

Appendix E

Workforce Planning Analysis Documentation

The following summary was developed by BW Research for the Air District to inform the Workforce Planning analysis discussion in the PCAP.



MEMORANDUM

To: Bay Area Air Quality Management District
From: BW Research Partnership
Date: February 12, 2024
Re: Workforce Assessment PCAP Submission

INTRODUCTION

This memorandum summarizes the workforce planning assessment conducted by BW Research Partnership in support of the Bay Area Air Quality Management District’s (BAAQMD’s) Priority Climate Action Plan (PCAP). This memo:

- Forecasts workforce needs for Residential Building Decarbonization and Mobility Hub activities within the region;
- Identifies key occupations and skills;
- Surfaces opportunities for residents of frontline communities;
- Discusses job quality and high road approaches underway;
- Highlights relevant organizations and initiatives that are complementary to, and already engaged in, work that supports the activities outlined in the Measures.

The memo concludes with a discussion of the strengths, weaknesses, opportunities, and threats to the region’s workforce as it seeks to support the Measures and related activities.

The building decarbonization and mobility hub measures being led by BAAQMD will create good jobs in growing clean energy sectors that can be filled by residents of the region. Meeting the demand for these jobs with a supply of qualified and trained workers, pulled from all areas within the region, will require a commitment to partnership and learning from many different stakeholders and a willingness to invest in equitable workforce development activities over the long run.





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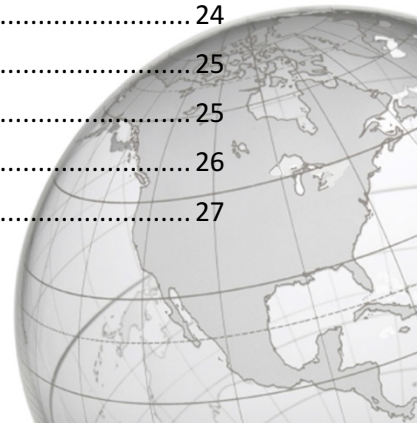
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FORECAST OF LABOR DEMAND AND SKILLS IN NEED

Five Priority Occupations

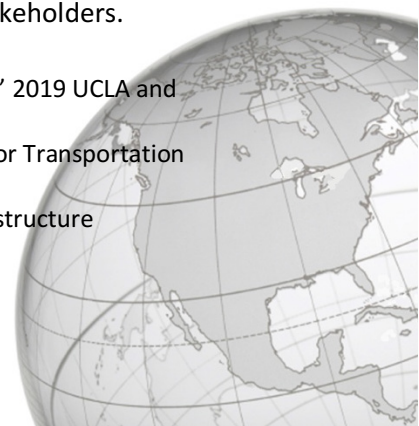
A review of literature^{1 2} and interviews with building decarbonization and transportation experts surfaces five occupations that are crucial to the successful deployment of the proposed Residential Building Decarbonization and Mobility Hub Measures. Although these are not the only occupations that will be in-demand through these activities, they are at greatest risk of supply shortages driven by the Measures and similar initiatives in the region. These occupations also often require specialized skills or certifications, meaning that supply cannot be “ramped up” immediately. A sustained shortage of these workers would greatly hinder the success of the detailed Measures. For the remainder of this report, these five occupations are referred to as the “priority occupations”. The five occupations are:

- **Electricians** install, maintain, and repair electrical wiring, equipment, and fixtures.
- **Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers** install or repair heating, central air conditioning, HVAC, or refrigeration systems, including oil burners, hot-air furnaces, and heating stoves.
- **Plumbers and Pipefitters** assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases.
- **Construction Laborers** perform tasks involving physical labor at construction sites.
- **Carpenters** construct, erect, install, or repair structures and fixtures made of wood and comparable materials, such as concrete forms; building frameworks, including partitions, joists, studding, and rafters; and wood stairways, window and door frames, and hardwood floors.

For the remainder of this memorandum, these five occupations are referred to as “priority occupations” that are likely to see the greatest increase in demand through the Residential Building Decarbonization and Mobility Hub measures identified. Based on the typical attributes of these jobs including wages, benefits, training needed, and access to training pathways, the increase in demand for these occupations provides a significant opportunity to create and maintain high road jobs throughout the Bay Area. By focusing workforce development on these occupations, BAAQMD and its partners can maximize the funding resources available and streamline engagement with critical stakeholders.

¹ “CALIFORNIA BUILDING DECARBONIZATION WORKFORCE NEEDS AND RECOMMENDATIONS.” 2019 UCLA and Inclusive Economics. <https://innovation.luskin.ucla.edu/california-building-decarbonization/>

² “Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)” 2023 San Jose State University and Mineta Transportation Institute. <https://transweb.sjsu.edu/research/2227-California-Climate-Action-Plan-Transportation-Infrastructure>





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Key Occupations by Measure – Residential Building Decarbonization

The occupations at greatest risk for supply shortage for residential building decarbonization activities are primarily 1) Electricians, 2) Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers, and 3) Plumbers and Pipefitters.³ Although there are thousands of workers currently working in these occupations across the Bay Area, their concentration in the region is lower than the national average (Location Quotient), meaning that these occupations make up a smaller share of the Bay Area workforce than they do for the broader country (Table 1). For example, the concentration of HVAC/R Mechanics and Installers is 14% lower in the Bay Area than the national average. Therefore, the additional occupational demand spurred by these building decarbonization measures will need to be met from a smaller-than-average pool of workers.

The median hourly wages for all priority occupations exceed the regional median wage of \$36.10/hour for all priority occupations and offer living wages⁴ for single adults with no dependents as well as family sustaining wages for households of four with two working parents.⁵ It is important to note that the current residential building decarbonization market is largely comprised of low road contractors, which means that wages may be on the lower end of the distribution highlighted below in Table 1. While the 25th percentile of wages for each of these occupations still earn more than the living wage for a single adult in the Bay Area, introducing workforce standards—such as those highlighted in the Residential Building Decarbonization measure—can help ensure that workers receive higher wages and have higher rates of access to benefits.

Table 1. Top Occupations for Residential Building Decarbonization Measure 2023⁶

	Total Employment	Location Quotient	25th Percentile Wage	Median Hourly Wage
Electricians	13,417	0.93	\$29.77	\$41.60
Plumbers, Pipefitters, and Steamfitters	8,039	0.88	\$30.19	\$38.24
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	6,677	0.86	\$27.46	\$36.40

³ “CALIFORNIA BUILDING DECARBONIZATION WORKFORCE NEEDS AND RECOMMENDATIONS.” 2019 UCLA and Inclusive Economics

⁴ Living wages—unlike the federal poverty line—include regionally-specific costs, such as housing, healthcare, and transportation, and therefore provide a more local perspective of economic well-being.

⁵ MIT Living Wage Calculator. <https://livingwage.mit.edu/metros/41860>

⁶ Data from JobsEQ. 2023Q4.





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Key Occupations by Measure – Mobility Hubs

Similar to the Residential Building Decarbonization priority occupations, there are thousands of workers throughout the Bay Area economy who are already working in the priority occupations for Mobility Hubs. The occupations most needed for Mobility Hubs—primarily through the development of the infrastructure needed to support these hubs—are 1) Construction Laborers, 2) Carpenters, and 3) Electricians.⁷ Electricians and Carpenters both offer median hourly wages that are higher than the regional median wage of \$36.10/hour for all jobs (Table 2). Importantly, same as above, these jobs also offer living wages⁸ for single adults with no dependents as well as family sustaining wages for households with two working parents (Construction Laborer median wages do not meet family sustaining wage criteria).⁹ It is also important to note that the concentration of Construction Laborers, is the lowest of the five priority occupations, at about 20% lower in the Bay Area than the national average (Location Quotient).

Table 2. Top Occupations for Mobility Hubs Measure 2023¹⁰

	Total Employment	Location Quotient	25 th Percentile Wage	Median Hourly Wage
Electricians	13,417	0.93	\$29.77	\$41.60
Carpenters	21,263	1.20	\$30.32	\$37.84
Construction Laborers	21,496	0.80	\$23.99	\$30.04

Projected Demand and Gap Analysis

Modeling the precise employment impacts of the proposed Measures would require detailed cost estimates or a detailed quantification of specific activities, neither of which were available at the time of writing this memorandum. The proposed Measures also align closely with existing regional goals for building decarbonization and transportation improvements, and the scale of these regional goals far exceed the workforce demands that would be imposed purely through the Measures. Given that neither

⁷ “Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)” 2023 San Jose State University and Mineta Transportation Institute

⁸ Living wages—unlike the federal poverty line—include regionally-specific costs, such as housing, healthcare, and transportation, and therefore provide a more local perspective of economic well-being.

⁹ MIT Living Wage Calculator. <https://livingwage.mit.edu/metros/41860>

¹⁰ Data from JobsEQ. 2023Q4.





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workforce demands would occur in isolation, **the workforce estimates below forecast the total employment needed for the broader regional goals**, which provide an ‘umbrella’ of activities which include the activities outlined within the Measures. Accordingly, the below estimates should be understood as regional demand according to broader goals and policies beyond the Measures, but that include activities like those outlined in the Measures. This information can be useful in devising regional workforce strategies that identify industry-wide workforce needs beyond a specific Measure or initiative, hopefully allowing for coordination of workforce development efforts across programs and initiatives to support programmatic efficiency and effectiveness.

Residential Building Decarbonization

An economic impact analysis for the decarbonization of all relevant residential buildings in the Bay Area¹¹ conducted by Inclusive Economics¹² found that between 10,300 and 15,900 workers¹³ working full-time on building decarbonization would be needed throughout the Bay Area for 25 years to fully electrify and decarbonize the entire residential building stock to meet net-zero GHG emissions by 2045.

This analysis concluded that the workers would be needed immediately to ensure that overall residential decarbonization goals were met on time, and that this work would be available over an entire 25-year career. This also means that, for every year that the residential building decarbonization workforce does not achieve its annual capacity goal, the more decarbonization activity will have to be squeezed into the remaining years.

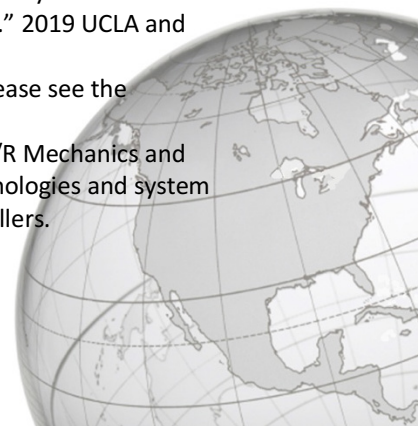
Using Inclusive Economics’ original trade-level research, an estimated 4,900 HVAC/R Mechanics and Installers will be needed for the remaining 21 years to 2045, representing a sizable 73% of the workers currently employed across the entire occupation.¹⁴ Put another way, 4,900 HVAC/R Mechanics and Installers would have 21-year long careers working full-time on residential building decarbonization in the Bay Area. In contrast, the number of HVAC/R Mechanics and Installers in the Bay Area only increased by 11% between 2017 and 2023, suggesting training and education pipelines will need significant support to attract and train this number of workers. Electricians are also poised to see

¹¹ Throughout this report, the Bay Area is defined to include Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Solano, and Sonoma Counties. Santa Clara County is omitted from the workforce analyses.

¹² “CALIFORNIA BUILDING DECARBONIZATION WORKFORCE NEEDS AND RECOMMENDATIONS.” 2019 UCLA and Inclusive Economics

¹³ Original calculations were adjusted to remove Santa Clara County. For more information, please see the appendix section.

¹⁴ These estimates are “total” workers needed, which is agnostic to the total number of HVAC/R Mechanics and Installers currently working on residential building decarbonization. Innovations in HVAC technologies and system designs (i.e. in-window systems) may put downward demand for HVAC/R Mechanics and Installers.





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substantial demand increase through Residential Building Decarbonization—amounting to 12% of the current number employed today (Table 3).

Table 3. Occupation Projections for Residential Building Decarbonization

Occupation	Total Employment 2023Q3 ¹⁵	Historical Employment Growth (2017-2023) ¹⁶	Workers Needed from 2024 Through 2045 ¹⁷	Share of full-time worker relative to 2023
Electricians	13,417	19.3%	1,650	12%
Plumbers, Pipefitters, and Steamfitters	8,039	-3.4%	450	6%
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	6,677	11.2%	4,900	65%

Improving Regional Transportation

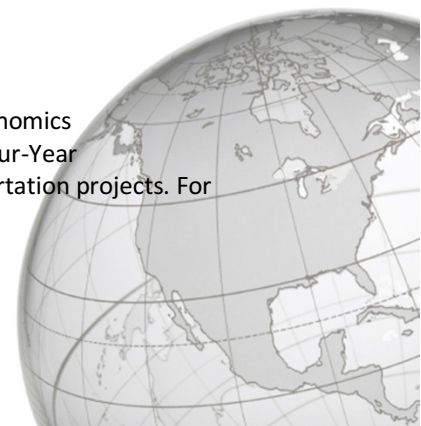
A report on the economic impacts of California’s Climate Action Plan for Transportation Infrastructure shows that Construction Laborers, Carpenters, and Electricians will be in highest demand through the types of activities outlined in the Metropolitan Transportation Commission’s 2023 Transportation Improvement Plan (TIP). The 2023 TIP contains a range of transit and mobility activities, some of which include the activities outlined in the Mobility Hub Measure. An estimated additional 870 Construction Laborers, 630 Carpenters, and 540 Electricians are projected to be needed annually to support the TIP’s activities throughout the Bay Area through 2030 (Table 4).¹⁸ While this does not equate to a substantially higher growth rate in additional jobs, the context of historical job growth—particularly for Carpenters—highlights the need to reinforce training and career pathway entry points for these occupations.

¹⁵ Data from JobsEQ. 2023Q4.

¹⁶ Data from JobsEQ. 2023Q4.

¹⁷ “San Francisco Bay Area Residential Building Decarbonization Jobs Estimates.” Inclusive Economics

¹⁸ CAPTI figures were proportioned to the Metropolitan Transportation Commission’s 2023 Four-Year Transportation Improvement Program that includes local, state, and federally-funded transportation projects. For more information, please see the appendix section.





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Table 4. Occupation Projections for Transportation Improvements

Occupation	Total Employment 2023Q3 ¹⁹	Historical Employment Growth (2017-2023) ²⁰	Additional Workers Needed from (2024 Through 2030) ²¹	Growth Rate From 2023
Electricians	13,417	19.3%	540	4%
Carpenters	21,263	-4.2%	630	3%
Construction Laborers	21,496	8.9%	870	4%

One additional consideration is that neither Measure will be implemented within a vacuum. As California’s housing crisis continues, the need to build more housing will continue to increase. Many occupations that support the two Measures are also key occupations within the new housing construction industry. Furthermore, other infrastructure projects and initiatives—ranging from climate resiliency projects to ports and clean energy generation and transmission—are already underway or will be during the time of implementation of these two Measures. These types of projects will also require many of the same occupations as housing construction and broader infrastructure.

The additional workforce demands for the same priority occupations will place additional strain on the talent pipelines and support systems highlighted throughout this memo. This will require increased coordination and planning across industries and the workforce ecosystem, especially including employers and worker organizations such as unions. It also underlines the importance of moving quickly on the funding and other programmatic recommendations highlighted in this memo.

Key Skills and Education

The priority occupations for both Measures overwhelmingly do not require a four-year degree. Between 78% and 84% of workers currently in these occupations do not have a four-year degree. This is in stark contrast to the Bay Area average for all workers, where 42% have at least a four-year degree. These data make it clear that the occupations created through these Measures create good-paying jobs (Table 1 & Table 2) without extensive educational requirements (Figure 1).

¹⁹ Data from JobsEQ. 2023Q4.

²⁰ Data from JobsEQ. 2023Q4.

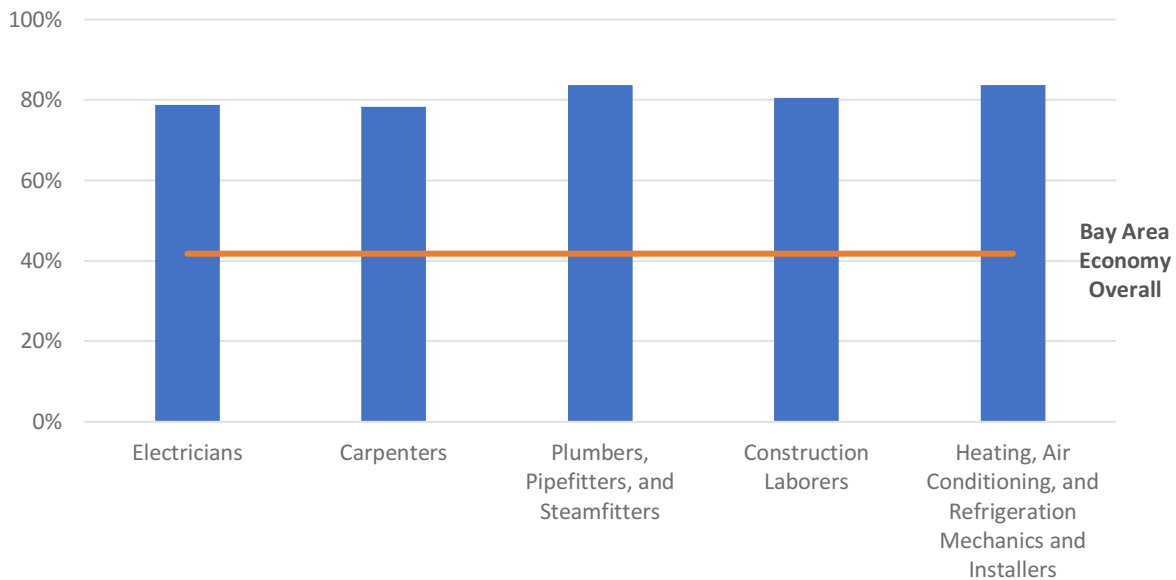
²¹ “Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)” 2023 San Jose State University and Mineta Transportation Institute





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Figure 1. Share of Workers With Less Than Four-Year Education By Occupation²²



O*NET—a free online database supported by the US Department of Labor/Employment and Training Administration—lists the top Knowledge, Skills, and Attributes needed for specific occupations. Many of the top Knowledge, Skills, and Abilities are shared across the priority measure occupations. For instance, all five priority occupations have Building and Construction as a one of the most-needed knowledge attributes, and four out of five occupations have Problem Sensitivity and Near Vision as top abilities and Critical Thinking as a top skill (Table 5).

Table 5. Top Three Knowledge, Skills, and Abilities Across All Priority Measure Occupations²³

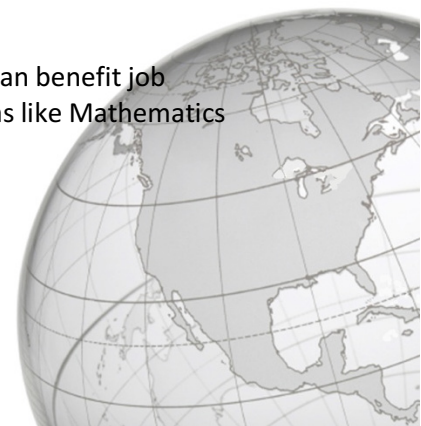
Knowledge	Skills	Abilities
Building and Construction	Critical Thinking	Problem Sensitivity
Mechanical	Troubleshooting	Near Vision
Mathematics	Active Listening	Deductive Reasoning

Common Entrance Ramps for Priority Occupations

Pre-apprenticeships, vocational and technical schools, and apprenticeship programs can benefit job seekers by offering early experience and teaching foundation skills, including key areas like Mathematics

²² Data from JobsEQ. 2023Q4.

²³ KSAs identified through O*NET





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and Building and Construction (Table 5). Apprenticeship programs, in particular, offer “learn and earn” environments that can be more financially feasible for job seekers, particularly those from disadvantaged backgrounds. Furthermore, these programs allow students to “test drive” jobs before making a commitment to formal schooling or programs.

The most common pathways to entry in these priority occupations are summarized below, and highlight the breadth of entry points, the importance of experienced workers in training new workers, and the time required.

	Common pathways?	Typical time requirements?	Licensing?
Electricians	California State-approved school as a trainee. The list of approved schools includes union JATCs (Joint Apprentice and Training Committee), community colleges, and adult schools.	8,000 hours for general electricians and 4,800 for residential electricians; can take 2.5-4 years	After approved hours, trainees take the California State Certification Exam to be a licensed Electrician
Heating, Air Conditioning, and Refrigeration (HVAC/R) Mechanics and Installers	Typically entails enrollment in an apprenticeship or secondary educational program	2-4 years	No formal license is required by technicians so long as they are supervised by a licensed contractor; an exception is an EPA Section 608 Certification specific to the handling of refrigerants.
Plumbers	Ibid	ibid	No formal license is required by technicians so long as they are supervised by a licensed contractor.
Carpenters	Ibid	ibid	Ibid





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<p>Construction Laborers</p>	<p>Of the priority occupations, Construction Laborers have the least formal requirements or pathways. But hiring is often based on prior job site experience, so vocational or technical schools, pre-apprenticeships, apprenticeships, and potentially even some secondary education can be useful in helping candidates distinguish themselves in the hiring process.</p>	<p>ibid</p>	<p>ibid</p>
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Certifications for New Workers

The core occupation and trade-specific training that job seekers looking to enter priority occupations will pursue will likely include the necessary skills and certifications for entry-level workers. Ensuring accessibility to these training opportunities and relevant credentials can ensure that all job seekers are prepared to succeed once on the job site. Some relevant certifications—that are often incorporated into new workers trainings—in Residential Building Decarbonization²⁴ include:

- OSHA 10
- CPR/First Aid
- Multi-Craft Core Curriculum (MC3)
- Urban Green Council GPRO Fundamentals of Building Green Training Program
- BPI’s Building Science Principles, Infiltration and Duct Leakage, and Air Leakage Control Installer Certificates
- HVAC Excellence Employment Ready Certifications
- NATE Ready-to-Work Certification

The OSHA 10, CPR/First Aid, and Multi-Craft Core Curriculum (MC3) also support a broad base of skills and knowledge for entry-level Mobility Hub workers. Electricians may also benefit from having an Electric Vehicle Infrastructure Training Program (EVITP) certification, which is required for at least one worker on a project team for all state-funded charging infrastructure projects in California.

²⁴ This list is largely drawn from the list developed by the Bay Area High Road Training Partnership Contractor Training RFI Response.





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The cost of these programs depends largely on the training institution. Union apprenticeships offer experience-adjusted prevailing wages throughout the apprenticeship, while programs at community colleges or private colleges could cost thousands of dollars in tuition if students are unable to secure California College Promise Grants or other tuition waivers.

Certifications for Incumbent Workers

There are a number of certifications that can help incumbent workers upskill and demonstrate proficiency or excellence. Below are some certifications specific to Residential Building Decarbonization:

- BPI Air Conditioning & Heat Pump Professional, Building Analyst Technician or Professional, Heating Professional, and Retrofit Installer Technician Certifications
- HVAC Excellence
- NATE HVAC Support Technician and Professional Certifications
- NADCA Credentials

For Mobility Hub Electricians, the EVITP certification is a particularly useful certification to hold as it ensures they are eligible for a greater number of federal and state projects.

Certifications for Contractors

The certification process to become a licensed contractor depends on the occupation, but it can present a challenge for some individuals. For example, to get an HVAC contractor’s license in California one must pass the trade exam, pass the California Law and Business exam, pass an asbestos exam, provide a contractor bond, meet the insurance requirements, and importantly—pass a background check. This process can present a substantial barrier to potential contractors and may even limit the number of individuals who seek contractor licenses—resulting in fewer employers in the industry. Making it easier for well-trained individuals to overcome certain barriers like insurance requirements can help increase the accessibility of licensure and entrepreneurialism.

Economic Opportunity for Low-Income and Disadvantaged (Frontline) Communities

With enforceable standards and policies, additional resources, and active stakeholder engagement, employment demand created through Mobility Hubs and Residential Building Decarbonization Measures can also offer substantial opportunities for Low-Income and Disadvantaged Communities (LIDAC) or frontline communities.²⁵ Nearly 1.8 million residents that are 16 years or older—accounting

²⁵ LIDACs are generally defined at the census tract level and include communities that meet EPA IRA DAC (defined at the census block group level), MTC Equity Priority Communities, or AB617 CERP definitions.





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for just under a third of the region’s working age population—live within frontline communities. Although the labor force participation rates are identical between frontline and non-frontline areas, the unemployment rates are notably different.

The unemployment rate in 2022 in non-frontline regions was 4.8%, compared to 6.5% in frontline areas—meaning that unemployment in frontline communities was roughly a third higher. It is important to note that a higher unemployment rate in frontline communities means that there may be more job seekers within those communities. However, job seekers from these communities may need additional resources and supports to overcome challenges of poverty and systemic disinvestment. Household incomes are also substantially lower within frontline communities, with the median household in non-frontline communities 78% higher than their frontline counterparts (Table 1).

Table 6. Employment, Unemployment, and Labor Force Participation Rate by Community, 2022^{26 27}

	Population	Employment	Unemployment Rate	Labor Force Participation Rate	Median Family Income
Non-LIDAC	4,040,368	2,116,653	4.81%	66.58%	\$168,620
LIDAC	1,739,666	889,397	6.49%	66.52%	\$94,700

There are several ways that the Measures may directly and indirectly present economic opportunity for residents within LIDACs. Both Measures will:

- Prioritize frontline communities and incorporate policies that protect existing affordable housing and prevent displacement.
- Prioritize projects within communities. Doing so may help increase awareness of programs, accessibility for local workers, and improve the transportation and housing of members of those communities.
- Engage with CBOs to ensure community interests and needs are being addressed.

The Residential Building Decarbonization measure will also address health and safety concerns in homes, so that they are best suited to serve residents and provide maximal efficiency benefits and cost savings. Importantly, the Measure includes support of workforce development programs to support entry into decarbonization careers, as well as development of workforce standards for retrofits projects to increase the number of family-sustaining and high-quality jobs.

²⁶ Community unemployment rate and labor participation rate are calculated as weighted averages using population.

²⁷ Data from US Census Bureau. 2022 Estimates





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The activities outlined in the Mobility Hubs and Residential Building Decarbonization Measures can help drive investment and economic opportunity for residents in these communities while also supporting improvements to housing stock and mobility options.

JOB QUALITY AND THE HIGH ROAD APPROACH

Definitions of High-Quality Jobs

Creating jobs through these Measures that are “high-quality jobs”²⁸ will bring benefits to the businesses involved with these Measures, the workers carrying out the Measures, and to the communities where those workers reside. The criteria considered in determining job quality varies considerably. Job quality definitions increasingly integrate more holistic criteria that capture the totality of the working experience and worker well-being. For example, the Department of Labor defines “good jobs” through a set of principles²⁹ that include (descriptions of each principle modified from original):

- 1) **Recruitment and Hiring** – applicants are recruited from all communities, and evaluated free of discrimination, based on skill-based requirements
- 2) **Benefits** – workers are provided and encouraged to use family-sustaining benefits such as health insurance, a retirement plan, and work-family benefits
- 3) **Diversity, Equity, Inclusion, and Accessibility** – all workers have equal opportunity in a workplace that centers DEIA
- 4) **Empowerment and Representation** – workers can form and join unions and have agency in the performance and direction of their work
- 5) **Job Security and Working Conditions** – workers operate in a safe workplace, with job security and predictability, and proper classification of their status
- 6) **Organizational Culture** – workers are valued and engage in respected work
- 7) **Pay** – workers are fairly paid a living wage that increases with increased skills and experience.
- 8) **Skills and Career Advancement** – workers have equitable opportunities to advance and access to training and education

²⁸ The terms ‘high-quality’ jobs, ‘high road’ jobs and ‘good’ jobs tend to be used interchangeably by academics, advocates and workforce professionals. For example the Department of Labor uses all three in its brief “Good Jobs in Federal Investments: a Toolkit for Employers, Workers and Government.” Distinctions and differences in definition revolve around what to consider in defining a job as “good/high-quality/high-road” beyond economic factors, such as broader worker well-being, social good, justice, environmental sustainability, and unionization opportunities.

²⁹ <https://www.dol.gov/general/good-jobs/principles#:~:text=Diversity%2C%20Equity%2C%20Inclusion%2C%20and,systemic%20barriers%20in%20the%20workplace.>





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These principles are mirrored in the categories that the California High Road Training Partnership (CA H RTP) proposes as comprising job quality. They include:

- **Family-sustaining wages and benefits** that include health care, pension, paid sick leave
- **Career pathways** that are clearly defined and include access to education, training, and support services
- **Stable and predictable schedules** that are reliable and consistent
- **Worker voice and agency** that includes respecting and valuing the worker and **the right to organize and join unions**
- **Healthy work environment** with adequate training and protection, that incorporates racial equity practices

This definitional alignment can further be demonstrated through a blog post by the Secretary of Labor Julie Chu that highlights the California High Road Training Partnership as being a model effort for the DOL Good Jobs Initiative.³⁰ BAAQMD is actively partnering with several organizations that comprise the CA H RTP in developing these measures.

Connecting Priority Occupations to High-Quality Jobs

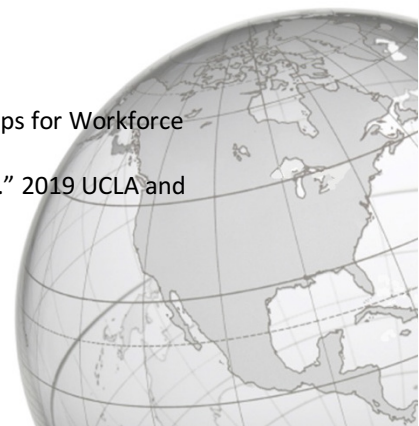
As the Aspen Institute highlights in a recent report: “jobs don’t fall on a “good jobs/bad jobs” binary; rather, they fall somewhere along a continuum.”³¹ Depending upon labor standards, procurement approaches, use of project labor and community workforce agreements, apprenticeship, and wage requirements—among other elements—any job within these five priority occupations has the opportunity to become a high-quality/high-road job as defined by the H RTP and DOL Good Jobs Principles.

The sectors where these occupations will be located can have a significant impact on job quality. As highlighted in the California Building Decarbonization report, workers employed in building electrification work that takes place in large commercial and utility sectors tend to be “high road” sectors, while residential and small commercial construction are more at risk of generating “low road” opportunities.³² This report highlights the findings of other reports regarding lower pay and more limited benefits for workers in these low road sectors.

³⁰ <https://blog.dol.gov/2023/07/13/the-high-road-to-the-middle-class>

³¹ “Lessons and Takeaways from Supporting Small Businesses To Improve Job Quality: Seven Tips for Workforce Organizations”, The Aspen Institute, April 2022

³² “CALIFORNIA BUILDING DECARBONIZATION WORKFORCE NEEDS AND RECOMMENDATIONS.” 2019 UCLA and Inclusive Economics





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Given that the building decarbonization measure is focused on residential and small multi-family homes, there is a greater risk of creating lower quality jobs than through a focus on other building sectors. However, there are a number of strategies that can provide new workers, existing workers, and workers in adjacent fields with access to high quality jobs and help existing contractors engage in high-road approaches through Residential Building Decarbonization and Mobility Hub activities. While meeting all requirements of the most ambitiously defined high-quality or high-road job may not be immediately possible, there are many steps that can boost the quality of a job. They can range from establishing labor standards and wage requirements to monitoring and enforcing workplaces to ensure worker safety and health, to establishing clear career development opportunities that let workers move along a career pathway, among many other approaches.

The following sections outline some of the challenges that new workers, existing workers, and workers in adjacent fields may face in accessing and maintaining high quality jobs in the five priority occupations as well as targeted opportunities that BAAQMD and its partners can explore to address and overcome those challenges.

New Workers

Challenge: There are a number of challenges for new entrants seeking entry into priority occupations. These priority occupations generally require specific skills and experience gained through education, training, apprenticeships, and work experience. Individuals currently in, or recently completing training, education, and/or apprenticeships may have difficulties finding and connecting with employers who seek to provide high-road job opportunities. The small contract size of individual homes also means that few union signatory contractors³³ may be interested or able to work in the residential market. A final challenge—which is particularly true for Residential Building Decarbonization rather than Mobility Hubs—is that job quality in specific occupations is at risk of being lower, especially with many types of building retrofits and simple energy efficiency measures. According to one report by Smart Cities Prevail,³⁴ residential construction workers make 33% less than their non-residential construction counterparts, and benefit rates are substantially lower.

These challenges are intertwined, and solutions must both stimulate demand for high-quality jobs while also supporting the pathways into, and supply of, high-quality workers. The need to support both the supply and demand for high-quality jobs can be difficult to balance.

³³ A union signatory is a company that has agreed to meet a union’s guidelines and has a subsequent legally binding agreement with a union.

³⁴ Littlehale, S. (2019). Rebuilding California: The Golden State’s Housing Workforce Reckoning. Smart Cities Prevail. <https://www.smartcitiesprevail.org/wp-content/uploads/2019/02/SCP-Rebuilding-CA-Press-Release-02.20.19.pdf>





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Opportunity: The Bay Area is already working to address the challenges outlined above that may impact implementation of the Residential Building Decarbonization and Mobility Hub Measures. On the building decarbonization side, programs that aggregate residential projects such as one in the City of Berkeley, are already under way throughout the Bay Area and will make these projects more accessible to labor signatory contractors and capitalize on economies of scale. The Residential Building Decarbonization Measure’s addition of workforce standards, Community Based Organization engagement, and contractor supports aims to ensure that the jobs created through the measure will generate high-quality jobs, work with communities to find solutions, and increase the accessibility of the economic opportunity to workers and job seekers from frontline communities and other historically excluded groups. Fortunately, research shows that the activities outlined in the Mobility Hub Measure are likely to support high job quality³⁵ that is common throughout the transportation infrastructure construction industry, often via prevailing wage contracts with labor signatory contractors or Project Labor Agreements. The scale of contracts is one driver of this, and several counties and cities within the Bay Area have prevailing wage requirements for contracts above a certain amount.³⁶

On the supply side, new entrants to the five priority occupations have an increasing number of on-ramps to begin careers in building decarbonization or supporting mobility hubs. Pre-apprenticeship programs offer an opportunity to combine career awareness and hands-on learning experimentation. Pre-apprenticeships that offer wraparound support services and pay participants are particularly impactful in increasing the accessibility of pre-apprenticeship programs for disadvantaged and historically excluded job seekers including women, BIPOC, and other historically disadvantaged job seekers. The Bay Area High Road Training Partnership recommends at least one year of case management for those in training programs to ensure that life events have minimal impact on participants’ ability to learn and advance their careers. Many pre-apprenticeships adopt Multicraft Core Curriculum (MC3) that provides a foundational set of experience and skills that allow program completers to matriculate into a range of trade-specific training programs.

Workforce intermediaries and workforce development boards can also be helpful in establishing relationships between employers and job seekers, providing career navigation support and support services to workers, and developing multi-partner collaboratives, among other efforts. State and local workforce development boards implement a range of different workforce programming, leveraging federal funding and other sources, while workforce intermediaries—which can intersect with workforce boards—convene participants in a workforce ecosystem to design and implement workforce interventions.

³⁵ “Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI)” 2023 San Jose State University and Mineta Transportation Institute

³⁶ <http://www.opencompca.com/issues/project-labor-agreements/california-government-project-labor-agreement-list/>





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High school Career Technical Education (CTE), adult schools, and community colleges also offer job seekers the chance to gain experience and education. High school CTE programs are particularly important in providing younger students with an understanding of the types of roles available within the clean energy space and the opportunity to practice some of the daily skills and activities required for those jobs. These programs can then help connect interested high school students to pre-apprenticeship, apprenticeship, or other training opportunities.

Existing Workers

Challenge: Continued learning and advancement opportunities are crucial to ensure that workers are prepared for new technologies and can advance in their careers. Training in the five priority occupations typically occurs continually on the job, and workers in those fields can specialize or advance via trade or scope-specific certifications. While there are increasing options, there can be a “chicken-egg” dynamic where a lack of market entry by specific technologies can leave existing workers unfamiliar with the technologies and unable to gain the training needed.

Opportunity: There are already several initiatives throughout the Bay Area that are helping current workers get the training they need. For example, BayREN’s Energy Expert program helps contractors and their employees receive training about financial incentives and provides contractors with marketing and outreach, and adds them to an exclusive contractor database. Joint Apprenticeship Training Centers (JATCs) are another high-road training institution for current workers (as well as new workers). Union programs operated through JATCs offer prevailing wages and apprenticeships that allow workers to continue to get paid while they learn. Another solution can be to promote more informal training such as manufacturer-specific information on new heat pump features taught by wholesalers and distributors for HVAC/R Installers and Repairers, or formal certifications like the Electric Vehicle Infrastructure Training Program (EVITP) that ensures journeymen Electricians have the EV-infrastructure specific knowledge to install and maintain charging infrastructure.

Contractors

Licensed contractors have the foundational technical knowledge and skills needed to conduct day-to-day activities. Additional education and certifications can help increase awareness of the most up-to-date technology, rebate and incentive programs, and help them navigate the bidding or administrative process. There are a number of partners and organizations involved in supporting contractors—including minority, women, and disadvantaged business enterprises (MWDBEs). These organizations are highlighted in the following section.





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The challenges and opportunities discussed below primarily focus on residential building decarbonization contractors. Contractors/employers that will be operating within the Mobility Hub space are already likely to be high-road contractors that pay prevailing wages, offer frequent training for current workers, and are often union labor signatories.

Challenge: There is a shortage of high-road residential contractors within the Bay Area, largely as a consequence of market structure. In the residential market, lowest-cost contractors often win bids with price sensitive consumers that are already wary of unplanned (replacement is often catalyzed by sudden system failure) and relatively high-cost expenses. Workforce standards—including certification and licensing—can be hard to secure, monitor, and enforce in the residential, lowest-bid market. Addressing this challenge will not only require incentivizing demand for high-road contractors to enter the residential market, but also supporting existing contractors as they seek to become high-road employers.

Opportunity: As with addressing the challenges for new and existing workers, the Bay Area is already thinking about and working to address challenges related to supporting high road contractors. The Bay Area High Road Training Partnership has made and continues to make considerable headway in thinking about and navigating these issues.³⁷ Their recommendations are wide ranging but include:

1. Set floor wage and minimum job quality requirements.
2. Provide resources and supports for contractors to meet those requirements.
3. Offer incentives to those who go beyond wage and job quality requirements.
4. Funding support to assist in trainings and certifications for contractors and their employees.
5. Streamlined rebate and incentive processes and sources of information. Paid training to gain familiarity with rebates and incentives is also important.
6. Funded efforts to engage with and build trust within communities. This includes information and “meet and greet” sessions and partnerships with CBOs to build cultural competencies and language skills to better work within BIPOC and immigrant communities.
7. Supporting the creation of MWBDE contractors and support to meet high road standards and public procurement requirements.

A number of the partnerships highlighted below have already begun efforts that seek to address many of these recommendations, but additional funding and collaborations are needed to scale these efforts to meet the needs for high-road building decarbonization.

³⁷ “Bay Area High Road Training Partnership Contractor Training RFI Comments on Inflation Reduction Act Residential Energy Rebate Programs” <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-DECARB-01>





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KEY PARTNERSHIPS AND OTHER INITIATIVES TO COORDINATE WITH

Organizations and Initiatives Within the Bay Area with Workforce Component

- **Bay Area High Road Training Partnership:** is a California Workforce Development Board initiative that built a regional coalition around job quality and job access for local residents within residential building decarbonization.
- **BayREN:** BayREN has a number of Education and Training Initiatives, including the Climate Careers program, which is an earn-and-learn program that helps introduce local young adults to enter decarbonization careers.
- **City of Berkeley’s Just Transition Residential Electrification Pilot:** Seeks to decarbonize affordable housing low-to-moderate income households, while also introducing workforce standards.
- **California Energy Commission Equitable Building Decarbonization Program:** This program includes a Direct Install Program and an Incentive Program for residential decarbonization.
- **California Energy Commission (CEC) Training for Residential Energy Contractors (TREC) workforce program:** The CEC is administrating the state’s TREC program funded by the IRA. As the name suggests, this grant seeks to support the training and diversification of residential contractors. The CEC in the late fall of 2023 sent out a survey to stakeholders to supplement public comment and enhance program delivery.
- **Construction Trades Workforce Initiative:** a nonprofit partner of the East Bay Building Trades that seeks to connect union construction labor with key stakeholders—including job seekers, training providers, public agencies, communities, and developers.

Education and Training

New Entrants

Pre-Apprenticeship

Below is a non-exhaustive list of the pre-apprenticeship programs throughout the Bay Area that offer MC3 training, which would be relevant to workers for both Measures:

- **Rising Sun Center for Opportunity, Opportunity Build program**
- **Cypress Mandela**
- **City College Apprenticeship Programs**
- **Richmond Build**
- **SF City Build**
- **North Bay Trades Introduction Program**





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- **Plumbing, Heating & Cooling Contractors Association (PHCC)**

Adult Schools, Community Colleges, and Career and Technical Education

- **IDEAL ZEV:** California Air Resources Board (CARB) and the California Energy Commission (CEC) have partnered on the Inclusive, Diverse, Equitable, Accessible, and Local (IDEAL) Zero-emission Vehicle (ZEV) Workforce Pilot. This initiative, funded at \$6.5 million, will offer investments to large and small educational institutions and community organizations to support pathways for clean transportation jobs, including electric vehicle charging.³⁸
 - Simultaneously, CARB has allocated \$1.5 million for the existing Adult Education & Vocational School Zero-Emission Vehicle Technology Training Project,³⁹ which aims to provide investments to non-traditional workforce partners with deep connections to disadvantaged communities.
- **Diablo Valley College**
- **Foothill College**
- **Laney College**
- **Santa Rose Junior College**
- **Skyline College**

Organized Labor

- **Joint Apprenticeship Training Centers (JATCs)**

Incumbent Workers

- **Joint Apprenticeship Training Centers (JATCs)**
 - **IBEW EVITP Certified Electric Vehicles Technician (CEVT) program**
- **International Certification Board**
- **Testing, Adjustment, and Balancing Bureau**

Contractors

- **Manufacturer- and distributor-led trainings** are among the most common methods for contractors and their employees to learn new technologies or methods. Most contractors

³⁸ <https://ww2.arb.ca.gov/our-work/programs/accessible-clean-transportation-options-sb-350/expand-workforce-training-and>

³⁹ https://ww2.arb.ca.gov/sites/default/files/2023-08/fy21-22adultandvocational_solicitation.pdf





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regularly stay in frequent contact with manufacturers and distributors through purchasing and warranties, so leveraging these strong existing relationships with contractors is essential.

- **Buildings and Construction Trades Contractors Associations** offer contractor training and support for labor signatory contractors.
- **Emerald Cities Collaborative E-Contractor Academy** is a free resource that offers guidance to small and disadvantaged contractors to scale their business into decarbonization and clean energy industries.
- **BayREN: Home+** is a resource available to contractors (and with some mandatory trainings for contracts that are part of BayREN’s Contractor list) to cover the basics of building science, heat pump technology, and compliance for certain certifications. BayREN is also a reliable resource for contractors looking for information on rebates and certifications.
- **Community Choice Aggregate Contractor Support Programs**
 - **MCE Community Choice Energy** is a community choice aggregator that provides stipends to contractors within their service region for contractors and crews to attend heat pump manufacturer training.
 - **Silicon Valley Clean Energy FutureFit Fundamentals Contractor Training program** incentivizes training for contractors as well as compensation for each electric device installed within a customer’s home.
- **National Association of Minority Contractors** offers training and other resources for contractors within their networks. Trainings include opportunities for upskilling as well as resources and work with pre-apprenticeship and apprenticeship programs.
- **TECH Clean California Training Hub** offers low or no-cost trainings to contractors and their employees. Several initiatives offer trainings under the TECH umbrella, including the Energy Star Manufacturers Action Council, The Association for Energy Affordability, and the National Comfort Institute.
- **PG&E** offers a range of trainings for contractors and workers.





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STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS FOR THE BAY AREA'S HIGH-ROAD WORKFORCE IN RESIDENTIAL BUILDING DECARBONIZATION AND MOBILITY HUBS

Strengths

- 1. Many key stakeholders in the Bay Area have accepted the high road as a goal and a variety of coalitions and conversations are already underway.** Organizations and employers throughout the Bay Area have embraced the high road as a goal to work towards. Coalitions—such as the Bay Area High Road Training Partnership for Residential Building Decarbonization—have already made significant progress in furthering conversations within residential building decarbonization. Job quality within the construction industry for transportation infrastructure in California is already reputedly strong.
- 2. Emerging coordination and relationships with unions.** Unions are deeply involved in the discussions and coalitions occurring throughout the Bay Area. The Construction Trades Workforce Initiative (CTWI) has been working as part of the Bay Area High Road Training Partnership for Residential Building Decarbonization to support union's role within residential electrification. Construction of transportation infrastructure in California also has a long history of union involvement.
- 3. There is a strong network of high road training and education providers throughout the Bay Area.** The Bay Area's union training centers and a large number of pre-apprenticeships and vocational trainings—often offered at no cost—with support services provide a number of accessible on-ramps for jobs seekers of all backgrounds.
- 4. The state of California and local jurisdictions have already developed climate action plans that complement the Measures.** The proposed Measures are not novel solutions or concepts to the state or the region. There are several state, regional, and local-level programs that support the exact types of activities proposed through the measures, meaning that workforce planning can—and should be—coordinated across initiatives.
- 5. Access to a wide range of state and regional funding streams exist to support current programs.** An array of partners—including utility providers, state, regional, and local governments are already harnessing federal, state, and local funds to propel initiatives and projects related to workforce within Residential Building Electrification and Mobility Hubs.





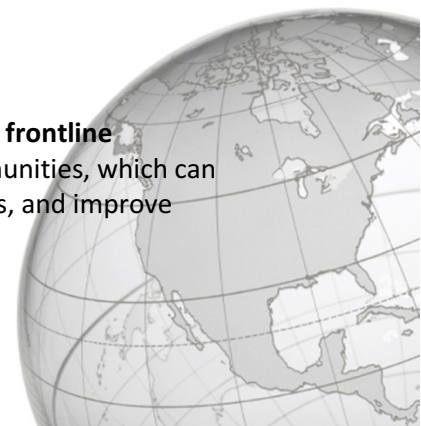
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Weaknesses

- 1. There is a lack of current data on job quality within each of the existing sectors.** Stakeholder interviews and existing research provide a general understanding of market dynamics, but there is a scarcity of up-to-date, granular information about job quality within these specific markets, which makes it difficult to measure and monitor.
- 2. A limited number of high-road contractors are focusing on the residential building decarbonization market.** Market dynamics within residential building decarbonization often favor lowest-bid contracting, which makes it difficult for high-road contractors to operate within the existing market, leaving low-road contractors with less commitment to create high quality jobs.
- 3. There are few MWDBE contractors, and those that exist can struggle to access publicly funded projects.** MWDBEs tend to lack the resources and administrative capacity that might enable them to pursue publicly funded projects that require substantial training requirements, include job quality standards, or require the tracking of detailed metrics. Without services to support MWDBEs in these positions, they will likely struggle to participate in publicly funded projects and support high road approaches.
- 4. Contractors operating in the residential building decarbonization sector must navigate tensions and tradeoffs when deciding between programs that incentivize whole home retrofits (with stronger climate and workforce options) or single appliance replacement.** Whole home retrofits can be more cost effective by reducing crew transportation and improving home efficiency and cost savings in the long run, but cost and construction-wary customers may often favor single appliance replacement.
- 5. Awareness of careers and entry points, particularly for job seekers from frontline communities, is lacking, but is essential to ensure that a sufficient number of workers is available to implement the Measure activities.** Recruiting and retaining a large number of additional workers will be difficult in the current tight labor market with low unemployment, meaning that establishing larger, more sustainable worker pipelines for these occupations is a crucial objective.

Opportunities

- 1. The Measures are designed intentionally to support workers and projects in frontline communities.** The Measures propose favoring projects within frontline communities, which can support career awareness, increase accessibility to employment opportunities, and improve





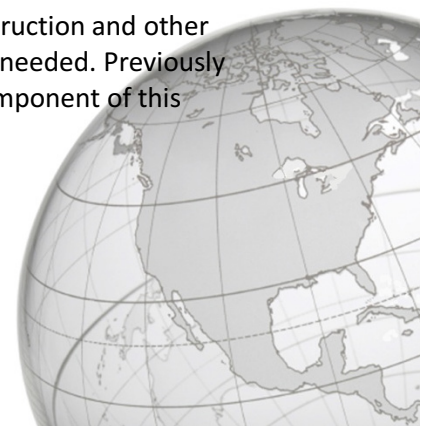
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those communities. Planned coordination with CBOs can also increase engagement of frontline communities and hard-to-reach populations throughout the planning and construction process.

- 2. Innovative methods are being tested to increase value propositions for residential building decarbonization that can boost opportunities for high-quality jobs.** Project aggregation is a key innovation that aims to make these projects more appealing to high-road contractors while also driving efficiencies of economies of scale. Novel business models, such as no-money-down retrofits, may also remove some of the industry’s existing barriers to adoption.
- 3. The existing network of organizations within residential building decarbonization means that there are more informational touchpoints for contractors.** Improving information sharing and access to resources can bolster the positive impacts of this network.
- 4. The use of qualified contractor lists for state and regionally-funded projects can help drive demand for high-road contractors and employment opportunities.** Supporting contractors to achieve contractor list standards will be an important component of this strategy.
- 5. There is a great opportunity to leverage significant state and federal funding for increasing demand and workforce needs.** Adding workforce standards will increase opportunities to leverage the power of public funds to support high road employment.

Threats

- 1. Maximizing residential building decarbonization efforts while ensuring job quality and equity in accessing opportunities may introduce contradictory tensions.** If cost efficiencies cannot offset additional project costs from high-road labor standards, project costs may increase and uptake of residential building decarbonization may occur at a slower rate—or may require greater public funds to subsidize. Conversely, high workforce standards may produce barriers to participation in the market by MWDBEs, which may lack the administrative capacity or profit margin to meet such standards.
- 2. The scale of additional workers needed for Measure-related and unrelated decarbonization efforts throughout the Bay Area may leave positions unfilled for extended periods, particularly at a time of near record-low unemployment.** The significant demand for these priority occupations across decarbonization activities as well as housing construction and other infrastructure projects means that a coordinated strategy across industries is needed. Previously mentioned career awareness and talent attraction strategies are one core component of this broader need for action.





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- 3. Growing the number of high-road contractors and building out qualified contractor lists will be a challenge for the region.** A limited number of contractors will restrict the number of available apprenticeships or other learning roles under supervision. If the number of contractors is restricted enough, it could ultimately end up hampering the capacity of publicly funded projects.
- 4. The number of interested parties throughout the Bay Area means that coordinating and establishing delineating leadership responsibilities is of great importance.** Representative leadership and regular coalition meetings can help facilitate the range of stakeholders operating in unity.

Conclusions

The various Residential Building Decarbonization- and Mobility Hub-related initiatives, pilot programs, and array of stakeholders mean that the Bay Area is at the national forefront of the most pressing workforce issues related to Residential Building Decarbonization and Mobility Hubs. The tasks of decarbonizing the region's residences and changing how residents travel and commute are monumental tasks. The Measures as drafted provide a roadmap for how these types of projects can succeed in reducing greenhouse gas emissions while supporting high road employment. With a successful template in hand, the region can then leverage the breadth of other federal, state, and local funding to meaningfully affect change at scale throughout the region. Implementation of these Measures is the next step forward, and learning from and building on that implementation will help the Bay Area continue to advance the national understanding of impactful climate actions that improve the economic opportunities of all residents.





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MEASURING OUTCOMES

Using metrics to track the progress and accomplishment for outlined goals is an imperative step in understanding a program or initiative's success. Below is a list of metrics that could help quantify and track the success of high road employment outcomes for communities within the Bay Area.

- Demographics of the workforce (gender, race, ethnicity, educational attainment)
- Geographic distribution of workers
- Share of workers from within frontline or low-income and disadvantaged communities
- Median and average wages and benefits rates for workers
- Number of certified or licensed workers
- Number of contractors that meet workforce standards
- Number of contractors that apply to support the measure-funded activities
- Number of women and minority-owned businesses that apply to support measure-funded activities
- Number of women and minority-owned businesses engaged in measure-funded activities
- Use of community benefit plans or community benefit agreements





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APPENDIX A: METHODOLOGY

Forecasting Residential Building Decarbonization Workers

Estimates for the Residential Building Decarbonization measure workforce were developed largely from existing work conducted by Betony Jones and Inclusive Economics. A presentation developed by these authors titled “San Francisco Bay Area Residential Building Decarbonization Jobs Estimates”⁴⁰ provides employment estimates for decarbonization efforts across the nine county Bay Area on a 25-year basis. For this project, the “Deep Efficiency and Electrification” job totals were highlighted because these entail comprehensive building decarbonization activities in line with the measure outlined for this PCAP. Because the research area for the PCAP excludes Santa Clara County, which was originally included by Inclusive Economics, BW Research proportioned total employment by the share of inhabited residential units in the desired eight counties. The numbers presented in this memo represent the total number of workers needed that would be working on residential decarbonization full-time for 21 years in order to decarbonize all residential buildings in the eight county Bay Area region.

Forecasting Demand for Mobility Hub Workers

The research team heavily leveraged research developed by Serena Alexander, Shams Tanvir, and T. William Lester at San Jose State University and Mineta Transportation Institute titled “Evaluating Benefits from Transportation Investments Aligned with the Climate Action Plan for Transportation Infrastructure (CAPTI).” This report quantifies the economic and workforce impacts of the statewide Climate Action Plan for Transportation Infrastructure (CAPTI). The CAPTI activities—which include investments in public transportation, walking and biking infrastructure, electrification of transportation fleets, and reducing vehicle miles traveled—are similar to the mobility hub measure. Because this report looked at statewide spending on transit, the BW Research proportioned the jobs created via the post-CAPTI spending to the Metropolitan Transportation Commission Draft 2023 TIP amount of approximately \$2.725 billion annually.⁴¹ It should be noted that additional transportation-related jobs may be created and supported by activities that occur outside of Bay Area counties (high speed rail, for example) but use workers from within the region. Funding for private or other consumer-accessible charging infrastructure may not be included as well.

⁴⁰ “San Francisco Bay Area Residential Building Decarbonization Jobs Estimates.” Inclusive Economics.

⁴¹ <https://mtc.ca.gov/funding/transportation-improvement-program/draft-2023-tip>

