EIS is specific to either a local cluster of counties or an entire state. The audience that full-service EIS target includes not only job seekers and employers, but also intermediaries that provide needed support services, such as educators, training providers, counselors, and community based organizations.

Full-service EIS typically do not have a particular industry focus but instead provide services to meet the labor matching needs of the more prominent industries in their region. The focus of full-service EIS is to provide not only employment matching services but also a continuum of services to support successful labor market exchange with the ultimate goal of lowering unemployment. This continuum of services includes career assessment, career counseling, employability training, information about jobs in demand, connections for displaced workers to available education and training options, training and retraining, and case management services.

Table 15.2 Full-Service EIS Characteristics

Name	Years in Existence	Industry Focus	Geographic Service Area	Target Audience
Green Career Network www.energycenter.org	1	Energy, Utilities, Renewable Energy, Energy Efficiency	San Diego, CA	People who are currently in the green industry but want information about additional opportunities and people who are looking for a career change or who are displaced and are now starting to consider starting a green career
Los Angeles Urban League (LAUL) www.laul.org/worksource-centers	90	General	South Los Angeles, CA	Students, parents, educators, intermediaries, job seekers, and employers
North Valley Job Training Consortium (NOVA) www.novaworks.org	18	General	Northern Santa Clara County, CA	Unemployed workers in the service area
Sacramento Employment Training Agency (SETA) www.seta.net	32	General	Sacramento County, CA	Students, adults, seniors (industry professionals who want to switch careers), employers, and trainers.
Employ Florida Marketplace www.employflorida.com	4	General	Florida	Students, parents, educators, intermediaries, employers, job seekers
ISEEK Energy www.iseek.org/industry/energy	12	Energy, Health Care, Information Technology, Manufacturing	Minnesota	Students, parents, teachers (K-12 and secondary), dislocated workers, veterans, disabled workers, ex-offenders, immigrants, refugees, counselors, and advisors.
Workforce Florida www.workforceflorida.com	75	Clean Energy, Life Sciences, Information Technology, Aviation/Aerospace, Homeland Security/Defense, Financial/Professional Services, and Manufacturing	Florida	Students, parents, educators, intermediaries, employers, job seekers

Information provided by administrators of full-service EIS indicated that the most common services offered by these EIS either through web portals or at their physical locations were:

- Job posting and search (All)
- Information about education and training options, and/or delivery of training (EFM, Green Career Network, LAUL, NOVA, SETA, Workforce Florida)
- Resume and cover letter assistance (ISEEK Energy, LAUL, NOVA, SETA)
- Skills assessment (EFM, ISEEK Energy, LAUL, SETA, Workforce Florida)
- Case management and job placement services (NOVA, LAUL, SETA)

Full-service EIS providers often partner with other agencies and institutions to deliver many of the above services. While green job boards tend to be fragmented and primarily partner with large employers and industry groups, full-service EIS heavily rely on partnerships with other local, regional and state institutions to support labor

exchanges. Such partnerships are deeply rooted in the communities and regions where these EIS operate and involve organizations such as educational institutions, training facilities, industry leaders, and state or local workforce agencies.

The most common partnerships that full-service EIS providers engage in include:

- **TRAINING OPPORTUNITIES:** Six of the seven full-service EIS administrators interviewed noted partnerships with public and/or private institutions for the offering of training programs to job seekers; these were the One-Stop Centers that are part of the federal WIA system. Some also connect employers with training providers for skill enhancement of incumbent workers and training of newly hired employees at an employer site. These partnerships are instrumental as they allow low-skilled job seekers to obtain additional skills that are required by employers, making them more employable and helping them to advance. Community colleges are often mentioned as training partners of full-service EIS.
- **JOB POSTINGS:** Full-service EIS typically do not operate their own online job boards, especially the ones focused on green industries. Instead they depend on the job board of their state and on relationships with regional businesses to keep apprised of job vacancies.
- **OUTREACH AND ADVERTISING:** Because the web presence of full-service EIS is limited and does not guarantee an easy outreach to all groups that need their services, the partnerships they foster with local businesses, educational institutions, community based organizations and other strategic entities assist in advertising their services to the public and employers. These partnerships help EIS providers reach out to populations that may not otherwise be aware of their services.

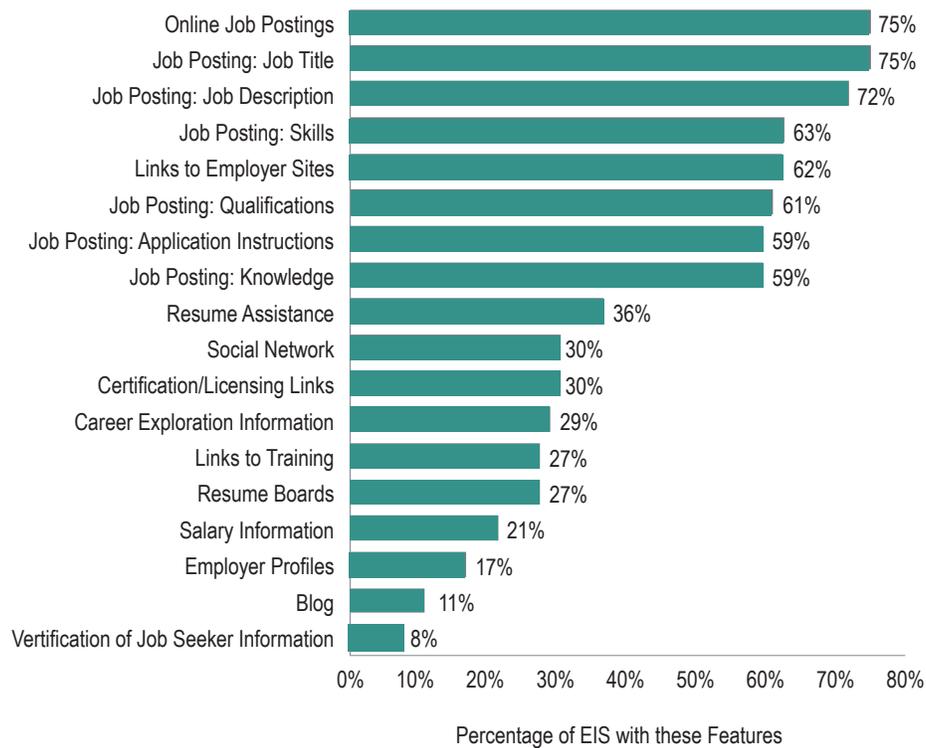
15.4 FEATURES OF EIS

After the list of various EIS was compiled, we conducted a cursory online review of each system to document common characteristics and features. We specifically were interested in whether or not a given EIS incorporates the following features and services: job posting details (title, description of duties, qualification requirements, etc.), additional site features (resume uploads, employer site connections, and social networking), additional intermediation services (links to training, career information, resume preparation services, etc.), and verifiable job seeker data, such as some type of a credential or skill-based test scores.

Figure 15.1 shows the list of the features and services that were tested, sorted from the most commonly utilized down to the least common. The bars on the graph represent the percentage of EIS that incorporate each of the features. All 68 EIS included in the inventory were screened for these features and services. Please note that three EIS could not be screened for some of the features directly related to job posting because access to these sites was restricted.

As expected, the most common feature is online job postings; included in 75 percent of EIS. The rest of the EIS (that do not have online labor exchange system and operate only a physical location) either connect to a different job site or provide only pre-employment services. Among the job posting features, job title and job description are the most commonly supplied data. Only three percent of EIS provides a job title, but then links to another site for more detailed information related to the job opening. Among the reviewed EIS, job posting features offered also include skill requirements (63 percent), minimum qualifications (61 percent), application instructions (59 percent) and knowledge requirements (59 percent). However, salary information is provided by only one out of five EIS reviewed.

Figure 15.1 Common Features of EIS



In addition to job posting features, other common services offered by EIS interviewed are links to employer websites (62 percent of EIS provide this type of connection) and social networks (30 percent). Intermediation services—which include links and/or access to training, certification, licensing, career exploration tools, resume assistance and interview preparation—are provided by less than a third of EIS identified. Of these intermediation services, resume uploading and other assistance was the most prevalent among the EIS included in the inventory (36 percent of EIS provide this).

We also looked at the frequency of content update among the EIS that have a web site. The content of the EIS (among those covered in the survey) is typically updated frequently; 89 percent update their content on at least a daily basis. The other 14 percent that perform content updates less frequently are full-service EIS, which provide services primarily off-line.

In the attempt to provide a high level assessment of the ease of use of each EIS, we ranked each online EIS using a scale from “very difficult” to “very easy” to use. The criteria utilized for this ranking included the availability of clear instructions for a job seeker, ability to access the site without registration, the number of clicks necessary to generate a listing of jobs, and other related criteria. All 66 EIS with an online component were assessed. The majority of the EIS are easy to access based on our criteria; 74 percent of the identified EIS were ranked as “easy” or “very easy” to access by the research team. Those that were ranked poorly on the ease of use required registration (either for a fee or without), did not provide clear instructions or paths for a job seeker to navigate the site, or required more than five clicks to get to job listing. These results can only be considered preliminary as a more comprehensive and representative evaluation of the ease of use of EIS is necessary. Such assessment would include evaluations from representative panels of target job seeker and employer populations of various aspects of the sites.

15.5 FUNDING

According to the data collected from the interviews, green job boards and full-service EIS are funded differently. Job boards are privately funded either directly through fees collected from employers for job posting services or by non-profit groups, such as industry and workforce associations. Most of the full-service EIS covered by our survey are supported by governmental funds, either through the U.S. Department of Labor or state and local labor or workforce agencies. Green Career Network in San Diego is the only full-service EIS among those interviewed that is not directly supported by governmental funding, but rather by a private non-profit organization.

As mentioned, job boards depend on the revenue they generate through their services. Most of this revenue comes from employer job posting fees. Some job boards also collect fees for advertisements on their websites and additional services to job seekers, such as resume writing assistance or career coaching. Since job boards' budgets depend so much on income generated from job posting fees, employment information systems with strong ties to the industry tend to fare better than those without such ties. For example, Energy Central portal was created by the utility and energy companies as an engine that would support labor exchanges in their industries. The interest of the industry in this job board allowed for significant growth and market share in the labor exchanges of this industry. On the other hand, the survival of job boards without explicit ties to the employers is dependent on their ability to solicit employer participation. Many of these job boards interviewed cited lack of funding as a main obstacle to development. As a rule, they don't have sufficient resources to offer additional services to job seekers.

Full-service EIS are able to provide the level and amount of services that they do because of the funding they receive through workforce related grants. Not only do grant funds support the expanded offerings of full-service EIS but in most cases grants dictate the use of funds toward specific purposes for specific types of jobseekers. The attainment of grants with a particular industry focus, like green jobs, translates to full-service EIS incorporating particular skills, training, and information into their offerings.

15.6 EFFECTIVENESS OF EIS

Although Internet-based job search has become standard practice for all ages and demographics in a variety of industries, the literature suggests that EIS are only partially effective in meeting the needs of employers and jobseekers. Specifically, online job boards prove to be the most instrumental in providing an initial set of contacts for employers and job seekers, but have achieved limited results for successful job matching that leads to employment. The information from our interviews with subject matter experts in the field of labor exchanges suggests that employers are experiencing a low match rate, even after going through large pools of resumes generated by online job posting.

This may be explained by one of two factors. The first is a poorly designed matching algorithm that provides an employer with hundreds of candidates who do not qualify for a given position. Experts claim that larger, more established online job boards as well as some spidering job search systems tend to have more sophisticated matching algorithms compared to smaller or industry-specific job banks. Indeed, our research supports this proposition—when asked about specific matching algorithm utilized, the administrators of green job boards reported no specific job matching system in place, other than a keyword search.

The second factor is the lack of other verifiable information about job applicants built into an automated labor exchange system that would be used to produce the most relevant matches between job seekers and employers. Such verifiable data include diplomas, certifications, references, credentials, test results, etc. According to Richard Maher of Maher & Maher, a management consultant specializing in e-learning for the public workforce systems,

very few online job search systems offer these, and employers have recently started turning to social networking sites and online communities in search of talent.

There is also a significant body of literature suggesting that online job search systems primarily benefit employed workers and prove to be relatively ineffective in reducing unemployment durations. Stevenson finds that the vast majority of workers using the Internet to gather information about employment are those who are already employed.⁷ In addition, employers prefer to hire workers that are employed elsewhere because they are looking for experience and suitable skills. Since online job search engines make it easier for employers to identify such workers, these systems may particularly advantage employed versus unemployed job seekers.⁸ This raises an important issue—the role of EIS in expanding the pool of new workers vs. simply “reshuffling” existing workers. This issue takes on greater importance given the current levels of unemployment in California and across the U.S.

However, even among employed workers looking for employment elsewhere, the effectiveness of online job search differs. For example, various experts we interviewed suggested that professionals at higher levels of education are more likely to use Internet job search engines. Stevenson complements this observation by showing that the number of low-skill jobs advertised online is significantly fewer relative to the number of high skill jobs, and concluding that “Internet job search as a mediating mechanism may have a much smaller effect, or no effect, on those with a high school degree or lower and a larger effect for those with some college education and beyond.”⁹ In fact, among the green job boards included in our study, the majority are serving middle-skill and college educated job seekers.

This may also suggest that the full-service type of EIS explored in our study provides a more successful model of job matching for unemployed and disadvantaged populations. These EIS are better positioned to offer additional labor market intermediation services, such as career exploration, resume and interview assistance, connection to training, case management and other employment-related services. Privately run job banks are not designed for this purpose and primarily function solely as a “marketplace” for employers and job seekers.

Strategic partnerships that full-service EIS providers form with other agencies play a vital role in their successful employment matching functions. Through partnerships and ongoing dialogue with local employers, full-service EIS can ensure that they are meeting the needs of businesses in their immediate service area. Employers are provided with potential job candidates who have been screened for particular qualifications and a successful match is more likely. Since most full service EIS are One-Stop Centers they have full access to the federal resources of WIA including the additional support services for disadvantaged job seekers.

However, our research suggests that because some full-service EIS do not operate green job boards online and, in most cases, are limited in the geographic scope of their services, their role in labor market exchanges in green industries is limited. These EIS only host jobs available in their geographic service area and do not post job opportunities in energy efficiency and renewable energy careers that would require relocation. Some of the EIS interviewed offer additional labor market, career awareness and training information related to green careers on their websites, but, as a rule, they do not tie this information to job postings. The most extensive online energy-related EIS offerings are found at ISEEK Energy portal. This web portal includes significant learning resources for a job seeker who is looking into starting or transitioning to a clean energy career. The features of the site include career guides, aptitude assessment tests, and connection to education and training requirements. However, the employment matching portion of the site is limited to (1) providing links of the online job boards of major

⁷ Stevenson, B. (2009). “The Internet and Job Search.” Ch. 2 in *Studies of Labor Market Intermediation*. D.H. Autor, ed. Chicago, IL: The University of Chicago Press. p. 84.

⁸ Nakamura, A.O. et al. (2009). “Jobs Online.” Ch. 1 in *Studies of Labor Market Intermediation*. D.H. Autor, ed. Chicago, IL: The University of Chicago Press. p. 36.

⁹ Stevenson, 2009, p. 82.

renewable energy industry associations and groups, and (2) connecting the user to the general online job bank, in this case Minnesota Works, that posts all available jobs and doesn't systematically differentiate between energy related openings and general job postings.

Green job boards are fairly successful in providing job listings within their industry specialty, but have a very limited ability to secure jobs for low-skilled and currently unemployed individuals. Online job boards appear to be used far less often by low-skilled workers, which may be a result of a lack of Internet access among this population, or a lack of necessary skills (such as English proficiency) to use these services. Or, it may be simply because employers are not using these job boards to post low-skilled employment opportunities. Based on our interviews, many employers do not wish to post low-level openings online because they fear they would get overwhelmed with the number of applications received, and they do not typically have matching or sorting algorithms that would allow doing that automatically using a certain criterion, such as educational level, certification, etc. Niche job boards appear to work well for employers that need to fill vacancies in middle- and higher-skill areas within their specialized industries, however. Administrators of more established job boards report that returning clients constitute the majority of their customer base. Because available jobs are typically returned to job seekers through a simple keyword search within the green area represented by the job board, limiting the job bank to only those in green-related occupations provides relevant job vacancies as opposed to more general openings.

Further analysis of how effective the full-service EIS and green job boards are as intermediaries in labor exchanges is difficult because there are no outcome measures that are consistently tracked and reported. When asked about how they track their performance, most green job board administrators reported that they do not follow-up with employers to find out whether or not a vacancy was filled and how successfully. The number of postings is claimed to be the main self-identified measurement of their success. Some online job boards also collect general feedback and testimonials from repeated customers, but such efforts are sporadic and do not allow for an objective evaluation of outcomes.

The inclusion of social networking and blogs is a relatively new component of job boards and, according to the survey data, proves to increase effectiveness in ensuring successful matches. Social networking tools allow for outreaching to job seekers and employers, relaying real-time information to their networks, and providing a form of screening for both employers and job seekers. Among those included in the survey, green job boards are the only EIS group that is currently operating social networking accounts or blogs. The full-service EIS that were interviewed have yet to incorporate these tools into their operations.

15.7 CHALLENGES

We asked the EIS providers surveyed about the challenges they face in operating their online systems. Administrators of both types of EIS reported a variety of issues. Because of the inherent differences in funding streams and organizational support between green job boards and full-service EIS, we describe these challenges separately.

15.7.1 JOB BOARDS

Challenges reported by green job board administrators touch upon operational issues specific to their area of expertise as well as those that are faced by the labor market as a whole. The challenges reported include:

- **ECONOMY** (e.g., ECJ): The current economic condition has created a flood of unemployed job seekers of all skill levels. Job bank operators report that they have more job seekers looking for positions, while the number of job postings is generally down. In addition, they are concerned that “overqualified” candidates that are out of work apply for lower level positions, thus limiting the chances of low-skilled individuals to secure employment.
- **VISIBILITY** (e.g., EHS Careers, Job Central): The challenge to remain visible and reaching the target audience is another concern for job boards, both green and general. They also face the issue of educating users of their site to ensure that all services are being utilized as a tool to employment procurement.
- **FINANCING** (e.g., Clean Techies): Retaining sufficient financial resources for growth and development of new services is challenging for green job boards, as they are predominantly self-supporting, private entities. Their budgets are often limited to day-to-day operations, and do not allow for additional support services to disadvantaged populations.
- **“GREEN” ACCEPTANCE** (e.g., Green Jobs Spider): The challenge to instill a sense of security about green jobs is important. Some online system administrators report that job seekers exhibit some hesitancy toward moving to a green field because of perceived instability in this emerging sector, as well as lack of awareness about (or existence of) career ladder opportunities.

15.7.2 FULL-SERVICE EIS

When asked to identify some of the key challenges facing full-service EIS, administrators reported some internal and external issues. The key issues impeding the successful matching of job seeker and employer include:

ACCESSIBILITY (e.g., ISEEK Energy, LAUL): Several full-service EIS administrators felt that it is crucial that their target audience be able to easily utilize the services and understand the importance of the services offered. However, due to limited marketing and outreach budgets, their ability to market and make the services available to disadvantaged or special populations is a concern.

ECONOMY (e.g., LAUL, Workforce Florida): The current state of our country’s economy is a major challenge, as there are an insufficient number of jobs to employ the masses of currently unemployed workers.

RELEVANCY (e.g., ISEEK Energy, EFM, Workforce Florida): Multiple full-service EIS providers reported facing the challenge of staying current with labor market trends and continually updating services to keep job seekers desirable to employers.

15.8 BEST PRACTICES

We identified best practices in EIS based upon the information gathered through interviews with EIS administrators, as well as interviews with subject matter experts in the early stages of research. The best practices identified here represent key components that make employment matching successful. The practices that were noted by multiple EIS administrators include the following: (1) establishment of strategic partnerships, (2) offering a wide range of additional services to job seekers, (3) maintaining social networking accounts and blogs, (4)

maintaining current information, (5) utilizing well-developed matching mechanisms and verifiable data, and (6) providing support services to disadvantaged populations.

15.8.1 ESTABLISHING STRATEGIC PARTNERSHIPS

- Many full-service EIS providers establish partnerships with community colleges and private education institutions. These partnerships allow EIS providers to connect job seekers to affordable training and education options, thus improving the job seeker's chances of securing employment. For example, the Los Angeles Urban League attributes its success in job placement of the "tough to serve" population in South Central Los Angeles to the partnerships they formed with local education providers.
- Partnerships with other governmental agencies, community based organizations and non-profit establishments are also crucial for advertising the services of EIS to job seekers who have no easy access to computers and the Internet.
- Partnerships with industry play a significant role in supporting EIS sustainability and relevancy. According to the data we collected, green job boards that have strong ties to employers and industry groups are more sustainable and financially viable. For full-service EIS, partnerships with local industry leaders provide a conduit for EIS to connect job seekers to employers in the immediate geographic area. For example, Sunnyvale-based North Valley Workforce Investment Board (NOVA) is primarily composed of industry representatives from its service area who play an important role in job placement.

15.8.2 ADDITIONAL SERVICES TO JOB SEEKERS

- According to various studies and subject matter experts, job posting by itself is not effective in addressing unemployment unless it is a part of a continuum of employment matching services. In isolation, job listings primarily benefit employed workers looking for jobs elsewhere, but when complemented by other employment services, EIS can provide better job outcomes for unemployed and underemployed populations. Some of the important additional services we identified include offering of skills and aptitude assessment tests, providing career cluster and occupational demand information, connecting a job seeker with a training provider, clarifying certification and licensing requirements, assisting with resume writing and self presentation, and connecting job seekers with potential employers through social networks online. Considering the high level of confusion surrounding green industries and careers, it is especially important for EIS to contain information necessary to educate its user about options available to them in green areas.
- Specialized training in key industries can often be supported through federal funds. Sacramento Employment Training Agency (SETA) is currently able to offer green training to its audience through recently acquired federal funds.
- Special projects that are geared toward developing existing services in a focused area can be accomplished with dedicated funding. Workforce Florida, for example, has allocated funds for "innovative demonstration projects related to clean technology."

15.8.3 MAINTAINING SOCIAL NETWORKING ACCOUNTS AND BLOGS

- As an emerging phenomenon, online social networking offers unique solutions to some of the shortfalls of traditional EIS. Social networking accounts provide sets of data for employers and job seekers about each other. These data inform the decision-making of both labor market participants. Employers utilize social networking accounts to filter potential candidates using verifiable sets of data about them. With most EIS not confirming credentials or training, social networking sites fill in as a proxy for verification. Job seekers use these sites to learn more about potential employers in the industry or specialty of their interest and form opinions about where they would or would not want to work. Most of the green job boards interviewed use social network accounts such as Facebook and LinkedIn, while full-service EIS have been slow in capitalizing on this trend.
- Another important online tool used by the green job board that is crucial for success is blogging. The use of a website blog allows EIS to provide timely, relevant information to its users. For example, the blog of idealist.org posts information about labor market trends, relevant conferences, and tips for job seekers. The combined usage of social network accounts and blogs work to create a network of like-minded job seekers and employers, establishing a community of users and thus strengthening the purpose of EIS.

15.8.4 MAINTAINING CURRENT INFORMATION

- Keeping up with trends in industries and occupations is integral to maximizing the efficiency of an EIS. Acquiring labor market information through research organizations or state Departments of Labor can influence the decisions that EIS providers make regarding who is being employed, where they are being employed, and what skills are necessary for employment. Some large general job boards, such as Monster.com and Simplyhired.com, as well as some full-service EIS, such as SETA, include occupational trend information on their websites, while green job boards rarely address this need due to budgetary constraints. [Employ Florida](http://EmployFlorida.com), a full-service EIS, identifies and posts career clusters in demand. This information influences their decisions regarding the type of training that should be recommended to job seekers.
- Staying current with technology and new developments in the field of labor market exchanges is important for keeping an EIS visible to its users. EHS Careers notes that in order to maintain market leadership they strive to “keep current and maintain and build upon visibility in the market.”

15.8.5 ONE-STOP SERVICES FOR SPECIAL POPULATIONS

- Making available some self-help services for job seekers who do not have access to essential products/services extends the reach of EIS to marginalized populations. For example, a physical location that contains a computer lab, copy machine, fax service, clothing, transportation, and case management services can better assist the low-income population that has needs not met by job boards alone. These services ensure that the portion of the population that may not have Internet availability at their homes can still take advantage of the assistance offered by full-service EIS. Additionally, focused training, skills assessment, and case management for traditionally marginalized groups (formerly incarcerated, long-term unemployed, etc.) may help reduce unemployment durations among them.

- EIS that have employers who are looking to hire job candidates of a specific population can more effectively target unemployment reduction among those groups. Job Central, for example, notes that their members specifically reach out to military, veterans, and disabled job seekers.

15.9 SUMMARY OF KEY FINDINGS

The following are the key findings of our research into the various types of EIS and their strengths and weaknesses:

- The two main types of EIS are job boards and full-service EIS. Both provide labor market information to job seekers and employers in order to improve efficiency of the exchange.
- Job boards are typically privately run and funded, and offer a narrow set of services centered on an online search platform. Most serve a broad geographic area, and they may be general or focused on a niche industry like green.
- Job boards have been effective at targeting specifically green occupations, particularly for higher skilled workers with a college degree. They have used social networking and frequent updates to their online content to increase their effectiveness. Job boards are much less effective at targeting middle- and lower-skilled workers, however, because of a lack of employer interest and job seeker barriers to accessing this information.
- Most green job boards use simplistic matching algorithms, as they do not have extensive experience with, or budget for, sophisticated matching software. This significantly limits the functionality of online EIS and creates difficulties for employers in filtering candidates when large numbers of applications are received.
- Job boards that are a service of established industry groups seem to fare better than those without such industry ties, as they have more job postings indicating a consistent flow of employment opportunities.
- Full-service EIS are publically run and funded through the One-Stop system, and offer a comprehensive set of services, typically based at a physical location. Full-service EIS often partner with other organizations and agencies to provide support services and access to education and training.
- Full-service EIS generally have a local or regional focus. While this limits the options available to job seekers and employers, it may also enable stronger industry ties and tailored matching.
- Full-service EIS have been slower to use online content and networking to expand their reach, and few have specifically targeted job matching for green occupations. However, they may provide a better model of how to target disadvantaged and/or unemployed populations, as well as less-skilled workers.
- Most EIS of both types do not capture complete information on success and placement, making evaluation of outcomes difficult.

15.10 CONCLUSIONS AND RECOMMENDATIONS

The CPUC's WE&T Task Force outlined a basic vision for creating an EIS-style web portal for energy efficiency related jobs in California, and included this description in the EE Strategic Plan. We were tasked with assessing the various options for creating this portal, and making recommendations about how to proceed. The premise for this task was that job mismatch or "gaps" in labor demand and supply for the energy efficiency sectors would be a problem that EIS could help address.

Based on the findings of this WE&T Needs Assessment, however, this is no longer the correct approach. Current levels of spending in energy efficiency initiatives are unlikely to yield a significant number of new jobs that require new workers to be trained. Additionally, the limited job growth that will occur will most likely be in traditional occupations that include energy efficiency related skills, rather than energy efficiency-specific occupations. The WE&T Needs Assessment also shows the complexity of the training and career paths that exist, and the fact that not all training programs are created equal, as many programs do not have adequate links to jobs, and some lead to low-wage and dead end jobs. As a consequence, the training programs that label themselves "green" are actually less likely to provide job seekers with needed career preparation than traditional occupational programs.

The implications of these findings for the creation of an energy efficiency web portal for California are twofold. First, the CPUC *should not* create a new job board specific to the energy efficiency sectors. There is very limited data on the effectiveness of EIS in improving outcomes for job placement, and furthermore these niche jobs are not projected to be in high demand.

Second, EIS is clearly the responsibility of workforce agencies not energy regulators. The federal government has already committed enormous resources to providing employment information services via the One-Stops. Job matching is not an easy task, and it has been attempted in many different ways with mixed results. Though we know that the One Stop system does not serve every unique industry or worker adequately, any initiative to improve coordination and efficiency of the energy efficiency labor market should build off this existing resource. It clearly represents the best point of entry if the CPUC elects to get involved in EIS, because of its comprehensive services and strong partnerships, targeted support for unemployed and disadvantaged populations, and existing infrastructure targeted regionally throughout the state.

Rather than try to reinvent the wheel, we suggest that the CPUC encourage state action to improve the One-Stop system in California so that it can better collaborate. Specifically, the One-Stop system in California should take a sector strategy approach that acknowledges energy efficiency (like ISEEK in Minnesota). From this point, the CPUC could more effectively expand its working relationships with the One-Stop system and other strategic partners, such as Job Central, the member organizations of the Green Collar Jobs Council, and the EDD's Labor Market Information Division and green information portal. The CPUC could also support the use of existing resources that represent best practices for EIS, such as incorporating social networking sites, and increasing the usability and relevance of online materials.

Building career pathways is an extremely complex process, and our study just scratched the surface of understanding how this works in the energy efficiency sectors in California. Stepping into this arena can actually be a disservice to workers if the CPUC portal provides superficial information rather than the in-depth set of career development services that can support job seekers in developing successful careers related to energy efficiency and other demand-side activities.

15.11 CASE STUDIES

The following are three case studies of EIS conducted as part of this analysis.

15.11.1 EMPLOY FLORIDA MARKETPLACE

<https://www.employflorida.com>
850-414-7638

15.11.1.1 OVERVIEW

Established in 2004, Employ Florida Marketplace (EFM) is the job matching portion of the state's One-Stop Centers. EFM links all of Florida's state and local workforce services and resources. The primary goal of EFM is to have a comprehensive marketplace for posting and finding jobs. In addition to online access, the services and resources of EFM are also available to users at the physical One-Stop Career Center locations.

15.11.1.2 PARTNERSHIPS AND FUNDING

EFM operates on funds provided through the Workforce Investment Act. Strategic partnerships enable EFM to provide a wide range of resources for job seekers and employers. Some of these established partnerships and their services include:

- *Florida's Department of Education*: To provide information about available education programs. EFM is in the process of incorporating programs that have "green" emphasis.
- *Florida's Department of Children and Families*: To identify job seekers who are receiving Temporary Assistance for Needy Families (TANF) and food stamps.
- *Florida Research and Economic Database*: To provide labor market information data that allows a job seeker or employer to see the opportunities that exist near their home.

15.11.1.3 JOB SEEKER SERVICES

Services provided for job seekers include:

- Ability to post multiple resumes
- Job search
- Resume and cover letter builder
- Skills inventory
- Employer information
- Virtual recruiter
- Job market trend information
- Green job portal (currently in development)
- Consumer reports about education costs (currently in development)
- Website tutorial (currently in development)

15.11.1.4 EMPLOYER SERVICES

Services provided for employers include:

- Job posting
- Resume search
- Work keys (to assess candidate certifications)
- Training grant information
- Labor market information
- Information about government tax incentives

15.11.1.5 SPECIAL AUDIENCE SERVICES

EFM offers specialized information and resources for some special audiences namely, veterans and older workers. The job seeker web page has links to resources for both of these groups. In addition, EFM currently allows employers to flag veteran jobs and green jobs.

In addition to jobs specific to veterans and older workers, EFM occasionally creates special job portals. For example, in response to the recent oil spill in the Gulf of Mexico, EFM opened a temporary job portal to serve the needs of the employers in the area.

15.11.1.6 TARGET AUDIENCE

EFM's target audience is job seekers and employers, consisting of students, parents, educators, and intermediaries. The majority of EFM's job seekers and employers reside and operate in the state of Florida but there is some presence from entities outside the state of Florida.

15.11.1.7 ENERGY EFFICIENCY/RENEWABLE ENERGY INCORPORATION

EFM has incorporated green jobs into its current service offerings. Additionally, the organization is in the process of creating a green jobs portal to consolidate all jobs and resources related to this sector. Green jobs postings, information about related education, and relevant training programs will be included in the green jobs portal. Employers and jobs listed in the green jobs portal will undergo a verification to ensure green authenticity.

15.11.1.8 CHALLENGES

One of the main challenges cited by EFM is to create balance between the needs of job seekers and the needs of employers. Another noted challenge is keeping information up to date which can be difficult if the source agency does not update their data in a timely manner. There is also an issue of maintaining the security of a user's personal information. EFM has found that some job seekers do not want to share information that is needed for reporting of federal funds. Finally, misuse of the system is an ongoing challenge. There has been detection by EFM of misuse of resumes and some presence of marketing or scams on their job posting site.

15.11.1.9 SUCCESSES

EFM measures its success by heavy website traffic and the number of job postings. In the month of September 2010, EFM cites 150,000 users and approximately 21,800 jobs posted on their peak day. In the same month,

postings from external sites, numbered 244,000. The site boasts about 7,500 employers and roughly 320,000 unique job seekers. EFM claims that their site has, in one place, more services and resources than most other states.

15.11.1.10 FUTURE PLANS

Future plans of EFM include the addition of consumer reports, a user tutorial, the green job portal, verification of green postings, and protecting the security of job seekers. EFM feels that these additions are necessary steps toward realizing their primary goal of being a comprehensive marketplace for the posting and finding of jobs.

15.11.2 ISEEK ENERGY

<http://www.iseek.org/>
651-201-1512

15.11.2.1 OVERVIEW

ISEEK was established in 1998 by Minnesota's then governor to be a one-stop information center for job seekers. The purpose was to combine career, job, and education information in one easily accessible location. ISEEK began as a partnership with state government agencies and education institutions to collectively supply career and education related information.

15.11.2.2 PARTNERSHIPS AND FUNDING

Funding for ISEEK is provided by contributions made by its joint power organization. ISEEK also operates through grant funds and income from new projects. Partnerships that ISEEK has established to expand their service offerings include:

- Minnesota State College
- University of Minnesota
- Various Minnesota state departments

15.11.2.3 JOB SEEKER SERVICES

Services for job seekers include:

Career Information

- Energy Careers Information and Knowledge Test
- Energy industries information
- Description of energy careers
- Description of green energy careers
- Information on Minnesota green careers and industries

Education Information

- Information on energy classes
- Student testimonials
- Energy pathways
- Competency models
- Training and program information
- Educator resources

Job Information

- Energy jobs in demand and salary information
- Energy employers and employer profiles
- Information on what energy employers are looking for
- Energy job search
- Links to related job sites

15.11.2.4 EMPLOYER SERVICES

Services for employers include:

- Job postings through MinnesotaWorks.net

15.11.2.5 SPECIAL AUDIENCE SERVICES

ISEEK's industry sites offer resources for special audiences. Their industry sites have a focus on Energy, Healthcare, Information Technology, and Manufacturing. The special audiences that are served by ISEEK include workers with disabilities, ex-offenders, immigrant workers, and refugees. Resources for special audiences consist of specialized information, career choices, job training and education, job search, and links to other related information sources.

15.11.2.6 TARGET AUDIENCE

Services provided by ISEEK are geared toward Minnesota residents. ISEEK's target audience consists of students, parents, teachers (K-12), the special audiences listed above, and intermediaries.

15.11.2.7 ENERGY EFFICIENCY/RENEWABLE ENERGY INCORPORATION

In addition to general industry information, ISEEK Energy provides links to credit and non-credit programs offered at education and other organizations in the state for specific industries, such as renewable energy or energy efficiency. The home page of ISEEK Energy contains a link to a state-specific Careers fact sheet and brochure, in addition to information about Minnesota's Renewable Energy Marketplace (MNREM).¹⁰ MNREM is an extensive site that provides information on training, job creation, and industry innovations all related to renewable energy.

¹⁰ <http://www.mnrem.org/wiki>.

15.11.2.8 CHALLENGES

ISEEK identified four notable challenges toward meeting their primary goal. The first is gaining people's attention. Given the large pool of employment assistance sites, it can be difficult to attract the attention of job seekers. Second, ensuring ease of usability is a challenge noted by ISEEK. Making a site easy for users to navigate is important for keeping a strong user base. The third challenge reported by ISEEK is to keep data current. Lastly, maintaining adequate funding is a challenge faced by the organization.

15.11.2.9 SUCCESSES

ISEEK counts among its successes the quality of the content provided by its partners. The organization also measures their success by the amount of website traffic they experience. On average, they report 100,000 unique users each month on ISEEK.org. Additionally, ISEEK claims that they receive positive feedback from users, industry professionals, their Board of Directors and have received numerous performance awards.

15.11.2.10 FUTURE PLANS

Future goals for ISEEK are focused around keeping current with technological advances and applying them to their user services. The main ISEEK site will continue to offer specialty sites that reflect the future high growth industries and occupations.

15.11.3 GREEN JOB SPIDER

<http://www.greenjobspider.com/>
203-816-0339

15.11.3.1 OVERVIEW

Green Job Spider is a niche green online job search engine serving the United States. The site's founder, Chris Russell, states that connecting job seekers and employers is the primary goal of his website.

15.11.3.2 JOB SEEKER SERVICES

Green Job Spider offerings the following services for job seekers:

- Job listings
- Green job blogs
- A calendar of green events
- Videos relating to trends and opportunities in the green workforce industry
- Podcasts of green blog topics

Job seeker services are provided at no cost. Green Job Spider cites their target audience as anyone who is looking for a green job. This group includes recent graduates and the recently unemployed, as well as experienced professionals.

15.11.3.3 EMPLOYER SERVICES

Employers in any green industry can purchase any of the following fee-based services through Green Job Spider:

- Job “scraping” from corporate websites
- Job “spidering” to other green job boards
- Cross-posting of jobs
- Advertisement

15.11.3.4 OPERATION

Green Job Spider notes that they post an average of 12,500 job postings each month. This online job board is self-funded through fees paid by employers who purchase their services. Advertising is done online and in person at various green related events. The content of Green Job Spider is updated daily through an indexing process that takes place every night. Job matching on this website is done with the use of third party software supplied by JobSoftware.com.

15.11.3.5 CHALLENGES

One main challenge in matching job seekers and employers, reported by Green Job Spider, is the hesitation in moving from traditional industries to green industries because of the uncertainty about the “green” economy. The website’s administrator notes, however, that this issue is less prevalent among recent graduates.

CHAPTER SIXTEEN:

16. PIPELINES FOR DISADVANTAGED WORKERS

16.1 INTRODUCTION

The purpose of this section is to identify strategies and best practices to promote the successful participation of minority, low income, and disadvantaged workers in WE&T programs that lead to job placement and retention in family-supporting jobs with career paths in the energy efficiency sectors. Since the 1970s, there has been a significant decrease in the number of middle-income jobs that do not require a college degree, which makes it more difficult for Californians from disadvantaged communities to compete in the job market.¹ The decline in the manufacturing sector throughout the United States, and particularly in California, has had an especially large impact on the ability of those without a post-secondary education to find steady employment in living wage jobs.² As stated in Chapter 2, since the 1970s we have seen the rise of a bifurcated labor market with a concentration of low education and low-wage jobs at one end of the market and high education, high-wage jobs at the other end. As a result of these structural changes, there is a significant shortage of good jobs that provide advancement opportunities for those without college degrees, especially workers from disadvantaged backgrounds that may have additional barriers to employment.

16.1.1 DISADVANTAGED WORKERS AND BARRIERS TO SUCCESS IN THE JOB MARKET

The term “disadvantaged worker” is commonly used as an umbrella term for any individual who may have greater than average difficulty finding and retaining employment or moving beyond a low-wage job. In this chapter, we use it to address both job seekers and low-wage workers. Disadvantage often arises from historical and socioeconomic factors that affect entire communities or groups of people, such as poverty or racial, gender or other forms of discrimination, or from individual physical or other disabilities.³

Other factors that are commonly cited as barriers to employment for disadvantaged workers include low levels of educational attainment, homelessness, single parenthood, having a criminal record, and difficulty in accessing jobs due to lack of reliable transportation. Many of these factors are mutually reinforcing or result in additional barriers, and it is common for low-income individuals to have more than one of these challenges, compounding their difficulty in obtaining and keeping a living wage job. The 2002 National Survey of America’s Families found that the number of barriers to employment significantly impacts a person’s ability to find and maintain work—51 percent of

¹ Mazzeo, C., B. Roberts, C. Spence, J. Strawn (2006). *Working Together, Aligning State Systems and Policies for Individual and Regional Prosperity*. Washington, DC: Working Strategy Center and CLASP.

² Miller, C. & K. E. Porter (2005). *Barriers to Employment for Out-of-School Youth: Evidence from a Sample of Recent CET Applications*. New York: MDRC.

³ Although many employers may not intentionally discriminate based on race, a recent study in New York City showed that white applicants for entry level positions received twice as many call-backs from employers as equally qualified black applicants. See Pager, D., B. Bonikowski, B. Western (2009). *Discrimination in a Low-Wage Labor Market: A Field Experiment*. *American Sociological Review*. 74:777.

those surveyed with no barriers to employment were employed compared with 29 percent of participants with one barrier and only 13 percent of those with two or more barriers.⁴

Finally, disadvantage is defined, in part, by the profile of labor demand in a particular time or sector, so it is important to contextualize what we think of as “barriers.” For example, when union manufacturing jobs were plentiful, having only a high school diploma was not a disadvantage. Furthermore, being a woman is not a disadvantage for the teaching profession, but it is for work in construction.

Strategies for overcoming barriers for disadvantaged students, job seekers or workers must take into account the multifaceted nature of barriers. As we have emphasized throughout this report, it is important to look at both the supply side of the labor market, i.e., preparing workers and helping them overcome barriers that they are able to change, as well as the demand side of the labor market, including the kinds of jobs that are created and the specific practices of employers.

16.1.2 OPPORTUNITIES IN GREEN AND SECTOR STRATEGIES

The large public investment in, and resulting growth of, the energy efficiency and related sectors in California presents a potentially viable opportunity to build pathways out of poverty for individuals who have been historically disadvantaged in the labor market. A large number of the jobs in green sectors are considered “middle-skill” opportunities, meaning that they require less than a bachelor’s degree but do require some college, apprenticeship or other technical training, as affirmed in our job projections (see Chapter 3), as well as in other studies (see Chapter 2). Because they do not require a college degree, middle-skill jobs that pay living wages and provide opportunities for advancement are a promising career option for workers starting out with limited educational opportunities.

The development of these sectors is not immune to the structural changes described above and in Chapters 2 and 5; as they grow, these industries may follow the same pattern of many existing sectors, with low wages for workers in many of the non-professional jobs.⁵ Although there may be middle-skill opportunities, there is no guarantee that these jobs will pay middle wages. Therefore, demand-side strategies become critical to stimulate demand for the right kind of job, that is, middle-skill, middle-wage jobs, and/or lower-skill jobs that have a living wage floor and are connected to a career pathway.

As described in Chapter 3, because of high rates of unemployment in energy efficiency related sectors like construction, current levels of investment may not lead to the new job growth needed to employ large numbers of entry level workers in the field. Usually when implementing a sector strategy, funders and implementers identify sectors and jobs that have substantial job openings, have living wages as a starting salary, and provide career pathways that allow workers to move up a wage ladder as they acquire skills. In targeting disadvantaged populations, prerequisites for jobs must be matched with job seekers who can attain them. However, for the WE&T Needs Assessment, the targeted sectors have been chosen for reasons other than their expected workforce outcomes (i.e., their expected energy savings outcomes). Therefore, supporting disadvantaged workers in these specific industries will likely only be effective if they include some combination of strategies that address labor demand.

⁴ Baider, A., & A. Frank (2006). *Transitional Jobs: Helping TANF Recipients with Barriers to Employment Succeed in the Labor Market*. Washington, DC: CLASP.

⁵ Holzer, H., & R. Lerman (2007). *America’s Forgotten Middle-skill Jobs*. Washington, DC: The Workforce Alliance.

The high concentration of middle-skill positions presents an opportunity for those who can acquire the needed skills. Such training is often offered at the community college level and, particularly in construction, in state-certified apprenticeship programs.⁶ As stated earlier in this report, there is widespread recognition in the workforce development field that sector-based strategies, which address the needs of both employers and workers, and build collaborative partnerships between stakeholders within a particular industry, have had the most success in training, placing, retaining, and creating career pathways for workers in jobs that do not require college or post-graduate degrees.⁷

The same elements and best practices of sector strategies hold true for connecting disadvantaged workers with middle-skill jobs. However, additional attention must be devoted to creating pathways that specifically support disadvantaged workers. Building career pathways that are real pipelines out of poverty requires addressing challenges on both the demand side of the labor market, ensuring that a significant number of high-quality jobs are accessible to disadvantaged workers; and the supply side, making certain that workers are sufficiently prepared to take advantage of such opportunities when they arise. Demand-side strategies involve deep engagement with employers to provide industry-specific expertise, and policies that will stimulate demand and shape job quality in the sector. Labor supply strategies, on the other hand, require deep engagement with workers to provide career matching, screening, and other supports, as well as integrated skills training that includes technical training, basic skills, and job readiness in each sector.

Much work has previously been done on building pathways out of poverty,⁸ and the issues and best practices relevant to energy efficiency sectors are not unique. However, there have been some innovative applications of these strategies that are specific to the construction industry and have been applied in green programs. Therefore, this chapter first gives a brief overview of the existing best practices for both demand-side and supply-side strategies, presenting the key program elements that funders and policymakers should look for to distinguish promising initiatives. Next, in order to illustrate a variety of ways in which these strategies have been put into practice, we present three case studies.

16.2 SUPPLY-SIDE STRATEGIES: WORKFORCE PREPARATION

Preparing low-income and disadvantaged workers and job seekers for placement and retention of a good job requires addressing multiple barriers and challenges. These include financial and logistical challenges, low educational attainment, language barriers, and others. Here we focus on the type of barriers that can be addressed through targeted training and supportive services. There is an extensive literature on barriers to employment, which we will not fully review here, but from which we have extracted a number of best practices for developing training programs that serve the needs of disadvantaged workers from recruitment to sustainable employment. This section gives an overview of the critical features of such programs.

EXTENSIVE RECRUITMENT AND SCREENING OF CANDIDATES is essential to ensure that training opportunities are made widely available to disadvantaged workers. This usually requires deep engagement and

⁶ Holzer & Lerman 2007.

⁷ Conway, M., A. Kays Blair, S. L. Dawson, L. Dworak-Munoz (2007). *Sectoral Strategies for Low-Income Workers: Lessons from the Field*. Washington, DC: Aspen Institute.

⁸ See, for example, Giloth, R., ed. (2004). *Workforce Intermediaries for the 21st Century*. Philadelphia: Temple University Press.; Fitzgerald, J. (2006) *Moving Up in the New Economy: Career Ladders for U.S. Workers*. Ithaca: Cornell University Press.; or Maguire, S., J. Freely, C. Clymer, D. Schwartz, and M. Conway (2010). *Tuning in to Local Labor Markets: Findings from the Sectoral Employment Impact Study* Philadelphia: Public/Private Ventures.

relationships of trust with the targeted communities. Recruitment is often achieved through collaboration with embedded community or faith-based organizations.

Screening and matching candidates for specific jobs is also critical so that prospective trainees are fully aware of the requirements of the target occupation and to make sure the occupation matches the student's interests and abilities. Screening also ensures that there are no insurmountable barriers that would limit a trainee's ability to find employment once they entered the labor market. Screening and matching of basic physical requirements should happen before students enter training programs.

SOFT AND BASIC SKILLS include training in basic job skills, or "soft" skills, such as time management, basic communication, and understanding of how to interact with colleagues and customers.⁹ Holzer and Wissoker examined surveys of over 3,000 employers in four large metropolitan areas and found that people lacking soft skills such as basic job readiness and social skills had a harder time performing well or keeping their job than those who only lacked technical skills.¹⁰ Individuals with a limited educational background may also lack the basic math or reading skills necessary for certain jobs. This is particularly a barrier to apprenticeship programs that require an entrance exam.

EFFECTIVE LEARNING STRATEGIES address students where they are. Best practice programs include a comprehensive curriculum that prepares workers for life-long careers and skills advancement and uses adult learning strategies. The curricula for these programs often include leadership and environmental literacy, soft skills, and occupational skills as well as contextualized learning of math and language skills using practice-based adult learning pedagogy. Cohort-based programs that move the same group of participants through the program together have proved to provide needed mutual support, while bridge programs, geared to adults who have been out of school for many years, support students as they transition into educational environments. Some programs also offer opportunities for trainees to network with employers, learning from them as mentees. These are the types of learning strategies that have proved to be important elements of many successful programs. In addition, programs geared toward low-income adults must also make logistical and scheduling accommodations to ensure minimal financial impact on students and enable participation.

A COMPREHENSIVE PACKAGE OF SERVICES that link to employment is crucial for supporting low-income workers as they transition from public assistance, to training, to employment. Such wrap-around services include public assistance, transportation and child care subsidies, and possibly income supports during training, or paid training, like in apprenticeship programs. Other services include career counseling, job placement, and case management. Once a student is employed, post-employment services are an important factor in ensuring sustained employment. These include continued intensive case management, job retention counseling, additional educational development, and continued emergency financial supports,

STACKABLE, PORTABLE, AND INDUSTRY-RECOGNIZED CERTIFICATIONS AND CREDENTIALS that allow students and workers to get credit for previous training and that link explicitly to identified "rungs" on a career ladder. Students should be exposed to multiple pathways leading to options for further education, entry into apprenticeship programs, and other careers. As described in Chapters 4 and 5, certification is a key component of ensuring job quality. For disadvantaged workers, it is especially important to have the opportunity to earn individual industry-recognized skills certifications as well as entry level occupational certifications. These provide an immediate benefit in the job market, as well as a foundation that can be built upon through further training and experience.

⁹ Pavetti, L., M. Derr, J. Kauff, G. Kirby (2005). *Universal Engagement in Practice: Lessons from the Implementation of the Pathways Case Management System*. Washington, DC: Mathematica Policy Research, Inc.

¹⁰ Holzer, H. J., & D. Wissoker (2001). "How Can We Encourage Job Retention and Advancement for Welfare Recipients?" *New Federalism, Series A, No. A-49*. Washington, DC: The Urban Institute.

PRE-APPRENTICESHIP PROGRAMS are a specific example, in the construction industry, of preparation for industry-recognized credentials at the front end of a career pipeline. Pre-apprenticeship programs that have a real commitment to helping disadvantaged workers gain entry into an apprenticeship in the trades establish partnerships with one or more apprenticeship committees in their region, and use a curriculum that is designed to prepare a worker for apprenticeship testing and the apprenticeship itself. The Multi-Craft Core Curriculum of the Building and Construction Trades Department of the AFL-CIO is a good example of how pre-apprenticeships can better support disadvantaged workers. This new curriculum, which is being integrated into several YouthBuild programs in California, provides a gateway from entry-level training programs into union apprenticeships, and establishes, for the first time, standardized pre-apprenticeship for entry into any one of the building trades.¹¹ In many other cases, pre-apprenticeship programs are related to apprenticeship in name only. This is the situation when they are not well-articulated with the trades and are simply entry level construction training programs with no links to career pathways.

ON-THE-JOB TRAINING OR OTHER WORKPLACE-BASED LEARNING that provides a hands-on learning experience and focuses on gaining skills in the workplace, usually through demonstration by a more experienced worker. This benefits employers and workers simultaneously because it increases the likelihood that skills taught are industry-relevant and in demand. Moreover, the benefit of this type of instruction for workers is enhanced in programs like apprenticeships, which pay apprentices for their hours of on-the-job training and increase wages corresponding to an increase in skills.

A SUSTAINABLE FUNDING SOURCE ensures the program can continue providing service without interruption. Successful programs leverage multiple funding streams from state, federal, and charitable sources. Some also receive support from industry.

MEASURING OUTCOMES, including job placement and retention, is important for evaluating the success of any training program.

16.3 DEMAND-SIDE STRATEGIES: SHAPING THE LABOR MARKET

Policies to stimulate demand were outside the scope of this research project, but they are clearly the key to creating significant numbers of jobs and increasing opportunities for disadvantaged jobs seekers and workers. Though California leads the nation in the amount of ratepayer resources devoted to energy efficiency investments, major barriers to market expansion of these industries (particularly financing) have not yet been overcome. The contribution of the WE&T Needs Assessment to the question of job creation is to underscore the need for realistic views on the number of jobs created by these investments (see Chapter 3) and the importance of a professionalized workforce and high work quality standards in the market and in market expansion (see Chapter 4).

Short of job creation, there are demand-side strategies that can specifically address improving outcomes for disadvantaged workers. We separate these into voluntary partnerships with employers, and policies that set job quality and job access standards.

¹¹ Pleasure, R. (2010) "Building Trades Curriculum." Building & Construction Trades Department, AFL-CIO; Emerald Cities Collaborative.

16.3.1 EMPLOYER ENGAGEMENT

As a rule, sector strategies must be “demand-driven,” so that training programs are developed in response to skills shortages identified by employers. A common element among successful training programs is their deep connection with an employer, or group of employers, in a particular industry, within a specific labor market. Through these relationships, programs identify employers’ workforce and training needs, design occupation-specific skills trainings to meet those needs, and connect employers with potential workers. In some cases, employers commit to hiring directly from a training program or provide internship opportunities for workers, enabling them to get work experience and skills advancement through on-the-job training.

As shown in the previous chapters, most of the training programs, whether they be in community colleges, community based organizations or elsewhere have engaged employers in a variety of capacities, such as guidance on curriculum development, etc. However, these relationships haven’t always resulted in job placement, the key metric of success. These voluntary strategies work—i.e., result in hiring from training program participants—when employers see the benefits of partnership. This can be due to lowering search and hiring costs or subsidizing training that they would otherwise pay for themselves.

Employer engagement is also critical to address specific barriers to employment affecting specific groups. In some cases, there may be ways to reduce these barriers. For example, employers may have a blanket requirement that job applicants have no criminal record, but there have been cases in which employers have been convinced to accept applicants with infractions that are not relevant to the job at hand, developed supervision strategies to lower perceived risk, or other reentry strategies.¹²

Voluntary adoption of skills certification by employers and the creation of career pathways is another strategy to improve outcomes for disadvantaged (and other) workers. Union apprenticeship programs are one example of a clearly defined way to attain middle-skill jobs that pay living wages and enable advancement along a payscale linked to skills advancement, because the career ladder is codified in the collective bargaining agreement. However, union density has fallen, the number of union jobs is limited, and apprenticeship programs have long waiting lists, making it even more difficult for disadvantaged workers to access these premium career pathways. In the non-union sector, there seems to be a lack of clear career pathways from low-wage, entry-level jobs to career steps that progressively reward workers as they gain skills and experience. A root cause of this problem in the non-union sector may be related to a lack of clear skills standards and employer-recognized certifications that command a wage commensurate with the training investment.

In some sectors, like the hospital industry, workforce development practitioners have worked with employers to build a standardized progression of skills and certifications so that workers have a pathway up as they add experience and training.¹³ As described in Chapter 4, the DOE’s efforts to create guidelines for skills standards and certifications in the residential retrofit sector are an example of this career pathway development, which addresses the needs of unskilled workers as well. Development of skills standards, in this case, was primarily motivated by the goal to improve work quality, but the potential workforce benefits are evident. If these guidelines are adopted by industry, they could provide a framework for wage progressions linked to skills acquisition, although this is not guaranteed.

¹² National Employment Law Project PolicyLink, Ella Baker Center (2010). *Expanding Opportunity: Employing the Formerly Incarcerated in the Green Economy*. Available online at http://help.3cdn.net/86140a17fe3652675a_bgm6b807d.pdf.

¹³ Fitzgerald, J. (2006). *Moving up in the New Economy: Career Ladders for U.S. Workers*. Ithaca, NY: Cornell University Press.

16.3.2 WAGE FLOORS AND HIGH-ROAD STANDARDS AND CAREER PATHWAYS

Adequate starting wages and the existence of rungs in a career ladder are critical in designing sector initiatives for jobs in energy efficiency related sectors. Since these conditions are not present in some segments of the construction industry, particularly the residential and small commercial sectors,¹⁴ efforts to improve job quality and job access have been the focus of many pathways out of poverty initiatives and advocacy groups, including Green for All, the Apollo Alliance, the Emerald Cities Collaborative, and other labor and community organizations. The following strategies represent best practices for addressing job quality and job access.

LOCAL, TARGETED, AND FIRST SOURCE HIRING POLICIES: Some cities and jurisdictions have local hire policies that apply to publicly funded construction projects. These require contractors to make efforts to employ workers who live in a designated area or who graduate from a city-approved training program. Some policies stipulate a specific quota of workers that must be hired from a target area, while others require “first source” hiring, meaning employers must make a good faith effort to hire from the local community before looking elsewhere. In some cases targeted hiring can be from anywhere within the jurisdiction, while in other cases it is more specifically targeted to low-income zip codes or subdistricts. In some states, hiring is targeted expressly at women and minorities, who are underrepresented in construction jobs. However, because Proposition 209 prohibits public entities in California from affirmative action to address discrimination, local hire policies, whether city ordinances or negotiated as part of a Project Labor Agreement (PLA), may serve as a substitute for reaching disadvantaged workers.¹⁵

Although local or targeted hire agreements are helpful in creating opportunities for workers, the more targeted the policies, the more likely they are to reach disadvantaged workers. For example, a generic local hire policy targeting a particular city could create opportunities for only the most educated or qualified residents. A policy that sets specific quotas for hiring from particular CBO-run training programs or outreach centers would be more likely to benefit workers with barriers to employment.

HIGH-ROAD AGREEMENTS: High-road agreements (sometimes also known as community benefits agreements) spell out the workforce goals of a given project or program. They include both targeted hiring policies and labor standards to ensure minimum wage and benefit levels. These agreements are usually negotiated through a multi-stakeholder process on publicly funded construction projects and have recently been extended to cover energy efficiency programs in many cities, including Portland, Oregon, Seattle, New York, Milwaukee and Boston, among others. In some cases labor standards are tied to a multiple of the minimum wage or other wage standard. In other cases, high-road agreements are pre-hire collective bargaining agreements (often called project-labor agreements) with one or more unions that establish the terms and conditions of employment for a specific construction project. Along with wage standards, they can include the local or targeted hiring provisions mentioned above, minimum apprentice ratios, and/or funding for pre-apprenticeship programs.¹⁶ This creates a pool of high-road contractors who can be relied upon to provide good jobs.

MANDATORY CERTIFICATIONS AND LICENSES: Mandatory certifications and licenses set standards of competency in a particular occupation, which often lead to a market-determined higher wage. This creates value for workers who invest in training. For disadvantaged workers, mandatory licensing can increase the number of good jobs, but can decrease access unless accompanied by specific inclusion strategies. At minimum this includes

¹⁴ See Chapter 4 for more information on the labor market conditions of these sectors.

¹⁵ Text of Proposition 209 available at <http://vote96.sos.ca.gov/Vote96/html/BP/209text.htm>.

¹⁶ Kotler, F. (2009). *Project Labor Agreements in New York State: In the Public Interest*. Ithaca, NY: Cornell University, School of Industrial and Labor Relations—Extension Division, Construction Industry Program.

strong training pipelines, as discussed in the previous section, as well as subsidies for the cost of testing and obtaining a mandatory certification or license.

16.4 CASE STUDIES

The following three case studies illustrate many of the best practices discussed above. They also illustrate the variation in the intermediaries that lead sector strategies. The Los Angeles case is led by a community college, the Bay Area case by a city economic development agency, and the San Diego case by a community-based organization that serves as a Weatherization Assistance Program contractor.

16.4.1 LOS ANGELES ENERGY-UTILITY SECTOR INITIATIVE

The Los Angeles Energy-Utility Sector Initiative is a multi-stranded sector initiative involving multiple partners in the city of Los Angeles. The Initiative operates under the umbrella of the city's comprehensive economic and workforce planning process, under the direction of the Mayor's office. The city of Los Angeles coordinates its workforce development activities by convening key stakeholders, including the Chamber of Commerce, the LA County Federation of Labor, key educational partners and others, for high level agreements about which sectors to target for funding and which organization should be the designated workforce development intermediary for each targeted sector.

The Regional Economic Development Initiative (REDI) at Los Angeles Trade–Technical College (LATTC) was selected as the workforce intermediary for the energy-utility industries. REDI leads a strategic alliance of key organizations, including employers, educational institutions, public agencies, labor unions, and community-based organizations. This group of partners, called the Los Angeles Infrastructure and Sustainable Jobs Collaborative (the Collaborative), is working to create an integrated education, training, and workforce infrastructure for the sector. With functional control of the city's workforce development funds and as the designated lead for external funding opportunities, LATTC is tasked with analyzing needs, coordinating partners, and filling in gaps in the workforce system.

The Collaborative has conducted labor market research, built relationships with employers, and developed detailed assessments about specific skill and competency needs for job categories that are projected to grow in the energy efficiency sectors, including weatherization and energy auditing. In all these programs, training is tailored to the unique requirements of the energy-utility industry, but also integrated into the programs of the public career technical institutions, including LATTC.

Training program design is based on identifying multiple career pathways for students, including associate degree transfer programs to a four-year college, articulated with California State University Los Angeles (CSULA), apprenticeship, and entry-level employment as weatherization installer. Training for entry-level weatherization jobs is structured as a full-time, short-term, "fast track" training academy that integrates technical, basic, and soft skills into one curriculum, but also includes efforts to make students aware of career pathways up from entry level jobs, such as installers, to more skilled positions, such as energy auditors. Training is thus structured to create a full range of stackable certificates and degrees and with articulation between non-credit and credit programs.

The Utilities and Construction Prep program and the Weatherization program were designed to meet the particular needs of disconnected and underprepared adults. Using a cohort-based learning community, these programs address basic skills in math and English through contextualized learning, work readiness, and financial

literacy, all in the context of preparing for careers in the utility and related construction sectors. Upon completion, students are ready to move into employment, or to continue in apprenticeship or educational programs to obtain certificates or degrees.¹⁷ While not directly involved in local hire or high-road agreements, LATTC is the chosen training provider for Los Angeles's Green Ordinance, which includes a high-road agreement. The college is also involved in efforts to create a new job classification for energy efficiency work at the Los Angeles Department of Water and Power (LADWP), and facilitates entry into the utility apprenticeship program. Thus, though LATTC does not lead strategies to improve job quality and access, it does partner with groups who are engaged in such efforts. The college does this with the express purpose of avoiding or minimizing investments in training for low-wage dead end jobs.

16.4.2 RICHMOND BUILD

Richmond BUILD is an example of a sector strategy embedded in city government. The city of Richmond's Construction Skills and Green Careers Training Academy, named Richmond BUILD, is a pre-apprenticeship program that provides employment and career training for low-income disadvantaged Richmond residents in the construction, energy efficiency, and renewable energy industries. The program is a model of collaboration between many partners to serve the needs of both employers and the disadvantaged workers that the program trains. The 15-week program provides training in a variety of construction and career skills, including weatherization and solar installation; basic math and reading; computer and job searching skills; work readiness; and environmental literacy. Training is a combination of classroom learning, lab work, and on-the-job training.

The program offers a comprehensive package of wrap-around services and post-employment support, which has contributed to the excellent job placement and retention rate of graduates. In order to further facilitate job placement, the program has also developed a partnership with employers to provide continued on-the-job training for a twelve-week internship period, during which the city subsidizes half the trainee's wages. In the solar industry, Solar Richmond, a Richmond BUILD partner, reduces risk for employers by temporarily covering the workers' compensation insurance and tax costs of hiring graduates. This and other internship programs allow solar companies to "try out" graduates, enabling graduates to prove themselves on the job.¹⁸ Due to the program's success—placing 90 percent of graduates into jobs paying at least \$17/hour and 25 percent into building trades apprenticeships—75 to 100 residents compete for entry into each cohort of 30 students.

In addition to being a best practice program, Richmond BUILD's success with placing graduates into good jobs has been bolstered by the city's local/targeted hire policy. All city-funded construction contracts require that contractors set aside 25 percent of project work hours for Richmond residents who have completed the Richmond BUILD program. The Director of Employment and Training Development for the city of Richmond not only oversees Richmond BUILD, but also oversees compliance for the city's local hire ordinance. The director is in a unique position to understand the hiring needs associated with upcoming city projects and closely monitors that contractors hired by the city are complying with the local hire agreements and employing Richmond BUILD graduates. The City of Richmond also recognizes Richmond BUILD graduates as having the equivalent of six months' work experience, so graduates have a better chance when applying for city public works jobs.

¹⁷ Regional Economic Development Initiative (2009). *Los Angeles Infrastructure and Sustainable Jobs Collaborative Progress Report: Outcomes Achieved to Date*. Retrieved from: <http://www.lattc.edu/dept/lattc/REDI/Utility.html>.

¹⁸ One training provider in another city cautioned that care needs to be taken to ensure that employers do not simply use training subsidies as short-term free labor, but rather as effective on-the-job training leading trainees to long-term employment.

16.4.3 MAAC

The Metropolitan Area Advisory Committee (MAAC) Project is a San Diego-based organization that promotes self-sufficiency for low- and moderate-income families by providing social, educational, housing, and employment services. In addition to providing a range of programs to improve clients' economic standing, the MAAC Project runs the San Diego area's federally-funded Weatherization Assistance Program (WAP), which provides weatherization services to low-income families. The MAAC Project combines workforce development and weatherization work in its ARRA-funded "Green Careers in Weatherization" training program. The grant for this program doubled WAP funding and set aside at least 20 percent of funds for training. MAAC also conducts green construction job training through the U.S. Department of Labor funded YouthBuild program, which has also been expanded with ARRA funding.

The MAAC Project decided to take on an expanded training program in weatherization only after doing extensive research, which ensured that there was sufficient demand for new hires and identified employer skill needs. The infusion of ARRA funding into weatherization projects has promoted some growth in the industry, at least in the short term. The program has made considerable efforts to connect with local unions and apprenticeship programs, offering a rare career ladder from the lower wage residential sector into the higher wage commercial sector. Union partners provide an assessment of MAAC Project trainees' "soft" and "basic" skills so that the program can better address their needs in these areas. These partnerships have created pathways for MAAC program graduates to enter state-certified apprenticeship programs to continue their training.

In terms of employment, the San Diego Unified School District's (SDUSD) Project Labor Agreement/Construction Careers Project Stabilization Agreement (PSA) provides a considerable number of union construction jobs for graduates of the MAAC programs who enter apprenticeship programs. This agreement, which governs a \$2.1 billion bond passed in 2008 to repair, renovate, and revitalize 181 neighborhood schools, stipulates that SDUSD will hire workers from within San Diego County, with 70 percent of all workers coming from the county and 35 percent of all workers coming from areas of high poverty and unemployment.

The MAAC Project has years of experience doing workforce development in low-income communities. Both the Weatherization and YouthBuild programs provide a comprehensive set of services for participants, including case management services, employment readiness, and job search training, as well as financial assistance and incentives. Students have the opportunity to earn an industry recognized certification through the program, and receive assistance with job placement, as well as case management for a year after graduation.

Although the MAAC Project demonstrates many of the qualities of a successful program, the labor market in San Diego, for the most part, is still not creating jobs, including weatherization jobs. Even with training, many MAAC Project graduates have significant barriers to employment, which put them at a competitive disadvantage in today's tight labor market. Although ARRA funding has boosted the weatherization industry temporarily, the lack of an overarching retrofit policy in San Diego contributes to uncertainty in the labor market.

16.5 IMPLICATIONS AND ANALYSIS

There are a number of established best practices for connecting low-income and disadvantaged workers to good jobs, and successful programs that are already using them to good effect in California. Some of these components were incorporated into the recent California Clean Energy Workforce Training Program (CEWTP) solicitation, an innovative ARRA-funded program jointly managed by the California Workforce Investment Board (WIB) and the California Energy Commission (CEC). While the training programs are too new to evaluate their success in

implementation of these practices, their outcomes, or their sustainability, the CEWTP represents a significant leap forward in terms of promoting sector strategies and many of the specific components outlined here.

Unfortunately the existing best practice programs are still very small and make only a tiny dent in fulfilling the needs of low-income, minority, and disadvantaged communities. The limiting factor for all these programs is demand, not workforce infrastructure. All good programs have very long waiting lists, but program administrators are reluctant to expand training if they cannot connect graduates to jobs.

Creating demand is the key strategy for overcoming these limitations. The CPUC and other funders of incentives and programs have an opportunity to create demand that is conducive to successful incorporation of low-income, disadvantaged workers. However, measures must also be taken to shape the labor market in such a way that the jobs created provide real opportunities for workers coming out of poverty. Workforce preparation programs that provide basic, soft, and hard skills training and wrap-around services are most effective when *married* to demand-side programs such as high-road agreements and skill certifications that help ensure job quality and job access. LATTC's de facto position as the training organization for Los Angeles' green ordinance, the SDUSD Project Stabilization Agreement, and other emerging demand-side programs illustrate the power of implementing strategies on both the demand and supply sides.

The paucity of new jobs will inevitably lead to tensions between the policy goals of getting dislocated and experienced unemployed workers back to work and bringing in new low-income and disadvantaged workers. Given the choice, employers are likely to favor experienced workers. While there are no easy solutions, strategies that maintain or improve job quality in the construction industry—such as high-road agreements tied to strong pipelines into apprenticeship programs—can and are being used to build alliances among the existing workforce and new, more disadvantaged job seekers. Creating and funding training programs that do not lead participants into a job with strong wage floors and career pathways may be a tempting solution during a time when “any job is a good job,” but in the long run may undermine the goals outlined here.

16.6 RECOMMENDATIONS

- When making investments in energy efficiency that are aimed at the inclusion of low-income, minority, and disadvantaged workers and job seekers, program administrators should use the best practices outlined in this document as a set of criteria to evaluate potential programs and applications for funding.
- In examining current practice at the CPUC or the IOUs, it is not clear which WE&T or resource programs are currently tasked with improving the inclusion of low-income, minority, and disadvantaged workers in training programs leading to good jobs. The CPUC needs to clarify this policy goal and link it to specific ratepayer-funded programs.
- There are several ways in which ratepayer- and publicly-funded energy efficiency programs could potentially contribute to these goals if they are implemented as policy. However, funding, competing priorities, and regulatory constraints would each need to be addressed.
- As noted in the case study of residential retrofits in Chapter 4, program design can explicitly incorporate the demand-side elements listed above, such as high-road agreements that set labor and local hire standards in retrofit programs. Portland's Clean Energy Works program illustrates this approach.
- The utility LIEE program could expand partnerships, like the weatherization pilots with LATTC and CityBuild (also described in Chapter 12), but program goals and design would have to change to ensure strong wage floors and clear career ladders that reward skills acquisition if better workforce outcomes for disadvantaged

communities is prioritized. Policymakers need to weigh the competing policy goals and budgetary constraints of these programs, since reaching the target number of households is now codified in statute.

- Utilities could allocate a percentage of their training funds to support workforce programs that meet the best practice criteria described above.

CHAPTER SEVENTEEN:

17. IMPLICATIONS, CONCLUSIONS, AND RECOMMENDATIONS

The WE&T Needs Assessment has included (1) a comprehensive examination of the economic restructuring that will result from energy efficiency and other demand-side management policies and programs and (2) an extensive review of the capacity of California's current workforce education and training infrastructure in preparing workers for jobs in these sectors. This year-long project has been framed by two goals:

- Ensuring the availability of a qualified and engaged workforce to achieve California's energy efficiency and other demand-side management goals; and
- Maximizing the opportunities for California's workers, including workers and job seekers from low-income, minority, and disadvantaged communities, to obtain good jobs with career ladders.

The first goal was articulated as the vision statement for addressing workforce issues in California's Long Term Energy Efficiency Strategic Plan (EE Strategic Plan), adopted by the CPUC in September 2008.¹ The second goal derives from the CPUC's objective of ensuring full participation of minority, low-income, and disadvantaged communities, addressing education at all levels, and developing successful collaborations with workforce and educational institutions (whose mission is successful career outcomes for students, workers, and jobseekers). Given that the CPUC's primary mission is not focused on workforce outcomes, the WE&T Needs Assessment attempts to reveal the circumstances in which workforce goals and energy efficiency goals are complementary, and what the trade-offs are when these goals do not complement each other.

The WE&T Needs Assessment is a third-party report. The analysis and recommendations presented here are solely the responsibility of the authors and do not necessarily reflect the views of the utilities or the CPUC. In addition, the recommendations in this chapter are not limited to actions that are under the purview of the CPUC and/or the utilities, but also call for action by other policymakers and program designers in a variety of agencies and institutions.

This chapter summarizes the analyses presented in the previous chapters, draws implications from these findings, and presents recommendations for actions going forward.

17.1 THE CURRENT STATE OF THE CALIFORNIA ECONOMY

The state of the California economy sets the overall context for analyzing how energy efficiency and related policies and programs affect jobs and create a need for changes to the workforce education and training infrastructure. At present, two major problems plague the California economy. The first problem is a result of the Great Recession and the jobless recovery. California's unemployment rate stubbornly remains at over 12 percent

¹ The EE Strategic Plan states, "By 2020, California's workforce is trained and fully engaged to provide the human capital necessary to achieve California's economic energy efficiency and demand-side management potential." California Public Utilities Commission (2008b). *Long Term Energy Efficiency Strategic Plan: Achieving Maximum Energy Savings in California for 2009 and Beyond*, page 74. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf>.

as of early 2011 and is significantly higher among construction workers. The second problem is the long-term structural bifurcation of the labor market into well-paid, higher-skilled jobs and low-wage, lower-skilled jobs, with little growth of jobs in the middle.

This situation has two implications for the WE&T Needs Assessment. First, there is a large queue of unemployed workers, particularly in construction, where 43 percent of jobs in California have been lost since the industry's peak in 2003 (see Chapter 2). Second, without specific policy interventions, the jobs created by the investments in energy savings will mimic the wage disparities seen in the rest of the economy, with some high-wage jobs in professional occupations and many low-wage jobs for those without a college degree. These wage disparities have immediate serious social implications for families and communities in California and, ultimately, will undermine the competitiveness of California's economy.

17.2 LABOR DEMAND AND SUPPLY IN ENERGY EFFICIENCY SECTORS

The energy efficiency and related investments resulting from programs and policies identified in this report provide a significant stimulus to the California economy. Using our medium scenario, we project these programs and policies will result in an investment in 2020 of about \$11.2 billion dollars from ratepayers along with state, federal, and private sources, up from an investment of about \$6.6 billion in 2010. The 2020 investment is projected to create a total of 211,000 jobs for that year, including jobs directly generated by the investments in energy efficiency activities, indirect jobs resulting from demand for inputs for these activities, and induced jobs resulting from the increased household and business incomes and reduced energy expenditures from these activities. These are job person-years, meaning that each job represents one full-time job for a single year, not a permanent job.

The number of directly-generated jobs in energy efficiency and related activities is projected at 52,371 full-time equivalent jobs for the year 2020; the remaining jobs are the result of the indirect and induced labor demand. These direct jobs represent a significant growth from the 27,718 total direct jobs we estimate were generated in 2010 from energy efficiency and related policies and programs. Direct jobs are the focus of this study because they are directly linked to energy efficiency and related activities and the potential need for skill development.

The number of trained workers needed to fill the new jobs created is projected to be at least 78,205 over the eleven-year period beginning in 2009. This number is larger than the number of full-time equivalent jobs (52,371) because most jobs include both energy efficiency and other work (i.e., the work from one new full-time equivalent job will be distributed to more than one worker). To forecast training needs, the key estimate is the yearly increment of workers needed to fill new positions, above and beyond those hired in the previous year, since the latter were presumably trained before hire. For the year 2020 alone, the number of new workers that will require specific training in energy efficiency and related sectors is forecast at 5,262. Thus, from a total job creation forecast of 211,000 person-year jobs in 2020, the number of new slots available for workers needing specific training in energy efficiency and related skills is only 5,262.

Two-thirds of the workers in these additional direct jobs are in the construction trades (e.g., electricians, plumbers and pipefitters, sheet metal workers, carpenters, laborers, and construction supervisors). Another 17 percent of workers are in the architecture and engineering, management and public administration fields (including utility and third-party program administrators). The remaining 16 percent are in manufacturing, advertising, office administration, and other industries.

The proportion of new jobs in traditional occupations dwarfs the number of workers needed in new and emerging specialized occupations (e.g., solar installers or energy auditors). This finding is based on current staffing plans estimated from government data; if specialized energy efficiency occupations become more prevalent over time,

this balance may change. The degree of specialization depends partly on business decisions, but also on what certifications the state encourages and where it spends its training resources.

At present, there are a significant number of unemployed and underemployed skilled workers in the relevant industries that employers are likely to draw from before hiring new inexperienced trainees. Graduates of training programs will be competing against experienced workers and can be expected to have difficulty in finding work utilizing their newly acquired skills, a point echoed many times in our interviews with training providers. In all sectors, this pool of unemployed workers is likely to exceed the number of new jobs created in the energy efficiency and related sectors at least until 2020.

Emphasis on incumbent worker training (as opposed to pre-employment training) is critical because the number of workers currently employed in energy efficiency related occupations far outweighs the number of new workers that are projected to enter these fields through 2020. Some, if not many, of these incumbent workers are likely to require skills upgrade training as new methods of work and new technologies are introduced.

The quantitative analysis shows that, at least through 2020, concerns about shortages of new workers for energy efficiency and related work are unwarranted, particularly for the primary energy efficiency occupations. There may be difficulty hiring for specialized niches. Such as professionals with significant work experience, or short-term shortages for positions with new certification requirements, but these are the exception. In contrast, concerns about shortages of jobs for recent graduates of education and training programs are real and likely to persist through 2020, particularly for those with less than four years of college. As a result, great caution should be used in considering the funding of new training programs; the focus should instead be on upgrading the energy efficiency skills and knowledge of the incumbent workforce.

17.3 WORK QUALITY AND JOB QUALITY: CASE STUDIES OF HVAC, RESIDENTIAL RETROFIT, AND ADVANCED LIGHTING

The WE&T Needs Assessment project includes case studies on work quality and job quality in three key sectors—the heating, ventilation, and air conditioning (HVAC) sector, the residential retrofit sector, and the commercial lighting sector. These studies focus on the incumbent workforce and examine workforce issues that create obstacles to achieving the state’s clean energy and workforce goals.

A key obstacle to achieving energy goals, which was frequently identified in our interviews, is the prevalence of low-quality energy retrofit work, with the improper installation and maintenance of HVAC equipment being a prime example. For the large commercial and public sectors, these quality concerns were mentioned only rarely, and were not identified in the EE Strategic Plan as problematic. For the residential and small commercial sectors, the problem of low-quality energy retrofit work was frequently mentioned in our interviews and was also confirmed in numerous reports on utility- and publicly-funded programs. Whenever equipment is improperly installed, the actual energy savings are less than expected and the cost-effectiveness of programs suffers as a result.

Our analysis suggests that poor quality work is not simply a consequence of a lack of training of the construction trades workforce, but rather is due to the overall market dynamics in the residential and small commercial markets. These markets are characterized by “low-road” conditions, including lax enforcement of building permits, codes and standards, employment laws, and contractor licensing requirements. Such conditions in these sectors make it difficult for businesses to compete on the basis of quality and also result in workers not being rewarded for high standards of competence. Low-road conditions are usually correlated with low wages and high turnover, and neither employers nor workers have an incentive to invest in training. Public investments in workforce education and training are not sufficient to build a high-road market. Training investments in low-road markets

frequently are not recovered, as so many workers leave the field. Furthermore, these investments do not lead to changes in practice, as employers compete on cost, not quality.

Low-road conditions are prevalent in the entire residential sector, but this is particularly the case in HVAC. Prior studies have reported that in the HVAC sector 30 to 50 percent of energy savings potential is lost due to poor quality installation, less than 10 percent of HVAC change-outs are done with building permits, and there is a very widespread recognition by industry players of the prevalence of the low road. HVAC is a cautionary tale that is important to keep in mind as the new Energy Upgrade California residential program rolls out and as the low-income programs are revisited. Program managers and policymakers need to pay careful attention to low-road conditions in the residential sector, and they should implement measures to ensure that such conditions do not undermine quality and the success of these initiatives.

As a general rule, utility- and publicly-funded programs have addressed quality through back-end inspections and verification, but not by conditioning incentives on up-front contractor and worker quality standards. This is now changing, and recently these programs have begun to focus on the quality of work being performed, as well. There are now several examples of new programs that focus on quality in an effort to carve out higher quality market segments and improve installation and maintenance of energy efficient equipment and systems. New programs include the HVAC quality installation and maintenance programs, the advanced lighting controls program, and, to a more limited extent, Energy Upgrade California.

Clearly, the utility programs cannot drive the market or build the high road by themselves. The utilities are part of a statewide effort to improve quality in HVAC, which was called out in the EE Strategic Plan for major restructuring. This effort includes the development of the Western HVAC Performance Alliance, an industry and government partnership to build consensus and specific strategies to close off the low road. Some of the strategies include efforts by the California Energy Commission (CEC) and the California State Licensing Board (CSLB) to enforce code and penalize contractors who perform unpermitted work, as well as establishing partnerships to carry out trainings for local building inspectors. This combination of incentives for high-road contractors and efforts to close off the low road is an important step forward. If these efforts are successful, they will support the development of a more stable and professionalized workforce. They will also likely drive up the up-front costs of HVAC installation. While further evaluations are warranted, the expectation is that higher energy savings, particularly the more valuable peak energy savings associated with the lower peak energy use under properly installed HVAC systems, will compensate for the higher labor costs over the long run.

In the residential retrofit sector, Energy Upgrade California is the new statewide program for implementing AB 758 and has aligned \$275 million for residential retrofits from the investor-owned utilities (IOUs) and state and federal sources. It is designed to carve out a home performance market with a strong focus on quality work, along with the delivery of substantial energy savings. Whether or not this program will be able to professionalize or create good jobs for the residential retrofit workforce is uncertain, as near-term cost considerations seem to be paramount. Thus far, the program design only includes standards and certification requirements for contractors, with no requirements for workers. In addition, the standards that have been adopted emphasize building envelope and auditing, rather than quality installation of HVAC and other building systems with known quality concerns.

The deployment of advanced lighting controls in the commercial construction sector presents an important contrast to the conditions in the residential and small commercial sectors for HVAC and building retrofits. The commercial advanced lighting controls industry was faced with deficiencies in quality installation similar to those found in the HVAC market. In response to this situation, the lighting sector has demonstrated how the utilities, with the support of the CPUC, can be proactive leaders in planning for workforce needs and setting standards that support quality work. Creating an industry partnership (known in the workforce development world as a sector initiative), utility program managers collaborated with research institutions, manufacturers, and others to address

deployment of advanced lighting control technologies that had been stymied in the market. Recognizing the quality installation problems plaguing the deployment of these technologies, the utilities collaborated with the International Brotherhood of Electrical Workers (IBEW) and the National Electrical Contractors' Association (NECA) to develop journey upgrade training. In a relatively short period of time, this training has been disseminated throughout the network of electrical apprenticeship programs, community college programs, and utility training centers. Early on, Southern California Edison funded curriculum development, while the apprenticeship programs and community colleges funded the training. The advantage of working with the apprenticeship system is that it represents an existing industry partnership, with employers at the table—a key characteristic of successful sector initiatives and one necessary to ensure that the training is put into practice in the field. Partners and mechanisms are already in place to facilitate agreements about skill standards and to provide access to a stable, professionalized incumbent workforce that can integrate new knowledge into a base of solid occupational training. Targeting training to electricians, who must be licensed in California, and limiting participation in incentive programs to those who have achieved this standard of training has paved the way for contractors to compete on the basis of quality in this industry.

Adoption of rigorous training standards and certifications is a key step for addressing the quality issues that threaten the state's achievement of its energy efficiency goals. It raises both the technical skills of workers and the bar for contractors, enabling them to compete on quality considerations rather than cutting corners to offer the lowest bid. However, certification requirements should be approached with care, as not all credentials are created equal. Rigorous, industry-recognized credentials should be distinguished from other certificates offered by some training programs that neither meet a common set of standards nor receive wide recognition within the industry. In interviews, employers in both residential and commercial sectors stressed the importance of on-the-job training and work experience, and expressed doubts about certificates that could be obtained without training in the field. Professional licenses and state-approved certifications usually require a minimum amount of work experience along with testing and other requirements.

The loss in energy savings due to improper installation and poor maintenance practices in the energy efficiency sectors appears to be closely correlated with poor outcomes for workers. Although additional documentation and assessment are needed, anecdotal evidence suggests that there are low wage floors and limited career ladders in most job categories in residential and small commercial retrofit and HVAC markets. These low-road conditions may contribute to diminished energy savings due to poor installations. Limited-scale policies and programs with energy efficiency as the primary objective cannot be expected to fundamentally change these markets' broader labor conditions, but policymakers do still have options to consider that effect, and potentially ameliorate these market conditions.

Moreover, poor worker outcomes also exist in some of the low-income programs that are fully subsidized by ratepayer and public sources. Since most programs do not report wage levels (programs funded under the American Recovery and Reinvestment Act are the exception), we do not know how widespread low wages are. But the fact that these programs are fully funded by government and the utilities means that these entities can set the rules in this market, in terms of contractor requirements, use of certifications, and potentially, agreements with employers about wage floors and ladders.² With the support of the CPUC, the utilities can take critical leadership roles in addressing the workforce obstacles that impede energy savings goals, such as spearheading sector initiatives that bring together industry stakeholders, and supporting quality training and certification standards. These efforts can support improved worker outcomes, but they will be more effective as part of a more comprehensive strategy for market transformation.

² Outside the energy efficiency domain, the utilities have required labor standards when they have agreed to Project Labor Agreements (PLAs) in, for example, power purchase contracts. PLAs incorporate prevailing wage and other labor requirements.

In the residential sector, where this comprehensive strategy for market transformation is most needed, broad efforts to improve conditions and provide upward career trajectories for workers include two sometimes overlapping strategies: “high-road” agreements and certification strategies. High-road agreements set labor standards (wage floors) and local hire requirements, thereby mandating both job quality and access to jobs for workers from low-income, minority, and disadvantaged communities. Certification strategies encourage employers to adopt graduated levels of certifications that are directly or indirectly tied to wage progressions. Both of these efforts are being promoted by the Obama administration through its “Recovery through Retrofit Working Group.” In response, the Department of Energy (DOE) has developed a set of industry guidelines for skill standards and certifications for the main job categories in residential retrofit, and is encouraging their voluntary adoption by states and employers. In addition, the DOE ARRA-funded Better Buildings grant program is funding a number of residential retrofit programs based on high-road agreements. However, these strategies are not as well developed in California as in some other parts of the country.

17.4 THE STATE OF OUR CURRENT WORKFORCE DEVELOPMENT INFRASTRUCTURE

Programs to prepare Californians for work in energy efficiency and related activities are embedded within the state’s larger, complex workforce infrastructure. Among the numerous institutions responsible for workforce education and training for both new and incumbent workers, only the utilities’ Energy Training Centers are exclusively dedicated to training in the energy efficiency and related arenas. The vast majority of education and training for energy efficiency is embedded in existing institutions, which parallels our findings in the labor demand projections that most of the new energy efficiency work will be integrated into existing occupations.

Although existing institutions are the main venue for energy efficiency training, this does not necessarily mean that the existing workforce development infrastructure is fully prepared to meet the needs of the energy efficiency workforce. As in many states, California’s workforce development infrastructure is highly fragmented. Efforts are being made at both the national and state levels to rectify this situation, but at present coordination is still limited and irregular among the federally-funded Workforce Investment Boards (WIBs), the community colleges, the state-certified apprenticeships, and other training and education agencies. The WIB system is currently driven by a “work first” mandate, with most resources going to the One-Stop Career Centers to connect workers to any job as quickly as possible rather than investing in skills upgrading and career development. The limited training funds that are available are dedicated to individual training accounts, hindering the ability of the WIBs to coordinate with either community colleges or apprenticeship programs. Sector training strategies built on partnerships among business, labor, workforce education and training institutions, and other stakeholders, combined with a system of portable and stackable credentials and certifications, have been embraced as key directions for reform by both the Obama administration and the state of California. However, they are not well established in most sectors, including the energy efficiency and clean energy sectors.

Our research identified a surprisingly large number of training programs (over 1,500 training tracks) targeting occupations identified as prominent in our jobs projections or self-identified as teaching energy efficiency, demand response, or distributed generation. These programs vary by level, depth, and scope, and include the eight main training institutions: K-12 schools, high school level Regional Occupational Programs (ROPs), community-based organizations (CBOs), community colleges, private sector training programs, apprenticeship programs, utility training centers, and four-year colleges and universities. The majority of training programs are in traditional occupations, and there is a range in the degree to which they have incorporated energy efficiency skills and knowledge. Training programs that are specialized in energy efficiency constitute a minority of training programs in relevant occupations. Most of these specialized programs are either very short courses targeting advanced

incumbent workers, mostly professionals; short-term, narrowly focused training for entry-level workers at CBOs and private organizations; or intermediate technical-level training at community colleges. Comparisons across programs are hindered by the lack of consistent record keeping and the lack of outcomes data that tracks program participants into jobs.

In the professional occupations (architecture, engineering, construction management), clear career paths and articulation agreements exist between community colleges and four-year colleges. In addition, there is a systematic linking of educational degrees and professional certifications and licensing in many professions. This system leads to significant returns to education investments both for students, through higher wages (and in this recession, lower unemployment), and for employers, through worker retention and higher productivity. In the training programs serving the commercial and public construction sectors, union apprenticeships (run by joint labor–management committees, or JACs) provide the greatest number of trained tradespeople, the greatest depth and scope of training, the highest degree of certification, and the best worker outcomes in terms of jobs and wages. Unfortunately, for both apprenticeship and four-year colleges, access to entry is beyond the reach of many disadvantaged workers. There are some pre-apprenticeship and college bridge programs that help break down these barriers and more of these are needed to build strong pipelines for disadvantaged workers.

In the residential sector, there is a much spottier training infrastructure and far fewer graduates from training programs, as most workers learn primarily on the job. There are some entry-level programs at CBOs, ROPs, and community colleges, but these are of short duration and low skills level, and mostly lead into low-wage jobs. There are also a limited number of programs leading to residential technical specialties such as HVAC worker, auditor, and building inspector. Finally, there are utility classes that are typically taken by contractors or professionals, and less so by construction workers. These different levels of training are not linked to each other in either the job market or in training pathways, though some programs at community colleges are attempting to forge these links.

Other elements of California's workforce infrastructure include the educational programs, including career development programs, offered by the K-12 system, and various job matching services, including the statewide One-Stop Career Center system for all sectors and the private job boards with niche markets in energy efficiency or green.

17.5 WHAT THIS STORY TELLS US: IMPLICATIONS FOR FUTURE DIRECTIONS

The picture painted by this research shows us what is needed to address the various workforce issues in energy efficiency and related sectors. If unaddressed, the issues and problems will undermine our ability to achieve our energy efficiency and other clean energy goals, as well as our ability to create opportunities for Californians, including those from disadvantaged communities, to obtain good jobs with career pathways.

First, our findings suggest that we need to have a more realistic understanding of the numbers of “green” jobs that result from energy efficiency policies and programs. Even with an investment of \$11.2 billion in 2020 (our medium scenario forecast)—which will generate a significant overall stimulus of 211,000 jobs—only about 5,300 additional workers will require energy efficiency training in the year 2020 and about 78,000 additional workers over the ten-year period from 2010 to 2020. The huge queue of unemployed workers in the key occupations overwhelms the number of new openings. As a consequence, current training program graduates will continue to face severe challenges in competing for scarce jobs. At the same time, there are many times more incumbent workers who will require some training to upgrade their skills as new technologies, more stringent codes, and new operations and maintenance practices are introduced.

The concern that there will be a shortage of workers available to enter new energy efficiency jobs is unwarranted for most jobs, and particularly for middle-skill jobs, at least through 2020. However, skill deficiencies among the incumbent workforce in some specific sectors remain an issue. The most prominent concern that has emerged is the prevalence of work that does not meet quality work standards for the installation, maintenance, and operation of energy efficient equipment and materials.

Our research shows that while training workers is part of the solution, the problem is deeply embedded in larger market issues that limit the ability of high-road firms, who compete on the basis of quality, to compete successfully with low-road firms, who compete on the basis of up-front cost.

The current lack of work quality standards and/or their enforcement undermines employers' incentives to invest in training and to recruit and retain a qualified professionalized workforce. Although hard data is lacking, anecdotal evidence suggests that turnover is high in sectors like HVAC, where quality problems are endemic. When this is the case, public investment in training is partially lost because trained workers leave the industry. Moreover, the absence of skill standards and certifications that correspond to work quality standards renders training providers unable to determine what precise skills to train for. Numerous trainers in our interviews said, "Just give me the standards so I know what to train for."

The CPUC regulates the IOUs, firms that are responsible for a multi-billion dollar energy industry in California. The CEC is the primary energy policy agency; it has responsibility for building and appliance standards and currently allocating the energy-related ARRA funds. The leadership of these agencies in building a clean energy economy strengthens their role as critical drivers of economic development in the state. Through their decisions and policies, both the CPUC and CEC affect not only the quantity of jobs created (by stimulating the demand for energy efficiency and clean energy), but also the quality of work and the quality of jobs that are created. The CPUC and the CEC have become increasingly aware of this role and are now explicitly addressing workforce training issues. The findings in this report suggest that these agencies can and should help build the high road and close off the low road by supporting strong conditions on contractors who benefit from incentive programs, the establishment of common skill standards and certifications, compliance with existing codes, and other quality standards that are part of a high-road strategy. These agencies and the IOUs can also support the development of sector initiatives that follow the model of the California Advanced Lighting Controls Training Program (CALCTP), and bring together, employers, labor, educators and other stakeholders in a particular industry to coordinate their efforts.

The tendency in the recent period, particularly with ARRA funding, has been to use public workforce investment dollars to fund short-term training programs—usually around 40 hours in length—that are specific to energy efficiency and renewable energy occupations, such as solar installer or energy auditor. These are mostly geared toward the residential construction industry where, as we have shown, there is very little formal education and training for non-professional workers.

This strategy was utilized by the CEC and the California Workforce Investment Board, the main agencies in charge of ARRA funds for clean energy investments and green jobs training (respectively), and was intended to spur innovation and lasting partnerships. It was a strategy that made sense before the severity of the recession in the construction industry was apparent, and when several major demand drivers, including Property Assessed Clean Energy (PACE) and Home Star, were expected to generate significant numbers of jobs in the residential sector in a very short period of time. The ARRA-funded programs have yet to be completed or evaluated, so their effectiveness cannot yet be assessed. The evaluation of these ARRA programs was announced by the CEC in 2010, but the extent to which workforce outcomes will be appraised is unclear at this time.

For the future, we propose a different approach. Our analysis has identified a plethora of training programs in the existing institutions that comprise California workforce education and training infrastructure for energy efficiency

and related activities. These programs are mostly for traditional occupations in which the specific skills related to energy efficiency are being integrated or could be integrated into existing curriculum. Although California's existing workforce education and training infrastructure is certainly not without its flaws, we recommend, to the extent possible, that the focus be on improving this existing infrastructure and "greening" the relevant education and training programs. Shorter-term, specialized programs are not viable substitutes for longer-term occupational training.

IN THE COMMERCIAL AND PUBLIC SECTORS, our research clearly shows the union apprenticeship programs to be the major long-term occupational training leading workers to achieve mastery of their trade and be placed into career-oriented jobs. Apprenticeship programs also have the advantage of being embedded in a structure in which employers support training, provide good wages and benefits, and garner the value of their training investments through the retention of a highly skilled and highly productive workforce. Community colleges support this system through pre-apprenticeship programs and related classroom instruction. This combination of classroom training and heavily emphasized on-the-job training under the supervision of journeypersons contributes to the comprehensiveness and sustainability of the apprenticeship system, as do the following characteristics:

- Clear standards regulated by the state and the federal Department of Labor (DOL);
- The incorporation of numerous industry-recognized certificates in specific skills that are embedded in a broad multi-year occupational training;
- Direct management of the training programs by a consortium of employers who can continually update curricula as needed; and
- Self-financing mechanisms.

Community colleges also have terminal degrees in some of the same occupations as the trade apprenticeships, such as HVAC, but these reflect much lower skill attainment than apprenticeships, which are usually five-year programs.

Given the state's interest in supporting a stable and professionalized construction workforce that can meet all necessary work quality standards, apprenticeship is the system that should be most strongly supported. In terms of investments in training, the state and the utilities should prioritize working with the apprenticeship system and ensuring that these programs have the resources and expertise to integrate the latest energy efficiency skills into their curricula. Because apprenticeship can be difficult to access, investment of public dollars also should go towards providing strong pre-apprenticeship pipelines using proven best practices and clear articulation with the trades, in order to help disadvantaged workers gain ingress to apprenticeship programs.

Supporting apprenticeship also entails avoiding the investment of public training dollars in firms that directly compete with employers who pay into apprenticeship training trusts, as this creates an uneven playing field and undermines private investment in training. Wherever possible, when determining standards for participation in incentive programs, the state and the utilities should use bidding mechanisms that consider quality and demand high standards; this will help ensure that employers working within the apprentice system are given opportunities to participate in incentive programs and other investments in energy efficiency and clean energy. Requirements and rankings for contractors in contract bids and in incentive programs should recognize the value of the employers' financial contribution to training. Although not the only candidates, union employers are generally in a good position to meet both the goals of quality work that can achieve energy savings and quality jobs that can maintain a professionalized workforce, due to the fact that they are integrally linked to apprenticeship programs and pay high wages and benefits.

IN THE RESIDENTIAL SECTOR, the challenge of developing the skills of new workers and upgrading the skills of incumbent construction workers is much greater, and carving out a market for high quality energy efficiency work

will require overcoming many obstacles. Apprenticeship programs are much less common in the residential sector; the market share of unionized contractors is limited to a few specialty trades in a few regions. Most workers learn on the job, receive very little formal training, have low levels of educational attainment, and many do not speak English. Most training in the residential sector is targeted at disadvantaged workers for entry-level jobs in weatherization, solar installation, and other lower-skill jobs, or is private fee-based training for jobs such as energy auditing or rating. There has been mixed success, both in terms of job placement rates and in terms of the wage and career ladders of the available jobs when there is successful placement. In addition to entry-level training for workers, there is some skills upgrade training for contractors at the utility training centers and in private training programs.

The experimentation that is occurring in attempts to transform the residential retrofit market presents opportunities for assessing the relative effectiveness of various strategies for both energy savings and workforce outcomes. These strategies include Energy Upgrade California's emphasis on certification of contractors, DOE's voluntary guidelines for skill standards and certifications for workers in the main job categories in residential retrofit, and high-road agreements that include labor standards and local hire provisions. Some of the projects using high-road strategies are trying to introduce union labor, with its apprenticeship structure, into residential retrofit initiatives. If successful, this could overcome work quality and job quality issues, but these projects are challenged by union labor's rigid craft lines (and their associated wage levels) that don't make sense in the context of small jobs in individual houses.

For low-income and disadvantaged workers, the present situation creates a severe challenge because of the scarcity of jobs and the surplus of experienced workers that employers are likely to prefer. Here there are choices, and we take a strong stance: The first choice is to invest in short-term trainings that lead into jobs in the residential retrofit or renewable sectors. These are unlikely to be good jobs—unless there are significant labor demand strategies such as high-road agreements that improve wages in these markets. The other choice is to invest in longer-term pipelines that lead to real career pathways. This entails investing in post-secondary education that terminates with a degree or recognized and valuable certification, or investing in pre-apprenticeship programs that lead into apprenticeship. This lesson—that training for bad jobs does not help disadvantaged workers—has been learned in other sectors and applies equally to energy efficiency related sectors.

The emphasis on worker outcomes for the low-income programs funded by utility ratepayers does involve significant changes to the structure and goals of these programs. These programs have focused exclusively on the installation of energy efficiency measures for low-income customers. Workforce outcomes were not a program objective and were not tracked by either the utilities administering the programs or the individual contractors. We recommend restructuring these programs so that in addition to providing access to energy efficiency measures for low-income customers, they will also provide access to energy efficiency jobs for low-income, minority, and other disadvantaged workers.

17.6 JOB CREATION

Though this study was not about job creation, the enormity of the unemployment problem underscores its importance at every turn. This study suggests some avenues (albeit limited) to bolster job creation. First, poor quality work limits the cost-effectiveness of existing energy efficiency and related programs and undoubtedly works against comprehensive market transformation. When poor installation renders energy efficiency equipment less effective, and energy usage does not decline as promised, consumers are less likely to invest. Financing is a case in point: Financial institutions want investment-grade audits that are rigorous enough to guarantee a stream of revenue from energy savings to pay back loans. These require a licensed and bonded Professional Engineer, often

cost over \$10,000, and are currently only used in very large commercial buildings where the energy savings is great enough to warrant the investment in a high cost audit. This rigorous licensing is deemed necessary, not only because of the knowledge needed for the audit, but also for accountability, as the engineer puts his or her license on the line. If a lower level of certification, based on a journey-level skilled trade rather than a professional engineering license, could be developed for smaller buildings, lower cost audits could expand financing and thus the market for retrofits.

In addition, public resources should only be allocated to job training programs when there is a documented need for training (i.e., the job training programs should be demand-driven). If there is a choice, funds should be allocated to job creation strategies rather than training strategies when there are limited job prospects due to the queue of experienced, unemployed workers. And, as has been shown by other studies, energy efficiency building retrofits create more local jobs than many other investments in traditional or renewable energy, largely because fewer dollars go to importing materials and fuels from outside the state.

17.7 RECOMMENDATIONS

Below we present specific recommendations for these specific groups of stakeholders:

- The CPUC, the CEC, the utilities, and other agencies and policymakers that support investments in energy efficiency and related activities;
- Policymakers, funders, and practitioners in the workforce development realm; and
- Utility workforce education and training programs.

Our targeted recommendations fit into two overarching prescriptions that are driven by the state's intertwined clean energy and workforce goals. They address the role that the California state government has in shaping the kinds of jobs that are created as the state moves towards a clean energy economy, as well as the capacity of our workforce development infrastructure to effectively respond to this economic restructuring. Implementing these recommendations will require partnerships, coordination, and collaboration on behalf of all parties.

- **CREATE AND ENFORCE STANDARDS TO EXPAND THE HIGHER QUALITY SEGMENTS OF ENERGY EFFICIENCY SECTORS:** Establish policies and require utility and other publicly-funded programs focused on energy efficiency and other demand-side management activities to clearly delineate and align the skills, certifications, and additional standards governing workers and contractors, so that quality work conditions can be maintained and workforce planning can occur.
- **IMPROVE WE&T PLANNING AND COORDINATION:** Establish state-level policies, support effective collaborations, and provide incentives to improve workforce planning and coordination among clean energy agencies and workforce agencies, and among the major education and training institutions, particularly apprenticeships, community colleges, and utility training programs. Emphasis should be placed on sector strategies built on partnerships between business, labor, and training and educational institutions.

17.7.1 RECOMMENDATIONS FOR CPUC, CEC, UTILITIES, AND OTHERS AGENCIES SUPPORTING INVESTMENT IN ENERGY EFFICIENCY AND OTHER DEMAND-SIDE MANAGEMENT ACTIVITIES

State agencies, utilities, and others involved in energy efficiency and related programs and policies should determine and align skill certifications and analyze costs and options for encouraging their adoption by industry in the following ways.

- **INCENTIVE PROGRAMS:** Require contractors who participate in energy efficiency rebate and incentive programs to have third-party certifications, licenses, building permits, and/or other relevant standard certifications. Certification requirements should apply to both workers and contractors.
- **DIRECT CONTRACTS:** Award state and utility direct install contracts using a best-value contractor rating system that includes documented history of high-quality work, hiring of workers with appropriate certifications, ongoing investments in worker training, and compliance with building codes and employment laws.
- **LOW-INCOME STATE AND IOU RESIDENTIAL PROGRAMS:** For fully subsidized low-income programs, modify program objectives to include workforce outcomes. Assess current workforce outcomes and if they are not adequate, use high-road agreements and sector strategies to pilot incorporation of the new national DOE skill standards and certifications or other strategies to improve both energy efficiency and workforce outcomes.
- **ENERGY UPGRADE CALIFORNIA FOR RESIDENTIAL:** Require Energy Upgrade partners and implementation contractors to include not only building envelope standards but also standards for HVAC installations and other building systems. Establish pilot programs that include high-road agreements as part of the portfolio of funded programs, paying particular attention to strategies that bundle jobs to achieve a large enough scale to attract a broad set of contractors, including those with strong administrative and training capacity.
- **ENERGY UPGRADE CALIFORNIA FOR COMMERCIAL:** Require the use of high-road agreements, including apprenticeship, prevailing wage, and local hire provisions. The use of high-road agreements will support higher quality installations, increase the benefits of training investments, and promote the achievement of California's workforce goals.
- **LICENSING:** Review and if warranted change licensing requirements for building and construction trades contractors and technicians to ensure competency-based licensing.
- **REPORTING OF WAGES, TURNOVER, AND OTHER LABOR CONDITIONS:** Modify program evaluation methodologies and protocols for energy efficiency, demand response, and distributed generation to require the inclusion of worker outcomes, including compensation, benefits, turnover, and retention rates. Existing methodologies address energy and environmental costs and benefits but do not address workforce costs and benefits. Workforce issues affect both the costs and benefits of these programs, by way of the quality of installations and maintenance and the benefits associated with investments in training. Moreover, the achievement of the state's energy efficiency goals needs to be considered alongside the achievement of the state's workforce goals.

- **PUBLIC CHARGE REAUTHORIZATION:** Include desired workforce outcomes in the list of goals for energy efficiency, low-income, and renewable programs (including distributed generation) with the reauthorization of the public goods charge.
- **SECTOR STRATEGIES:** Encourage drivers of energy efficiency investments to support sector strategies for deployment of new measures and technologies such as energy storage, integrated demand-side management, commercial building benchmarking, and others, through co-funding, participation in setting work and skill standards, and serving as conveners of contractors and other key stakeholders.

17.7.2 RECOMMENDATIONS FOR WORKFORCE DEVELOPMENT POLICYMAKERS, FUNDERS, AND PRACTITIONERS

- **SECTOR STRATEGIES:** Direct and support workforce development funders (including Workforce Investment Boards, the Employment Training Panel, etc.) and training and education institutions as they develop, serve as intermediaries for, and coordinate their programs with sector strategies. When key elements of sector strategies already exist, as in the case of the Western HVAC Alliance, the workforce development community should participate by providing co-funding and technical assistance on sector strategy best practices, as well as by providing training and education services.
- **GREENING TRADITIONAL OCCUPATIONAL PROGRAMS:** Incorporate energy efficiency skills and knowledge into traditional occupations in the construction trades and the relevant professions, particularly engineering and architecture. This greening should focus on the main training institutions of apprenticeship, community college, and four-year colleges, and be a preferred alternative to creation of new, shorter-term, narrowly focused programs in specialized skills related to energy efficiency.
- **INCUMBENT WORKER TRAINING:** Focus resources on incumbent worker training and journey upgrade training. Consider the adoption of meaningful continuing education requirements for licenses and certifications to support participation of incumbent workers in these trainings and to integrate energy efficiency into the main knowledge and skill base of the relevant professions and trades.
- **COMMUNITY COLLEGE AND APPRENTICESHIP COLLABORATION:** Promote system-wide collaboration between the community colleges and the apprenticeship programs at the pre-apprenticeship, apprenticeship, and continuing education levels. Further investigation of barriers and best practices is necessary to identify strategies to do this at a system level.
- **CERTIFYING PRE-APPRENTICESHIP:** Support and strengthen pipelines into skilled trades work, using models such as PG&E's Power Pathways program, pre-apprenticeship programs, and high school career academies. These pre-apprenticeship programs should be linked to state-certified apprenticeship programs and built on best practice models. Efforts to build stronger pipelines should be connected to workforce and economic development policies, including high-road agreements with local hire clauses.
- **DATA ON TRAINING OUTCOMES:** Promote improved data availability on outcomes for training program participants by making available (with security safeguards) administrative data on employment of publicly-funded training program graduates. Job placement rates and career advancement should be adopted as priority metrics of program success. New policy is needed to make existing data that can track

individuals in training programs and in the labor market available for research, while safeguarding privacy and confidentiality issues.

17.7.3 RECOMMENDATIONS FOR CHANGES TO UTILITY WORKFORCE EDUCATION AND TRAINING PROGRAMS

- **SUPPORT SECTOR STRATEGIES:** Initiate, help fund, and partner with other organizations to develop robust sector strategies in key energy efficiency sectors such as HVAC, building operators, benchmarking, and other emerging areas (as well as LIEE or other programs undergoing review or redesign).
- **TRAINING CENTER CLASSES:** Modify the structure of classes offered by the Energy Training Centers to increase the number of course series that are longer in length than typical classes, focus on a specific occupation, have a workplace-based hands-on component, and offer clear learning objectives that lead to certification. These course series were shown to have a greater impact on energy savings than the typical short classes. In addition, recognized certifications for contractors and workers are expected to improve workforce outcomes as well.
- **COLLABORATIONS:** Expand collaborations between the Energy Training Centers and contractor associations and building and construction trades associations. The emphasis should be on collaborations with high-road associations demonstrating commitment to investments in ongoing workforce training, such as participating in apprenticeship programs.
- **SUPPORT FOR CURRICULA DEVELOPMENT:** Actively participate in the content development, review, and updating of curricula, and support instructor professional development for the main “home institutions” that train building and construction professionals and tradespeople, such as apprenticeship programs, community colleges, and four-year institutions. Energy Training Center staff should be encouraged to share their expertise as appropriate to ensure that curricula incorporate up-to-date information on new technologies and practices.
- **GOALS FOR INCLUSION OF DISADVANTAGED WORKERS:** Adopt as a goal for the Energy Training Centers the inclusion of low-income, minority, and disadvantaged workers and job seekers. Develop and implement specific programs in collaboration with organizations that have a track record in this arena, emphasizing sector strategies that can lead to placement in good jobs with career ladders.
- **EVALUATION OF WORKFORCE OUTCOMES:** Assess and determine what additional information is required to evaluate workforce outcomes for the Energy Training Centers. At a minimum, the Energy Training Centers should begin to collect information from participants on occupation, prior education, and work experience.
- **CAREER DEVELOPMENT AND ENVIRONMENTAL INTEGRATION IN K-12 PROGRAMS:** Increase the emphasis on career awareness and career exploration in ratepayer-funded education programs servicing K-8 students and support career preparation programs in career academies and Regional Occupational Programs. Evaluate and work toward the integration of environmental and ratepayer-funded energy curricula. There is substantial evidence that the integration of environmental and energy curricula will increase the support of teachers for these programs. These efforts should be supported by strong collaborations with K-12 schools, particularly those programs, like the California Partnership Academies, that target disadvantaged students.

- **EVALUATION OF K-12 EDUCATION PROGRAMS:** Work with education agencies, schools, and funding partners to allow for the collection and reporting of demographic information on students participating in ratepayer-funded education programs (i.e., Connections). The present lack of information hampers the evaluation of existing programs.

17.7.4 RECOMMENDATIONS FOR FURTHER RESEARCH AND CAPACITY BUILDING

- **WORKFORCE OUTCOMES OF ENERGY EFFICIENCY PROGRAMS:** Expand funding for research on the implications of energy efficiency and related investments on jobs, job quality, and job access, and on employment and career outcomes for training program graduates. Comparative research that captures the impact of different labor conditions on energy efficiency outcomes should be prioritized. Basic job and workforce information is needed for the state's major clean energy and efficiency investments, including wages, turnover, and workforce characteristics.
- **SECTOR STRATEGIES RESEARCH:** Provide funding to support research on, and technical assistance and capacity building for, existing and emerging sector strategies in the energy efficiency sectors. These funds should be used to disseminate best practices of CALCTP and other successful sector initiatives to new initiatives, and to provide technical assistance to these initiatives. Sector initiatives should target commercial building benchmarking and retro-commissioning, new forms of energy storage, measures to support integrated demand-side management, vehicle electric charging station infrastructure, or others.
- **FUTURE WE&T NEEDS ASSESSMENTS:** Future studies in targeted sectors are needed to assess the specific skill requirements and effectiveness of training programs. These needs assessments, including the one programmed for HVAC, should not be limited to skill gaps analyses but should include analyses of key labor conditions such as wages, career ladders, turnover and retention rates, and employer investments in training and retention. Needs assessments should include an employer survey of the various segments of the targeted sector in order to gather this information. This approach is critical to assess the higher quality segments of the industry, determine skill standards and certifications when necessary, and ensure that training investments help support high-road development.
- **NATIONAL CENTER FOR THE CLEAN ENERGY WORKFORCE:** Support and fund the California Energy Commission's proposal to create a National Center for the Clean Energy Workforce. The mandate of the proposed center is to help California grow a clean energy economy by promoting high-road economic and workforce development. The proposed center would work toward these ends by supporting research, providing technical assistance, and serving as an information clearinghouse. In these ways, the center would help the state achieve energy savings while improving the lives of California workers.

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The Donald Vial Center carries out research on the emerging green economy and climate change policy in California, as these relate to the labor market, to workforce development, and to workforce policy.



The Center for Labor Research and Education (Labor Center) is a public service project that links academic resources with working people.

Both the Labor Center and Donald Vial Center are projects of the UC Berkeley Institute for Research on Labor and Employment



Research Into Action, Inc., is a social marketing and evaluation research firm. They specialize in evaluation research and market assessment design and analysis services in the fields of energy efficiency, renewable energy, and natural resource management.



The Centers of Excellence is an initiative of the California Community Colleges Economic and Workforce Development (EWD) Program that supports the community colleges by providing customized data on high growth, emerging, and economically critical industries and occupations and their related workforce needs.



Public/Private Ventures (P/PV) is a national consulting non-profit organization dedicated to creating and strengthening programs that improve lives in low income communities.

This study was funded by the California utility ratepayers under the auspices of the California Public Utilities Commission.

