

Putting California on the High Road: A Jobs and Climate Action Plan for 2030

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Chapter 3: Supply-Side Workforce Development Strategies: Preparing Workers for the Low-Carbon Transition

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Contents

I. Introduction.....	98
II. Lessons for High-Road Workforce Training and Education for the Transition to a Carbon-Neutral Economy.....	100
III. Understanding California’s Existing Workforce Development Infrastructure	102
A. The Three Phases of Training	102
B. Occupation Types and Typical Career Preparation Pathways	104
C. California’s Core Postsecondary Education and Training Institutions	107
1. <i>State-Certified Apprenticeship</i>	109
2. <i>California Community Colleges</i>	111
3. <i>Four-Year Colleges and Universities</i>	113
IV. Using California’s Workforce Development Infrastructure for the Carbon-Neutrality Transition	114
A. Entry-Level Inclusion: Strengthening Pathways to Family Supporting Careers for Disadvantaged Workers.....	115
1. <i>Pipelines into Skilled Construction Trades: Apprenticeship Preparation Programs</i>	121
2. <i>Pipelines into Technical and Family-Supporting Blue-Collar Occupations</i>	122
3. <i>Pipelines into Professional Occupations</i>	123
B. Foundational Education and Training for the Future Workforce: Incorporating New Knowledge and Skills.....	125
1. <i>Training for Skilled Construction Trades</i>	125
2. <i>Training for Technical Occupations</i>	126
3. <i>Training for Professional Occupations</i>	127
C. Incumbent Worker Training: Upgrading the Skills of the Existing Workforce	128
1. <i>Upgrading Skilled Construction Trades</i>	130
2. <i>Upgrading Technical Occupations</i>	133
3. <i>Upgrading Professional Occupations</i>	133
V. Summary and Recommendations	133
Endnotes	140



I. Introduction

This chapter identifies priorities and provides recommendations for the best approaches to skill building for the transition to a carbon-neutral economy, while prioritizing middle-class careers and inclusion of disadvantaged workers. It outlines the roles that the state's existing workforce development infrastructure can play in preparing workers for changes in the labor market that will occur as the state undertakes the climate measures outlined in California's Climate Change Scoping Plan. It also presents recommendations for a coordinated statewide strategy built on California's robust education and training institutions in partnerships with high-road employers, unions, and community-based organizations.

The strategy is based on a fundamental principle for workforce development: training must serve the needs of both employers and workers to be successful. Public funding can add value but only if both workers and employers see the benefits of training. For workers, this means wage and career advancement as skills are acquired; for both public and private employers, this means increased productivity and quality performed by trained workers. Training programs should be designed to address the particular skill needs of an industry sector; in tune with hiring and promotion practices of employers in the industry; and calibrated to the number of actual jobs. More than simply paying attention to need, the state's workforce efforts must be grounded in an approach that is rooted in industry and starts with the jobs.

When combined with the strategies described in Chapter 2 on the demand side of the labor market, these recommendations for preparing workers (the supply of labor) can ensure that Californians are ready to contribute to and thrive in the transition to a carbon-neutral economy. The workforce development solutions presented here can equip workers with the skills they need to adapt to new technologies and meet the needs of businesses in energy, transportation, and other key industries as they reduce their greenhouse gas emissions. The recommendations can also ensure that the economic benefits arising from policies to mitigate climate change are more accessible to workers from disadvantaged communities. These recommendations are based on the current capacity of the state's workforce development infrastructure and identify gaps, areas to improve alignment and coordination, and opportunities to leverage existing funding.

With about 40 million people, and about 12 percent of the nation's population, California's workforce and education systems are tasked with serving more people than any other state. These services are provided through largely decentralized service delivery structures that include 11,000 K-12 Schools, over 1,000 School Districts, over 1,000 Charter Schools, 113 Community Colleges (in 72 Community College Districts), 58 County Welfare Departments, 58 County Offices of Education, 45 Local Workforce Boards, and various state departments and agencies, including the Labor and Workforce Development Agency (comprised of the California Workforce Development Board



(CWDB), Department of Industrial Relations-Division of Apprenticeship Standards (DIR-DAS), Employment Training Panel (ETP), and Employment Development Department (EDD)), the State Board of Education (SBE) and California Department of Education (CDE), the California Community Colleges Chancellor's Office (CCCCO), the Health and Human Services Agency, the Department of Rehabilitation, the California Department of Social Services, and the California Department of Corrections and Rehabilitation.

The foregoing institutions and organizations provide a variety of skill-building, job-matching, and educational and employment services and grant programs and are funded by both federal and state funding programs, including the federal Workforce Innovation and Opportunity Act (WIOA) program. Each workforce training program and funding stream plays a different role in this highly decentralized system, though CWDB works with the representatives of workforce, human service, and education programs to develop a common policy vision for the provision of workforce services in the state. This policy vision is articulated in the WIOA State Plan.¹

The vast majority of the jobs that can help lower greenhouse gas emissions across the economy are in traditional professional, technical, and blue-collar occupations related to the key industries producing energy and fuel, consuming energy and fuel, or other heavy-emitting activities. For these industries, specific knowledge and skills related to cleaner production are only one component of a much broader occupational skill set. Very few of these jobs are specialized jobs where the main skill set is focused exclusively on lowering greenhouse gas emissions. For example, the 2009 Needs Assessment commissioned by the California Public Utilities Commission (CPUC) showed that approximately two-thirds of the jobs generated directly by energy efficiency investments in California are in the building and construction trades—e.g., electricians, sheet metal workers, plumbers, laborers, carpenters, stationary engineers, and others.² Around one-sixth of the jobs created are for professionals such as architects and engineers. Only 2 percent are specialized energy efficiency occupations like energy auditor, and even then, auditors often perform other tasks unrelated to energy savings.³

Rather than creating any exclusively “green” jobs, the economy envisioned by the Scoping Plan will be built and run through existing occupations which may incorporate new skills or tasks that result in lower greenhouse gas emissions. Mechanics for zero-emission vehicles are still motor vehicle mechanics, workers who manufacture electric cars are still autoworkers, electricians who build solar farms are still electricians, and engineers who design methane digesters for dairies are still engineers, even though, in all cases, their skill sets continually evolve. In other words, very few new occupations are created by climate mitigation activities, but instead, new aspects to traditional occupations are developed. Accordingly, workforce preparation for the transition to a carbon-neutral economy can and should leverage the state's existing workforce training and education infrastructure that serves these occupations, rather than being treated as a new and separate initiative.



Moreover, as described in more detail in Chapter 5, an analysis of the principal industries and occupations affected by climate policy shows the predominance of blue-collar occupations in each of the Scoping Plan economic sectors. This finding does not negate the importance of professional occupations (those requiring a four-year degree), but does suggest that greater emphasis should be placed on skill and career development in blue-collar jobs.

II. Lessons for High-Road Workforce Training and Education for the Transition to a Carbon-Neutral Economy

Over the past 10 years, misconceptions about both the genesis and nature of “green jobs” and what made workforce development programs effective led to the creation of new short-term training programs for “green” occupations like rooftop solar installer or energy auditor. Many of these programs, some of which were funded by the American Recovery and Reinvestment Act (ARRA), had poor results for job placement and wage improvements for participants.⁴ The examples of the first wave of green jobs training during the ARRA era, when combined with best practices in workforce development, offer key lessons that shape the report’s recommendations on preparing workers for the transition to a carbon-neutral economy:

- The goal of training investments is to deliver skills for a broad set of workers who often are not specialized “green” workers, but whose actions impact greenhouse gas emissions. For example, architects and HVAC workers both have a significant impact on the energy use in buildings and need broad foundational training for their occupations as well as specialized training to incorporate energy efficiency best practices into their work. Broad occupational training is better for workers, who will not be locked into a narrow technological skillset as the economy changes, and at the same time provides employers with a workforce that can quickly adjust to rapidly evolving technologies.
- Training on its own is not sufficient to ensure that workers transition into good careers in the carbon-neutral economy. Jobs should drive training, and training programs, in turn, need to be evaluated on job placement outcomes—not just in any job, but career-track jobs with decent entry-level wages and pathways to advancement.
- For training institutions to be responsive to actual jobs, they need to know what skills are needed by employers. Skill and certification standards, addressed in Chapter 2 on demand-side policies, are critical to provide signals to training institutions on what to train for. Critical intelligence should also be gathered from



annual assessments conducted by industry partnerships. Indeed, in its new approach of “start with the jobs,” CWDB prioritizes industry-based partnerships that first organize workers and employers on the “demand side,” identifying jobs and skills before reaching out to training partners on the “supply” side.

- Benefits from investments in training will not be realized by either workers or employers in high-turnover, low-wage jobs. Training partnerships funded with public dollars should engage “best-in-class” employers in their specific industry: those who invest more in training, require greater skills, and offer higher wages than employers who compete on the basis of low wages.
- The inclusion of disadvantaged workers, a priority in state policy, requires that skill standards and certifications must always be coupled with intentional policies to bring these workers into the career pipeline. If disadvantaged workers are not supported to acquire the skills needed, standards and certifications can create barriers, rather than pathways into good jobs.
- Training funds committed by agencies responsible for climate policy implementation should be used to build on, rather than as a substitute for, the state’s existing workforce development infrastructure. Agencies in charge of climate policy implementation should not create independent workforce development programs, which would result in further fragmentation and lack of coordination of the state’s training infrastructure. Such fragmentation creates confusion for those seeking training.
- The primary role of agencies in charge of climate policy implementation with regard to workforce training and education should be to identify emerging technologies and changing production processes as these developments occur and mature. They should work with labor and education agencies to identify priority occupations and changes in skill sets that arise from technological innovation. As described in Chapter 2, they should then incorporate those skill standards in the requirements of programs that seek to encourage investments in emerging technologies and climate mitigation and adaptation activities, to ensure that there is demand for workers with the appropriate skills.

Industry training partnerships are key to successful workforce training for occupations not requiring a four-year degree. Sometimes known as sector strategies, industry partnerships bring together multiple employers, labor, community, education, and workforce partners to develop a strategy to address workforce issues within a particular industry. 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 interview training graduates as job openings occur. Sector strategies function best with an intermediary to convene the partners, coordinate the planning and implementation of the projects, develop agreements on skill standards and appropriate certifications, contract with



training providers (e.g., community colleges and apprenticeship programs), develop or update curricula, and design and carry out other implementation tasks. The intermediary can also help negotiate the exact nature of the commitments by the partners, particularly around sharing the costs of training, development of wage ladders or promotion opportunities for workers with upgraded skills, and other key mechanisms to assure sustainability and benefits for both employers and workers.

III. Understanding California's Existing Workforce Development Infrastructure

The transition to a carbon-neutral economy will impact workers in various occupations and industries, from architects and engineers to janitors and transit workers, from electricians and carpenters to mechanics and machinists. These and other occupations receive training and education through distinct pathways in the state's robust and complex network of core postsecondary education institutions. To understand how workers prepare to enter careers in the transition to carbon-neutrality, this analysis identifies three phases of training, four general occupation categories, and the skill development pathways and primary educational institutions for each. The overall system is illustrated in **Exhibit 3.1** and will be described in more detail below.

A. The Three Phases of Training

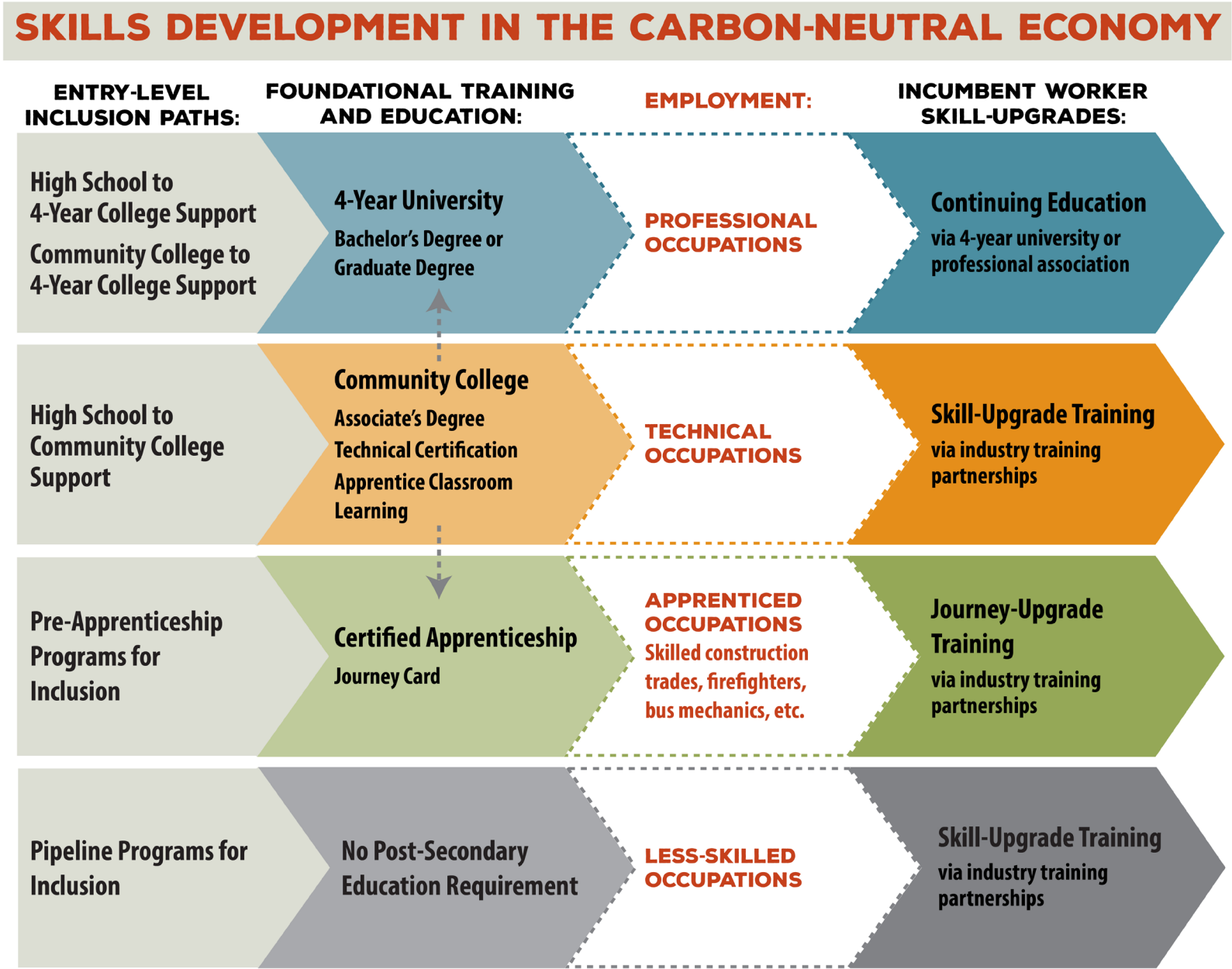
Ensuring that California's workforce is able to adapt to the transition to a carbon-neutral economy will require policy interventions at three distinct phases of training and education.

❖ Entry-Level Inclusion Paths

This phase of training is for the subset of workers coming from disadvantaged and historically marginalized communities. It requires investments in basic workforce preparation and a comprehensive set of supports that help workers overcome various barriers to employment. These programs are designed to help disadvantaged workers get access to the same opportunities as more-privileged Californians, putting them on a path into foundational training and education and, thereby, into career ladders across the spectrum of middle-class occupations, including blue-collar, white-collar, and professional occupations. Workers who are not disadvantaged typically have better access to pathways into the next phase of foundational training or access to entry-level positions in good career-track jobs.



Exhibit 3.1. Skills Development in the Carbon-Neutral Economy



❖ Foundational Training and Education

Workers entering skilled occupations in the carbon-neutral economy receive intensive training—usually before they enter the workforce—from the state’s core postsecondary education and training institutions: the state-certified apprenticeship system, the California community college system, and the state’s four-year colleges and universities. Programs that train for key occupations need to continually incorporate new technology-related knowledge and skills in curricula in relevant fields and occupations.

❖ Incumbent Worker Skill Upgrades

Most workers who will be faced by changes in jobs and skill needs due to the transition to a carbon-neutral economy are already in the workforce. Skill upgrades for incumbent workers are an essential component of a comprehensive strategy to prepare the workforce as employers introduce new technologies and processes in both old and new businesses.

The relevant institutions and best practices for these three phases of training differ by industry and occupation, and any workforce development strategy must take these differences into consideration.

B. Occupation Types and Typical Career Preparation Pathways

The three phases of training described above are carried out differently in different occupations and industries. This section describes the most important occupational categories below, with the caveat that the boundaries between these categories are blurry. This categorization is meant as a conceptual tool to distinguish among the major career pathways that exist in the labor market.

❖ Professional Occupations

Professional occupations key to the carbon neutrality transition, such as architects and engineers, generally require a bachelor’s or graduate degree and tend to receive training and education through the state’s **four-year colleges and universities**. In general, there are robust career training pathways for professional workers because there are clear educational credentials (bachelor’s and master’s degrees in engineering and other relevant professions) and usually a state professional license requirement based on education, work experience, continuing education, and a test of competency. Professional licenses are usually issued by a state agency or



state-sanctioned professional association. Two of the most common mandatory licenses related to the carbon-neutrality transition are for Professional Engineers (P.E.) and Registered Architects (R.A.). 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. These requirements also ensure that licensed workers are continually maintaining and upgrading their skills.

❖ Technical Occupations

These occupations, which include a large variety of technical, mechanical, administrative, and other jobs across the Scoping Plan sectors, require postsecondary training and/or education but generally do not require four-year college degrees. Some examples of occupations include facility managers and energy data systems operators in energy efficiency, electrical systems operators, and water and waste technical occupations. The primary postsecondary institution to provide this type of training is the state's **community college system**. Training pathways here are multiple and various and not always as clearly defined as for the professional occupations or the occupations served mostly by apprenticeship programs. Training requirements range from short certificate programs to full two-year educational credentials. In some cases, employers have worked with community colleges or other training institutions to develop state-certified apprenticeship programs for these technical occupations; see below for a description of apprenticeship.

In the United States, for many technical occupations, there are no clear educational requirements for hiring. The exception is the healthcare profession, where many occupations have specific certification requirements, from the X-ray technicians to dental hygienists. But in many occupations where safety and accuracy are less urgent, qualifications are less systematized, and employers' hiring practices are not always transparent. This situation creates challenges not only for prospective workers, but also for training institutions like the community colleges, because there is no clear signal about what training is needed and valued by employers. Clearer certification frameworks, along with deeper industry partnerships, could provide more effective indicators for skill delivery.

❖ Skilled Construction Trades and other Apprenticed Occupations

The skilled construction trades are a subset of technical occupations where the predominant model of formal training is the **state-certified apprenticeship program**. The skilled trades are highlighted, because of the significance of construction work in all the Scoping Plan sectors and because the apprenticeship model for the skilled



trades is very well developed and a key asset that the state has for the transition to a carbon-neutral economy. State-certified and federally-registered apprenticeship programs are also available for other occupations with willing employers, and in fact, the use of the apprenticeship model is expanding and has strong support from the Newsom Administration. It is fair to say that apprenticeship is most highly developed and widespread in the skilled construction trades and is still less significant in most other occupations, with the exception of firefighters and a few other key occupations.

Previous research, including the *Needs Assessment and Guidance Plan*, has highlighted the particularly strong performance of certified apprenticeship in preparing workers for long-term careers in the construction trades. Certified apprenticeship is an earn-while-you-learn workforce training system that combines classroom and on-the-job training. Intended to prepare apprentices for a career in a particular trade, program graduates earn an industry-recognized credential and can progress to a journey-level position, which is the skill certification in the trades. For energy efficiency, the critical occupations are in building and industrial energy systems; they include electricians who work on lighting, plumbers, pipefitters, sheet metal workers, stationary engineers who work on heating ventilation and air conditioning, and related occupations.⁵ For renewable energy, depending on the specific technology, the critical occupations include electricians, ironworkers, boilermakers, and others. The basic trades—such as laborers, carpenters, and operating engineers—work on most construction projects, including renewables and energy efficiency.⁶ Transportation infrastructure—such as high-speed and light rail, smart roads, and other transportation projects—also include the full spectrum of the construction trades.

❖ Less-Skilled Blue-Collar Occupations

Many workers in key occupations for the carbon-neutrality transition are not expected to have any formal postsecondary education before they are hired but rather learn on the job, which creates challenges for any effort to upgrade these workers' skills *en masse*. These occupations include residential construction workers, truck drivers, manufacturing production workers, and forestry, waste, and agricultural workers.

Because of the lack of formal training programs in these occupations, skill upgrades can only be addressed through engagement of employers. Workforce development institutions can provide training resources, but employers' commitment and clear signals on what training is needed is essential. Where workers are represented by a union, labor-management partnerships can be developed, as in the state's High Road Training Partnerships initiative.



C. California’s Core Postsecondary Education and Training Institutions

Most workers in middle-class careers must go through some form of foundational, postsecondary education. **Exhibit 3.1** shows how these training pathways differ by occupational groups. For professional workers, the pathway is by definition through a four-year college. For other technical jobs, this pathway may be through a two-year community college credential or associate degree. For the construction industry, at least the portion of it that provides workers with a middle-class career, that pathway is generally apprenticeship. Apprenticeship is also used in a limited number of other skilled occupations, and new efforts have been initiated to expand apprenticeship into non-traditional occupations such as transit workers, manufacturing workers, and others.

Exhibit 3.2, below, gives summary descriptions of the training and education services offered by the state’s core postsecondary institutions, as well as the average time needed to complete the standard programming in each institution. As indicated in **Exhibit 3.2** and explained more fully below, each of these institutions provides education and training opportunities at all three phases of training—from entry-level inclusion programs, to foundational training, to incumbent worker skill upgrades. However, the majority of their training and educational opportunities address foundational training.

Exhibit 3.2. Institutional Overview

Institution	Summary Description	Average Length of Training
State-Certified Apprenticeships	<ul style="list-style-type: none">• Long-term training in the building and mechanical trades, and, increasingly, in other sectors and occupations.• Apprentices typically start with little or no experience and learn to be experts in their occupation while working full-time for an employer and receiving classroom instruction.• Wages increase with skill level.• Most joint apprenticeships in construction offer skill-upgrade training for journey workers to update or enhance their skills.	3 to 5 years



Institution	Summary Description	Average Length of Training
Community Colleges	<ul style="list-style-type: none"> • Postsecondary education that is open to those with limited resources and low basic skill levels. • Students may obtain a terminal associate degree after two full-time years of study and/or receive a vocational certificate in a shorter amount of time, usually one year. • Students can obtain industry-recognized certifications from accredited credentialing agencies that test for competencies based on well-established industry skill requirements, where they exist. • Students may obtain an associate degree and transfer to a four-year college. • Most apprentices receive the classroom portion of their learning through classes administered by the community colleges. Community colleges also provide pre-apprenticeship training to help disadvantaged students gain access to apprenticeship. Incumbent workers also access community college classes, primarily for reskilling or skill-upgrade training. 	<p>6 months to 2 years</p> <p>(some custom programs as short as 4 weeks)</p>
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. 	<p>4 years or more</p>



1. State-Certified Apprenticeship

Apprenticeship is the core postsecondary training institution for the skilled construction trades and is increasingly the preferred model for other non-professional occupations. Registered apprenticeship—which can be either state or federally certified apprenticeship, or both—is an earn-while-you-learn workforce training system that combines classroom and on-the-job training. In California, registered apprenticeship programs are regulated by the state Division of Apprenticeship Standards (DAS), housed within the Department of Industrial Relations (DIR). DAS ensures that certified programs meet specific minimum training benchmarks and other criteria to ensure quality and accountability.⁷

In 2018, there were almost 80,000 apprentices in all occupations in California, ranging from firefighters to cosmetologists,⁸ including nearly 54,000 apprentices in more than 230 apprenticeship programs in the construction trades. California has invested \$15 million each year over the past three years through the California Apprenticeship Initiative to promote the creation of new apprenticeship programs in transportation and logistics, advanced manufacturing, health care, and information technology.⁹

The following provides a description of the apprenticeship system for the skilled construction trades, where apprentices are prepared for a career in a particular trade and program graduates earn a journey card, which is an industry-recognized credential. Apprenticeship in the trades is particularly important for achieving the state's climate goals because of the key role of the construction industry in building clean energy and sustainable transportation systems and infrastructure, in retrofitting buildings and industry to lower energy use, in constructing denser cities to reduce vehicle miles traveled, and in other activities to lower greenhouse gas emissions.

Apprenticeship programs in the construction trades can either be joint (i.e., a partnership between a local union and the employers with whom it has collective bargaining contracts) or unilateral (i.e., run solely by the employer[s] in a nonunion work environment). For the past five years, 89 percent of graduates of state-certified apprenticeship programs were from joint programs, and only 11 percent were from unilateral programs.¹⁰ Programs are mostly funded by the private construction industry; in the case of Joint Apprenticeship and Training Committee (JATC) programs, contractors and workers each make small payments for every hour worked that are deposited in a training trust fund. The state government helps fund the classroom portion of the training, which is administered by the community college system and carried out by each apprenticeship's local public educational partner.

Requirements for the attainment of the journey-card credential vary by trade. For the electrical apprenticeship, for example, the *minimum* state requirements are 8,000 hours of on-the-job training, 640 hours of classroom learning, and competency tests for each



level of advancement.¹¹ In practice, programs often exceed this minimum; for example, all IBEW apprenticeship programs in California require between 800 and 900 hours of classroom training.¹²

The yearly number of openings in each apprenticeship program is determined according to the current labor contracts of each local union and to expectations about future work. Such demand-driven training ensures that people are trained only if jobs exist for them; unions will not sponsor new apprentices unless there will be enough work for them to finish their three- to five-year training program. Apprenticeship openings, therefore, tend to track cycles in the construction sector,¹³ with the number of program openings increasing only when the construction industry expands or unions' share of it grows. By limiting the number of new slots to the capacity of the unionized construction sector, this model avoids the common problem of low job placement rates that training program graduates sometimes face.¹⁴

Apprenticeship provides clear benefits to workers, and in the unionized construction trades, is one of few pathways to a middle-class career for workers without a college degree.¹⁵ Apprentices receive the same health, pension, and other benefits as journey-level workers, and their training is free. During an apprenticeship, workers receive pay increases on a periodic basis as they acquire new skills, and upon graduation, they obtain their journey card and receive journey-level wages.¹⁶ For example, first-year apprentices in the Ironworkers start at \$18.00 per hour plus benefits; after completion of their four-year apprentice program, they will be paid the journey wage, currently \$36.00 per hour.¹⁷ Apprentice wages vary by trade and sometimes by county. Across all apprenticeships, workers who complete an apprenticeship see an average lifetime earnings gain of almost \$270,000. This is a greater income premium than community college.¹⁸ The programs also provide a clear safety benefit: apprenticeship includes comprehensive safety training, and construction workers are less likely to experience injuries¹⁹ in an occupation that has very high injury rates and the highest number of fatalities of all industries in California.²⁰

Employers also benefit from apprenticeship programs. Because of these direct, strategic investments in their workforce, employers are able to access skilled workers and upgrade their skills quickly as technologies change. Joint apprenticeship programs also have been shown to retain skilled workers amid the ups and downs of an extremely cyclical industry.²¹ These advantages lead to substantial employer investment in apprenticeship programs, one of the key factors in their success.

Although the main emphasis of the apprenticeship system is to deliver foundational training for the skilled construction trades, it also provides infrastructure for the other two critical phases of training: incumbent worker skill upgrades, and pipelines for inclusion. Journeypersons currently working in the skilled trades are periodically required to participate in "journey-upgrade" programs, which rely upon the same curriculum



committees and trainers as the apprenticeship system. Similarly, many programs also are closely linked with pre-apprenticeship programs aimed at preparing workers from disadvantaged backgrounds to participate and succeed in apprenticeship training. These additional components of the apprenticeship system will be addressed in the corresponding sections below.

Outcome Data from CWDB

In the 2018 Workforce Metrics Dashboard Report, the California Workforce Development Board (CWDB) evaluated the workforce development outcomes of state-certified apprenticeship programs, administered by the Department of Industrial Relations—Division of Apprenticeship Standards (DIR-DAS). This data shows that as of April 2017, state-certified apprenticeship programs were actively serving 74,221 registered apprentices. Sixty-three percent of these participants were people of color, 6 percent were women, and 5 percent were military veterans. These figures reveal the increasing racial diversity since program year 2014-15, when 59 percent of participants were people of color. In recent years, apprenticeship programs have expanded to include new occupations, but the great majority of program participants are still in the skilled construction trades.

The Workforce Metrics Dashboard reports that 86 percent of graduates of the apprenticeship program in 2015, the year of the most recent data on graduation rates, were employed as wage earners one year after finishing the program with an average annual wage of \$82,156.²² Graduates of apprenticeship had the highest median annual wages of all programs assessed in the Workforce Metrics Dashboard.

2. California Community Colleges

The California Community College system is the nation's largest higher education system, with 114 community colleges serving 2.1 million students annually.²³ This network of institutions is tasked with four main objectives: providing basic technical skills education leading to industry certification; supporting transfer to four-year colleges; aiding economic development by responding to labor market needs; and offering continuing education for incumbent workers. The vast array of roles that community colleges play is an enormous state asset.

Community colleges in California serve a wide range of populations, from recent high school graduates wishing to obtain their first two years of 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. The community college system is the primary system providing higher education opportunities for low-income youth, immigrant youth, and people of color. In the fall semester of 2017,



the community colleges served more than 1 million students of color, who made up 73 percent of the students system-wide.²⁴ Community colleges also serve as the main pipeline for inclusion of students from disadvantaged communities into professional occupations through their transfer programs into the California State University system and the University of California. Sixty percent of California State University and 30 percent of University of California graduates are community college transfers. California community colleges also have a long history of serving incarcerated and formerly incarcerated students through regular and long-distance education. Current efforts to assist the state's incarcerated and formerly incarcerated population are the result of two key laws: Senate Bill 1391 (Chapter 695, Statutes of 2014) and The Public Safety and Rehabilitation Act of 2016 (Proposition 57, 2016). Twenty-two community colleges provide instruction and support services to more than 7,000 inmates within California's 35 prisons.²⁵

Community colleges play multiple roles in workforce training. The bulk of their programming focuses on providing foundational training, education, and industry certification to students preparing to start their careers. The community college system provides one- or two-year terminal credentials in technical occupations, as well as two-year associate degrees. Roughly 1.4 million of the students are enrolled annually in Career Technical Education (CTE) certificate programs.

Community colleges also administer the publicly funded classroom portion of state-certified apprenticeship programs, which are required to have a local educational partner. The colleges also facilitate student internships and work-based learning programs with employers. True to the word "community," the colleges work with community-based organizations, charitable foundations, and local workforce development boards to remove barriers to entry for disadvantaged populations. Finally, contract education programs provide training for incumbent workers through partnerships with specific employers, which are funded by the employers themselves, collectively bargained training funds, and the state's incumbent worker training program administered by the Employment Training Panel (ETP).

Outcome Data from CWDB

The CWDB's 2018 Workforce Metrics Dashboard Report also evaluated the workforce development outcomes of the California Community College system, limiting their analysis to the system's CTE programs, as opposed to their transfer programs to four-year colleges or the other programming they offer. These roughly 200 CTE programs integrate academic knowledge with technical and occupation specific skills, across many occupations.

As with the analysis of the state-certified apprenticeship programs, three key metrics consist of graduation rates, as measured by certificate attainment; post-exit employment



rates; and post-exit wages, measured one year after exiting the program.²⁶ In program year 2014-15, CTE programs served 228,299 exiting participants. Among these exiting participants, 19,299 (8.5 percent) received Chancellor's Office-approved certificates, an associate degree, and/or a California Community College bachelor's degree. The remaining 209,000 (91.5 percent) exited without receiving official certification, though they may have obtained an accredited industry certification or achieved some other educational goal (known internally as "skill builders"). Among all the exiting participants, 66 percent were earning a wage four quarters after exiting the program.

As with state-certified apprenticeship programs, those who completed certification fared better in terms of post-exit employment as well as wages. The differences, however, are much smaller: 71.8 percent of those who attained a certificate were earning wages four quarters after exit, while 65.9 percent of those who did not achieve certification were employed. The median annual wage for certificate earners was \$33,420 and for non-earners, \$30,672. Very large numbers of community college students complete programs in occupations that are lower wage than construction, such as general business, retail, and hospitality. The lower returns from community college education compared with apprenticeship should thus not be interpreted as an apples-to-apples comparison.

3. Four-Year Colleges and Universities

California's colleges and universities are key to training workers in professional occupations that are critical to addressing climate change and achieving the state's climate targets. This robust education infrastructure includes numerous academic departments in engineering, architecture, transportation planning, agriculture, forestry and natural resources, and other key departments. Also critical are research centers at the University of California (e.g., the UC Davis Lighting Technology Center, the UC transportation research centers, and the UCLA Smart Grid Energy Research Center), which not only carry out research on technology, but also train the next generation of specialized engineers and planners.

In the professional occupations, particularly the key technical occupations related to clean energy and transportation, there are clear career paths with requirements for licenses to practice, based on industry-recognized educational credentials, on-the-job-training, and competency exams. For example, in order to obtain a license to practice, an architect must not only attain an educational degree, but also pass a competency exam and work a specified number of on-the-job hours under a licensed architect. To maintain their credentials, most professional workers must obtain continuing education credits, so there is a built-in mechanism to upgrade skills. These are middle- and upper-middle-class jobs, with significant returns on training and earnings clearly correlated with training.



There are of course significant barriers for gaining access to professional education and careers for disadvantaged students, but also important efforts to overcome these barriers. The community college system functions as a pipeline through its transfer programs, and California's public universities have developed specific outreach programs to support high school students from low-income backgrounds and under-performing schools.

IV. Using California's Workforce Development Infrastructure for the Carbon-Neutrality Transition

How well is the state leveraging these core postsecondary institutions to prepare workers—especially disadvantaged workers—for good jobs in the transition to carbon-neutrality? To optimize investments of public funds, the state's primary workforce education and training institutions need to break down silos. While some collaboration occurs across institutional lines, apprenticeship programs, community colleges, workforce development boards, community-based organizations, and public agencies do not always operate as a comprehensive workforce development system serving the California economy as a whole, and, more specifically, the industries critical to decarbonization. This section analyzes the effectiveness of this infrastructure in:

- Providing pipelines for workers from disadvantaged communities into career-training pathways and family-supporting jobs;
- Ensuring that the next generation of workers in key occupations needed to lower greenhouse gas emissions are trained in the most advanced theory and practice; and
- Upgrading the skills of incumbent workers to prepare them for the transition to a carbon-neutral economy.

The following section addresses the steps that the state's workforce development system and training and education institutions have taken to execute these functions, document best practices, and identify gaps. The summary of recommendations pinpoints key opportunities for further state action to bring best practices to scale and develop a comprehensive strategy to best undertake workforce preparation for the carbon-neutrality transition.



A. Entry-Level Inclusion: Strengthening Pathways to Family Supporting Careers for Disadvantaged Workers

The state is committed to ensuring the inclusion of all Californians in the economic opportunities created by climate policy, which is made explicit in the Scoping Plan.²⁷ The removal of barriers for workers from disadvantaged communities not only contributes to equity, but also increases the pool of trained workers to execute climate change mitigation and adaptation work and the diversity of that pool. Career access, advancement, and mobility improve the efficiency of the labor market by ensuring workers have the opportunities to provide their highest value.

The inclusion of workers from historically marginalized communities will not occur without intentional intervention, as persistent trends in the labor market continue to produce significant wage inequality across racial, ethnic, and gender lines. Connecting disadvantaged workers with career-track jobs requires specific efforts to overcome challenges on both the demand and supply sides of the labor market. On the demand side, addressed in Chapter 2, it is critical to ensure that jobs are accessible to disadvantaged workers and provide living wages and advancement opportunities. On the supply side, discussed here, it is critical to prepare workers so that they can take advantage of job opportunities when they arise. The success of inclusion programs should be measured by their ability to place graduates in career-track jobs with family-supporting wages and benefits, or to provide access to further training that offers entry into such jobs.

Building pathways to these career tracks will require targeted strategies specific to each occupation type: skilled construction trades and other apprenticed occupations; other technical and white-collar occupations served largely by the community colleges; and professional occupations. The state's core postsecondary educational and training institutions currently provide a variety of pipeline programs that can form the bedrock of efforts to increase inclusion into key occupations for the transition to a carbon-neutral economy, including professional occupations in engineering and architecture, and technical and blue-collar occupations such as facility managers, electricians, transit workers, mechanics, water and waste workers and others. See Appendix A, Mapping Sectors to Industries and Occupations, for a list of key occupations that are in industries that have key roles in reducing greenhouse gas emissions reductions.

Niche training programs to promote inclusion in the “green economy,” however compelling on paper, do not offer a comprehensive approach to workforce development. Inclusion efforts affixed only to specialized tasks in a particular industry or sector shortchange both workers and employers; in contrast, foundational skills training helps workers perform a broader array of tasks and more readily adapt to technological



advances. At the entry level for any careers, foundational skills must precede the acquisition of specialized skills. For example, an apprentice electrician must learn the basics of electricity before learning the particulars of solar energy, and a future engineer must have foundational STEM education before learning about energy efficiency.

Most work critical to a carbon-neutral economy is undertaken as an element of existing jobs. Pipeline efforts will thus be more successful as part of the state's existing workforce development programs that provide comprehensive training for high-quality careers, rather than as stand-alone programs where workers learn a narrow set of skills. It will be much cheaper and more effective to integrate bridges and pathways into existing broad curricula, rather than creating or expanding stand-alone “green” training programs.

Inclusion efforts can create pathways for unemployed adults or workers trapped in low-wage jobs, as well as high-school-to-career transitions. Targeting students still in high school can place young people from disadvantaged communities on a better career trajectory. Efforts underway in the community colleges, four-year colleges, and certified apprenticeship system to create greater opportunities for a smooth transition from high school to further education and careers are addressed below.

To target unemployed or low-wage adult workers, successful inclusion training programs require deep engagement with workers—providing career matching, screening, and other support, as well as integrated skills training that includes technical training, basic skills, and job readiness for each industry. A significant body of work has assessed how workforce development strategies can build pathways out of poverty. Much of this literature focuses on the construction industry but the lessons are applicable to other sectors involved in the carbon-neutral economy.²⁸ The CPUC Needs Assessment reviewed this work and describes the following elements as critical to building successful pipelines for inclusion.²⁹

- Extensive outreach, recruitment, and screening of candidates;
- Training for basic skills and entry-level technical skills;
- Effective adult learning strategies, including contextualized learning (for example, math in the context of construction blueprint reading), cohort-based bridge programs (to help create support networks for workers who have been long detached from training and education), and schedule accommodations for working adults and parents;
- Supports such as training and mentoring for life and soft skills, career counseling, and case management;
- A comprehensive package of services, such as transportation and child care assistance, driver's license acquisition, and other supports, many of which can be provided through other public funding; and
- On-the-job training or other workplace-based learning.



Reaching deep into the community to recruit workers may require specialized organizations that can find and orient new workers, help them identify the most appropriate training programs, prepare them for entry into these programs, and support their retention. At-risk youth, veterans, the formerly incarcerated, women in nontraditional occupations, and other groups all face specific barriers and may require tailored supports and programs, in addition to the strategies listed above.

For workers facing added barriers to employment, an increased level of support may be needed for successful completion of pre-apprenticeship or other pipeline programs. The following examination of efforts to assist formerly incarcerated Californians in the labor market illustrates this point. This population is of critical focus right now due to the large numbers of Californians who are being or will be released due to criminal justice reform and the greater awareness of the challenges that re-entry workers face.

Addressing the Challenge of Reentry: Efforts to Promote Employment for Formerly Incarcerated Californians

Criminal justice reform has accelerated in California in recent years, decreasing the state's prison population by approximately 24 percent, or 42,300 people, since its high point in 2006. As the result of a federal court order requiring California to reduce its prison population, the state embarked on a number of interlocking initiatives. The Public Safety Realignment Initiative, AB 109 (Chapter 15, Statutes of 2011), began housing new nonviolent, nonserious offenders in county jails. Proposition 36 (passed in 2012) and Proposition 47 (passed in 2014) further reduced the prison population, while also addressing jail overcrowding. These reforms raise the question of how California will reintegrate this population into the state's economy.

People with past criminal convictions face many barriers to employment, particularly access to stable jobs that pay a living wage. Research has shown that a criminal record lowers the likelihood of a callback from a job interview by more than 50 percent, with an even lower callback rate for African Americans with criminal convictions.³⁰ Nationwide, 60 to 75 percent of re-entering citizens lack employment for up to one year following their release.³¹ Those who do find employment following incarceration tend to be concentrated in low-wage industries, with one longitudinal study finding previous incarceration to be associated with a 20-percent decrease in future wages.³²

California faces one of the nation's highest rates of recidivism, with an average of 61 percent of formerly incarcerated individuals falling back into a cycle of re-offense and conviction.³³ A 2008 national study by the Urban Institute found that controlling for other factors, employment reduced the likelihood of recidivism by nearly half. Furthermore, the study found that higher wages reduce the likelihood of recidivism even more, with an hourly wage of \$10 or more decreasing the likelihood of recidivism down to just 8 percent, nearly three times lower than the 23 percent rate for people without employment.³⁴



In California, policy interventions have moved toward removing barriers to employment faced by formerly incarcerated individuals. In 2017, for example, the state legislature passed the California Fair Chance Act, one of the strongest “Ban the Box” laws in the country, which prevents public- and private-sector employers from asking about an applicant’s criminal record until after a conditional offer of employment has been made.³⁵ A 2018 report by Californians for Safety and Justice found that one in five Californians (an estimated eight million people) are still living with an old criminal conviction, and face over 4,800 laws that impose collateral consequences long after successful completion of a sentence that make it harder for people to rebuild their lives. Their survey found that 76 percent of Californians with a criminal conviction have experienced a barrier to success, including 46 percent who experienced difficulty finding a job, and 35 percent who experienced difficulty in obtaining an occupational license.

California releases approximately 36,000 people from the state prison each year, a portion of whom have received in-prison job-training rehabilitative services such as Career Technical Education (CTE) or have participated in programs operated by the California Prison Industry Authority (CalPIA). Concurrently, California manages federal Workforce Innovation and Opportunity Act (WIOA) funds through its State Workforce Plan developed by the California Workforce Development Board, and implemented by Local Workforce Development Boards (Local Boards) in 14 regions across the state.

While there is some, often informal, coordination between these two systems there is no formal, sustained, and systemic, relationship between them. Various re-entry and workforce programs have been created to target this population, and while these programs have provided good data and lessons learned, an ongoing marriage of the two systems is needed to better integrate services operating in isolation, and to fill gaps and provide holistic and long-term outcomes to reduce recidivism.

Formed in late 2017, the Corrections Workforce Partnership Agreement is intended to strengthen linkages between the workforce and corrections systems in order to improve the process by which formerly incarcerated and justice-involved³⁶ individuals re-enter society and the labor force. The Prison to Employment Initiative Grant Program was included in the 2018-19 State Budget and provides \$37 million over three years to operationalize integration of workforce and re-entry services in the state’s 14 labor regions. The goal is to improve labor market outcomes by creating a systemic and ongoing partnership between rehabilitative programs within California Department of Corrections and Rehabilitation (CDCR) and the state workforce system by bringing CDCR under the policy umbrella of the State Workforce Plan.

The CWDB has issued Regional and Local Planning Guidance through WSD18-01 spelling out new planning requirements on how Local Boards and Regional Planning Units (RPUs) will partner with Community Based Organizations (CBOs), CDCR contracted re-entry service providers, and representatives of Parole and Probation to



provide seamless, integrated services to this population in each of the 14 RPUs. RPUs are being encouraged to build on existing regional partnerships, including existing Community Corrections Partnerships (CCPs) to develop a comprehensive regional vision and plan for successfully integrating the formerly incarcerated and other justice-involved individuals into the labor market.

The State of California has recently increased its investments in pre-apprenticeship for disadvantaged populations, including the formerly incarcerated (in addition to federal WIOA dollars), this is addressed below in Section IV.A.1. The following promising example illustrates the strength of pre-apprenticeship programs as a vehicle for formerly incarcerated individuals to find career-track jobs that help to break the cycle of trauma and re-offense. The transition to a carbon-neutral economy provides the state with an opportunity to expand pathways to high-quality employment for this population.

PROMISING PRACTICE #3.1

Flintridge Center's Apprenticeship Preparation Program for Formerly-Incarcerated Workers

The Flintridge Center's Apprenticeship Preparation Program (APP), serving Los Angeles County, is one of a dozen pilot pre-apprenticeship programs supported by the CWDB with funding from the California Clean Energy Jobs Act (Proposition 39, 2012), and one of four with a focus on formerly incarcerated women.³⁷ The program provides a 12-week course offered three times per year that prepares participants for success in union apprenticeship programs in the building and construction trades.

The APP includes the Multi-Craft Core Curriculum (MC3) of North America's Building Trades Unions (NABTU), hands-on training at Habitat for Humanity construction sites, and a pathway into high-quality careers in union apprenticeship programs. The MC3, required by state law for construction pre-apprenticeship programs, provides basic training designed to prepare workers for any construction trade and to help

participants determine which trade is the best fit, thus increasing long-term retention.

The program also includes "wrap-around" supportive services, both in class—in the form of life-skills workshops—as well as out of class, in connections to childcare and housing assistance, tool and boot provision, record expungement, or drug and alcohol counseling. Workers get jobs in the skilled construction trades, such as electricians, carpenters, and sheet metal workers. The success of Flintridge's model can be seen in the key metric of recidivism: of the participants served in 2016, 94 percent have not become re-incarcerated, compared with 54 percent of formerly incarcerated individuals within Los Angeles County.

Flintridge's APP utilizes an innovative, trauma-informed approach to address challenges facing participants outside the classroom and to



promote success. This approach includes a focus on holistic recovery by incorporating components on fitness, nutrition, peer learning, collaborative skill building, and creative expression. The trainers themselves have experienced incarceration and act as mentors to participants. This kind of peer education is a key element of success according to project participants and is somewhat unique in programs serving the re-entry population.

These comprehensive approaches are paired with support in contacting and entering apprenticeship

programs with local unions. Specifically, Flintridge works with the Los Angeles and Orange Counties Building and Construction Trades Council to match program participants with slots in joint apprenticeship programs working on projects governed by local hiring laws and project labor agreements.

The Apprenticeship Preparation Program at Flintridge is funded by the CWDB, the City of Pasadena, private foundations, corporate sponsors such as Capital Group, and individual donors.

Best Practices and Scaling

Flintridge's model addresses two critical components of successful pre-apprenticeship programs:

1. Providing deep supportive services, offered by trusted mentors and teachers, that help participants overcome challenges related to poverty, mental health, and in this case, the specific challenges of re-entry after incarceration; and
2. Addressing employment barriers by directly connecting participants to family-supporting, career-track jobs as union apprentices, through a partnership with the local building trades council.

The program's interventions are aimed at treating sources of trauma as well as preparing individuals for greater success as they navigate the challenges of obtaining work, balancing life responsibilities, and addressing conflicts. Recently, the Employment Development Department (EDD) encouraged Flintridge staff to develop proposals for incorporating their best practices into the California Department of Corrections and Rehabilitation prison employment programs. The best practices highlighted above have been lifted up in the CWDB Annual Reports on Prop 39 Pre-Apprenticeship, and are included in the CWDB SB1 Workforce Guidelines, a set of 10 standards that the state believes should be met by any construction pre-apprenticeship partnership.³⁸ These practices and standards inform the CWDB High Road Construction Careers initiative, and could inform related RFPs from any state grant-making agency. Getting to scale requires a simple formula: a high-functioning pre-apprenticeship partnership connected to both the building trades and the agencies and resources with specific expertise in serving a justice-involved population. This is a virtuous circle that engages ex-offenders in the project of building new lives—and California's carbon-neutral future.



1. Pipelines into Skilled Construction Trades: Apprenticeship Preparation Programs

California has developed a robust model for apprenticeship preparation in the construction trades. Pre-apprenticeship programs using this model have proven track records for improving access to state-certified apprenticeship for workers from disadvantaged backgrounds and communities. They create a pipeline into apprenticeship for workers who have not been given the guidance and support necessary to successfully apply for entry on their own, who lack job readiness and other basic academic or construction skills, or who face other barriers. Once in an apprenticeship program, workers are on an earn-while-you-learn training pathway, and their wages rise as they acquire new skills.

In the past, the state did not have clear standards for pre-apprenticeship programs, and it had a very mixed track record in terms of placing participants into state-certified apprenticeships or good jobs in the construction industry. For example, during the American Recovery and Reinvestment Act (ARRA) period, some California Energy Commission (CEC) funded programs that were named pre-apprenticeship had little connection to state-certified apprenticeship programs and poor placement records.³⁹

In recent years, key elements of success and standard curricula have been identified by the federal Department of Labor, California's Division of Apprenticeship Standards, and the California Workforce Development Board. These elements have been incorporated as requirements for funding in competitive solicitations issued by the state, and training completion and placement rates have improved accordingly. A standard requirement in these solicitations is the use of the Multi-Craft Core Curriculum (MC3), which exposes students to multiple trades and helps them find the best fit, while providing basic construction skills, general job readiness skills, construction math, and occupational safety and health training. Another requirement is that the local building trades council is a named sponsor of the pre-apprenticeship training programs and could in some cases assume the role of articulating the training with apprenticeship programs of multiple trades in their local region. Perhaps the most significant innovation is the CWDB emphasis on building *partnerships* rather than programs, where training projects link labor, community, education, and the public sector in a joint effort to deliver successful pre-apprenticeship recruitment, training, and placement.

These elements were first explicitly incorporated in the pre-apprenticeship program funded with Prop. 39 funds for energy retrofits in California schools, as described in Chapter 6. Program outcome data have shown superior performance; the twelve pilot programs had average training completion rates of 83 percent and placement rates of 65 percent.⁴⁰ These programs all used the MC3 and included a partnership with the local building trades council among other entities. Other partners varied, but usually included



a community-based organization with deep ties to targeted workers, as well as local workforce boards and educational institutions (namely, adult high schools and community colleges). While funding for pre-apprenticeship under Prop. 39 training program has been exhausted, the same model of high-road pre-apprenticeship is now being developed for workforce investment with funding from the Road Repair & Accountability Act (Senate Bill 1, 2017). Funding in SB 1 includes \$25 million to the CWDB to develop pre-apprenticeship partnerships for disadvantaged job seekers, providing pipelines into construction careers.⁴¹ These pre-apprenticeship programs must use the MC3, coordinate with local state-certified apprenticeship programs, and include recruitment and retention strategies for women, minority populations, formerly incarcerated individuals, and disadvantaged youth. Pursuant to this legislation, the California Workforce Development Board has also developed guidelines for public agencies receiving funds to participate in, invest in, or partner with new or existing pre-apprenticeship training programs. The CWDB's SB 1 Workforce Guidelines establish ten standards for quality pre-apprenticeship, and are relevant to construction pre-apprenticeship writ-large.⁴² See **Promising Practice #6.2: Pre-Apprenticeship Programs for Structured Pathways Into Apprenticeship**, in Chapter 6.

2. Pipelines into Technical and Family-Supporting Blue-Collar Occupations

As described above, apprenticeship offers the best structure in which to link inclusion programs because the-earn-while-you-learn model provides paid work as part of its training program. This is one of the main reasons why community colleges and other institutions are trying to expand apprenticeship to non-construction occupations. Apprenticeships are being developed for several important low-carbon occupations, including zero-emission vehicle mechanics and water utility workers.

A number of other programs initiated by employers, unions, community colleges, and community-based organizations have also developed for blue-collar and technical occupations that are engaged in the transition to carbon neutrality. For example, LA Trade Tech has offered utility line worker training for women and weatherization training, both in partnership with the Los Angeles Department of Water and Power. New initiatives include a partnership being developed by the community colleges with the Transformative Climate Communities (TCC) program—a comprehensive emission reduction and community revitalization initiative funded by the Greenhouse Gas Reduction Fund (GGRF)—to analyze where pipeline programs could be developed by the community colleges to serve the economic development projects funded by the TCC.

Again, success depends on developing the deep engagement and supports needed by workers from disadvantaged communities or those with particular barriers to employment



as well as on a strong connection to jobs, which usually requires a partnership with employers and/or unions when relevant. A new initiative funded by the CWDB—the High Road Training Partnership, which has supported incumbent worker training via labor-management training partnerships—offers promising inclusion programs, precisely because employers are partners, and training always starts with the jobs. See Section IV.C for a discussion of the H RTP initiative.

3. Pipelines into Professional Occupations

Finally, broadening access to economic opportunities that emerge from the growth of low-carbon sectors should not exclude efforts to broaden inclusion in jobs that require bachelor's or graduate degrees. For professional occupations that require further postsecondary education, inclusion efforts are most successful when linked to preparation in high school, as it is much more difficult to create paths to higher education after workers have been detached from school for long periods of time. Efforts are underway to build successful school-to-career transition in both community colleges and four-year institutions. The existing initiatives include the California Partnership Academies (CPA),⁴³ the California Linked Learning Initiative,⁴⁴ and the California Career Pathways Trust.⁴⁵ Each of these inter-linked initiatives promote college and career readiness for students in low-income communities by integrating rigorous academics with career-based learning and real-world workplace experiences. Funding to improve inclusion into professional and technical occupations related to the transition to carbon neutrality should contribute to these existing initiatives.

For many disadvantaged Californians, the community college system is itself a pipeline into professional occupations. Robust remedial education is available to support students that come to community college with basic education deficits. Transfer programs from community colleges to colleges and universities that offer bachelor's and graduate degrees is a fundamental part of the state's educational strategy. For programs targeting students who will transfer to four-year colleges, specialized programs customized to critical occupations for the carbon neutrality transition are not needed because students at the community college level are still gaining their foundational knowledge—specialized training occurs later. Building on this essential premise, community college efforts for inclusion cut across all programs for all occupations, as described below, rather than remaining isolated in niche programs designed only to address greenhouse gas emission reductions.



PROMISING PRACTICE #3.2

Approaches for Systemic Inclusion Efforts: The Community College System

In 2018, the California Community Colleges' Chancellor and Board of Governors approved a new "Vision for Success" to be implemented by all 114 community colleges.⁴⁶ This mandate specifically addresses California's equity gap and provides a roadmap for educational achievement and entry into living wage jobs within underserved populations. Two of the Vision's six core tenets are:

- Reduce equity gaps across graduation, transfer to four-year institutions, and entry into a job within the student's field of study through faster improvements among traditionally underrepresented student groups, with the goal of cutting achievement gaps by 40 percent within five years and fully closing those achievement gaps within 10 years. \$140 million annually is invested by the community colleges in the Student Equity Allocations program in addition to individual college investments in the success of underserved populations.⁴⁷
- Reduce regional achievement gaps across all of the above measures through faster improvements among colleges located in regions with the lowest educational attainment of adults, with the ultimate goal of fully closing regional achievement gaps within 10 years. Strong Workforce Program funds of more than \$200 million are invested by the Community College System annually in regional best practice programs for Career Technical Education.⁴⁸ This amount is additive to the annual apportionment received by the colleges.

Also in 2018, the legislature revised the California Community Colleges' apportionment formula to require that 40 percent of a community college's annual

funding be based on achieving progress toward the "Vision for Success." This performance incentive, which takes effect in 2020, is a major departure from the prior practice of funding based on the number of full-time equivalent students and is already impacting the way students from underserved populations are recruited and supported.

Underserved populations are supported through the community colleges' Guided Pathways program, which offers career exploration and planning, provides student support services, and assists in student completion through streamlined programs structures and proven success strategies like the cohort model.⁴⁹ Further development of Guided Pathways now creates meta-majors within related fields of study, offering students a career "lattice" that allows credit transfer across programs and enables students to seamlessly shift their education strategy as their career goals evolve. For example, a student starting in an electrician program can shift to carpentry, if so desired, and retain many course credits in the transition.

Guided Pathways also creates new career resiliency through "stackable credentials" within the pathway. This feature enables the student to earn industry-recognized and accredited certifications in multiple related competencies, broadening transferable skills that are valuable during down-cycles in the economy.

Significant funding linking K-12 students to community college programs also was approved by the legislature in 2018. This funding creates an infrastructure that facilitates early career decisions, enables more students to complete community college courses while in high school, and reduces the length of time for students to enter a living wage job.



B. Foundational Education and Training for the Future Workforce: Incorporating New Knowledge and Skills

Most skilled workers across the economy complete some form of postsecondary education as their foundational education before they embark on or change their career. This period of intense training shapes their knowledge and skills for many years to come. Ensuring that they acquire the training needed for the low-carbon transition for each field of study and associated occupation is essential to the state's climate efforts. All fields of study undergo change as the skill needs of employers evolve, and the state's training and education institutions have processes in place to update curricula over time.

1. Training for Skilled Construction Trades

Apprenticeship programs continually respond to employers' changing needs because employers sit on the apprenticeship curricula committees that determine what is taught. They also pay for training via their contributions to the training trust fund. This close relationship between industry need and training facilitates the incorporation of new knowledge and skills that are required as new technologies are adopted. Apprenticeship programs that are linked to employers at the cutting edge of low-emission, high-efficiency practices thus have an immediate mechanism to update curricula regularly.

However, it is risky for apprenticeship programs to invest in training for new technologies that have yet to broadly penetrate the market. For emerging technologies that the state is trying to promote through research and development funds, subsidies, and other policies, there is a parallel need for funding curriculum enhancements and training of instructors. The agencies that serve as hubs of emerging and best practice low-emission technologies may have an interest in lowering this risk in order to help apprenticeship programs respond quickly to advancing technological change.

Employers who use apprenticeship are good targets as early adopters in efforts to promote low-emission technologies in their sectors. The advantage of working with employers that have state-certified apprenticeship programs is that these companies 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 professionalized workforce. Thus, public or ratepayer funding would be matched by significant private funding.

Over the past several years, the Investor Owned Utility Workforce Education and Training (IOU WE&T) team has collaborated in training instructors of sheet metal workers, carpenters, and stationary engineers to introduce, expand, and enhance energy efficiency content in their apprentice and journey-level worker training programs. These



collaborations have included customizing existing IOU classes for delivery to a specific audience, training trainers on building-envelope testing equipment, and providing educational materials on energy efficiency for instructors to customize and integrate into their training programs.

2. Training for Technical Occupations

Training for technical occupations that do not require a four-year degree is largely carried out in the community college system. While the community colleges do not rely on the strong contractual training partnerships with employers that exist in the apprenticeship system, they are strengthening industry advisory councils for their low-carbon initiatives. Many of these advisory councils have been in place for years at the state and regional level, informing ongoing curriculum development via subject-matter experts, donating lab equipment, providing work experience for students, and delivering professional development training for faculty. Leading-edge curriculum developed by industry associations is frequently offered at free or reduced licensing rates, allowing the colleges to continuously respond to evolving industry needs.

In order to prepare workers with the most advanced skills and knowledge needed to help achieve emission reductions goals, continued investments are necessary for curriculum upgrades at the primary institutions providing their foundational training and education. Community colleges require an intense internal process to incorporate new skills and knowledge through regular faculty curriculum review. Recent process designs through Lean Six Sigma techniques⁵⁰ and other evidence-based methods have significantly streamlined and shortened approval cycles. In some cases, cycle time has been reduced by two-thirds, while in other cases entire levels of review have been eliminated.

To further increase the system's speed and responsiveness, the "Doing What Matters" initiative from the Community Colleges' Chancellor's Office has developed deep industry partnerships and "Guided Pathways" in 10 key growth sectors, designed to train students in skills needed by employers at the regional level.⁵¹ The community college system employs a statewide "sector navigator" and regional deputy navigators for each sector. These staff members are responsible for liaising with employers to develop training partnerships, identify skill gaps, and connect graduates of the appropriate programs to job opportunities. Two of the sectors with sector navigators directly related to the carbon neutrality transition are the Advanced Transportation and Logistics Initiative and the Energy, Construction, and Utilities Initiative. Thirteen sector team members are assigned to connect industry priorities with community college programs, secure funding to develop responsive workforce initiatives, and support the colleges' implementation of those initiatives. Supporting these teams is a statewide network of labor market researchers and a constellation of industry advisory councils. More than 60 of the 114 community colleges are currently participating in these sector-based low-carbon initiatives.



Advanced Transportation and Logistics (ATL, formerly, the Clean Energy and Transportation Initiative/Advanced Transportation and Renewable Energy, CETI/ATRL) comprises a series of training programs aimed at developing skills for workers to go on to jobs in various branches of advanced clean transportation.⁵² Programs include training on electric, hybrid, and hydrogen fuel cells; gaseous fuel for heavy-duty vehicles; and photovoltaic, concentrated solar, geothermal, and wind energy technologies. Funding from the California Energy Commission (CEC) has allowed ATL staff to develop high school outreach and bridge programs to recruit students.

The Energy, Construction, and Utilities Initiative provides training for workers aiming to find careers in a wide range of fields, including as HVACR technicians, building operators, energy auditors, facility managers, automation and control technicians, workers in construction trades focused on residential and nonunion markets, and building energy systems professionals.⁵³ Hands-on courses train students to design, install, measure, operate, maintain, and analyze HVACR, lighting control, and building envelope systems in residential and nonresidential buildings to increase energy efficiency. Statewide professional development programs have trained faculty in Title 24 code changes as well as the occupations critical to energy efficiency noted above; funds from Prop. 39 have provided \$5 million annually to support the initiative.

3. Training for Professional Occupations

Academic departments at four-year colleges and universities have a process for curriculum review and revision that is largely led by faculty and accrediting bodies. Academic programs preparing graduates for professional occupations relevant to the carbon neutrality transition are predominantly in a variety of engineering and information technology fields but also include architecture, transportation planning, and construction management. These programs provide students with foundational knowledge upon which employers in energy, transportation, and other climate change sectors can build through on-the-job training.

In order to enhance the skills of these workers to help achieve emission reductions goals, continued investments are necessary for curriculum upgrades at the primary institutions providing their foundational training and education. Two assets are critical here. First, the close ties to professional associations in a particular field help keep faculty abreast of advancements in knowledge. Second, in the case of the University of California system, the existence of research centers, some funded by the state agencies in charge of climate policy implementation, creates a hub for emerging technologies and a source of new knowledge that can be incorporated into curricula. See for example the California Lighting Technology Center at UC Davis, discussed in **Promising Practice #3.4**.⁵⁴



C. Incumbent Worker Training: Upgrading the Skills of the Existing Workforce

Once workers are in the workforce, employer engagement is critical for successful efforts to upgrade incumbent workers' skills. Employers' willingness to support worker training differs by industry and by occupation, creating opportunities and challenges for the state's efforts to facilitate incumbent worker training. The state should concentrate on collaborating with employers who have demonstrated commitment to ongoing investments in training, so public support builds from already-acquired skills and leverages industry investments in training.⁵⁵

For the skilled construction trades and other occupations where state-certified apprenticeship programs exist, the vested interest of employers who already participate and pay for apprenticeship facilitates their involvement in upgrade training, as well. For professional workers, a requirement for continuing education exists in most occupations, and the depth of foundational training facilitates both continual learning and an expectation of keeping up with changes in the field.

Incumbent worker training is more challenging in businesses that cannot rely on either the apprenticeship system or structured continuing education. For blue-collar and technical occupations in these businesses, there are some existing industry partnerships that can be leveraged and opportunities to create more industry-led partnerships can be explored. Examples of this work follow.

One model that could be expanded is the CWDB High Road Training Partnership (H RTP) initiative, which since 2017 has funded eight industry partnerships that all include incumbent worker training in sectors relevant to the transition to carbon neutrality. High-road training partnerships bring together industry leaders from management and labor in key industries and regions to identify skill needs and other shared problems. In response, staff representing relevant public resources—from community colleges and high schools to workforce boards and state agencies—work together to develop training and skill programs directly relevant to the industry and its workforce. Job quality is central to the CWDB High Road Training Partnership initiative, designed to simultaneously improve income mobility, address environmental challenges and resilience, and build skills for California's best employers. This initiative defines high road employers as firms that compete based on quality of product and service achieved through investment in human capital and can thus generate family-supporting jobs where workers have agency and voice in their worksite.⁵⁶ The H RTP initiative provides funding for the development of industry-based, worker-focused training partnerships to build skills for California's high-road employers in key climate sectors other than construction, including transit, building services, and logistics.

One example in the initial group of grantees is the Green Janitors training program, which has resulted in energy savings in commercial buildings at very low cost.



PROMISING PRACTICE #3.3

Green Janitors Education Program

The Green Janitors Education Program (GJEP) is a significant example of unions, community groups, and industry working together to advance the skills of incumbent workers to help them contribute to the transition to a carbon-neutral economy. Often overlooked as a climate mitigation resource, janitors are the frontline staff to keep buildings operating in the most low-emission way possible. GJEP trains janitors to be partners in energy efficiency efforts within buildings, as well as providing them with nontoxic products for cleaning. Since its start in 2014, this labor-management partnership has improved the lives of low-wage workers, while also helping them be more effective at implementing emission reduction strategies.⁵⁷

The program consists of a 30-hour curriculum and, to date, has trained nearly 600 janitors who work in buildings throughout Los Angeles, San Diego, and Orange counties. Janitors learn about the benefits of using green cleaning products instead of more toxic substances. They also learn about the importance of efficiency in electricity and water usage and how to recognize and respond to leaks or other wasteful practices.

In buildings that are certified to the green building standards in the Leadership in Energy and Environmental Design (LEED) certification program or are in the process of becoming certified, GJEP helps janitors actively participate in the LEED goals, with an emphasis on energy efficiency and building health. Prior to this program, most janitors had received no training in sustainable procedures and materials or the methods they could use to reduce energy and water consumption.

Between 2013 and 2016, 76 percent of buildings where GJEP was implemented saw a decrease in energy and water usage.⁵⁸ These buildings used

5.6 percent less energy on average in 2016 than non-GJEP buildings. In addition, water usage declined in 76 percent of buildings where the training program was implemented.

GJEP also helps janitors learn about recycling and compost practices that are newly required of many building owners as part of the Zero Waste goals of the City of Los Angeles and in statewide recycling and composting mandates. The training benefits building owners and tenants, as there are financial benefits for compliance with more stringent recycling and composting policies designed by the city. This training will also improve waste diversion rates and therefore emission reductions.

The program is a partnership that includes the U.S. Green Building Council-Los Angeles chapter, the Building Owners and Managers Association of Greater Los Angeles, the Service Employees International Union–United Service Workers West (SEIU-USWW), and the Building Skills Partnership. The Building Skills Partnership (BSP) is a nonprofit collaboration between SEIU-USWW, commercial building owners, janitorial employers, client companies, and community leaders. Its mission to improve the quality of life for low-wage property service workers and their families by increasing their skills, access to education, and opportunities for career and community advancement.⁵⁹

BSP is one of the first cohort of grantees in the CWDB High Road Training Partnership initiative, which is allowing it to expand to northern California. BSP was chosen because it links workforce innovation to regional challenges of job quality, economic mobility, and environmental sustainability.⁶⁰ The program has also been incorporated into the Los Angeles Mayor's Sustainability Plan.



In addition to the H RTP initiative, the state's Employment Training Panel (ETP), funded through a small addition to payroll taxes and other specific appropriations, has annual funds typically ranging between \$60 million to \$100 million to reimburse companies for incumbent worker training in California.⁶¹ ETP has funded a number of incumbent worker trainings for emerging technologies in advanced transportation, including low-emission transit fleet vehicle conversion efforts focusing on servicing and repair. It has also funded incumbent worker upgrade training in building systems and industrial energy efficiency. ETP funding has helped labor-management joint apprenticeship programs in the skilled construction trades add modules, in both their apprenticeships and their journey-upgrade programs, to incorporate cutting-edge technologies essential to the transition to carbon neutrality. These include the training programs developed by IBEW-NECA for advanced lighting controls, electric vehicle charging stations, energy storage, and microgrids. All have partnerships with community colleges. ETP complements and aligns with the H RTP initiative: H RTP provides initial funding for partnership development. Once formed, these partnerships can then also apply for training funds from the ETP.

The community colleges maintain an Upskill California network of 23 colleges that engage exclusively in incumbent worker training. An example is Chaffey College's InTech Center in Fontana which trains incumbent workers in industrial electricity, mechanical systems, automation and controls, and HVAC. This self-sustaining facility contracts with employers to fund worker upskill programs, using ETP funds where appropriate. Regional employers comprise the InTech Center Advisory Council, investing in worker training, building out the center's facilities, guiding curriculum, and providing adjunct instructors. Similar programs and industry relationships exist throughout the Upskill California network.

1. Upgrading Skilled Construction Trades

Because apprentices are put on the job as soon as they enter the training program, apprenticeship by definition addresses incumbent worker training. The capacity of the apprenticeship system to quickly adapt to changes in skill needs in an industry is especially valuable for fourth- and fifth-year apprentices who are close to mastering their trade.

Apprenticeship also provides valuable infrastructure for incumbent workers in the construction trades, namely, journeypersons. This journey-upgrade training is usually provided at no cost to workers, as it is paid for through the training trust that funds the apprenticeship program. Journey-upgrade programs that are developed for emerging technologies are then eventually incorporated into the main apprenticeship programs. A number of journey-upgrade programs have been developed to prepare workers installing key emission-reducing technologies.



PROMISING PRACTICE #3.4

The California Advanced Lighting Controls Training Program (CALCTP)

One acclaimed example of workforce training to support emission reductions in the energy sector is the California Advanced Lighting Controls Training Program (CALCTP). CALCTP is a statewide initiative aimed at upgrading the skills of currently employed electricians. The program builds on existing skills by training and certifying C-10 licensed electrical contractors and state-certified general electricians in the proper way to program, test, install, commission, and maintain advanced lighting control systems. 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. The program encourages the expanded use of existing technologies, such as dimmers and occupancy sensors, while also proactively developing the skills necessary to install and maintain emerging technologies, such as photo-sensors, relay modules, and communication-based control devices. Improving upon the installation and maintenance practices of this incumbent workforce has the potential to dramatically improve energy efficiency in commercial buildings across the state, helping California achieve its energy efficiency and emission reduction goals.

The CALCTP program is a model industry partnership, because it brings together employers, government agencies, community colleges, and labor organizations to develop training curriculum and infrastructure to meet the workforce needs of the advanced lighting control sector as a whole. Partners include utilities such as PG&E and the Sacramento Municipal Utility District; research institutions such as the California Lighting Technology Center at UC Davis; the industry association, the National Electrical Manufacturers Association (NECA); and the union that

represents electricians, the International Brotherhood of Electrical Workers (IBEW). This partnership began as the utilities and other agencies charged with improving energy efficiency in the state—as well as researchers, employers, and the electricians union in the lighting controls sector—identified workforce issues as a significant impediment to the adoption of advanced lighting controls.

This program also is integrated into the apprenticeship infrastructure, so pipelines for entry-level workers are already in place, and apprenticeship connections with pre-apprenticeship programs ensure inclusion of people from low-income communities. For this reason a certification, which sometimes is seen as a barrier to entry for historically marginalized groups, actually expands opportunities by being part of a full training pipeline from entry-level to advanced.

The missing piece of this model certification program is that it has not at the time of writing been incorporated as a requirement in utility incentive programs for advanced lighting. Returns on the large private investment made by NECA and its union partner will not be realized without policy to help create demand for electricians who know how to properly install this emerging and very promising technology.

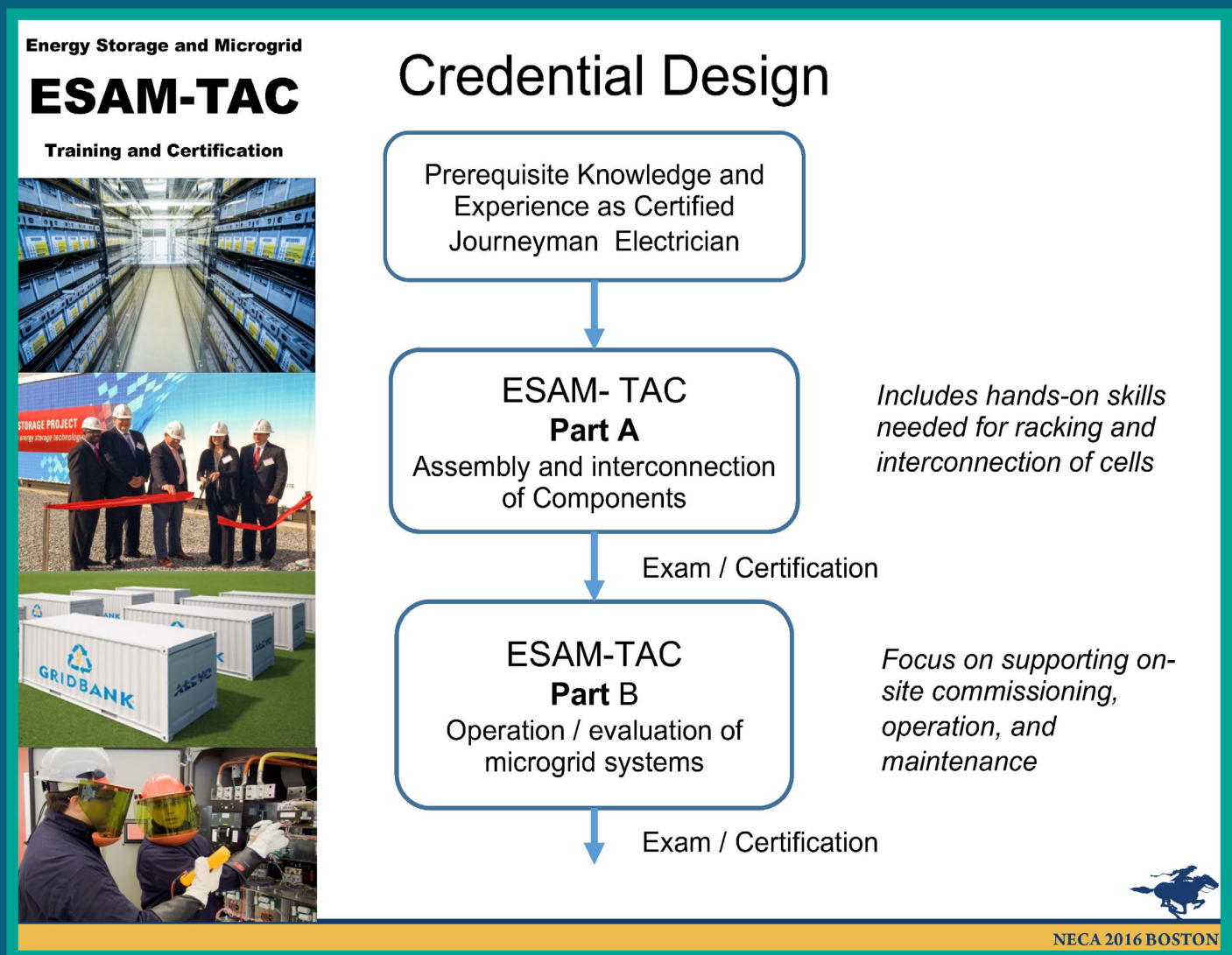
The CALCTP industry training model has been replicated for electric vehicle charging stations, where the same partners have created an upgrade certification—the Electrical Vehicle Infrastructure Training Program (EVITP)—for electricians installing charging stations. Here, policy has supported this investment in training: the CPUC issued a decision that workers installing any utility-owned charging station have to be certified with EVITP to help ensure



proper installation and safety. The industry partnership has also developed the ESAM-TAC training and certification program for battery and microgrid installation, again building upon the foundational knowledge of electricians and creating a credential for advanced emission-reducing technologies that is industry recognized and validated by a third party, in this case the Electric Power Research Institute (EPRI). Community colleges were involved in the initiation of

CALCTP as an alternative site for this training and also are involved in EVITP and ESAM-TAC.

The strength of these skill certification initiatives is their ability to respond to clear demand for skills in the marketplace, which is facilitated when industry-recognized certifications exist in the market or in government programs to incentivize advanced, clean technologies.



2. Upgrading Technical Occupations

Industry partnerships are essential for incumbent worker training for occupations not requiring a four-year degree, but they do not exist in many industries. As described earlier, intermediaries often play a role in convening employers and developing industry partnerships. These intermediaries can be workforce development and training institutions, including community colleges, and are also often nonprofit organizations and unions.

3. Upgrading Professional Occupations

Continuing education and professional development for professional occupations are linked closely to professional organizations, graduate programs, and university research centers in engineering and other key fields that are relevant to climate change mitigation. As with upgrading curricula in degree programs, there are well-developed mechanisms in place for skill upgrades for professional workers, mostly through incentives or mandates for continuing education to keep professional standing or obtain promotions. This infrastructure has been used and could be expanded upon by state agencies and bodies involved in promoting emerging emission-reducing technologies.

One gap noted by a number of experts is the need for continuing education for public agency professional staff who are charged more and more with managing systems to lower greenhouse gas emissions. For example, transportation researchers pointed out that local or regional transportation managers have limited access to training and capacity building in emerging systems design that can lower vehicle miles traveled (VMT). Professional development for professional staff in often budget-strapped and atomized public agencies that impact VMT is an opportunity that could be addressed through a competitive solicitation process as described in the recommendations below.

V. Summary and Recommendations

The State of California is in an excellent position to leverage its training and education infrastructure to provide employers in the carbon-neutral economy with a skilled workforce, while concurrently preparing workers for pathways into family-supporting, career-track jobs. The supply-side workforce development recommendations outlined here are critical, but work best in tandem with the demand-side strategies outlined in Chapter 2. Unless there is demand for skilled workers, in the form of real jobs with actual employers, graduates of training programs will not get jobs, and unless the jobs created are good jobs, workers will not benefit from training.



In order to prepare California’s workforce for the transition to a carbon-neutral economy, state investments in education and training should seek to influence the skill development of a broad set of workers whose actions impact greenhouse gas emissions, rather than to train a specific number of workers solely on specialized “low-carbon” tasks. These workers often are not specialized “low-carbon” workers nor do they think of themselves as such. For example, architects and HVAC workers both have a significant impact on the energy use in buildings, but may not have the specific energy efficiency training needed to incorporate best practices into their work. Investment in ongoing training to develop and upgrade the knowledge, skills, and abilities (KSAs) of workers in key occupations related to greenhouse gas emissions is therefore needed. In this context, the most effective and strategic investments in training incorporate KSAs pertinent to climate change mitigation into the broader skill sets of workers in the prominent occupations.

The above analysis highlighted the robust infrastructure that the state has for workforce development in its community college, certified apprenticeship, and public university systems. It presented how these institutions support foundational postsecondary training for the next generation of workers in the key occupations critical to the transition to a carbon-neutral economy. It showed the role these institutions can play in broadening access to career-training pathways and jobs for workers from disadvantaged communities, as well as their role in upgrading the skills of the incumbent workforce. The three phases of training—including pipeline training for workers from disadvantaged communities for entry-level jobs or further training, incumbent worker training, and postsecondary training and education in the state’s core institutions of community colleges, state-certified apprenticeship, and four-year colleges—all must be a part of the necessary adaptations within the workforce development system as the economy transitions.

Crucially and in summary, investments in training should:

1. Support and enhance existing programs in California’s key workforce development institutions, so that they can respond to the needed changes, instead of building new training programs specifically for new clean technologies.
2. Fund comprehensive training that prepares workers for careers, rather than niche programs that train on one particular “green” skill or “green” technology.

Funding already exists for many of the initiatives recommended below. Ratepayer funds for the Electric Program Investment Charge (EPIC) and IOU energy efficiency programs both already fund training, but the funding could be better deployed with this



clear strategic vision for skill development. Pipeline training for the skilled construction trades has been available from Prop. 39 and will soon be available from SB 1. Instead of each specific climate program funding its training program, funding should support and enhance existing programs. A number of agencies responsible for implementing climate policy also have training funds. The challenge is to align these funds and avoid duplication and further fragmentation of training for California's workers.

Specific recommendations include the following:

1. Redirect and align funding for industry-led incumbent worker training.

State investments stand to make the greatest immediate impact by focusing on training workers already employed in the key occupations of the transition to a carbon-neutral economy. Employer engagement in training of incumbent workers is critical. For the professional occupations, continuing education that already is embedded in licensing or credential renewal may be sufficient; for blue-collar and technical workers, high-road training partnerships provide a model for successful incumbent worker training.

Funding is currently available from a variety of sources, including the CWDB, the ETP, the California Energy Commission, Caltrans, the community colleges, EPIC, the IOU workforce education and training budget, and other agencies involved in climate policy implementation; efforts should be made to align this funding and support industry partnerships as described below. **Funding from climate agencies should not be used to create new programs divorced from the state's existing training institutions.**

1a. Support high-road industry training partnerships.

The CWDB High Road Training Partnership (H RTP) initiative should serve as a model for expanded funding for industry partnerships in key industries in each of the Scoping Plan sectors.⁶²

State training investments stand to make the greatest immediate impact on skill delivery by focusing on training workers already employed in the key occupations of the transition to a carbon-neutral economy. Industry partnerships are essential for training incumbent workers and can also improve inclusion of disadvantaged workers in entry-level jobs. H RTP can serve as a model for an expanded initiative that could include apprenticeship programs, labor-management partnerships, and other industry-based, worker focused training initiatives in key industries. These initiatives and partnerships can deliver skills to accelerate the adoption of emission-reducing technologies. In addition, they can provide a structure in which to engage and protect workers and find collaborative solutions as technological change and/or climate policies cause large disruptions to or even elimination of certain jobs.



There are numerous opportunities for expansion of high road training partnerships in industries critical to achieving California's climate targets. As discussed in the sector chapters, examples of possible high-road training partnerships include: fire prevention jobs in California's forests and wildlands, where an expanded workforce is needed because of increased fire risk; occupations engaged in pollution abatement and process improvements in refineries; occupations involved in waste diversion activities, which are required due to more stringent waste diversion mandates; emerging water conservation programs in the state's water utilities; and occupations involved in methane capture in dairies and waste facilities due to new mandates on emissions with high global warming potential.

1b. Support existing apprenticeship programs and, where conditions are favorable, create new apprenticeship programs.

State-certified apprenticeship is one form of a high-road industry training partnership and is the gold standard in training for occupations that do not require a four-year college degree. Apprenticeship has the following advantages: it is industry driven and funded, provides high returns and no debt to workers through its earn-while-you-learn model, delivers broad skills needed by employers that lead to mastery of a trade or occupation, uses both classroom and on-the-job training, leads to wage increases as skills are acquired, and calibrates the number of training slots to the number of available jobs.⁶³ Governor Newsom has championed the expansion of apprenticeship, and the State Workforce Plan includes a commitment to significantly increase the number of apprentices in California.⁶⁴

New apprenticeship programs are in development in the manufacturing of zero-emission buses as well as in transit operations and vehicle repair and maintenance. In occupations where apprenticeship programs already exist or where there are willing employers who wish to initiate new programs, public funding for training should support these existing or new apprenticeship programs.

2. Redirect and align funding for a statewide strategy for pipeline programs to expand inclusion of disadvantaged workers into family-supporting career-track jobs in the low-carbon economy.

California's commitment to inclusion requires specific interventions that can reach all occupations critical to the carbon neutrality transition. All inclusion programs should include the following elements: 1) comprehensive services that include entry-level skills training and a suite of supports, mentoring, and wrap-around services tailored to targeted



populations; and 2) explicit connections to family-supporting jobs through specific commitments from employers or other proven avenues to job placement or entry into further career training that leads to placement in family-supporting careers.⁶⁵ Inclusion programs are needed in a variety of high-road occupations that already generate family-supporting jobs. They should not be developed for low-wage jobs unless coupled with strategies to make the low-wage jobs better or create ladders from low-wage to good jobs. As with incumbent worker training, funding from climate agencies should not be used to create new programs divorced from the state's existing training institutions.

2a. Support a statewide initiative for pre-apprenticeship for construction careers.

Support for pre-apprenticeship is critical to improving inclusion in the skilled construction trades. Any investments related to pre-apprenticeship should connect to, align with, or feed into the emerging statewide infrastructure that is being modeled by the CWDB High Road Construction Careers (HRCC) initiative. This initiative is developing a statewide pre-apprenticeship strategy that links to all state and local agencies that award public works contracts.⁶⁶ Pre-apprenticeship programs should not be developed to prepare workers for only projects in particular climate programs, but rather increase access to high-quality career pathways in construction.

The CWDB has identified and implemented successful practices that connect disadvantaged Californians to middle-class construction careers and can be scaled up for public works across California. The know-how and existing infrastructure for apprenticeship and pre-apprenticeship can be harnessed efficiently to align with climate investments.⁶⁷ Funding from disparate sources, currently administered by a variety of agencies, could be consolidated to support and expand the HRCC network of coordinated regional pre-apprenticeship partnerships. In order to ensure calibration between the number of pre-apprenticeship training slots and the number of job openings at a regional level, the consolidated funding stream could be governed by an interagency collaboration between CWDB, DIR-DAS, the community colleges Chancellor's Office, and agencies administering California Climate Investments (CCI).

2b. Support inclusion programs for technical and blue-collar jobs via high-road training partnerships.

There are a set of jobs critical to the carbon neutrality transition that do not require a four-year college degree and are not already linked to apprenticeship programs, but still offer important opportunities for inclusion programs. The high-road training partnerships described above for incumbent worker training are also a vehicle for pipeline programs. These collaborations can include partnerships with organizations that can provide the comprehensive supports needed for workers from disadvantaged groups so that a



qualified applicant pool is developed. One significant opportunity for creating inclusive pipelines is in water and energy utilities, where the existence of good jobs and an aging workforce present ideal conditions for inclusion policies. Other strategies designed to improve jobs while reducing emissions, such as initiatives to reform contracting processes so that they include strong labor and environmental standards, can also incorporate inclusion programs to ensure that as wages rise, opportunities for historically excluded groups are expanded. A key industry in this category is waste, where reform of contracting models is necessary to achieve the more stringent targets for waste diversion. Jobs in fire prevention and forest management in the Department of Forestry and Fire Protection also offer opportunities for inclusion through insourcing of work that is now contracted out and through the expansion of pipeline programs.

2c. Support inclusion programs for professional clean economy jobs.

A commitment to broaden access to economic opportunities that emerge from the growth of industries advancing carbon neutrality should also focus on inclusion into jobs that require bachelor's or graduate degrees, such as engineers, architects, and other professional and technical workers. For these jobs, inclusion efforts are most successful when linked to preparation in high school, as it is much more difficult to create such pathways after workers leave school. The California Partnership Academies, the California Linked Learning Initiative, and the California Career Pathways Trust all are recent initiatives, designed to build successful high-school-to-college transitions for California's many underserved youth, which can eventually lead into critical occupations related to climate mitigation and adaptation. The community college system, via its transfer programs, is itself a pipeline for many disadvantaged Californians into professional occupations.⁶⁸

Students must first gain their foundational knowledge before getting specialized training and should be exposed to as wide a variety of viable career paths as feasible during this phase of their education. Funding to improve inclusion into professional and technical occupations related to the carbon neutrality transition should contribute to these existing initiatives, rather than initiate new ones that focus only on climate-critical occupations.

3. Support curriculum upgrades and teacher training for emerging technologies in occupations critical to the low-carbon transition.

To prepare the next generation of energy engineers, electricians, zero-emission bus mechanics, transportation planners, and all the other priority occupations that are necessary to develop, design, plan, build, operate, and maintain new technologies that lower greenhouse gas emissions, the state should support the incorporation of



new relevant skills and knowledge in the existing key institutions that already provide foundational training for priority occupations. In this effort, the state should support curriculum upgrades and instructor professional development in apprenticeship programs, community colleges, and four-year colleges.

For training incumbent workers and educating the new generation of workers to embark on their careers in key climate-related occupations, continuing analysis of skill gaps is needed and should be done in collaboration with high-road industry partnerships. For emerging technologies, identifying the need for skill upgrades should be a component of the state's various strategies to encourage accelerated adoption of new cleaner technologies, as described in Chapter 2.

4. Track outcomes of all training programs.

To evaluate and improve training investments over time, all training programs should track workforce outcomes for the participants of publicly funded training programs. Methods of data collection and analysis, as well as the resources to support them, need to be identified and implemented before any field investments are made. Key metrics include not only number of enrollees and number of graduates, but also attainment of industry-recognized credential, job placement, job retention, initial wages and wage mobility over time. In addition, resources could be devoted to the challenging but valuable work of tracking the benefits to employers in increased productivity and quality. Requiring tracking at any level of training, from entry level to incumbent worker training, is essential to improve training over time and direct training investments towards the best outcomes for workers. The state should also continue to invest in third-party studies and evaluations that assess the broad, integrated, social and economic impact of workforce partnerships, considering the costs and value of building a high road training infrastructure that addresses both climate and equity concerns, and measuring broader community outcomes in addition to individual labor market advancement.



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