Opinion Dynamics

CPUC WORKFORCE STANDARDS EVALUATION

FINAL REPORT

9/16/24

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CONTENTS

TABLES & FIGURES

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LEGAL NOTICE

I. EXECUTIVE SUMMARY

In 2008, the California Public Utilities Commission (CPUC) adopted the California Long-term Energy Efficiency (EE) Strategic Plan, which identified energy efficiency as one of the state's highest priorities to achieve its economic and climate goals for 2020 and beyond.[1] Since 2008, California has hired contractors and passed subsequent legislation to evaluate and improve California's progress toward its energy savings goals.[2][3] In the last several years, one topic of interest has been using workforce standards—minimum requirements for technicians and contractors to install, diagnose, or repair electrical equipment—to increase demand for certifications and training, improve quality installations of EE technology, increase energy savings, and provide greater career opportunities for disadvantaged workers.[4]

D.18-10-008 emerged from the CPUC's historical interest in workforce requirements; however, the CPUC highlighted challenges in developing workforce requirements in the language of D.18-10.008, which states "…it remains elusive how to craft workforce standards that begin to make improvements in installation quality while ensuring the availability of appropriately trained workers and monitoring progress toward improved energy savings". Within the Decision, parties were divided about the correlation between workforce standards and increased energy saving. As such, the Decision recognizes that the workforce standards effort is "…a starting point for potentially more far-reaching requirements in the future, in coordination with the evaluation and adoption by the California Energy Commission of a 'responsible contractor policy' as set forth by Senate Bill 350." The Responsible Contractor Policy, as mandated by Senate Bill 350 Clean Energy and Pollution Reduction Act of 2015 (SB-350), states that the:

> *The Commission [CEC] shall adopt, implement, and enforce a responsible contractor policy for use across all ratepayer-funded energy efficiency programs that involve installation or maintenance, or both installation and maintenance, by building contractors to ensure that retrofits meet high-quality performance standards and reduce energy savings lost or foregone due to poor-quality workmanship.*

As of April 2023, the Responsible Contractor Policy remains an unfunded mandate.

D.18-01-008 required that all individuals performing installation work for large-scale non-residential heating, ventilation, and air conditioning (HVAC) and lighting control (LC) projects must meet the following standards:

- All projects that include the installation, modification, or maintenance of HVAC equipment in non-residential buildings that reserve a project incentive of $3,000 or more must utilize installation technicians who meet one of the following criteria:
  - Enrolled in or completed California or federally accredited HVAC apprenticeship.

[1] California Public Utilities Commission (CPUC). "California's Long Term Energy Efficiency Strategic Plan". 2008. Energy Efficiency Strategic Plan (ca.gov).

[2] Carol Zabin, et al., "California Workforce Education and Training Needs Assessment For Energy Efficiency, Distributed Generation, and Demand Response." 2011. California Workforce Education and Training Needs Assessment PART ONE (berkeley.edu)

[3] Carol Zabin, et al., "Workforce issues and Energy Efficiency Programs: A plan for California's utilities." 2014. Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities - UC Berkeley Labor Center

[4] According to D.19-08-006, a disadvantaged worker means a worker that meets at least one of the following criteria: 1) lives in a household where total income is below 50 percent of Area Median Income; 2) is a recipient of public assistance; lacks a high school diploma or GED; 3) has previous history of incarceration lasting one year or more following a conviction under the criminal justice system; 4) is a custodial single parent; 5)is chronically unemployed; 6) has been aged out or emancipated from the foster care system; 7)has limited English proficiency; or 8) lives in a high unemployment ZIP code that is in the top 25 percent of only the unemployment indicator of the CalEnviroScreen Tool.

- Completed at least five years of work experience at the journey level as defined by the California Department of Industrial Relations, passed a practical and written HVAC system installation competency test, and received credentialed training specific to the installed technology.
- Has a C-20 HVAC contractor license from the California Contractor's State Licensing Board (CSLB).[5]

- All projects that include the installation of lighting control systems in non-residential buildings that reserve a project incentive of $2,000 or more must utilize installation technicians who have earned a California Advanced Lighting Controls Training Program (CALCTP) certification.[6]

In addition to these certifications, the standardized terms and conditions for 3P programs provided in Appendix B of D.18-10-008 required implementers to identify any additional "skills certification and/or broader occupational training and experience that would reduce the risk of lost net lifecycle energy savings from poor installation, modification, or maintenance of the energy efficiency measures" that would be required for installers, contractors, or technicians working on projects for the program.

These standards were required for any new third-party (3P) solicitation released after October 11, 2018 (issue date of D. 18-10-008) and by July 1, 2019, for other new or renewed projects that meet these thresholds defined by the standards. Importantly, these requirements apply to downstream projects in which incentives are paid to the contractor or the customer and not to upstream programs where incentives are paid directly to the technology manufacturer, distributor, or retailer unless the entity was responsible for installing the equipment.

Since the enactment of Workforce Standards, the CPUC has continued to demonstrate its commitment to supporting workforce development through 1) its Memorandum of Understanding (MOU) with the California Workforce Development Board (CWDB)[7] and 2) an environmental and social justice action plan goal to "promote high road career paths and economic opportunities for residents of ESJ communities".[8] Although these activities are relevant to the CPUC's current historic engagement in workforce, education, and training activities, they are outside of the scope of the current evaluation and are not discussed further in this report.

In 2022, the CPUC hired Opinion Dynamics to evaluate the impact of Workforce Standards—with a focus on the standardized criteria for HVAC and LC projects[9]—and provide recommendations as to whether the standards should be eliminated, continued as defined, adapted, or expanded. The objectives of this evaluation were to:

- Determine the status of the responsible contractor policy (SB 350) and lessons learned that may impact Workforce Standards.
- Identify the number of EE programs that incent HVAC and LC installations and the number of projects that triggered Workforce Standards since October 11, 2018.

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[5] The Contractors State License Board provides licenses to construction contractors in California. These include 1) General Engineering Contractors (A Licenses), 2) General Building Contractors (B Licenses), 3) Specialty Contractors (C Licenses), and Limited Specialty Contracts (D Licenses). Currently, there are 42 specialty contractor license classifications, including C-20 warm-air heating, ventilating, and air-conditioning (HVAC) contractors and C-10 electrical contractors. https://www.cslb.ca.gov/About_Us/Library/Licensing_Classifications/

[6] *Note: Program Administrators may file a Tier 2 advice letter proposing other programs equivalent to CALCTP; however, to date, this option has not been exercised.*

[7] MEMORANDUM OF UNDERSTANDING (ca.gov)

[8] esj-action-plan-v2jw.pdf (ca.gov)

[9] NOTE: This evaluation focused on the HVAC and LC criteria and did not investigate other certifications or workforce training identified by implementers in their final contracts with IOUs.

- Characterize the existing training programs, certification processes, and requirements to maintain each of the credentials identified in D.18-10-008.
- Understand how Workforce Standards are implemented and enforced by key stakeholders.
- Assess the impact of Workforce Standards on key stakeholders.
- Determine the feasibility of an impact evaluation of Workforce Standards on desired outcomes.

To accomplish these objectives, Opinion Dynamics utilized qualitative data collection and analysis activities, which included:

- Secondary Data Review of 1) policy decisions associated with Workforce Standards, 2) all 2018-2022 non-residential HVAC and LC project data from the investor-owned utilities (IOUs), 3) contracts between IOUs and third-party implementers, and 4) relevant HVAC and LC credentialing materials (e.g., program descriptions, marketing and outreach materials, lesson plans).
- Semi-structured interviews with governmental staff (n=3), programming/contracting staff from the IOUs (n=10), 3P implementer staff (n=10), and contractors (n=6).
- Interviews with credentialing providers (n=8) for the HVAC and LC certifications to gain an understanding of the structure of each program/certification, evaluate their strengths, and identify challenges with the acquirement or renewal of each credential.

I.I FINDINGS AND RECOMMENDATIONS

Below, we summarize the main findings and recommendations that emerged from this study.

- **Conclusion 1:** As of April 2023, the Responsible Contractor Policy (SB 350) has yet to be funded. While the CEC is actively working towards securing funding in the next year, implementation has not been initiated.
  - **Recommendation 1:** We recommend that the CEC review the findings in this report to help inform the development of the Responsible Contractor Policy and Consumer Protection Guidelines.
- **Conclusion 2:** Currently, CALCTP provides two individual-level training credentials: 1) installer technician training and 2) Acceptance Test Technician (ATT) training. Decision 18-10-008 does not specify which credential is required. Currently, the installer technician training is designed to train licensed electricians on advanced lighting control installation techniques. In contrast, the ATT training requires individuals to either 1) hold a CALCTP Installer Technician Certification or 2) be an industry professional (e.g., electricians, C-10 electrical contractors, architects, engineers) with at least three years of experience. Notably, individuals who have completed the installer technician training are able to skip two of the three ATT modules (i.e., Lighting Controls Systems and Codes and Standards) due to their coverage in the Installer Technician Training. These individuals are only expected to complete the final 16-hour module on acceptance test procedures and documentation that aims to ensure individuals can complete acceptance tests in accordance with Title 24 requirements. Currently, CALCTP staff maintain an internal list of individuals with both installer technician and ATT certifications; however, a list of only the ATT-certified professionals and installer contractors (i.e., employers) is publicly available on the CALCTP website.
  - **Recommendation 2:** We recommend that the CPUC clarify its preference for the CALCTP installer technician training program as the ALC certification for Workforce Standards as it 1) serves licensed electricians who may be responsible for installing the technologies and 2) can serve as a pre-requisite for the more advanced ATT training program. IOUs should direct 3P implementers to collect the certification number of individuals, and other relevant information (e.g., technician name, contractor name) needed to verify certifications with CALCTP.

The CPUC should then direct the IOUs to coordinate with CALCTP staff to verify the validity of the certifications based on key information (e.g., name, contractor, certification number, date of certification).

- **Conclusion 3: Our review of HVAC credentials that satisfy the Workforce Standards requirements revealed a lack of consistent and uniform standards.** One clear example is the number of years of experience required for the various credentials. An individual with as little as one year of experience in an apprenticeship program would satisfy the Workforce Standards requirement. However, journeyworkers[10] require at least five years of hands-on experience, and C-20 contractors need at least four years of journey-level work in the past ten years. Outside of the inconsistency between the level of experience that individuals will have, there are no uniform exam requirements for certification for the apprentice and journeyworker. Furthermore, while there are databases of registered apprentices and journeyworkers, accessing the information requires knowing the technician's full name and the last 4-digits of their social security number. This makes it difficult for 3P implementers or IOU staff to verify individuals who hold these credentials. Currently, the C-20 trade exam appears to be the most robust, transparent, and regularly updated exam; however, since technicians do not qualify to take the C-20 licensing exam, the C-20 certification does not fully align with the Workforce Standards in D.18-10-008.
  - Recommendation 3A: While certification is not traditionally within the purview of the CPUC, they have a vested interest in ensuring the development of a qualified workforce to maximize energy savings and greenhouse gas emission reductions. We recommend that the CPUC collaborate with the California Department of Industrial Relations (DIR), California State License Board (CSLB), California Workforce Development Board, HVAC manufacturers, HVAC Distributors, Unions, California Community Chancellor's Office, and other relevant agencies to identify the best pathway forward for an HVAC technician exam that can be used for Workforce Standards.

  Recommendation 3B: We recommend that the CPUC ensure that the IOUs require the collection of necessary information (i.e., certification numbers for contractors and installation technicians and individuals' last names and last four digits of SSN for apprentices) to support verification for Workforce Standards enforcement.

- **Conclusion 4:** Our analysis of the HVAC apprenticeships in California found that no federally accredited apprenticeship programs or non-union state-accredited programs were actively recruiting individuals. Non-union contractors indicated that there is a gap in the quality and availability of training depending on a company's union affiliation. Non-union companies cannot send their employees to union-sponsored apprenticeship training offerings, so they view the requirement of a completed apprenticeship in Workforce Standards as a significant barrier to accepting EE projects.
- **Conclusion 5:** Contractors mentioned the need for more equitable credentialing standards for technicians, specifically identifying language and learning disabilities as barriers to pursuing credentials that require written examination for some of their employees.
  - Recommendation 5: As stated in D.18-10-008, the CPUC is "concerned that these requirements [do] not create barriers to disadvantaged workers participation in the programs." Following this guidance, we encourage the CPUC to provide a memo to sister agencies, DIR and CSLB, and training provider CALTCP that draws attention to requests uncovered in this research for training and examination opportunities in multiple languages and

[10] Note: While "Journeyman," "journeyperson," "journeyworker, and journey-level worker" are interchangeable terms, the California Apprenticeship Council has identified "journeyworker as the preferred designation. As such, we utilize "journeyworker" throughout the report.
See California Department of Industrial Relations (2021). California Code of Regulations, Title 8, Section 205. Definitions. Retrieved from https://www.dir.ca.gov/t8/205.html.

providing additional accommodation options for individuals with disabilities, such as additional time for examinations or allowing frequent breaks to make them accessible to a broader community of installers.

- **Conclusion 5:** In alignment with the 2018 decision, the IOUs integrated the language and requirements into any program contract that began on or after July 1, 2019. Due to the shift to 3P programs, the IOUs were no longer responsible for implementing the program and instead passed that responsibility on to the 3P implementers. Third-party implementers were required to develop an implementation plan that included how they would implement, track, and report on Workforce Standards. However, many of these programs were programs in which implementers were not responsible for hiring contractors or performing the work. To account for this, many of the 3P implementers focused on including Workforce Standards language and requirements in their contracts with program customers, associated contractors, and subcontractors. As a result, the final onus of responsibility for implementation fell on customers, which is not what the CPUC envisioned in 2018 when the CPUC established these standards.
  - **Recommendation 5:** Instead of 3P program designs allowing customers to hire their own contractor when participating in a program, we recommend that 3P program designs integrate the use of a preferred qualified contractor network. To develop this network, program staff would recruit and vet contractors and technicians to ensure that the installers meet the associated Workforce Standards requirements. Staff would then provide a list of these vetted installers for customers to choose from. The utilization of a preferred contractor/technician network in existing 3P programs (e.g., Trade Professional Alliance Network) can be beneficial to 1) ensure individuals and their teams hold the desired qualifications required by the CPUC and 2) streamline the process of submitting necessary program documentation.
- **Conclusion 6:** The standardized terms and conditions provided in Appendix B of D.18-10-008 directed the IOUs to request a demonstration of Workforce Standards compliance at least once a year from implementers; however, none of the PAs interviewed believed it was their responsibility to enforce or police Workforce Standards. As a result, there has been minimal enforcement of Workforce Standards since they were enacted in 2019. Currently, PG&E has the most robust approach to ensuring that 3P implementers are implementing and enforcing Workforce Standards, but they are asking for the credentials only from the contractor and not the technicians on-site. Our interviews with the 3P implementers echoed these concerns. Individuals highlighted the challenges and lack of feasibility of collecting reliable data at the technician level. As a result, neither 3P implementers nor PG&E currently request the correct information to verify that projects satisfy the Workforce Standards requirements. One potential reason relates to data availability and tracking. From our credentialing analysis, we found that, except for Acceptance Test Technicians, there is no public database that can verify the credentials of installer technicians for HVAC or ALC.[11] Furthermore, IOU staff shared the difficulty of tracking credentials at the installer/technician level instead of the contractor level.
  - **Recommendation 6:** We recommend that the CPUC formally designate the IOUs as the entity responsible for enforcing Workforce Standards and provide explicit guidance on what that means for the PAs in their interactions with 3P implementers. The CPUC historically and currently holds the IOUs accountable for achieving desired outcomes (e.g., energy savings), and thus, the IOUs are responsible for ensuring all their programs are successful in accomplishing these goals even if they are outsourcing the design and implementation of these programs to third-party implementers. As stated in D.18-10-008, "The Commission does not have experience with the practical implications of requiring workforce standards." While this report provides evidence of some

[11] While there is a public database to look up contractors with C-20 licenses since installers are not technically eligible to apply for a C-20 license, this does not help track credentials. Additionally, there is a public database to look up current HVAC apprentices; however, it requires individuals' full names and the last four digits of their social security number which is not readily available information. See DIR Apprenticeship Status and Safety Training Certification.

challenges in implementing workforce standards, we recognize that everyone is learning. As the IOUs take on the responsibility of enforcing Workforce Standards, the IOUs should present lessons learned and recommendations on how to make it work to the CPUC in an ongoing dialog.

- **Conclusion 7:** Due to the timing of Workforce Standards and the shift in IOU portfolios to include more 3P programming, we found that the role of IOU program managers shifted from managing the program's implementation to managing the contract and ensuring that 3P implementers meet performance deadlines. While not part of the initial investigation, several 3P implementers shared their experiences as the first wave of implementers participating in the new 3P program model. From the 3P implementers' perspective, IOUs were not as invested in the success of 3P programs as they were when they managed their own EE programs. Several 3P implementers experienced strict enforcement of their contracts despite delays caused by IOU review and approval processes, challenges receiving resources to recruit program participants, and a lack of flexibility regarding the KPIs and data collection structures to accommodate more innovative program design elements.[12] While the 2017 Responsible Contractor Study[13] reflected on how the size and capacity of a contracting firm can affect its ability to track and comply with workforce requirements, we found that in the new 3P pay-for-performance model, there is a need to consider the size and capacity of the firm as well. Smaller firms that secured contracts to implement EE programs faced difficulties due to their lack of experience working with IOUs and insufficient capital to cover the upfront program implementation costs. These challenges are exacerbated when the 3P implementers are responsible for implementing and enforcing requirements such as Workforce Standards. The implementers recommend that the CPUC consider updating the structure, execution, and standardization of EE programs across California, such as adjusting the pay-for-performance payment structure to support implementer cash flow, identifying opportunities to promote IOU investment and support of 3P programs, centering customer experiences on shorter review and payment processes, and standardizing the data collection and verification process for KPIs across the IOUs. Finally, all the implementers interviewed were thankful for the opportunity to provide feedback on their experiences implementing 3P programs. They requested future opportunities to provide feedback on these programs and draft CPUC decisions that may impact the success of their programs.
  - **Recommendation 7:** While the CPUC aimed to ensure that there were equal opportunities for implementers to secure contracts to implement 3P programs, we recommend that the Procurement Review Group (PRG) explore additional opportunities to support 3P implementers—especially smaller firms—with the data collection and verification requirements associated with Workforce Standards. This may include but is not limited to discussions around the proportion of contracts associated with pay-for-performance models, utilization of fixed fees to support the ramp-up phase of the program, and additional support mechanisms during the contract negotiation process. Additionally, we recommend that the CPUC develop a regular feedback mechanism to solicit 3P implementer feedback on program effectiveness and challenges and integrate implementer feedback into updates to the contracting process, program design, or measurement and verification processes.
- **Conclusion 8:** In identifying projects that triggered Workforce Standards, we identified discrepancies in the measure descriptions provided and their relevance to lighting control measures to determine whether Workforce Standards would be triggered. Upon closer examination of the measure packages (a.k.a. workpapers) associated with all projects that we could match in the CEDARS database, we found that most measure packages do not explicitly state whether the measure included a lighting control feature or was compatible with a lighting control

[12] These contracts followed the standard terms and conditions and guidelines outlined in 18-10-008 and 19-01-003. The CPUC since has issued Decision 23-02-002 to address challenges 3P implementers experienced during the solicitation and contract negotiation stages. The decision updated new 3P program solicitation processes and standardized terms and conditions.

[13] Opinion Dynamics Corporation. "Responsible Contractor Policy for EE Programs: Market Intelligence Study." CALMAC, December 2017. https://www.calmac.org/publications/Responsible_Contractor_Policy_Study_Report_FINAL.pdf.

system. Additionally, interviews with 3P implementers shared that IOUs have different definitions of what types of measures constitute advanced lighting controls. Going forward, it appears that fewer programs will incent general lighting measures. However, if lighting controls continue to be incentivized by programs and trigger Workforce Standards, there is a need to ensure the IOUs are consistently differentiating between general lighting measures (e.g., light fixtures, lamps, and ballasts) and advanced lighting controls.

  - Recommendation 8: We recommend that the CPUC ensure that there is a standardized definition for what constitutes "lighting controls". We recommend that the CPUC consider using the definition developed by the CALCTP Board to include: 1) occupancy and photosensors for both indoor and outdoor applications; 2) low and line voltage dimming systems; 3) demand response control systems, including Energy Management and Control Systems (EMCS) with Direct Response (DR) functionality/modules; 4) track lighting systems including current limiting devices; and 5) time-based scheduling systems, including automatic time switches, programmable lighting control panels, and part-night lighting.[14] Additionally, the CPUC should direct all the IOUs to utilize this definition when recording project measures in the CEDARS database. We recommend that there be a filter or flag for lighting controls within CEDARS.

- Conclusion 9: At the time of this retrospective study, there was insufficient data to measure the impact of Workforce Standards on project quality and energy savings. Moving forward, a retrospective impact analysis of Workforce Standards will not be possible until 1) a standard definition of what constitutes "lighting controls" that is utilized by the IOUs and tracked in the CEDARS database, 2) a statewide HVAC technician certification that can be used for Workforce Standards, 3) the ability for IOUs and 3P implementers to obtain certification information from credentialing providers to verify that HVAC and ALC installers meet Workforce Standards requirements, and 4) improved IOU and 3P implementer capacity to track installers on qualifying projects.
- Recommendation 9: We recommend that the CPUC take the following actions to better support the implementation and evaluation of Workforce Standards: 1) direct the IOUs to develop a process to enforce Workforce Standards using the lessons learned codified in this report and the findings from the discussions called for in Recommendation 3A and 3B above, 2) ensure a standard definition of what constitutes lighting controls is defined and utilized by the IOUs and tracked in the CEDARS database, 3) continue to collaborate with other state agencies (e.g., CWDB, CSLB, DIR) on relevant workforce certifications for HVAC and lighting technicians.

2. INTRODUCTION

The California Public Utility Commission (CPUC) has expressed an interest in workforce standards —minimum requirements for technicians and contractors to install, diagnose, or repair electrical equipment—for several years[15][16][17][18] to increase demand for certifications and training, improve quality installations of EE technology, increase

[14] CALCTP. *CALCTP Acceptance Testing Handbook*, November 17, 2022. https://calctp.org/content/CALCTP-AT_Handbook_Version_23_2022_cycle_11-17-22.pdf.

[15] California Public Utilities Commission (CPUC). "California's Long Term Energy Efficiency Strategic Plan". 2008. Energy Efficiency Strategic Plan (ca.gov).

[16] D.10.08-047

[17] Carol Zabin, et al., "California Workforce Education and Training Needs Assessment For Energy Efficiency, Distributed Generation, and Demand Response." 2011. California Workforce Education and Training Needs Assessment PART ONE (berkeley.edu)

[18] Carol Zabin, et al., "Workforce issues and Energy Efficiency Programs: A plan for California's utilities." 2014. Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities - UC Berkeley Labor Center

energy savings, and provide greater career opportunities for disadvantaged workers[19] (addressed most recently in D.18-05-041[20] and D.18-01-004[21]). Since these decisions, the CPUC has continued to identify opportunities to support workforce development through collaborations with the California Workforce Development Board[22] and explicit goals in their Environmental and Social Justice Action Plan[23]; however, this report aims to respond to the CPUC's request to test the underlying assumption that Workforce Standards—as defined in D.18-10-008—lead to more quality installation and increased energy savings. D.18-10-008[24] is the first step towards instituting these requirements. D.18-10-008 intends to begin implementation of Workforce Standards with a limited number of projects to collect experience and data on the impact of workforce requirements and then use that data to decide whether modifications to these standards should occur.[25]

Provisions in D.18-10-008 Ordering Paragraphs 1 and 2 (Page 76-77) summarized Workforce Standards for large non-residential heating, ventilation, and air conditioning (HVAC) and Lighting Control (LC) measures.[26] All the below requirements apply to all the individuals who perform the installation work, not just to the contracting firm itself.

1. All projects that include the installation, modification, or maintenance of HVAC equipment in non-residential buildings that reserve a project incentive of $3,000 or more must utilize installation technicians that meet one of the following criteria:
    - Enrolled in and/or completed California or federally accredited HVAC apprenticeship.
    - Completed at least five years of work experience at the journey level as defined by the California Department of Industrial Relations, passed a practical and written HVAC system installation competency test, and received credentialed training specific to the installation of the technology being installed.
    - Has a C-20 HVAC contractor license from California Contractor's State Licensing Board.
2. All projects that include the installation of lighting control measures in non-residential buildings that reserve a project incentive of $2,000 or more must utilize installation technicians who have earned a California Advanced Lighting Controls Training Program (CALCTP) certification. (*Note: Program Administrators may file a Tier 2 advice letter proposing other programs equivalent to CALCTP. However, to date, this option has not been exercised*.)

In addition to these certifications, the standardized terms and conditions for 3P programs provided in Appendix B of D.18-10-008 required implementers to identify any additional "skills certification and/or broader occupational training and experience that would reduce the risk of lost net lifecycle energy savings from poor installation, modification, or

[19] Disadvantaged workers are individuals who may reside in low-income communities or experience barriers to securing and retaining employment (e.g., limited English proficiency, receives public assistance, does not have a high school diploma or GED).
[20] California Public Utilities Commission. "Decision 18-05-041: Decision Addressing Energy Efficiency Business Plans." California Energy Efficiency Coordinating Committee, May 31, 2018. https://4930400d-24b5-474c-9a16-0109dd2d06d3.filesusr.com/ugd/849f65_25c301572da7419e96482e5dae5c347e.pdf
[21] California Public Utilities Commission. "Decision 18-01-004: Decision Addressing Third Party Solicitation Process for Energy Efficiency Programs." California Energy Efficiency Coordinating Committee, January 11, 2018. https://4930400d-24b5-474c-9a16-0109dd2d06d3.filesusr.com/ugd/0c9650_87ed0c0dfad84be2afdea812e30f2a53.pdf
[22] MEMORANDUM OF UNDERSTANDING (ca.gov)
[23] esj-action-plan-v2jw.pdf (ca.gov)
[24] California Public Utilities Commission. "Decision 18-10-008: Decision Addressing Workforce Requirement and Third-Party Contract Terms and Conditions." California Energy Efficiency Coordinating Committee, October 11, 2018. https://4930400d-24b5-474c-9a16-0109dd2d06d3.filesusr.com/ugd/849f65_73bda2a0c92e4279be07515821b767ea.pdf
[25] Ibid.
[26] Ibid.

maintenance of the energy efficiency measures" that would be required for installers, contractors, or technicians working on projects for the program.

These standards were required for any new third-party (3P) solicitations released after October 11, 2018 (the issue date of D.18-10-008) and by July 1, 2019, for other new or renewed projects that meet these requirements. Importantly, these requirements were identified for downstream projects in which the incentive was not paid directly to the manufacturer, distributor, or retailer of the technology unless the entity was responsible for installing the equipment.

Since the enactment of Workforce Standards, the CPUC has continued to demonstrate its commitment to supporting workforce development through 1) its Memorandum of Understanding (MOU) with the California Workforce Development Board (CWDB)[27] and 2) an environmental and social justice action plan goal to "promote high road career paths and economic opportunities for residents of ESJ communities".[28] Although these activities are relevant to the CPUC's current historic engagement in workforce, education, and training activities, they are outside of the scope of the current evaluation and are not discussed further in this report.

2.1 STUDY OBJECTIVES

In 2022, the CPUC hired Opinion Dynamics to evaluate the impact of Workforce Standards—with a focus on the standardized criteria for HVAC and LC projects[29]—and provide recommendations as to whether the standards should be eliminated, continued as defined, adapted, or expanded. The CPUC is interested in a study looking into the impact of these Workforce Standards on the industry and project outcomes to determine if Workforce Standards should be eliminated, continued as defined, adapted, or expanded. This report will focus on the following objectives that Opinion Dynamics was tasked with:

- Determining the status of the responsible contractor policy (SB 350) and lessons learned that may impact Workforce Standards.
- Identifying the number of energy efficiency programs that incent HVAC and LC installations and the number of projects that triggered Workforce Standards since October 11, 2018.
- Characterizing the existing training programs, certification processes, and requirements to maintain each of the credentials identified in D.18-10-008.
- Understanding how Workforce Standards are implemented and enforced by key stakeholders.
- Assessing the impact of Workforce Standards on key stakeholders.

3. METHODS

Due to the lack of understanding of the state of Workforce Standards, their implementation, and level of enforcement, the initial research for this study relied primarily on qualitative methods to understand the scale of projects that triggered Workforce Standards, the difficulty of attaining the required certifications, the level of implementation and enforcement of these standards within energy efficiency programs, and their impact on key stakeholders. Opinion

[27] MEMORANDUM OF UNDERSTANDING (ca.gov)

[28] esj-action-plan-v2jw.pdf (ca.gov)

[29] NOTE: This evaluation focused on the HVAC and LC criteria and did not investigate other certifications or workforce training identified by implementers in their final contracts with IOUs.

Dynamics employed the following research methods to address the research objectives in this report: secondary data review, baseline interviews, credentialing analysis, and contractor interviews (See Table 1). We summarize each method in detail below.

Table 1. Research Method by Research Objective

Objective	Secondary Data Review	Baseline Interviews	Credentialing Analysis	Contractor Interviews
Determine the status of the responsible contractor policy (SB 350) and lessons learned that may impact Workforce Standards.	X	X		
Identify the number of energy efficiency programs that currently incent HVAC and LC installations and the number of projects that triggered HVAC and LC Workforce Standards between October 2018 and October 2022.	X			
Characterize the existing training programs, certification processes, and requirements to maintain each of the credentials identified in D.18-10-008.			X	
Understand how Workforce Standards are implemented and enforced by key stakeholders.	X	X		
Assess the impact of Workforce Standards on key stakeholders.		X		X
Determining the feasibility of an impact evaluation of Workforce Standards on desired outcomes.	X	X	X	

3.1 SECONDARY DATA REVIEW

We began our research by reviewing existing reports, decisions, and public comments on Workforce Standards and the responsible contractor policy. For several of our analyses, we required information from investor-owned utilities (IOUs) to better understand 1) the scale of projects that Workforce Standards apply to, 2) the implementation, measurement, and enforcement of Workforce Standards for these projects, and 3) which key stakeholders to contact about the implementation or enforcement of Workforce Standards in California. We utilized a series of data requests to gain information about the current EE programs and the current data available for EE incentivized projects.

3.1.1 LITERATURE REVIEW

We reviewed the original policy decisions associated with Workforce Standards[30] and the portfolio shift to third-party (3P) EE programming[31] from the CPUC website. Ordering paragraph 15 in D.18-10-008 stated, "The Commission should request that the CAEECC convene a stakeholder process no later than July 1, 2020, to discuss experience with implementation of the Workforce Standards and the potential to extend these or new standards to additional programs

[30] California Public Utilities Commission. Decision 18-10-008.California Public Utilities Commission. Decision 18-01-004; California Public Utilities Commission. Decision 18-05-041.

[31] California Public Utilities Commission. "Decision 16-08-019: Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings," August 18, 2016. https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fdocs.cpuc.ca.gov%2FPublishedDocs%2FPublished%2FG000%2FM166%2FK232%2F166232537.docx&wdOrigin=BROWSELINK; California Public Utilities Commission. "Decision 21-05-031: Assessment of Energy Efficiency Potential and Goals and Modification of Portfolio Approval and Oversight Process," May 20, 2021. https://docs.cpuc.ca.gov/.

or projects…" Thus, in addition to the original documents, we also sought to review the associated stakeholder comments from meetings of the California Energy Efficiency Coordinating Committee (CAEECC). We searched for meeting notes that included Workforce Standards. Finally, we searched the California Measurement Advisory Council (CALMAC) website for previous studies investigating "Workforce Standards" or the "responsible contractor policy." We reviewed and took notes on all the documents we were able to find and utilized them to provide historical background for the study.

3.1.2 ENERGY EFFICIENCY PROGRAMS AND PROJECTS THAT TRIGGER WORKFORCE STANDARDS

In November 2022, we requested each IOU to provide us with key project information for all downstream non-residential projects that applied for an ALC incentive of $1,500 or more or an HVAC incentive of $2,500 or more on or after January 1, 2018.[32] We utilized this information to 1) identify the number of energy efficiency programs that currently incent HVAC and ALC installations, 2) document the number of projects that triggered HVAC and ALC Workforce Standards between 2018 and October 2022, and 3) identify potential case studies for closer examination of the impact of Workforce Standards. For each project, we received information about the building, technology type, measure descriptions and quantities, key incentive dates (application, installation, project completion, and paid dates), incentive amounts, and contractor/technician information where available.

PROGRAM-LEVEL ANALYSIS

We received a list of 21 Non-Residential EE Programs of which 17 contained Workforce Standards language in their contracts for either HVAC or ALC. We received program information from PG&E, SCG, SCE, and SDG&E. Where available, we reviewed the program contracts to evaluate how each program planned to implement Workforce Standards.

To supplement these materials that we received from the IOUs, we also reviewed the publicly listed 3P energy efficiency programs on each IOU website. We examined their applicability to downstream non-residential projects that incentivized HVAC, ALC, or both technologies. We identified the implementers for each program, the associated technology type, and the associated service territory for each program.

PROJECT-LEVEL ANALYSIS

In total, we received 869 HVAC projects and 7,368 ALC projects from all four IOUs. Upon receipt of the files from the IOUs, we cleaned the data to ensure consistency for analysis across all the IOUs. We then created two variables to aid in our analysis: 1) a time variable to identify projects that applied for incentives on or after the mandatory enactment of Workforce Standards in all the IOU EE program contracts and 2) an incentive variable to flag projects that met the incentive threshold of $3,000 for HVAC and $2,000 for ALC.

Once the data were cleaned, we ran a series of descriptive analyses to identify the number of projects that 1) met the incentive threshold and 2) had application dates after the Decision went into effect. Projects that met both the incentive threshold and applied after October 11, 2018, were categorized as projects that triggered Workforce Standards.

[32] Note: We requested projects that were $500 less than the threshold to trigger Workforce Standards to identify potential comparative case studies that would be of a similar scale but did not trigger Workforce Standards.

3.I.3 SELECTED REVIEW OF ALL PROJECT MATERIALS FOR THE EVALUABILITY OF A WORKFORCE STANDARDS IMPACT ANALYSIS

DATA COLLECTION

Upon initial review of the project data collected from the IOUs in November 2022, we identified that contractor information was missing from 93% of the HVAC (n=804) and 93% of the ALC (n=6,874) files. Due to our interest in assessing the viability of an analysis of Workforce Standards on key metrics (e.g., energy savings estimates), it was critical that we would be able to 1) identify projects that had Workforce Standards language in their contracts, 2) identify the individual who installed the technology, and 3) identify if individuals received one of the approved credentials described in D.18-10-008.

Due to our plan to utilize case studies to identify differences in key variables between projects that triggered Workforce Standards and those that did not, we chose to review a subset of project files that both triggered and did not trigger Workforce Standards. We requested all project files for a set of 19 projects (7 HVAC and 12 ALC) that were expected to serve as potential case studies to compare key measures between projects that triggered and did not trigger Workforce Standards. We sought to identify projects that 1) installed the same measure type, 2) were conducted in similar building types (as defined by CEDARS), 3) and were located within a nearby geographic region (defined as within 50 miles of one another). We sought to match at least one project that triggered Workforce Standards with one that did not. We filtered projects first by building type, then incentive amount, and finally location for a final list of 17 HVAC and 111 ALC potential case studies (Table 2).

To further narrow down our list to about 20 projects, we then sought to have project variation where possible in the 1) geographic location in California (i.e., Northern vs. Southern California), 2) the utility territories, 3) customer name, and 4) project completion date. We requested all project information for three HVAC projects from SCE, four HVAC projects from SDG&E, and 11 ALC projects from PG&E for our analysis (Table 2). No project files were requested from SCG.

Table 2. HVAC and ALC Project Selection for Review by Utility

	IOU Territory	Full List of Project Files	Potential Case Studies	Final Projects Selected for Review
HVAC	Total	869	17	7
	PG&E	666 (77%)	5 (29%)	0 (0%)
	SDG&E	83 (9%)	6 (35%)	4 (57%)
	SCE	63 (7%)	3 (18%)	3 (43%)
	SCG	57 (7%)	3 (18%)	0 (0%)
ALC	Total	7,368	111	12
	PG&E	7,368 (100%)	111 (100%)	12 (100%)
	SDG&E	0 (0%)	0 (0%)	0 (0%)
	SCE	0 (0%)	0 (0%)	0 (0%)
	SCG	0 (0%)	0 (0%)	0 (0%)

DATA ANALYSIS

We reviewed all the project files received and sought to identify contractor, technician, and installer names and contact information, assess the inclusion of Workforce Standards in the contract language with the customers/contractors, and analyze whether the contractors/technicians met the required credentials codified in D.18-10-008. We investigated the credentials of all the contractor and/or installer information that we retrieved from project documents by searching

their names in publicly available CSLB and CALCTP databases for the C-20 licenses and CALCTP certifications, respectively. Unfortunately, we were unable to verify apprenticeship information without technician names and social security numbers. Finally, we did not identify a publicly available dataset to validate journey-level credentials.

Although we initially aimed to conduct an impact analysis exploring the differences in work quality and energy savings between projects that triggered workforce standards and those that did not, we were not able to move forward with these case studies due to our inability to 1) identify which projects incented advanced lighting controls and 2) verify relevant credentials. We provide more information about the difficulties with data quality and data collection associated with Workforce Standards in Section 7.3: This study is covered under CPUC Contract 17PS5017 between Opinion Dynamics and the California Public Utilities Commission (CPUC or the Commission).

ACKNOWLEDGEMENTS

This project was a collaborative effort under contract to the CPUC. The evaluation team would like to thank the CPUC Staff for guidance and input throughout the project planning and execution. Finally, the evaluation team would like to thank the IOU program administrators (PAs), third-party (3P implementers), contractors, and credentialing staff who took the time to support this study by responding to research efforts.

3.2 BASELINE INTERVIEWS

To assess the current Workforce Standards implementation, enforcement, and impacts, we sought to conduct 30-to-45-minute semi-structured interviews with a variety of stakeholders involved in Workforce Standards. We received governmental and implementer staff contact information through a series of online web searches and public data requests. From November 2022 through June 2023, we conducted email outreach to staff at governmental organizations, IOUs, and 3P implementers. We conducted 23 interviews between November 2022 and June 2023 via phone or Microsoft Teams meeting. We spoke with governmental staff from the CEC and CPUC (n=3), programming/contracting staff from PG&E, SDG&E, SCE, and SCG (n=10), and 3P implementer staff (n=10) from PG&E, SDG&E, SCE, and SCG territories. We were able to contact CAEECC, but they indicated that they had nothing additional to discuss as CAEECC members had not discussed Workforce Standards since August of 2020. They indicated that the CPUC Energy Division guides the scope of the CAEECC workplan and a discussion regarding Workforce Standards has not been included.

3.3 INTERVIEWS WITH HVAC AND ALC CONTRACTORS

In addition to IOU and 3P staff, we also conducted interviews with six contractors to better understand what constituted a quality installation and their experiences with Workforce Standards in California. semi-structured interviews with three HVAC and three Lighting contractors licensed in the state of California. Each interview lasted 30-45 minutes and was conducted by phone or via Microsoft Teams. We recruited interview participants from program tracking data provided by each of the California IOUs. To solidify our sample and populate minor gaps in contact information, we ran each IOU-provided HVAC and ALC contractor list against the CSLB directory of licensed contractors. The outreach consisted of an initial invitation email briefly detailing our study and highlighting the potential to earn a $150 gift card for completing the interview. We then conducted phone call follow-ups, as necessary. The interviews were conducted between March and June of 2023. Interviews were recorded with participants' permission, transcribed using transcription software, and analyzed for key themes using NVivo.

The respondents consisted of five business owners and one senior account manager. Three of the contractors worked for large firms with more than thirty employees, and two had staff sizes of less than ten individuals. One HVAC contractor and one ALC contractor worked for a union-affiliated company, and the rest of the contractors interviewed were not affiliated with a union. All six contractors said their company focuses primarily on commercial work. The lighting contractors interviewed primarily conduct installations, whereas the HVAC contractors said they do a mix of maintenance and service work. All contractors interviewed had participated in at least one energy efficiency program.

3.4 CREDENTIALING ANALYSIS

One of our goals was to develop a baseline understanding of the training programs mandated in D.18-10-008 for HVAC and ALC technicians.

These programs included:

- The Department of Industrial Relationships (DIR) HVAC and associated apprenticeships (e.g., sheet metal, refrigeration, and air conditioning fitter)
- The California Lighting Controls Training Program (CALCTP) certification
- The C-20 HVAC contractor license

- The U.S. Federal Government's Registered Apprenticeship Program (RAP)

For each program, we conducted a review of publicly available online materials and conducted interviews with key stakeholders to improve our understanding of the key prerequisites of each program, their overall design, and potential impact on technician's performance of quality installations.

3.4.1 ONLINE LITERATURE REVIEW

We began with web searches of each program using the program names. For most of the credentials, we were able to acquire contact names and basic program information from each organization's website. However, the information available on each site varied greatly depending on the credentials. The CSLB website was the most robust in providing testing materials, pre-requisite requirements, and information about certification and recertification. For state-approved apprenticeships, the DIR website provided a list of active apprenticeship training centers with contact information but did not provide an overview of the apprenticeship programs. Similarly, we found that there was limited information available for the federal apprenticeship programs. In addition to utilizing these main sources, we also conducted web searches of related key terms. While we did identify one federal HVAC apprenticeship program, the Plumbing Heating Cooling Contractors Association (PHCC), but further investigation into the program revealed that they were not actively recruiting or providing training to apprentices at the time of the study. As a result, we were unable to identify any active federal HVAC apprenticeship partners in California. Finally, for advanced lighting controls, we were able to review and download training materials for both the CALCTP Technical Installation Program and the CALCTP-AT (Acceptance Testing) Program. Following our review of materials, we identified missing elements that we then explored in interviews with credentialing providers.

3.4.2 INTERVIEWS WITH CREDENTIALING PROVIDERS

The evaluation team conducted eight semi-structured interviews with credentialing staff to learn more about how certification training is provided to HVAC and ALC technicians and contractors in California. For HVAC credentials, we conducted interviews with staff from the CSLB, the DIR Division of Apprenticeship Standards (DAS), one state-approved union apprenticeship, and one federal-approved non-union apprenticeship. For ALC, we conducted interviews with representatives from CALCTP, the California Lighting Technology Center (CLTC) who were responsible for developing the CALCTP curriculum, and one of the CALCTP trainers.

Interviews were conducted in January and February 2023 via phone or Microsoft Teams meeting. Outreach consisted of an initial invitation email followed by two reminder emails as needed. We asked representatives semi-structured questions to learn more about how they provided certification training to HVAC and LC technicians and contractors who work on projects that trigger Workforce Standards. Each interview lasted approximately one hour, was recorded, transcribed, and then analyzed for key themes using NVivo software.

4. FINDINGS: PROGRESS TOWARDS A RESPONSIBLE CONTRACTOR POLICY

D.18-10-008 describes the Workforce Standards set forth in the Decision "as a starting point for potentially more far-reaching requirements in the future, in coordination with the evaluation and adoption by the California Energy Commission of a 'responsible contractor policy' as set forth by Senate Bill 350". Despite the mandate to develop a responsible contractor policy for all ratepayer-funded EE programs in 2015, our interview with CEC staff revealed that as of 2023, it has remained an unfunded governmental mandate. One reason for the lack of progress towards the responsible contractor policy was the lack of staffing and other resources within the Standards Compliance branch of the CEC. The staff member who shared that they are working to develop the responsible contractor policy in conjunction with consumer protection guidelines that will help inform customers of the importance of hiring licensed contractors for projects and protect them from difficulties they may encounter because of hiring individuals who do not have the

appropriate licenses and permits to conduct the work. At the time of the interview, the CEC was actively working to develop a work plan to be submitted in May of 2023 to secure resources for the research and development of both the responsible contractor policy and consumer protection guidelines. Given the policy's status, we are unable to glean any lessons learned from the implementation of the responsible contractor policy. Instead, the CEC staff are interested in findings from this study to help inform their development of both policies.

5. FINDINGS: ASSESSMENT OF HVAC AND ALC CREDENTIALING PROGRAMS

To gain an understanding of each of the credentials identified in D.18-10-008, we utilized a mix of interviews with credentialing staff and contractors, online literature review, and secondary data review to 1) describe each credential requirements, certification processes, and unique challenges they face in ensuring quality technology installs, 2) characterize the overall prevalence of each of the credentials in California, and 3) evaluate the consistency of the credentials, their verifiability, and ease of enforcement.

5.1 PROGRAM SUMMARIES

Below we summarize the key components of each of the CALCTP, HVAC Apprenticeship, Journeyworker[33], and C-20 credentials. We highlight successes and challenges in meeting the Workforce Standards requirements.

5.1.1 CALIFORNIA ADVANCED LIGHTING CONTROLS TRAINING PROGRAM (CALCTP)

CALCTP is a collaborative educational program for electric technicians and contractor staff that launched in 2010. The California Lighting Technology Center (CLTC) at UC Davis manages the program's curricula and recruits training partners, while the program itself is implemented by ICF Strategic Consulting.

TYPES OF CALCTP TRAINING

CACLTP focuses on providing training for both contractors and technicians on advanced lighting control systems within non-residential buildings. Currently, CALCTP offers business-level systems training for contractors, business owners, and mid-senior level staff called the "CALCTP Installer Contractor", as well as individual-level training for 1) Installer Technicians and Contractors and 2) Acceptance Test Technicians.

Business-level certification

For a business to receive CALCTP certification, a mid-senior level staff member, business owner, or contractor must complete a 4-hour systems course to ensure they understand advanced lighting controls systems, how the system(s) should function, how the system(s) interact within a building, and the regulatory and ethical roles played by technicians throughout the process.

Installer Technicians

[33] Note: While "Journeyman," "journeyperson," "journeyworker, and journey-level worker" are interchangeable terms, the California Apprenticeship Council has identified "journeyworker as the preferred designation. As such, we utilize "journeyworker" throughout the report.
See California Department of Industrial Relations (2021). California Code of Regulations, Title 8, Section 205. Definitions. Retrieved from https://www.dir.ca.gov/t8/205.html.

The Technical Installation course requires participants to be either state-certified general electricians[34] or C-10 licensed electrical contractors. General electrician apprentices are permitted to enroll in the last year of apprenticeship but must pass the DIR General Electrician Exam before receiving their CALCTP certification. Prior to applying to participate in the training, each individual must complete approximately 14 hours of prerequisite course modules to ensure that all participants are on an "even playing field" in terms of their baseline knowledge prior to entering the program. These prerequisites are free and can be completed online. Once individuals are accepted into the training program, they participate in 50 hours of lecture and hands-on training prior to taking a final exam for certification.[35] Participants are educated, trained, and certified on the broad function of lighting control systems, the installation of specific types of lighting controls (e.g., dimmers, sensors), and their maintenance. As of 2022, over 2,300 certified electricians have completed the CALCTP installer training since its origin in 2010. When compared to the 2022 list of certified and active general electricians in California (n=29,619), less than 10% of the general electricians have completed the CALCTP installer training.[36]

Acceptance Test Technicians

In 2014, CALCTP began offering the Acceptance Technician Training to support the Title 24 update that required all lighting control projects to certify that the devices and systems were properly installed and operational. Currently CALCTP is one of two entities that provides a state-approved acceptance technician training program. Individuals who have completed the intensive CALCTP installer technician training are eligible to take the additional acceptance test module; however, individuals without this certification, provide documentation that they have at least three years of experience working with a majority of lighting controls[37] to qualify. Individuals who are unable to provide documentation of their experience are unable to participate in the program.

Overall, the program takes 20 hours to complete. Similar to the installer technician training, the program is bimodal utilizing a mix of lectures and lab experience. Individuals learn about the necessary installation requirements, how to perform acceptance testing for various controls, and the necessary procedures for certifying the functionality of an installation. While the acceptance test is newer than the installer technician training, it currently is more popular since it is required under Title 24. A CALCTP shared the difference in demand for recertification for installer technicians and Acceptance Test Technicians,

> *It's really hard to re-certify people [as installer technicians] when there's no money to do it, there's no incentives to get them interested in even doing it. Whereas the Acceptance Test, of course they do it every year because they want to keep their certification at both the employer and the technician level in order to be able to do the work because it's required.*

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[34] Note: To become a state-certified general electrician in California, candidates must complete a minimum of 8000 hours of hands-on training. See: Department of Industrial Relations. "General Electrician" (2023): https://www.dir.ca.gov/dlse/ecu/1a.html.

[35] Note: At the time of this report, CALCTP was working on developing and rolling out an updated version of this training that was reduced to a total of 20 hours of lecture and hands-on training. See page 17 of this report for more details.

[36] Division of Labor Standards Enforcement. "Statistics of the DSLE-Electrician Certification Unit from 12-01-2002 to 01-01-2022" https://www.dir.ca.gov/dlse/ecu/ECU_stats.html.

[37] Lighting Controls defined by CALCTP are: 1) occupancy and photosensors, 2) low and line voltage dimming systems for both indoor and outdoor applications, 3) demand response control systems including Energy Management Control System with Demand Response functionality/modules, 4) track lighting systems including current limiting devices, and 5) time-based scheduling system including automatic time switches, programmable lighting control panels, and part-night lighting control devices.
See: California Advanced Lighting Control Training Program. "CALCTP-Acceptance Test Handbook," 2022. https://calctp.org/content/calctp-at_handbook_2019_cycle_11-4-19_0.pdf.

Finally, to ensure that Acceptance Test Technicians are properly certifying installations, CALCTP conducts regular audits as guided by the CEC. Every year, CALCTP staff audit 1% of projects that were tested by certified CALCTP acceptance technicians. Individuals who are not following the necessary guidelines can have their certification revoked.

CALCTP CERTIFICATION AND RENEWAL

All CALCTP trainings contain a series of modules that require participants to pass written and practical exercises, but also conclude with a summative written examination that must be passed to receive the certification. For an individual to receive CALCTP certification as either an installer technician or Acceptance Test Technician, individuals must provide proof of completion of the program, employment with a certified CALCTP contractor, and pay an initial application fee of $350. Every year on date of issuance, certified technicians must pay a $165 maintenance fee to remain in good standing.

For employers who have completed the systems course training, they must pay an initial application fee of $480 for self-employed contractors, $840 for contractors with one office, and $1,140 for contractors with more than one office. Recertification fees are billed based on projects completed (See Table 3).

Table 3. CALCTP Employer fees by Business Type

	Self-Employed		One Office		More than One Office	
	Less than 50 projects	50 projects or more	Less than 50 projects	50 projects or more	Less than 50 projects	50 projects or more
Initial Application Fee	$480	$480	$840	$840	$1,140	$1,140
Recertification Fee	$420	$210	$600	$300	$750	$460

Both individuals and employers must be recertified every three years in accordance with the new code cycle. Supplemental training may be necessary for recertification of CALCTP employers and CALCTP Acceptance Test Technicians to ensure all individuals are aware of current California code requirements.

CALCTP PROGRAM STRENGTHS

One of the strengths of CALCTP is the long-term relationships that ICF and CLTC have built to ensure the program's success. One of the marketing staff from CLTC shared their experiences working with ICF on the project: "we've just been emailing back and forth with [ICF] constantly for a decade to make sure that [the program] partnerships stay good. And I would say it's been very successful. No hiccups over the last decade, so."

In addition to the core partnership between CLTC and ICF, CALCTP works with several state agencies, utilities, and labor associations who help update, promote, and support the program. In the implementation of their training modules, they recruit ALC contractors and professionals to lead trainings associated with the technologies they are familiar with. One of these contractors shared his opinions on the scope and implementation of the Acceptance Test Technician training:

> *Yeah, I think the CALCTP training is probably the most robust training, and probably also the most comprehensive, [and] put together well. They partner with the CLTC, California Technology Center at UC Davis, and that's where the curriculum gets developed... And so, I think it's probably the best because it has partnerships with the manufacturers when [CLTC] develops the training, and so you have multiple manufacturers represented. It's Wattstopper, nLIGHT, it's Lutron, it's Enlighted, probably current GE,*

which would be Hubble, stuff like that is represented. So, you have so many different manufacturers represented that the electricians that are training in it really get a good overall view of a lot of different systems.

Another lighting contractor found value in participating in the CALCTP training since it helped their company stay up to date on building code developments and avoid regulatory issues. While the contractor didn't see it as an absolute necessity for all their technicians, they said they would continue to recertify at the employer level to stay up to date on industry developments.

In addition to the content, CALCTP staff have taken specific steps to build equity into their program to ensure that individuals, especially those from disadvantaged communities, are able to participate in their programs. First, part of the pre-requisite for installer technicians is the free 14-hour online course that ensures all individuals have a baseline understanding of lighting controls. Second, CALCTP purposefully has initiatives that focus on recruiting participants in disadvantaged communities and bringing them into the industry. One specific effort mentioned by staff was finding ways to reduce the upfront costs of the program by offering to take program cost out of apprenticeship wages.

CALCTP INSTALLER TECHNICIAN PROGRAM CHALLENGES

While the program design and structure have been strengths, staff members also shared the difficulties with enrollment and updating the program to match the rapidly changing lighting technology. While the Acceptance Test Technician has maintained a consistent demand due to the Title 24 requirement, the installer technician program has had difficulty recruiting individuals to participate. In conversations with contractors, CALCTP staff shared that two barriers were a lack of incentive to maintain the CALCTP installer certification and the length of the program. Staff noted that contractors were reluctant to have technicians complete the program because of the impact losing a technician for over a week to accommodate the 50-hour training would have on the company's productivity and costs. To address this, CALCTP staff were able to secure funding from the Department of Labor to do a major revision to shorten the installer technician curriculum.

In addition to the change in the program length, CALCTP staff shared that an incentive for individuals to initially certify and recertify would have a positive impact on enrollment for the installer technician training,

I really think that this new update's going to help with [low enrollment]. It's shorter, it's more concise, it's more up to date with technology. I think that will be, and if we could get that incentive, that would be, if we'd really be great that those would really help moving forward, gaining interest.

While CLTC does regularly make some minor adjustments to CALCTP training materials to stay current with code changes and emerging technologies, their capacity to implement substantial changes is limited by their ability to secure funding. The CALCTP trainer we spoke with shared, "that would probably be my only real gripe, is just, hey, let's update the curriculum quicker to keep up with the progression of the industry to make sure that the people taking the training are getting trained with what's actually being seen out in the field". Unfortunately, CALCTP is only able to stay updated so long as program staff at CLTC are able to secure funding to adequately develop new curricula for the CALCTP training modules. Without the funding from the Department of Labor, CLTC would not have had the resources to develop and implement the updates to the installer technician training which serves as the first major update that the program has had since it began in 2010.

CALCTP ACCEPTANCE TEST TECHNICIAN PROGRAM CHALLENGES

In terms of acceptance testing, CALCTP staff shared two barriers to the performance of quality installations. The first is the timing of when Acceptance Test Technicians become involved in a project. The staff member shared how the change in code has impacted quality lighting controls installs,

> *In the 2013 code, it was set up that before an engineer submitted their paperwork to the building department with their design, an Acceptance Test Technician had to review it. In the 2016 code, they got rid of that requirement, which also has impacted the program, because Acceptance Test Technicians are only certified by code to review what has been by the approved stamp plans... If it's not on the approved plan, you can't override the approved plan. The building department has ending authority, not you....*

The inability for the Acceptance Test Technician to provide feedback on the design plans can negatively impact the functionality and anticipated energy savings of the equipment on a project. The staff continued by sharing how the incorrect placement of a technology can cause a project to fail the acceptance test:

> *The big issues are the design. The designers will just, "Well, okay, this office space needs an occupancy sensor," and they'll just put it by the front door.... And so, if they put it right next to the door when you walk by the door, it's going to kick on. And those are things that the Acceptance Test Technician, a really good one, would say, "Well, if you put it right there, you're going to have this false positive. But if you move it two feet to the other end of the cubicle or the other end of the office, you're not going to have the problem." And so, design from my perspective or from what I see, is kind of the issue.*

Second, a challenge for the program is the availability of training sessions, "The biggest barrier to entry for those is just going to be the frequency in which the trainings are held and just where they are, right.... It would be great to be able to have more trainings available, spread out across the state." As of 2023, CALCTP administrators estimate that the CALCTP certification accounts for only 30% of Acceptance Test Technicians hired in the state of California. Given the need for Acceptance Test Technicians in California and that CALCTP is in competition with only one other CEC-approved certification program (National Lighting Contractors Association of America), there are opportunities for them to expand their training offering within the market.[38]

Finally, from a contractor perspective they suggested ensuring that the curriculum is more inclusive and equitable to include opportunities for individuals with limited English reading comprehension or learning disabilities. suggested was more equitable curriculum. They discussed their concern with CALCTP as a credential requirement especially for several of their technicians who may have difficulty with English written exams:

> *"It has been a very big source of stress for my technicians to be like, "Hey, I know you have 20 years of lighting experience, but now you need to go take a written test." My technicians know what they're doing. My lead electrician has dyslexia. When I told him he had to take a test for this, the absolute panic..."*

From the contractors' perspective, despite these employees having substantial experience with lighting and associated controls, they are limited in their ability to meet the requirements of Workforce Standards.

5.1.2 HVAC APPRENTICESHIPS

Under D.18-10-008, enrollment or completion of state and federally accredited HVAC apprenticeship programs would satisfy the Workforce Standards requirement. Within California, we could not identify any federally accredited apprenticeship programs or non-union state-accredited apprenticeship programs that were actively recruiting individuals for their programs.

[38] California Energy Commission. "Acceptance Test Technician Certification Providers," 2023. https://www.energy.ca.gov/programs-and-topics/programs/acceptance-test-technician-certification-provider-program/acceptance.

HVAC APPRENTICESHIP TYPES OF TRAINING

The cost, length, and curriculum in HVAC apprenticeship programs vary throughout the state of California. The coursework, prerequisites, and path to certification change based on that program's goals.

HVAC apprenticeships—federal and state--are typically five years in length, with apprentices needing at least 7,500 training hours based on program standards and industry criteria. These longer programs train apprentices on both commercial and residential HVAC. Union programs can bring in upwards of 200 apprentices into the program each year.

Programs interested in developing a state-accredited apprenticeship program create their own HVAC curriculum that is then reviewed and approved by the California Division of Apprenticeship Standards (DAS). For federally registered apprenticeship programs, the proposed curriculum is reviewed and approved by the U.S. Department of Labor. While the one contractor we were able to interview who is sunsetting their current federal HVAC apprenticeship program was not affiliated with a union, we are unsure of how prevalent union and non-union programs are at the federal level.

When these programs craft their curriculum, they must adhere to the state's Minimum Industry Training Criteria (MIC) for skills and time spent on specific tasks. The current Air Conditioning and Refrigeration MITC were developed in 2010 and require programs to ensure apprentices receive the following training prior to completion of the apprenticeship program[39]:

- Course and Supplemental Instruction
  - 216 hours per year on one of the following topics
    - Safety, First Aid, CPR and Green Technologies
    - Thermodynamic theory, principles, and practices
    - Brazing, Soldering, Welding, Installation practices, rigging and piping
    - Basic Electricity/Electronics, Motors, Electrical Controls, Direct Digital Controls, Pneumatic Controls, and all other industry control systems
    - Customer Relations, Energy Auditing and LEED Awareness
    - Compressors, Chillers, Air Flow, Hydronics, Direct Expansion, Heat Loads and Heating Systems
    - System Start Up, Energy Management, Systems Troubleshooting and Maintenance
    - Green Chill Awareness for Supermarket Refrigeration
    - Awareness of new and emerging technologies, and introduction of "Green" aspects in all classes.
- Hands-on Training
  - 1500 hours (20%) on shop work, preventative maintenance, parts, and delivery
  - 3400 hours (45%) on trouble calls and overhauls
  - 800 hours (11%) on piping rigging, welding, soldering, and brazing
  - 1800 hours (24%) on controls, start-up, and testing.

[39] Division of Apprenticeship Standards. "Air Conditioning and Refrigeration Industry Training Criteria.," 2010. https://www.dir.ca.gov/das/mitc.htm.

No specific skills or certifications are outlined in these requirements. As a result, programs may vary widely in their design and implementation of a state-accredited HVAC apprenticeship.

To keep track of the program's record keeping processes and apprentices' progress through the program, the DAS runs regular evaluations of apprenticeship programs in California. Evaluations ensure programs get their apprentices to their required hours for each skill included in the MIC. When evaluating programs, the main concern of the DAS and program administrators is the success of individual apprentices. Administrators want their apprentices to complete their programs within their declared timeframe, learn the skills necessary for certification, and successfully find a job when they graduate from the program.

The DAS emphasizes the importance of keeping apprentices on track to complete their programs within the timeframe in their agreement. A backflow of apprentices who are not progressing within the proper timeline strains the financial and educational capabilities of administrators. Further, to maintain a certified state program, program sponsors must ensure that 55% of their apprentices "satisfactorily complete the program's probationary period." To monitor this, some union apprenticeships conduct bi-yearly evaluations of programs. These evaluations check the boxes that they want programs to hit in terms of progression and certification rates. Union apprentice staff we interviewed shared that they strive to have high retention and certification rates in addition to ensuring that their apprentices can conduct quality installations on job sites.

HVAC APPRENTICE APPLICATION AND CERTIFICATION

Any individual who is interested in participating in an apprenticeship program can find the active HVAC apprentices on the DAS website. This website provides information about the apprenticeship program and contact information for the program administrator. Although each individual program has its own selection procedures and desired qualifications, many require a high-school diploma/GED, or ask candidates to complete a basic skills aptitude test that assesses individuals' spatial relations, mechanical and mathematical reasoning, and abstract reasoning. Individuals who are interested in exploring a career in the industry but may not yet have some of the necessary skills to participate as an apprentice, may be invited to participate in a pre-apprenticeship program. The pre-apprenticeship program gives the applicant a basic understanding of the HVAC industry and the typical work completed in the field.

While apprentices can achieve additional certifications outside of their original program to expand their knowledge and skillsets, to our knowledge, there are no uniform set of certifications that are required by the DAS. In our interviews, one of the union apprentice staff shared the importance of integrating the attainment of existing industry credentials into the design of the program and guiding apprentices in the importance and process of renewing these certifications, "Through the five-year program, there are a lot of certifications achieved by the apprentices that are part of their required curriculum that they have to get through. Some of them, very purposefully, we want to put in early, so that they go through the process in the apprenticeship program to learn how to keep their certification updated. So, we're hoping that continues when they're a [journeyworker] and they have to do it on their own." The interviewee did not specify what types of certifications they encourage apprentices to pursue or maintain.

Upon completion of the apprenticeship program, individuals reach "journey-level status." As such they are responsible for ensuring that they are renewing their credentials and attending any supplementary training that is needed to keep up with Title 24 building code.

HVAC APPRENTICESHIP DEMOGRAPHICS AND RETENTION

Within the workforce development, clean energy, and construction industries, a large focus is on how to secure a diverse workforce. As such, apprenticeship programs and the DAS have taken action to try to raise awareness about the opportunities to participate in HVAC apprenticeship programs and encourage individuals from "non-traditional backgrounds whether its foster care, juvenile detention, people who are underrepresented in the field like women" to

apply to jobs in the field. While there have been improvements, they noted that there's always more work to be done. In our interview with union apprenticeship staff, they shared that they make an effort to track the prevalence of women and Latine[40] individuals who apply and stay in their apprenticeship program. In their analysis of their own data, they've found that the most prevalent demographic groups are white and Latine apprentices. There are few women who apply and make it to the journey level. To increase the diversity of individuals applying to and completing HVAC apprenticeships, apprentice staff shared that they actively do outreach in disadvantaged communities at K-12 schools, career fairs, etc. and often encourage previous graduates from these communities to share their experiences with the program.

Apprentices vary in their ability to complete training successfully. Apprenticeship sponsors referenced the wide variety of skills needed and jobs performed as a large barrier to success. Some apprentices are capable of micromanagement and technical abilities, whereas others are built for the physicality of the trades. Program administrators may recommend further classes, behavioral work, or more training to address these differences in skill sets. Skills that are critical to securing a job post-graduation include the physical and cognitive ability to complete projects as well as soft skills such as time management, communication skills, receptiveness to feedback, and their ability to work with a team. Finally, many firms require individuals to have a valid driving license to be able to travel to various worksites.

HVAC APPRENTICESHIP INSTALLATION STANDARDS

HVAC apprentices are taught installations based on Title 24 and energy standards. On the jobsite, standards fluctuate by contractor. Some expect specific standards that surpass Title 24 and other baselines, along with standards for professionalism and communication. While installation standards are often subjective, apprenticeship programs follow the models described in codes like Title 24 to give an objective understanding of standards.

CHALLENGES TO HVAC APPRENTICESHIP AND PROGRAM SUCCESS

One challenge sponsors face is the ability to recruit and retain individuals in their apprenticeship program due to the length of the program. The standard length for an HVAC apprenticeship is five years. One respondent shared the difficulty in having younger applicants commit five years of their time to an apprenticeship. While the apprentice staff was eventually able to recruit an initial cohort of six apprentices, only one remained in the program as a fifth-year apprentice in 2023. Many apprenticeship programs across the state have had difficulties with recruitment that were exacerbated by the COVID-19 pandemic. In the pandemic, there was decreased enrollment and a lack of opportunity for hands-on training which forced apprentices to take longer than their allotted time to complete programs.

In addition to difficulties recruiting participants, cost serves as a challenge for program administrators. Due to California labor laws, all program providers are required to pay individuals to attend the training but can contain clauses that require individuals to pay the cost of the training back if they chose to leave the program of their own volition. While unions support these types of programs through union fees, participation in apprenticeship programs pose a significant out of pocket cost for non-union companies. A non-union apprenticeship provider shared "When it's all said and done to get this one [apprentice] through the pipeline, it's going to cost me a couple hundred thousand dollars." Additionally, the provider stated that there were additional costs when accounting for all the individuals who left the program early. As a result of the costs and difficulties recruiting interested individuals, the federal apprenticeship provider decided to no longer continue to offer an apprenticeship program.

[40] We recognize that there is a long ongoing debate between the terminology that is used to refer to individuals from Latin America (e.g., Latine/Latinx) and individuals with Spanish Heritage (i.e., Hispanic). Throughout the report, we utilize the gender-neutral term "Latine"— a term created by Spanish-speakers and one that is recognized in many Latin American countries.

Outside of recruitment and costs, there is some tension between union and non-union contractors. While all entities see the importance of quality training, each camp is critical of the others' training approach or program design. Despite having been trained in the union apprenticeship program, a non-union contractor shared the lack of teaching experience of the individuals teaching the courses, "I would call them subject matter experts…however, that did not make them a credible teacher. They had the [technical] skillset, but not the skillset to actually teach and impart that knowledge." However, when speaking to union staff, they believed that looking at both union and non-union work, they can see similarities between the technicians on the surface, but if you look deeper, it is apparent that non-union trained technicians are missing fundamentals,

> *I think they share a lot of the same type of passion. I think they share a lot of the same motivation. I think they have the capacity and the potential when we see what's going on. A big difference is the formalized training. That's a big difference. And so, when you go and you look at the quality of some of the installs, from the surface, a lot of it can appear to be pretty good. When you get up there, you start seeing where the formality of the fundamentals are missing.*

Similarly, another union contractor found that non-union training only scratches the surface of a union apprenticeship curriculum. They noted that most of their apprentices come from either a junior college program or a non-union company. Some of the contractors who have joined their apprenticeship worked in the industry for over five years but came to the union companies for their extensive training network. The contractor shared the differences between the junior college and the union training center, "My advantage as a union contractor is [apprenticeship] training because a junior college program maybe covers 20% of what they cover at the training center."

Despite their lack of union apprenticeship experience, two non-union contractors said they thought their installers were fully capable of completing installations at the same rate as union installers. One said they didn't see this credential as a matter of qualification, but as politics:

> *A small handful [of apprenticeships are] non-union organized. So, our employees have many years of experience, some of them decades, but for some reason, well, I know for what reason, it's a political one. They don't recognize that as sufficient training. We feel like we have a well-qualified workforce.*

Due to a lack of standards within the HVAC field, every apprenticeship program staff member we spoke with—union and non-union—had to create their own curriculums. The federal apprenticeship provider shared their experiences identifying a curriculum for their program,

> *In 2014, I started looking at what was involved with federal apprenticeships for HVAC and refrigeration. Come to find out… that the curriculum that was available was very last century… And what do I mean by that? There is a very minimal amount of technicians that need to learn how to spend a year in heavy welding of iron pipe. Now it's types of digital, direct, digital controlling, and other types of medium. One thing I did find is that of all the [curricula] I researched, and I researched over 30 of them, none of them talked about maintenance of equipment. optimizing performance or have a specific troubleshooting or thought process to troubleshooting. None of them.*

The lack of a core apprentice curriculum that teaches all apprentices the same skills needed to complete quality installations can make it difficult to 1) identify technicians that have the necessary training or experience for projects, and 2) verify whether participation in an apprenticeship program yields significant differences in the quality of the HVAC install and associated energy benefits.

5.1.3 HVAC JOURNEYWORKERS

According to the DIR, a journeyworker is an individual who has either completed an accredited apprenticeship program or completed the equivalent of an apprenticeship in the length of time in the field (5 years) and content of work experience (see MIC for HVAC apprentices above). Currently, there is no standard examination or credential that would validate an individual's status. While other trades have additional certifications that require completion (e.g., DIR General Electrician Exam) to earn the journey-level status, HVAC does not currently have any of these requirements. As a result, once an individual successfully completes an HVAC apprenticeship program, they automatically can work as a journeyman. Furthermore, the HVAC trade does not have any requirements for recertification, so individuals are able to indefinitely retain their journeyman status. Some unions and projects do require additional credentials from technicians, but most journeymen do not seek these credentials unless they are required to continue working in the field.

CHALLENGES TO HVAC JOURNEYMAN MONITORING AND SUCCESS

One challenge with journeymen is that there is limited oversight regarding what counts as "journey-level" experience. As one apprenticeship staff member shared, some contractors accept technicians that have completed a brief nine-month course as "trainees." These "trainees" receive on-the-job training, but there is no way of telling what these trainees do and do not know coming out of their brief courses. Due to the differences individuals may have in training, the union apprentice staff discussed that they utilize elements of the union-developed apprentice curriculum to evaluate the skills and abilities of individuals at the journey-level looking to join the union. The union trainers shared the elements they often see missing in a non-union trained journeyworker and their ability to complete a union-quality install,

> *I mean, you got some of the big pieces there, but you're kind of missing the parts that complete the story, and why we do what we do, and how does it relate to the end game, and what are those nuances to each system or each type of function that you're doing to make sure you're covering those pieces or those formalities that do make a difference.*

While the union training staff highlighted the importance of testing the knowledge of any new technicians applying to join a union at the "journey-level," non-union contractors only discussed the qualities they looked for in technicians more broadly and thus we are unable to evaluate how prevalent these processes may be within the field.

5.1.4 CONTRACTOR LICENSE: C-20

The final HVAC credential that satisfies the Workforce Standards requirements is the C-20 license that is provided by the Contractor State Licensing Board (CSLB). The C-20 License is a specialty contractor license in the state of California that certifies contractors to install, fabricate, maintain, service, and repair warm-air heating systems and water heating pumps.[41] A C-20 contractor's license is required to work on any residential or commercial project that is $500 or more. Contractors are eligible for five types of C-20 licenses: sole ownership, partnership, corporation, joint venture, and limited liability corporation. Each license qualification corresponds to the ownership status of the contractor.

C-20 TESTING AND LICENSE REQUIREMENTS

[41] C-20 - Warm-Air Heating, Ventilating, and Air-Conditioning Contractor. California Code of Regulations, California State Licensing Board, 2023. https://www.cslb.ca.gov/about_us/library/licensing_classifications/c-20_-_warm_air_heating_ventilating_and_air_conditioning.aspx

To achieve the C-20 license, interested individuals must first apply for the license and pay a non-refundable fee of $330. To qualify for the exam, applicants must have at least four years of Journey-Level experience that is verified through a certificate of work from their supervisor(s) and a government issued ID. All hands-on experience must have been completed in the last 10 years; however, the CSLB does allow apprenticeship experience, technical training, or other college-level education credits to satisfy some of the experience requirements without any temporal limitations to when they completed their education.

In total applicants must pass a three-hour trade exam, a three-hour law and business exam, and an open-book asbestos certification to be eligible for their C-20 license. For the three-hour exams, applicants are randomly given a set of 115 questions that cover a variety of topic areas. Trade questions evaluate applicants' knowledge of the relevant technology, its installation, and maintenance while law and business questions cover business organization and development, employment requirements, insurance, contact requirements, public works, and safety. For each exam, question options are divided into topic area banks, and each bank can have up to 800 question variations and are regularly updated every five years to reflect new technologies, adjust the weighting of the topic areas based on contractor needs, and remove any questions that are no longer relevant to contractors in the field. This process ensures that individuals are unable to cheat on the exam by memorizing response options and sharing questions with other applicants. In addition to a deep review and update of the trade and business and law questions, the CSLB also works to ensure that questions related to the California code are reflective of current Title 24 requirements. Every three years, once the new Title 24 requirements are finalized, the CSLB updates the relevant questions in their C-20 exams and other contractor exams to ensure they reflect the new codes prior to the January 1 implementation date.

Upon completion of the exam, applicants immediately receive their results. If the candidate passes the exam, they can submit forms and a $200 initial licensing fee along with a background check. Once submitted, they take an open-book exam on asbestos, and then officially receive their license. C-20s are valid for two years, whether active or inactive. Only active licenses allow contractors to bid on projects and perform work. Inactive licenses allow for retention of certification without having to reapply for the license and retake all the associated exams, but performing contracting work without a license is illegal and can result in disciplinary action.

C-20 LICENSE UPDATES AND RECERTIFICATION

To keep up with changes in the field of HVAC, the CSLB conducts a year-long process to regularly update all of their exams. The first step is occupational analysis, in which officials interview subject matter experts (SMEs) about tasks and topics important to the field. The board then moves into subject matter expert workshops, in which SMEs rework exam questions, sections, and difficulties. The board proofs these questions using other contractors to see if the difficulty is appropriate for license candidates. These alterations often respond to changes in policy like the Title 24 building, mechanical, and electrical code. Updating the exam enables the CSLB to keep workforce education updated with the newest trends and innovations in industry knowledge. Due to delays caused by the pandemic, the most recent HVAC exam was released on July 1, 2022, and this process will begin again in either 2024 or 2025.

Importantly, the CSLB does not require the retaking of the trade or business and law exams. Instead, the CSLB charges renewal fees every two years that are tiered based on a contractors' license activity. Active sole-owner licenses cost $450 while contractors with inactive licenses cost $300 to renew.[42] If for some reason, a contractor's license has expired, but they have been the person of record for five of the last seven years, they may request CSLB to waive the

[42] Online License Renewal (Single Qualifier Only). *California State Licensing Board, State of California, 2023.* https://www.cslb.ca.gov/OnlineServices/OnlinePayments/SoleOwnerRenewal/.

exam requirement in their application. If more time has passed, they will have to retake all required exams and pay the associated application fees.

C-20 LICENSE STRENGTHS

One of the strengths of the C-20 license is that it contains a robust examination to qualify new HVAC contractors. In addition to the capacity to develop and regularly update its exams, the CSLB also has an independent department that aims to identify individuals working without a license. While this department can press charges against individuals conducting work without a license, the CSLB also recognizes the importance of promoting licensure to more contractors. To accomplish this, the CSLB recently decided to allow individuals who had experience with an unlicensed contractor to apply for licenses so long as the experience could be verified by CSLB staff. From their point of view, "We don't take action against somebody for having made an application and disclosing they were an unlicensed contractor" instead, they believe that working to help remove the barriers to licensure is "in the best interest of everybody."

Additionally, the CSLB provides the most transparency regarding the process for applying and renewing licenses. They not only provided general study guides, checklists, and step-by-step instructions, but also have links to YouTube videos that show exactly how to navigate the website for certification.

C-20 LICENSE CHALLENGES TO SUCCESS

One glaring challenge with the C-20 certification as a credential for Workforce Standards is the inability for a technician to apply for and receive a license. In addition to the trade exam, the C-20 exam tests individuals on the business and labor laws that are required to own one's own business. Furthermore, while other CSLB licenses like the C-10 for electricians, require that all technicians working under the C-10 contractor be state-certified electricians through the DIR, the C-20 license does not have any certification requirements for technicians working under the license. Instead, within this model, the assumption is that if a contractor is C-20 certified, then they will train their employees to a level that would meet installation standards.

A second challenge is the lack of communication between certification entities. When discussing how the trade exam for the C-10 electrician license differed from the DIR state certification, the CSLB staff were unaware of not only how the DIR developed their exam, but that they even had an exam that they were regularly administering.:

> *I have no idea. Because DIR is over here and they created their own exam, so I have no idea. And as far as I understand, their electrician exam, their electrician certification is for everyone who is working as electrician in California. So, it would be not only the contractors, but everybody who works for them doing electrician work. And so, it would cover different things because ours is for the electrical contractor.*

The lack of communication between these two entities means that there may be an inconsistency in what is tested on the trade exams or there may be overlap in what is uncovered. We did not interview anyone at the DIR to assess the similarities or differences in their process or the content of their exams.

Finally, in terms of equity, an interviewee who helped individuals prepare for the C-20 exam believed that there was a strong bias in the current CSLB qualifications.

> *There is an education bias. You can have a business degree which counts for two to three years of necessary experience for the C-20 license which has no limit as to when you received the education. You could have gotten a Business Degree when you were 20, but you're applying to get a C-20 at 50 and it counts the same. People working in the field have to have four years of experience in the last 10 years. That's a bias that I've never been happy with.*

The trainer felt that the recency of degree does matter, but the recency of the technical experience does. They also acknowledged the lack of restrictions around the type of degree that can count towards the experience. Currently, any college-level degree may count. To make the process more equitable, they recommended that the education should be in a business or trade related field (e.g., architect, engineering, etc.) to qualify for some of the required experience for a C-20.

5.2 CREDENTIAL PREVALENCE AND VERIFICATION

To understand the accessibility of each of the credentials, their prevalence among current technicians, and ease of verification, we analyzed publicly available data and interviews with key credentialing staff.

In terms of the CALCTP credentials, we found a publicly available database that listed the active CALCTP certified businesses in California. [43] As of March 2023, there were 339 CALCTP certified contractors and 675 Acceptance Test Technicians in California. While a list of CALCTP certified installer technicians was not publicly available, our interview with CALCTP staff revealed that they internally have a list of these individuals and would look into whether they were able to make it publicly available on their website similar to the other certifications.

With respect to HVAC, we found that the DAS website did provide a space to search for individuals who were actively in or completed an apprenticeship program; however, social security numbers and full names are required to access this information, information not collected in program data. At this current time, it is not possible to track apprentice progress or the current number of apprentices without knowing this data. With respect to journeyworkers, we could not find a public list of journeyworkers working in California.

Finally, the only HVAC credential that had a publicly accessible database was the C-20 license. Individuals can look up all the active contractors with a C-20 license on the CSLB website. One limitation is that individuals are unable to view archived lists of contractors whose licenses may have expired. As of April 2023, there are 12,161 total active C-20 licensed contractors in California. 5,583 of these licenses belong to corporations, and 6,086 belong to sole owners. The remaining licenses belong to Limited Liability Corporations and Joint Ventures. Geographically, there are clusters of licenses in the most populated metropolitan areas in California including 309 licenses in Los Angeles, 264 are in Sacramento, 232 in San Diego, and 87 in San Francisco. Across the state, licensure has stayed steady between 12,000 and 13,000 licenses between the years 2018 and 2023.

5.3 EVALUATION OF CREDENTIAL CRITERIA

Upon review of the current ALC and HVAC credentials, there are multiple inconsistencies that stand out. **Error! Reference source not found.**First, we find that there is a lack of specificity as to which ALC training—installer technician or Acceptance Test Technician—satisfy the Workforce Standards requirements. Each of these programs have different training foci and require different pre-requisites (Table 4).

With respect to HVAC credentials, there is no uniform standard of experience that satisfies the current Workforce Standards requirements. Currently, an apprentice of any level and a journeyworker—who must have completed at least five years of field experience—equally satisfy the current Workforce Standards requirements. In principle, this assumes that individuals at the apprentice and journey-level would have the same knowledge and skills to perform a quality HVAC install. Without clear and consistent standards of what skills are expected at the various stages of an

[43] California Advanced Lighting Controls Training Program. "Why Use a CALCTP Certified Installer Contractor?" calctp.org, 2023, https://calctp.org/find-contractor.

apprenticeship and at the journey-level, we are unable to ensure that both credentials would yield the same results. Furthermore, the current apprenticeship standards allow a lot of room for variation between apprenticeship programs and do not identify what knowledge, certifications, and skills are required for apprentices to continue through the program. A summary and comparison of each credential for ALC and HVAC can be found in Table 4.

Table 4. Summary of Current HVAC and ALC Credentials

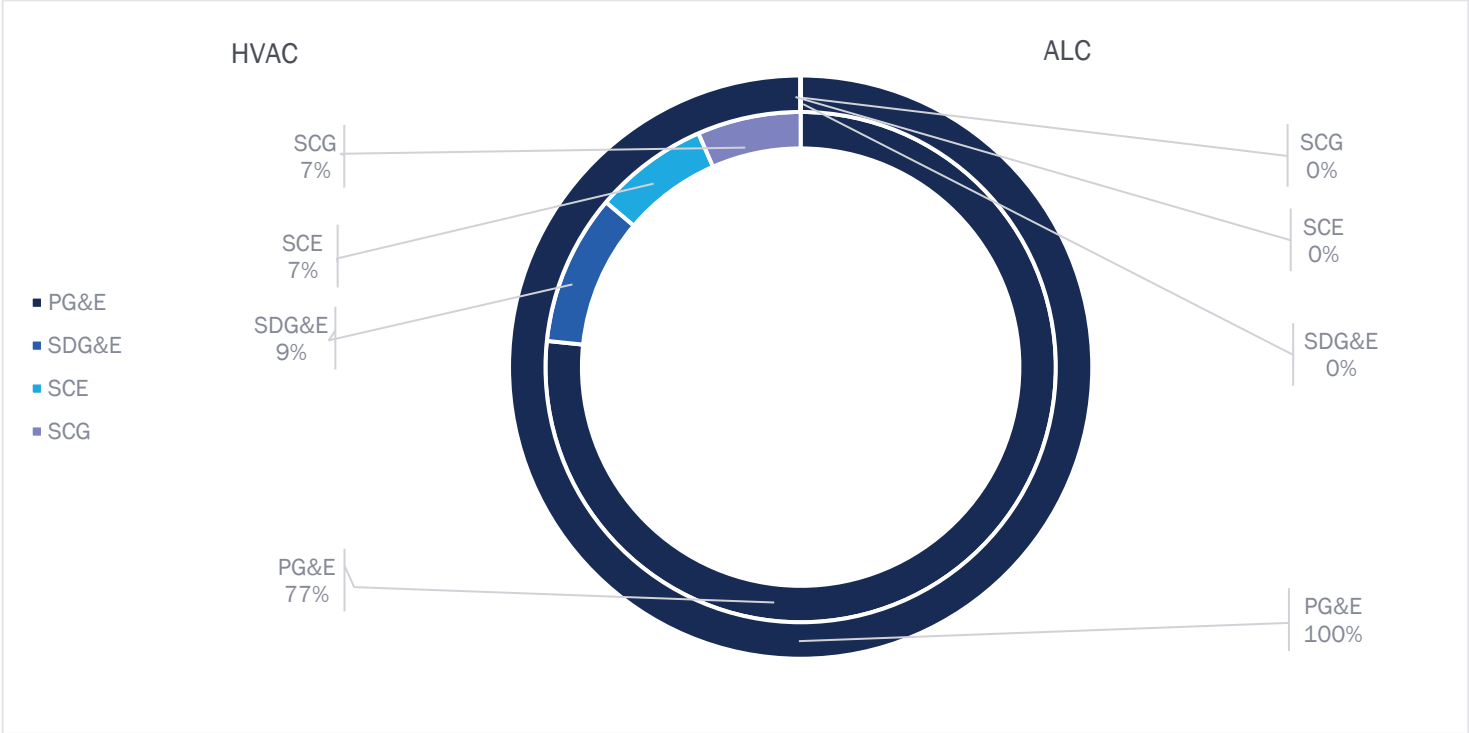
	Lighting Controls		HVAC			
	CALCTP		Apprenticeship		Journey-level	C-20 License
Certification Name/Type	Technician	Acceptance Testing	State	Federal		
Pre-Requisite/Certifications needed	DIR licensed General Electrician with 14 hours of free online course modules;	CALCTP Installer Technician Certification or an industry professional with three or more years of experience with ALC systems	Vary by program; Most common prerequisites include being 18 or older, having a valid Driver's License, High School Diploma, and/or GED	Vary by program; Most common prerequisites include being 18 or older, having a valid Driver's License, High School Diploma, and/or GED	Completion of a registered HVAC apprenticeship program or five years of equivalent experience/training.	Applicants must have at least four years of journey-level experience. Licenses can go to the owner(s) or a Responsible Managing Employee (RME).
Length of Program (hours needed to complete)	50 hours (to be reduced to 20 hours in 2023)	20 hours	Five years or 7,500 hours of on-the-job training and at least 216 hours of coursework per year	No exact length requirement, but hour logs needed in specific training areas. U.S. Department of Labor estimates 4 years to complete	N/A	Two 3-hour exams
Program Structure (in-person vs. online vs. hybrid)	Hybrid: Lectures in-person and online and labs in-person	Hybrid: Lectures online and labs in-person	In-person	In-person	In-person	In-person
Cost of Program	$350 application fee, $165 yearly maintenance fee to remain in good standing	$350 application fee, $165 yearly maintenance fee to remain in good standing	Depends on union affiliation: union-affiliated programs cost less as unions cover some costs, and non-union programs may require some out-of-pocket expenses.	N/A	Journey-Level is a status of employment for HVAC technicians. These employees are paid a salary by a contractor.	$330 application fee, $200 initial licensing fee, and renewal fees based on license activity and qualifier status.

Lighting Controls			HVAC			
	CALCTP		Apprenticeship		Journey-Level	C-20
Certification Name/Type	Technician	Acceptance Testing	State	Federal		
Accessibility of Program	Certification only valid if an individual works for a CALCTP certified contractor. Limited availability of training facilities near individuals.	Certification only valid if an individual works for a CALCTP certified contractor	Programs are available in a variety of geographic locations and to a diverse set of applicants.	None currently offered in CA	Access to apprenticeship programs and completing these programs are a limiting factor to earning journey-level employment.	Costs for the exam are high even if a contractor does not pass.
Tracking of Program (Public availability of credential data)	No	Yes	Yes-but requires SSN and Full Name or data request to the DAS.	No	No	Yes- Currently active businesses only.

6. FINDINGS: PREVALENCE OF PROJECTS THAT TRIGGER WORKFORCE STANDARDS

To understand how many HVAC and ALC projects currently trigger Workforce Standards, we requested that IOUs provide all HVAC and ALC projects that received an incentive from 2018-2021. The IOUs provided the research team with a total of 869 HVAC projects and 7368 ALC projects. PG&E provided the majority of the incentives for the HVAC projects (77%) and all of the incentives for ALC projects (Figure 1). About 20% of the HVAC incentives were provided by SoCal Gas (7%), SDG&E (9%), and SCE (7%).

Figure 1. Incentivized HVAC and ALC Projects by Utility



Of the HVAC projects provided, 803 projects (92%) received an incentive of $3,000 or greater (Figure 2). However, only 60% (n=490) of these projects applied for the incentive in the time period that would have triggered Workforce Standards requirements. Most of the projects that triggered Workforce Standards received incentives from PG&E (72%). Of the remaining projects, about 20% received incentives from SDG&E and less than 10% of projects received incentives from SCE (4%) and SCG (6%) (Figure 3).

Figure 2. Total Number of Projects that Triggered Workforce Standards

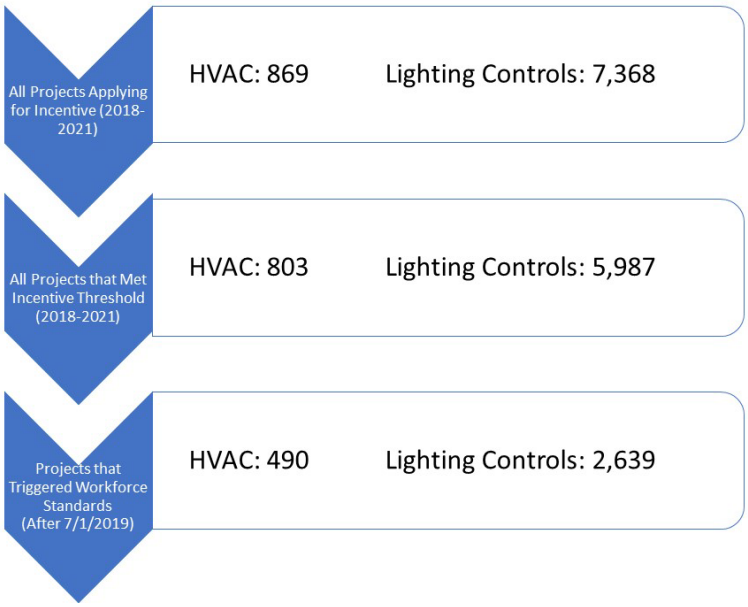
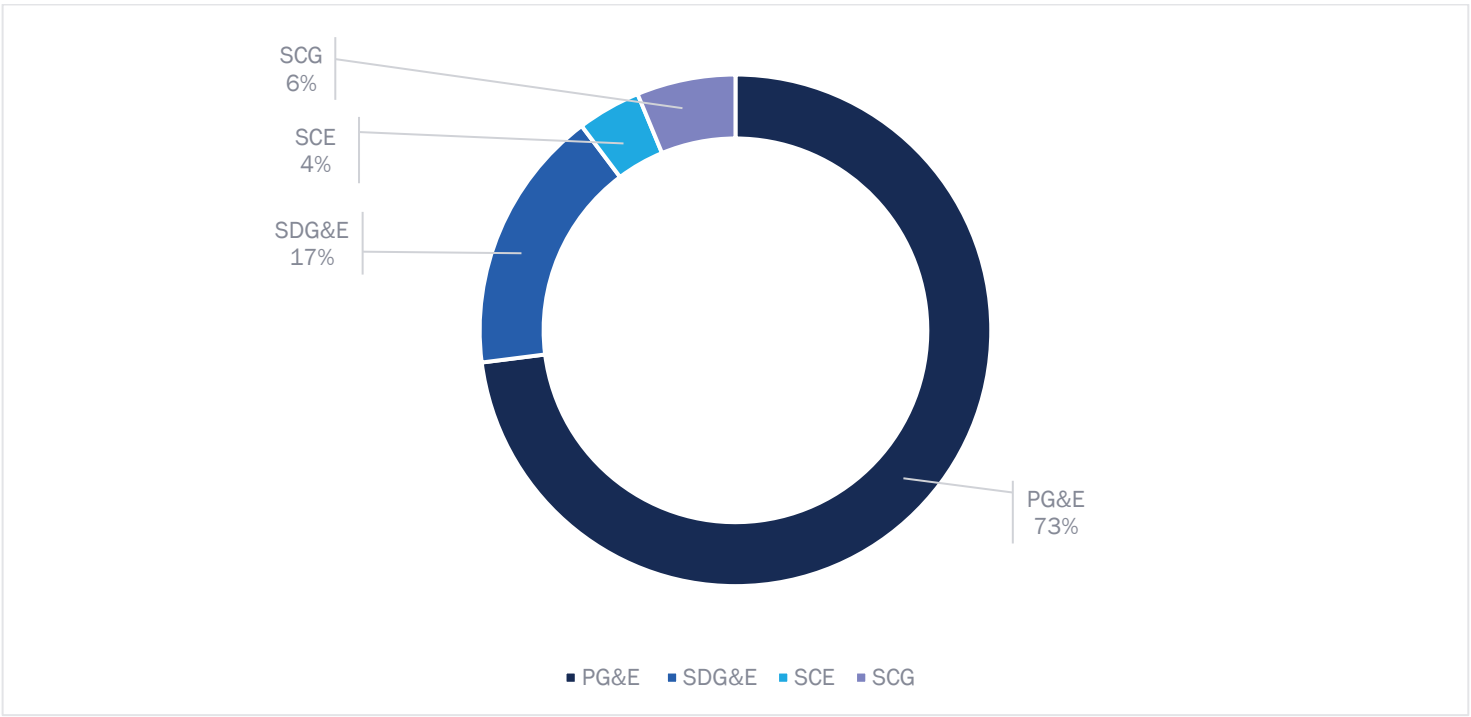


Figure 3. Percentage of HVAC Incentivized Projects that triggered Workforce Standards by Utility



With respect to ALC, only PG&E provided incentives to projects for ALC. Of the 7368 projects, more than three-quarters met the $2,000 incentive threshold for ALC. Less than 50% of these projects applied for the incentive on or after July 1, 2019, and would have triggered Workforce Standards requirements.

7. FINDINGS: WORKFORCE STANDARDS IMPLEMENTATION AND ENFORCEMENT

Utilizing interviews with IOU and 3P staff in conjunction with a review of materials we received from data requests, we sought to examine the current state of Workforce Standards with regards to its implementation and enforcement. In

this section we begin by characterizing the shift to 3P implemented EE programs, their design and impact on IOU responsibilities. We then discuss the roles of implementers and customers in Workforce Standards, current enforcement processes at the IOU and implementer levels, and their impacts on the data collection and verification of Workforce Standards in current EE Programming. We close this section by highlighting stakeholder feedback on Workforce Standards.

7.1 MOVE TO THIRD PARTY PROGRAMS

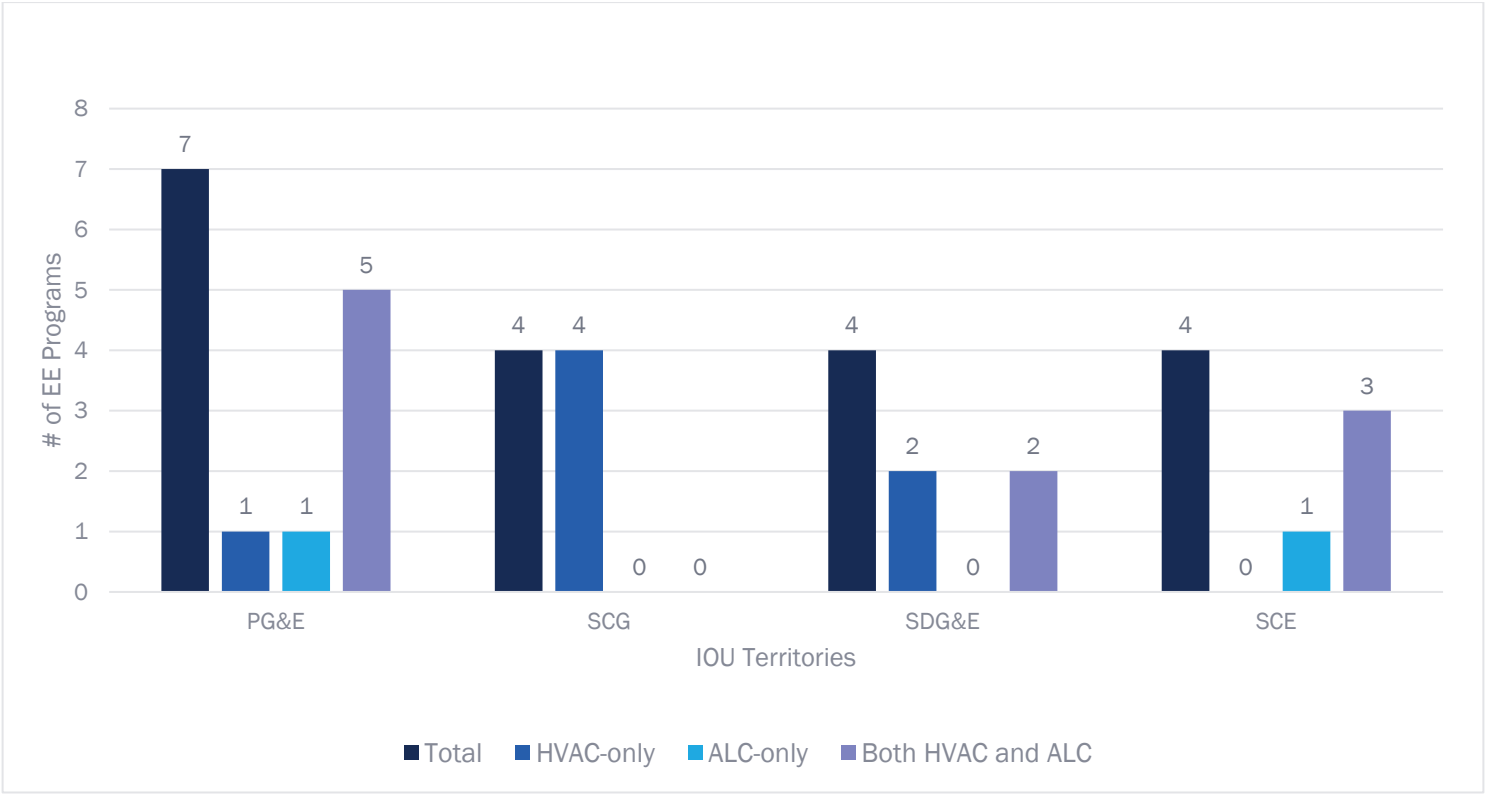
In 2016, the CPUC issued D.16-08-019 which required utility administrators to develop and implement a business plan to transition their portfolio from 20% 3P programming to a majority (at minimum 60%) 3P program design and implementation by 2020. This shift was modified (D.18-01-004) to account for ramp up time. In this updated decision, utilities were expected to have at least 25% of their portfolios consist of 3P programs by the end of 2018, 40% by the end of 2020; and 60% minimum by the end of 2022.

Beginning in 2017, utilities began to ramp down programs that they internally implemented, and where possible they began to replace these programs run by 3P implementers. As of 2023, program staff from SCE shared that the old programs no longer accept new projects and instead the focus is on "closing out any existing programs" that are a part of the utility-implemented or legacy programs. The other IOUs echoed that their legacy/historical programs were all moving to 3P implementation, but some could not "completely close until a new 3P program comes online."

When Workforce Standards were required for all programs on July 1, 2019, many of the IOUs were in the solicitation stage for securing new 3P programs. As a result, it was a relatively small lift to ensure that Workforce Standards were a part of the RFP and terms and conditions listed in the new contracts. The inclusion of Workforce Standards language in the 3P program contracts met the minimum obligation of the IOUs to ensure Workforce Standards were being implemented in their portfolios. To our understanding, Workforce Standards were not applied to existing programs that were ramping down as of July 1, 2019.

As a result of the shift to 3P programs, we found that none of the 19 current EE programs that trigger Workforce Standards are implemented by the IOUs.[44] Instead, all programs were implemented using the new 3P implementation model. Twelve firms were hired to implement the 19 EE programs in at least one IOU territory (Figure 4). According to the contracts, there were 14 programs involving HVAC work and twelve programs involving ALC work with some overlap between the two. Most programs were found in the PG&E territory (n=7) while SCG, SCE, and SDG&E had four programs each.

Figure 4. Total Number of EE Programs by Service Territory



7.1.1 3P MODEL STRUCTURE AND IOU ROLES

Almost all the 3P programs operate under a pay-for-performance model in which the implementer is expected to deliver energy savings prior to receiving payment. Importantly, there was great variation in the specific pay structure for each of the implementers' contracts. While some contracts were 100% pay-for-performance, others had as little as 60% of their payment structure under the pay-for-performance models. The remaining portion of their payment structure was often fixed billing or in a few cases payment for time and materials for certain activities (e.g., outreach).

Within the pay-for-performance model, the IOU must first verify the energy savings before they provide performance payments per project to the implementer. Depending on the project type, the projects may be subject to a technical review by the IOUs and/or the CPUC. During this review, either party may request additional information from the implementer before deciding on whether to approve the project for incentive payment. If projects are rejected, none of the parties involved in the project (i.e., implementer, contractor, or customer) receive payment for the installation. However, depending on the contract, implementers may receive additional payments for annual contract goals that are associated with cost effectiveness and other priority metrics.

PG&E for example highlighted the importance of customer satisfaction with the programs:

> *The customer satisfaction ratings that the programs get and the number of complaints that we deal with per implementer are really good indicators of whether things are being done properly after the fact. People generally are not shy about complaining to their utility if things don't go well and we don't really hear a lot.*

With the shift from IOU-implemented to 3P pay-for-performance programming, there have been shifts in the roles of IOU staff. One PG&E staff member reflected on the changes in their level of involvement in the project strategies and implementation:

> *It used to be, there was a lot of strategizing with the people who are doing our programs where now, the strategy is up to them. We have to take our hands off and we can make suggestions but it's not like we're in the driver's seat. We can say, "Okay, you're not performing here. What do you intend to do about it?"*

An SCE contract manager shared their experiences transitioning from a program manager to a contract manager, "I was basically handed a program and a contract and said, 'Memorize it and implement it.'"

The duties of the new contract manager role were best summarized by a PG&E manager:

> *Our teams manage the contract, manage the implementer, ensure performance is met, and that there's no customer satisfaction issues. They get involved with projects if they get stuck or need extra assistance but really more that of a traffic cop of the program at this point. Keep it moving…*

Structurally, the 3P programs diverted from historic IOU-implemented direct install programs. In the new 3P designs, only 26% of 3P programs (n=5) provided a licensed contractor to perform the installation of the HVAC or ALC technologies. Instead, most of the programs allowed customers to hire their own contractors. Within this model, implementers provided a list of contractors from existing networks (e.g., Trade Professional Alliance[45]) or other contractor partners that have been vetted to ensure that 1) they are licensed, 2), they have active insurance, 3), are aware of and agree to all program requirements, and 4) have a license relevant to the work-incentivized by the program. Customers are welcome to use these individuals or their own contractor so long as that contractor meets the requirements for participating in the program (e.g., licensure). This flexibility to allow customers to hire their own contractor was cited as a strength by implementers; however, implementers highlighted the importance of investing in and developing long-term relationships with the contracting partners that they recommend to customers. One implementer described how they support the contractors to reduce the barriers to participating in the EE program:

> *We provided support on how to navigate difficulties in the field. For example, for documentation, we need geotagged photos before and after installation. We helped show the contractors how to geotag the photos and how to upload them to our system. This minimizes the impact of the labor force. We work with contractors to build the document work to meet CPUC [Workforce] Standards into [the contractor's] workforce and ensure that it makes sense for their business and how they operate.*

Another implementer who utilized the Trade Pro Network highlighted the cost benefits of building a long-term relationship with these contractors:

> *Participating trade allies can either get referrals from [us] or bring projects to the program. While customers can hire whoever they like, we encourage them to use existing trade allies to streamline the experience. Ninety-nine percent of projects go through trade allies. Trade allies have a lower cost than contractors that the customers can find on their own…. because of the volume of referrals that are provided through the program. This lowers the capital and upfront cost to the customer.*

[45] The Trade Professional Alliance contains a directory of professionals (e.g., manufacturers, installers, contractors, consultants) in each of the IOU territories (i.e., PG&E, SCE, SDG&E, and SCG) who have applied to participate in the program and are expected to abide by a set code of conduct in exchange for benefits that vary slightly between the IOUs. Trade Professionals –also referred to as "Trade Pros" or "Trade Allies" can promote IOU programming with customers, apply for programs on behalf of customers, and if they have a CSLB license, can receive payment on rebate, incentive, and on-bill financing programs. Furthermore, in some contracts, Trade Pros can receive direct rebate payments from the IOUs to reduce the time to payment and help offset upfront costs for businesses.

7.1.2 CHALLENGES LAUNCHING 3P PROGRAMS

While implementers highlighted the benefits of having flexible program designs and strong relationships with contractors to support the implementation of their program, many implementers shared difficulties working with IOUs to launch and implement their programs.

Over half of the implementers we interviewed shared that one of the most significant challenges they experienced with launching their program was administrative delays in the early stages of program ramp-up. At a minimum, implementers experienced six-month delays with some reporting up to two years before they were able to receive approval for key program materials and documents and begin implementing their program.

One implementer we spoke with in July 2023 shared their experiences with these delays:

> *To put it into perspective, originally, we submitted our first draft of the marketing materials in October of 2022, and it has taken all this time really to get close to having those approved and we're still not there. … so, it's really delaying our effort to launch a full-scale recruitment effort with the customers.*

Another implementer shared, "[I keep being told] 'It's going to be two weeks.' I've been getting two weeks to death for two years."

Several implementers shared their perspectives as to why there have been significant delays to program launch. One individual believed that the utilities were not ready to support the launch of 3P programs:

> *But the hardest part for us in launching these programs is many of our utility clients were not ready to launch. They didn't have the documents in place; they didn't have processes in place, they didn't have procedures drafted of how they want to do things. And so, we spent a lot of time helping the utilities meet their obligations of the contract so that we could just start delivering projects.*

While the CPUC Decision to shift towards 3P implemented programs was to promote innovation in the design and implementation of EE programs, another implementer shared that the IOUs were not culturally or procedurally prepared to support programs that provided new approaches and materials:

> *The challenge is that when you are bringing either a new program or something innovative, a lot of times the systems within those IOUs or personnel or the old school way doesn't quite catch up. And so, we run into a lot of bureaucratic challenges …the contract language has probably been used for the past 15, 20 years and it's been similar for all contracts. Well, when you're trying to fit a round thing into a square hole, it just doesn't fit.*

Despite these launch delays, implementers were still responsible for achieving the same level of performance indicated in their contracts and expected to adhere to the originally scheduled timeline. A firm with a 100% pay-for-performance model shared how these delays financially impacted their business:

> *We're still in the ramp-up period in a way, but our ending day is not moving. Our start date keeps on getting pushed back and makes it harder for us to operate. Also, because it's pay for performance, we have not been able to deliver what we were planning to in this period because time keeps on squeezing. So, we're being punished because it's pay for performance. It's these double wedges that we encounter that make [the financial viability of the program] very hard for us.*

More than 80% of implementers we interviewed (n=8) echoed this sentiment that the pay-for-performance model had a negative impact on their financial capital. Another implementer with 100% pay-for-performance shared the struggles of not having fixed deliverables:

> *It is very well understood that this program is backward looking, and it takes a year for implementers to get savings. Even if they do everything right and everything perfect, there are no savings within that first year. And so, when you're talking about the preference of a utility to have a 100% performance-based compensation, it's understood that that's going to be a challenge for many implementers. And while we are one of the largest implementers and we can absolutely float that, I can see how that could be a challenge for some of the smaller groups out there.*

These financial challenges took such a toll on 3P implementers that one interviewee was considering pulling out of their contract early:

> *And I'll just speak bluntly here. We are running a significant loss on this program. It is challenging for a small business like us to sustain that. And if something does not change, we will pull out of this contract soon.... I don't think any of us have ever had a [negative] experience like this.*

An implementer working with a different IOU discussed their regrets signing the initial contract and the hesitation they have in accepting an extension to their program period:

> *It has been an absolute disaster; I am out hundreds of thousands of dollars... From a financial standpoint, it has been excruciating...we're a small business and we're getting crushed by this program...I was offered more time, but it's hard to build profit out of a several-hundred-thousand-dollar loss... If I could go back in time, I would not do it again.*

Larger companies shared that they were able to sustain the financial hits due to the size of their company, but discussed how the lack of financial sustainability and negative experiences thus far impacted their willingness to renew the contract going forward. One implementer shared, "I'm counting down the days until this contract is up".

7.1.3 CHALLENGES RECRUITING AND RETAINING CUSTOMERS AND CONTRACTORS

Outside of the launch stage of the program, another major challenge was recruiting and retaining contractors and customers. Historically, IOU account members have long-term relationships with their customers. In some cases, they may be "on texting terms" with customers. However, with the shift to 3P programs, one implementer identified the barriers to participation,

> *In third party programs where an IOU just hires you and says, "Well, quite frankly, it's all on you. Let us know when there's savings and please be sure to submit your final reports on time," that's a challenge because we do not necessarily have access to their systems, we do not have access to their customer base and relationships that their account managers may have, to knowledge of their potential prospective participants.*

As a result, 67% of the implementers shared that recruitment was an "uphill battle" and that there was a lack of support from IOUs to provide customer data and leverage their existing relationships to support the 3P program. Implementers noted that the main difference is in the level of investment of the IOUs into the program success.

> *The biggest hurdle is for IOUs to take interest in offering this wonderful program to their customers and use their wealth of relationships that they have with their customers and take interest in [the 3P program] and offer it.*

Another implementer shared that these relationships with account managers have been the most successful in recruiting customers since the IOU representatives have a direct relationship which helps to "lower the barrier to entry with customers." If account managers are unwilling or unable to leverage their existing relationships with customers, IOU staff can support implementers by sharing their customer data to support customer recruitment for programs.

While this was expected to help streamline and support targeted outreach, one implementer experienced delays in receiving the data, "[There] was a significant delay receiving our first batch of customer data. With a program of this size, you wanted to be able to do targeted outreach. And it was delayed. It was delayed more than six months."

Not only have implementers experienced data delays, but in another case, the customer data that they received was not applicable to their program. As a result, they had to independently identify which clients may be eligible for their program, "[They] don't know how to get to a list of those customers out of their system. So, we've taken to trying to estimate which clients [may qualify for our program]".

In addition to recruitment, one implementer articulated how the overlap between program designs created additional competition, impacting their ability to meet their program goals. In one case, they had to hand a project to the statewide program rather than being able to continue to work on the project and have it count towards their savings goals. They described this experience, "So we had got into one project, it was great. About 20% of our annual savings goal, but we had to hand that over to the organization that's doing the statewide program, which is fine. We didn't understand that when they were on the [customer] list". Not only was this implementer competing with other programs for customers, but also directly competing with the IOU they were contracted with:

> *When we start the outreach, the challenge is if the customer's talking to their [IOU] account rep, they're offering the same incentives or maybe slightly different incentives than we are. So, we're having to compete with the [IOU] itself to get projects done and incentives in the door so that we can get compensated… from a customer perspective, I think it's confusing. You've got two parties calling you, including the utility itself that are competing to help you do projects, and you've got to choose which one you're going to go with.*

Finally, implementers emphasized the impact of the length and complexity of the incentive process for contractors and customers on program participation and retention of customers. A smaller implementation firm working with direct install contractors reflected how the delays to payment caused by IOU and CPUC review processes impacted contractors' willingness to participate in their program:

> *And there's nothing worse than knowing that the contractor's not going to get reimbursed for the work that they did. And I just keep thinking, they come to us saying "we want to get paid, we invested all this money," and I'm like, I'm sorry, but because we can't get paid, we can't float you. That's the situation that we're in. It's all contingent on whether the CPUC approves it. And nobody gets paid for any of the work unless it is 100% vetted and approved by the utility and the CPUC. And yeah, we have had contractors that have walked away from us and there are definitely contractors that are not happy with this. And it's unfortunate because it's affecting the market.*

The inability to pay contractors in a timely manner was exacerbated by the COVID-19 pandemic. The increase in labor and equipment costs from the pandemic led to a decrease in the attractiveness of incentives associated with the program according to one implementer, "…you can't offer an incentive higher than [the incremental measure cost]. Well, when that doesn't get adjusted and all equipment is higher and all labor is, now you're offering incentives that really don't make much of an impact". In addition to the inflation of labor and equipment costs, customers experienced delays in receiving incentive payments due to the lengthy review process that is associated with the custom projects. While the review process can take months, the estimated time to get through the review process varies drastically from project to project, which has impacted implementers' capacity to "provide any kind of predictable timeline." While newer NMEC programs were expected to be more streamlined than custom projects, an implementer stated that the IOUs and CPUC are applying the custom review process and rules to these programs that also delays the review and approval of NMEC site and population projects.

The combination of the lengthy review process and stringent criteria for project approval (e.g., proof of influence requirements[46]) 1) further reduces the impact of the incentive as an effective mechanism to promote customer participation and 2) further discourages future participation in EE programs. One implementer shared how these barriers impact their ability to run a successful program:

> *You're not seeing a lot of people come to the program because your incentives are not super attractive. The process is not attractive. When you do have customers participate in the program, the lengthy wait times and review times don't cause repeat business, which is a big issue for third-party programs. What you're really trying to do is you're trying to build repeat business. You're trying to have a customer participate in your program once and be wowed and astonished at how easy and streamlined the process is and how impactful the incentive was. And when you can't generate that, you don't have them coming back.*

As a result of these barriers and limited resources, one implementer had to adjust their outreach strategies to focus only on projects that are easy to process. They described the challenges with proof of influence requirements in moving projects forward:

> *Instead of actually trying to get projects, now you're avoiding certain projects, because you know what's entailed, or you're easily declining projects because you're thinking, this is going to be identified as free ridership... So we're in a position now, where I'm having to just tell my staff, my outreach staff, don't even bother with custom, don't bother with NMEC. We have not been successful. We've spent so much money on resources. Limit your outreach to projects that don't require maybe the influence that are just very easy to process and will get through because we can't spend the resources, and we're almost 90% positive it'll be declined.*

Overall, while the original decision to shift to more 3P implementers was made to promote innovation and provide additional opportunities to a wide array of businesses, implementers have struggled with 1) the structure of the pay-for-performance model 2) the delays and lack of administrative support from the IOU program managers, 3) competition with IOUs and other statewide programs for energy savings, and 4) increased challenges recruiting contractors and customers to participate in their programs due to the stringent requirements and delays in incentive payment. These difficulties impacted implementers financially and led some to consider pulling out of their contract early or not renewing the contract once it was finished.

7.1.4 IMPLEMENTER RECOMMENDATIONS FOR FUTURE 3P PROGRAM SUCCESS

Finally, 3P implementers provided recommendations on how to improve the implementation of 3P programs. Structurally, they recommended that the pay-for-performance model be adjusted for future contracts to increase the proportion of fixed fee, time and material, or deliverable payments within contracts to support the ramp-up phase of programs. In addition, the implementers requested that the CPUC provide mechanisms that promote IOU investment in and support of the 3P programs to promote their overall success. From the perspectives that were highlighted above, the relationship between the IOU account managers and implementers can be crucial to ensuring the success and sustainability of their programs going forward. Pulling from that, implementers emphasized the importance of centering

[46] The CPUC requires documentation for the ex-ante review of custom projects to illustrate that the program has provided an informational or financial influence on a customer's decision to install higher efficiency measures. This measure reduces the number of customers enrolling in programs already planning to implement EE measures. Implementers must provide a preponderance of evidence that must include 1) an influence narrative and 2) evidence that may include but is not limited to documentation of all customer meetings, emails, and phone calls. (See Statewide Custom Project Guidance Document Version 1.4)

customer experiences within the 3P EE programs. As implementers noted, the incentive amount was inadequate to motivate customers to participate in programs due to their negative experiences with program requirements and payment delays. Implementers suggested reexamining the burden of stringent requirements such as the proof of influence and identifying ways to reduce the amount of time necessary for review and payment of incentives. Several implementers specifically suggested utilizing a Net 30 rather than a Net 45 or in some cases Net 60 payment term to promote businesses' cash flow by ensuring they receive a payout a month after invoicing.

Finally, and perhaps most importantly, two-thirds of the implementers were directed to the CPUC to support a shift in the structure, consistency, and execution of EE programs across California. One implementer shared the need for broad changes:

> *We need a pendulum shift. I feel like we are getting over-monitored, over-regulated, and meanwhile, my other big frustration is I work in energy efficiency. I am taking energy off a distressed grid. I believe that should be priority one in California, especially since we have so many rolling blackouts, et cetera. I am taking energy off the grid. I am getting over-regulated, delayed. But meanwhile, the companies that are installing EV chargers and, it seems like the money is just flowing. The performance metrics required of those dollars are so simple compared to what I'm doing, and it baffles me. I understand the global impact of sustainability…I don't trust the CPUC's vision right now.*

In addition to reexamining the vision and goals of the EE programs, implementers asked for increased consistency with the expectations for the IOUs. They believe that the CPUC Decisions should have more prescriptive language that defines not only the standards, but also what is required for utilities to comply with this work. A clearer understanding so that there are clear expectations as the directive moves down to the implementers. Implementers noted that IOUs interpret decisions and policies differently. At times different staff within the same IOU have different interpretations of what measures and documentation is needed to comply with CPUC decisions. As a result, there are inconsistent approaches to implementation that can change even within the life of a single program contract. To address this as well as the wide array of differences in the contract structures and expectations, one implementer suggested having a centralized entity be responsible for ensuring consistency across the IOUs:

> *I would be pushing for a statewide group to look at how to contract, how to structure the contract, what kind of flexibility you allow, not having to have all pay for performance [in the contract], measure packages should have a statewide group that all the IOUs can contribute to define the data collection for each one so that an implementer like us or a contractor that's doing projects across the state has one approach they can adopt, rather than have four different business processes to meet four different requirements from IOUs.*

Furthermore, three implementers shared the importance of soliciting and integrating implementer feedback into CPUC draft decisions. While the CPUC does have an open call for comments on decisions, implementers shared that they are unable to provide feedback in this format due to their limited resources. As a result, an implementer highlighted how they continue to miss opportunities to provide comments:

> *I think that what I'm finding is that it's so late in the game, or we find out the [IOU] already submitted their early opinion on something and you're like, 'Wait, wait, no, we haven't gotten the chance to give any feedback on that.' So I think that it would be better to be involved a little earlier."*

Another implementer contracted with a different IOU shared a similar sentiment, but highlighted the need for permanent staff to follow be able to comment on CPUC decisions:

> *Our budget was significantly cut over the last few years and so we just haven't been in the position where we can hire a full policy team…and it's been a struggle for us to keep up with [decisions] and be proactive*

about it. So we end up hearing stuff after the fact rather than really being able to be ahead of it…It takes a lot of time to really stay on top of the policy side of things. You need a dedicated person to do it almost.

For implementer staff who are able to attend CPUC calls, they discussed the complexity of following the CPUC discussions, "We go into these calls and sometimes we think like, oh, it seems like we need a lawyer. We need an attorney to interpret policy now. It's gotten way too complicated in understanding the requirements" The implementer continued to share their concerns about providing feedback directly to the CPUC, "When you disagree with the CPUC's opinion on something, as a third-party implementer, I don't want to go before the CPUC and have that discussion. To me, I feel like that discussion takes place with the utility and the utility should be making an argument on our behalf" Due to a mix of resources and concerns about the repercussions of providing feedback to the CPUC, the current mechanism for soliciting stakeholder feedback is unintentionally excluding 3P implementer perspectives who can provide unique perspectives about how decisions will impact program implementation and customers.

Due to the shift to 3P implementers' direct role with program participants, implementers emphasized the importance of having the "boots on the ground" involved in providing questions, opinions, and insights to the CPUC on how decisions may not only impact their programs, but also program participation in programs going forward. Some suggested creating a separate forum for implementers where they could freely share their feedback directly with the CPUC, develop structures that promote IOU advocacy for improvements to 3P programs and implementer needs, or continuing to conduct research that utilizes a third-party evaluator to solicit anonymous feedback on program design, execution, and evaluation.

7.2 IOU, IMPLEMENTER, AND CUSTOMER ROLES IN WORKFORCE STANDARDS

Given their direct role in the design and implementation of the program, the 3P implementers were expected by the IOUs to be responsible for implementing and enforcing the Workforce Standards requirements. Review of the contracts between the IOUs and 3P implementers revealed that 19 of the 21 contracts sent by the IOUs contained clear language and expectations that the 3P implementers would be responsible for documenting Workforce Standards requirements when triggered in program activities; however, the standard terms and conditions provided by D.18-10-008 included language that IOUs would be responsible for enforcing Workforce Standards by requesting relevant materials from the 3P implementers at least once a year. The clause on page B-2 of the Decision stated, "Prior to the commencement of any Services, once per calendar year, and at any other time as may be requested by Company, Implementer shall provide all documentation necessary to demonstrate to Company's reasonable satisfaction that Implementer has complied with the Workforce Standards." This exact language was utilized by SCE, SDG&E, and SoCalGas in 12 of the 19 contracts that contained Workforce Standards language. The remaining seven contracts were for PG&E programs and varied in the language used, but all indicated that the implementers would collect proper worker documentation and retain these documents to present to the PG&E as requested.

In addition to the contracts, each 3P implementer was expected to develop an implementation plan that illustrated how they would ensure that customers were aware of and followed the Workforce Standards for relevant projects. These implementation plans were integrated into all but two of the contracts with the IOUs. While the specific approaches varied, programs focused on 1) increased transparency of the Workforce Standards requirements in project materials, 2) integrating Workforce Standards language into customer applications and contractor/subcontractor contracts, 3) monitoring relevant credentials, and 4) maintenance of credential documentation for reporting to utilities. The language utilized in the contracts varied from passive language "when requested" to proactive and specific level plans about the platforms and applications they intended to use as part of the implementation and tracking process (e.g., Trade Ally Connect). Only one of the 3P implementers responsible for two programs in the PG&E territory provided an anticipated scale of applicability of Workforce Standards being triggered by projects in their program. The CoolSave program anticipated that 33% of all projects would trigger Workforce Standards, and the SmartLabs program anticipated that over 90% would trigger Workforce Standards.

7.3 WORKFORCE STANDARDS ENFORCEMENT AND PERCEIVED RESPONSIBILITY

In almost all of our interviews with various stakeholders, interviewees recognized the importance of credentials and enforcement of Workforce Standards; however, there was disagreement regarding who should be responsible for enforcing these standards in ratepayer funded EE projects. Below we describe the existing enforcement efforts, and stakeholder perceptions of responsibility.

7.3.1 EXISTING IOU AND IMPLEMENTER ENFORCEMENT EFFORTS

There was a wide spectrum of approaches from the IOUs in terms of their current mechanisms for enforcing Workforce Standards. At SDG&E, there were no formal enforcement plans in place. They rely on the customer, implementer, and trade allies to follow the contract terms and conditions, including Workforce Standards. “They’re all attesting that they’ve read, understand and in exchange for participating, they’re going to comply with those [Workforce Standards]. That’s really been our mechanism.” Despite this honor system approach, another staff member from SDG&E shared the importance of enforcement, “I think there definitely needs to be checks and balances to ensure that they're meeting them, yes, because anyone can just say that they're doing something, but if you have no mechanism as to report out on it, then you could just be gaming the system essentially.”

SCE staff similarly recognized the importance of enforcement but do not feel they are responsible for enforcing Workforce Standards. Instead, they see their role as ensuring that all parties involved in the contract are informed about the Workforce Standards: “I think based on the requirement that's been placed on the utilities is to inform. I think we do that better than anybody, to educate.”

When discussing potential mechanisms for enforcement, a SCE staff member mentioned that inspectors have not reported back anyone not in compliance, but they also were not sure of the direction that inspectors are given and if they explicitly are told to ask to verify credentials of installers/technicians on the site. Staff at SCG similarly shared that expansion of the existing inspections could promote enforcement but were unsure if that is encompassed in the current protocols. “I understand they have protocols for some of the items that we verify, but if that needs to be expanded [to include Workforce Standards], I think that could be a good addition to their scope.” It is important to note that the SCG staff that we interviewed did not have direct experience with projects or measures that meet the requirements of Workforce Standards and instead were discussing how they would approach implementation and enforcement if they encountered a project that met the Workforce Standards requirements in the future.

Unlike the other three utilities, PG&E has taken the greatest initiative towards enforcing Workforce Standards. Similar to SCG and SCE, PG&E plans to utilize their existing internal audit system that they use to regularly review documentation from their implementers to review proof of credentials for qualifying Workforce Standards projects beginning sometime in 2023. PG&E staff reiterated the importance of verification and enforcement but did not want to be the entity responsible for enforcing Workforce Standards. A PG&E staff member reflected, “We can put anything in our contracts, but if there's no diligence and no follow-up, then how stringent or how impactful are the terms in the contract if we don't do some kind of an auditing process which I think is where we're at now, that doesn't mean that we want to be the enforcer.”

The inclusion of Workforce Standards into the established tri-annual audit approach requires the audit team to look at the sample of implementers selected for a given period, the closed projects they have that trigger Workforce Standards, and select a percentage of those projects to request documentation of Workforce Standards credentials. Over the course of the year, the PG&E audit team reviews materials for each implementer but may not look at every project that meets Workforce Standards. Through this process, if the audit reveals that the implementer is not meeting performance expectations or Workforce Standards requirements, the contract manager will work with the implementer to help them do better if they need the extra support to meet their contractual obligations:

> *We don't want to discard them very quickly for any infraction…we would do as much as we can to help them do the right thing, but we would also be checking that they're making progress with those updates or those changes so that it's not just us giving them feedback that nobody acts on, but rather it's feedback, and we want to see how you do with that information and, at the next opportunity to check in on this, are you making progress.*

They believed that the three-to-four-month timeframe between audits "will give [implementers] time if it was more than just a one-off individual contractor, but, if they haven't been checking at all, that would be their opportunity to prove that they've corrected that across the board." However, the audit team did reflect on the choice to proceed with this enforcement mechanism:

> *We are actually tapping a process we already had…we picked the process that's not in the middle of a project approval flow, which would add time and potentially complexity to getting any particular project done. So, because we're using the audit flow, we're approaching the implementer once for multiple requests, and then presumably they have somebody that can try to do all of them at once. And so, I think by consolidating that effort, it also is a bit of a bit easier for the implementer…*

Due to the planned integration of Workforce Standards into the 2023 audit process, we do not currently have a sense of implementer compliance with the standard. Furthermore, our conversations with audit management staff articulated that they will be looking for "proof of licensure, proof that projects are using contractors that have taken the appropriate training for the lighting or HVAC projects that are of the size [for Workforce Standards]." While it is important to ensure the use of licensed C-20 contractors-individuals who are actively permitted to conduct HVAC work in California, the credential requirements for Workforce Standards apply to the technician or installer of the technology rather than the contractor. Thus, despite the additional efforts to be proactive, PG&E audits may not be able to evaluate implementer compliance with Workforce Standards.

Finally, at the implementer level, we see a similar disconnect between the documentation requested and the Workforce Standards requirements. Whether implementers were utilizing internal contractor networks, existing Trade Pro Networks, or requesting documentation from customers who chose their own contractor, 3P implementers focused on verifying the license of contractor. One implementer described their process for HVAC documentation:

> *In our documentation, especially for HVAC [we checked] that they did have a licensed [C-20] contractor and that they signed an application that they are a licensed contractor. Obviously, we don't police the contractor to see if their licenses are valid, but we do basically ask that the contractor for that particular installation does sign our application form. So, the customer is aware that they should use a licensed contractor and provide that name so again, there is follow up.*

Despite having the name of the contractor, the implementer above did not articulate that they look the contractors up to ensure they have a valid license. However, another contractor who enforces Workforce Standards not only looked up the validity of the license, but also ensured that individuals have the proper license for the project. For example, "We may ask questions if someone has a lighting license and is submitting a project for HVAC."

Ultimately, we found that while there are some existing enforcement processes, they are focused on the contractor rather than technicians performing the installations.

7.3.2 PERCEPTIONS OF RESPONSIBILITY

Due to the change in the program design and indirect relationship with contractors, stakeholders had differing opinions about who should ultimately be responsible for enforcing the Workforce Standards requirements. Many of the IOU staff we interviewed believed that the implementers should ultimately be responsible for enforcing the Workforce Standards

requirements for their programs. As one staff member shared, “We want the implementers to be responsible and the contractors to be responsible for their requirements overall.” Another IOU staff member echoed the shift in responsibility to the 3P implementers, “They are everything the utility used to do which is all of this qualifying and supporting documentation to ensure compliance with all the work papers. That’s their responsibility.”

When we asked implementers the same question, there was a lot of variation in their responses. About a third of the implementers believed it was the customer’s responsibility. They emphasized that they are not the ones installing the technologies and instead, the customers are responsible for choosing contractors and installers with the correct credentials, “...at the end of the day, it's the customer's responsibility. We can only request the information and to the best of their ability providing us their accurate information.”

In an interview with one of the 3P implementers, they acknowledge that they could inform customers of the requirement and support them when needed, but did not feel it was their responsibility to enforce these standards:

> *“...it will be the customer's responsibility to find the contractor to put in that boiler or that HVAC system. Obviously, we would try to see if we can provide any assistance, but again, at the end of the day, it's the customer's responsibility to find that contractor to do either the deemed installation or to work with us on the engineering side to implement any custom measures that we have recommended.*

Another 30% of implementers acknowledged that implementers should be responsible for enforcing Workforce Standards. An implementer shared that the main reason for wanting to take responsibility for enforcement is to reduce the number of projects that are rejected by the IOU:

> *Well, I would say that it's the implementer's responsibility. And that may shock you, but if you're not getting it upfront and taking care of it upfront, you can't wait after the fact and then have [the utility] ask you for it and then you don't have your ducks in a row. So, I'm going to take responsibility for it because I don't want my projects rejected.*

The remaining implementers passionately believed that it should not be the program implementers, but rather the IOUs or the CPUC who enforce Workforce Standards. An implementer shared that the contract language with the IOU indicated that the implementer would be responsible for enforcing Workforce Standards among their subcontractors rather than all contractors working on projects. They described how this would have impacted their decision to move forward as a 3P implementer:

> *They're in our contract, but it's very clear in our contract that it's for subcontractors. And so, I've had to point it out to the utility, the writing is very clear. If we had had to govern contractors that participate in the program, we would've never signed the contract because it would've been impossible for us to do that.*

Another implementer shared how it should be the responsibility of the IOU technical review team, but in the case that they don’t catch it, the CPUC should be responsible for enforcement due to their role in approval of projects, “So the letter of the law, ultimately, projects get approved by CPUC. My answer would be enforcing, that's ultimately the approval, and that I think is CPUC.”

IOU staff emphasized that they believed it was not their responsibility, but rather the task of governmental or quasi-governmental entities who should be responsible for enforcing Workforce Standards. One staff shared, “It doesn't seem to make a lot of sense for us to be policing permits and doing job site walks with regards to who's on-site, how are they trained, and all that when already entities already doing that. So, they have plenty of folks that are in the field that do that. It's a duplication.” This reflected IOUs' feeling that it was not their role to enforce workforce standards,

> *...the CPUC and legislature didn't require utilities to be enforcers because I think that would definitely be contrary to our history and also to the role that I personally feel utilities should play in this. Because it does create a hardship in our relationship with customers if we became the enforcers.*

Notably, one implementer described how the shift to 3P programs has led the IOUs to be more stringent with the documentation and enforcement of Workforce Standards:

> *They didn't really do anything the first six years with that workforce standard. When they outsourced it to third parties, that's when all of a sudden, they cared about it. So that's another key thing that we see that theme across the board when they were doing it, they could have cared less. Checked the box, made it super simple. When they gave it to us, then we had to provide all these forms, documentation, employee records, you know, name it. They're coming up with ideas, but they did next to nothing the last four to six years on that.*

Ultimately, it remains unclear who is responsible for enforcement and ensuring that there is consistent enforcement across programs and across IOUs in California. As one implementer staff reflected, "the enforcement piece, does that go to the CPUC ultimately, right? I don't know the answer to that".

7.4 IMPACT OF THIRD-PARTY PROGRAMS ON WORKFORCE STANDARDS DATA QUALITY AND ENFORCEMENT

Throughout the process of conducting this study, we had difficulty identifying individuals who interfaced with Workforce Standards and receiving high quality IOU data in a timely manner. While some of this may be accounted for given the complexity of the California data request system, we suspect that there was an extra layer of difficulty in procuring the necessary information related to Workforce Standards due to the additional degree of separation between the IOU staff and the implementation of the program.

7.4.1 PROCUREMENT OF PROJECT DATA

In our attempts to conduct baseline interviews with IOU staff, we ran into delays in identifying the appropriate contacts who could speak to the implementation of the standards. In one case, the individuals we talked with did not have a project that triggered the Workforce Standards requirements. As we investigated the projects that triggered Workforce Standards, we found that some IOUs did not provide required fields such as program names, customer information, etc. and required us to complete a follow-up data request to retrieve the missing information. For lighting projects, we only received a single measure code per project ID that reflected light fixtures, lamps, and ballasts but were unable to easily verify whether projects included a lighting control element without further investigation into the measure packages of the unique technologies installed for the projects. To explore whether there were additional codes associated with each project, we downloaded the CEDARS datasets from 2018-2022. For lighting controls, we were only able to match CEDARS data with 28% of the data provided by PG&E (n=2,058). The inability to match cases was due to missing project IDs in the CEDARS dataset suggesting that project IDs are not required for savings claim reporting. We did not find that additional measure codes were available for these projects.

To identify whether the fixture, lamp, and ballast measures included lighting control features, we reviewed the measure packages for all of the projects we were able to match with CEDARS Data. Upon review of the measure packages, we categorized each of the measure codes as having 1) an explicit description of lighting control features or 2) no explicit description of lighting control features and thus lighting controls compatibility remains uncertain. We found that only 25% of the projects incented by IOUs and matched with CEDARS data (n=518), had measures that explicitly stated lighting control features in their measure packages. The remaining 75% of the incented projects (n=1,540) may be

compatible with ALC systems but did not explicitly provide lighting controls features or compatibility in their measure packages.

We found that there was a wide spectrum of documentation provided for the subset of projects that we requested all available data for (See Table 2). The number of project files associated with each project ranged from three to 50 files. Additionally, there was great variation in the materials provided. Only two of the 18 projects provided CSLB license documentation in the materials sent to us. Four of the eighteen projects included Workforce Standards language in the customer contract, but only one customer agreed to comply with the standards.

Interviews with 3P implementers highlighted key challenges to defining program measures for Workforce Standards. An implementer shared how the CPUC decision did not have an explicit definition of what constituted advanced lighting controls, which caused IOUs to utilize different interpretations of lighting controls and what they believed triggered Workforce Standards:

> *We have [one IOU] that is interpreting as truly advanced controls. So not an exterior light that has an occupancy sensor built into it. That's not advanced lighting controls, that's basic controls. But that same requirement for another IOU, we're doing that same measure, and they're saying, "No, guys, you guys have to demonstrate this customer use a CALCTP, whatever it is, certified technician." So that's where we see the misalignment, it's just understanding the basics of what it is. And because the CPUC did not define what an advanced lighting control was when they put out that standard, the utilities had left and interpreted what they believe it is.*

7.4.2 IDENTIFYING CONTRACTORS

The shift in the program design from IOU-implemented programs to a 3P model has had significant implications on collecting quality data from projects. Within the data received from the IOUs, only 8% of the HVAC and 7% of the Lighting Control projects listed the associated contractor company names. Upon closer review of all project documents for the 18 projects, we were able to identify contractor names for each project. In total there were eight unique contracting companies who completed work on the various projects. Two unique contractors completed a total of six HVAC projects, and the remaining six contractors completed a total of twelve ALC projects.

Utilizing the CSLB public database and the CALCTP-certified contractor database, we reviewed whether each contractor held C-20 licenses for HVAC projects and CALCTP certifications for ALC projects. Of the two HVAC contractors, only one had an active C-20 license from the CSLB. The other contractor was from out of state and did not yield a result after searching for their name in the CSLB system. For the ALC projects, none of the contractors were certified CALCTP contractors on the online database; however, four of the six contractors had active C-10 electrical licenses.

7.4.3 TRACKING TECHNICIANS AND CREDENTIALS IN PROJECT DOCUMENTS

One of the most paramount pieces of information to determine whether Workforce Standards are being implemented is the name of the technician/installer performing the work. In the 2018 decision, the CPUC emphasized that the Workforce Standards requirements did not only apply to the contracting firm itself.[47] From the data we received, we could not determine who the individual(s) who installed the HVAC or ALC equipment was. None of the IOU project records or documents contained the technician or installer name. Without the technician or installer name, any entity tasked with verifying or enforcing Workforce Standards would be unable to verify credentials for projects. Without the

[47] California Public Utilities Commission. “Decision 18-10-008”

ability to differentiate between projects with credentialed technicians and those without, future evaluations of Workforce Standards are unviable.

Interviews with 3P implementers illustrated an increased burden in tracking technician-level data that was not feasible for implementers due to limited resources and tight pay-for-performance contracts. Two implementers shared that it would be extremely difficult to collect technician-level data. One implementer who had not had any projects trigger Workforce Standards shared:

> *I'm so many layers removed that from my perspective, keeping an eye on trying to successfully complete these projects. I would need [the customer] to put me in conversation with not only the manager of whoever contractor is, and then identify the person actually on site who needs to have a certificate... I'm sure that some of the contractors do have that. Maybe the bigger ones, I don't know. I don't if it's already something that just already exists, but if they didn't have it, it would really derail these projects.*

An implementer from another territory added the limitations of their ability to support data collection and verification in the current pay-for-performance model, "We don't have the resources to do that." For programs that work with governmental buildings or municipalities, an implementer suggested that it may be easier to get the contractor or technician information directly from the customer, "I doubt we'll be able to give you on time response frankly if you are coming to us.... So, it would probably be more thorough for the [reviewer] to say to the [government customer], you must have those standards. Please share them with us."

In addition to limited resources, implementers were concerned about the impact additional requirements like Workforce Standards would have on recruiting contractors and customers to participate in their program. Many implementers shared that they were already recruiting from a relatively small contractor pool of individuals willing to complete the various processes and verifications needed as part of an EE incentive program. One implementer commented on how introduction of these Workforce Standards would not help the program but rather discourage contractors—especially those from smaller firms—from participating, "[You're] putting out a barrier for them to participate in the program if they don't have, let's say it's a small minority contractor, they don't have the resources to go through all that training, get the certification or whatever they need, they're just not going to do it." For programs where the customer directly hired the contractor, there were concerns about customers' understanding of these requirements. An implementer shared how these additional requirements could impact customer participation in the program, "I'm worried that in some cases [customers] don't know, and therefore they may not participate in the incentive, or they might just say yes, even though they don't know, and then we're getting inaccurate information." Within the pay-for-performance model, if a customer does not collect or provide the technician information to comply with Workforce Standards, the implementers are concerned that the project will be rejected and that neither the implementer nor the customer would receive the payout for the project.

7.5 STAKEHOLDER FEEDBACK ON WORKFORCE STANDARDS

Finally, we asked IOU staff, 3P implementer staff, and contractors to provide feedback on the credentials used for Workforce Standards, ways in which they identified quality installations, and the impact of Workforce Standards on their businesses and programs.

7.5.1 CREDENTIALS AND QUALITY INSTALLATIONS

We asked IOU and Implementer staff for their feedback on the current credentials required under Workforce Standards. Two of the interviewees supported the implementation of Workforce Standards, especially for technologies such as HVAC. One staff member compared HVAC to more straightforward technologies,

If it's just a plug-and-play, you just plug it into the wall, again, the piece of equipment is going to operate the way it should. However, when you go into HVAC and you have to do gas line connections and things like that, you want to make sure that it is one, put in safely that you're not going to have a hazard, and you're going to achieve the savings that is expected.

Interviewees discussed feedback they received from individuals about the idea of Workforce Standards and shared, "[they] don't explicitly recognize independent certification." For HVAC in particular, we found that most of the apprenticeship opportunities available in California are led by the unions. Some of the non-union contractors felt there were certain credentials they deemed valuable for their installers that were not recognized under Workforce Standards. One contractor said that their employees are NATE certified for HVAC optimization, and this certification was a requirement of an energy efficiency program their company joined. The contractor continued to discuss the value of not only third-party training but manufacturer training as well. From our review of HVAC apprenticeships, we did not find any reference to existing third-party HVAC certification exams such as the HVAC Excellence,[48] EPA 608 Technician,[49] or NATE.[50]

In interviews with SDG&E staff, they believed that the benefits contractors received from having proper licensure and credentials would outweigh the costs of ensuring that all staff received that training, "I don't think there will be pushback and if they know that getting a contract is contingent upon them having credentials, then they'll make sure that they have them." Others articulated that some contractors "have a personal stake and a personal integrity to their workmanship and installations" because they want to have a positive reputation and grow their business.

In our discussions with two lighting control contractors, we found that cost plays a major factor in the motivation and capacity to conduct quality installations. While some contractors are focused on getting the next bid or ensuring that their firm is kept busy, others are motivated to train their employees to do quality installs to optimize the project outcomes and save money on the bid, "You don't want to have to pay someone to do it twice, so [they should] do it right the first time." What a quality install looked like varied from contractor to contractor; however, one contractor described that it was not only about the functionality of the install but also the level of professionalism of the job, "For me a quality install is a clean job that is professional and workmanlike. For example, symmetrical bends not going in different directions that look like a mumble jumble." This was similar to how other union staff described their goals for a quality installation. Despite the cost of pursuing credentials, one lighting contractor did view the CALCTP credential as a positive influence on quality installations. The company's employees develop their knowledge and skills that contribute to quality installations through CALCTP's continuous training and re-training. Not only does the quality of the installation impact the contractor's business, but it also can have larger snowball effects on the project timeline and the product's overall functionality. For lighting control systems, various specialty technicians are involved with the installation. First, there is the contractor who has a high-level understanding of the installation needs of a technology. For contractors with teams of individuals, they may have an installer technician put the technology in place, a program technician who is familiar with the manufacturer's programming system do the programming, and an Acceptance Test Technician to verify that the controls function as intended. Smaller crews (e.g., self-employed contractors) may do the installation themselves and work with a programmer sent from the manufacturer. As a result, the inability of a technician to ensure a quality installation can impact the building owner's capacity to use the space on the anticipated timeline or yield the anticipated energy savings as a function of poor technological optimization. As one contractor shared, "It's kind of a

[48] ESCO Group. "Areas of Certification." Progressive levels of certification. https://www.escogroup.org/certifications/default.aspx.
[49] U.S. Environmental Protection Agency. "Section 608 Technician Certification." EPA. Environmental Protection Agency, May 31, 2022. https://www.epa.gov/section608/section-608-technician-certification-0.
[50] North American Technical Excellence. "Become NATE Certified." NATE, July 14, 2022. https://natex.org/technician/become-nate-certified/getting-started-2.

snowball effect, where if from the very beginning the electricians aren't trained in putting the system incorrectly, then it snowballs into this cascading problem of all these different individuals and entities that are suffering from the system not being put in to begin with." To avoid this, the contractor emphasized the importance of education, "I think through education, way before you even have a project, and then the pre-project planning, having that education [of the technology] pre-project is probably the two most important times to guarantee a successful install." In terms of identifying staff that will be effective at quality installations, two contractors discussed the knowledge, skills, and experience they expect from their technicians. Technically, contractors want technicians to have a holistic understanding of the lighting controls system they are working on,

> *[Technicians are] trained in lighting control systems, they understand what the different components in the system are and how they're supposed to go together. They've had the training to look over lighting control submittals and understand reading the blueprints for lighting controls and the importance of reading what the devices are and how they go into the system.*

Another contractor valued union apprenticeship training, where individuals receive "bookwork and hands-on training." In addition to technical knowledge, both individuals highlighted the importance of critical thinking skills and analysis. This emphasis on critical thinking coupled with technical knowledge ensures installers can troubleshoot issues before the programming technicians arrive. Two contractors we spoke with felt that ensuring that technicians have performed quality installs was the responsibility of the contractor or supervisor looking over the project's work: "I expect the [supervisor][51] to look at all work done on the shift. To inspect that the site is clean and everything is installed correctly. The sensors and lighting are functioning before they sign off." A crucial element in this process is also having a supervisor or contractor who is knowledgeable about how the technology should be installed.

While training programs may provide experience with specific technologies, they may not be reflective of what is currently in the field. As a result, one of the contractors chose to take the learning into their own hands. Learning a new technology is something that the contractor or supervisor must do in their own time and is not covered by the union. Despite this extra cost, the contractor saw value in putting the effort into becoming an expert in the technology, "If I didn't understand it, there was no way I could police it effectively." Along with their supervisor, the contractor would first learn as much about a new technology and the conditions necessary for it to operate properly. They would then teach the installation elements to technicians first on a workbench and then in the form of a limited installation. High-level employees (e.g., contractors or supervisors) would check the work and be responsible for the high-level elements of the installation, such as the placement and programming of the technology.

Despite opportunities to provide hands-on training with supervision, the contractor ran into issues with technicians who diverged from the necessary protocol,

> *I had them practice on a workbench, so they had practice wiring before they were up on the ceiling. I had them do 20-22 samples because if they didn't do it the right way, it would destroy the equipment… Some 'enlightened' technical people thought that they were smarter and had great shortcuts. With these two clowns, more than half of the installs had been miswired in different ways in different rooms.*

Due to their affiliation with a union, the contractor received the union's permission to ask technicians to redo the installation on their own time. The rationale was, "if you have union wages, you're expected to do union-level work."

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[51] Supervisors refer to the work historically done by a foreman. While some contractors still use the term foreman, we use supervisors to be more gender inclusive throughout the report.

Without this support, the contractor would have lost additional money on the project to ensure a quality installation was complete, which could disincentivize them from enforcing high-quality work.

In addition to contractor oversight and responsibility for the work, one contractor recommended the use of an external individual to test the lighting system after installation. According to the 2016 Building Energy Efficiency standards, new and retrofit lighting projects with 20 or more luminaires require the performance of an acceptance test.[52] While technicians, contractors, and foreman may hold the certification to be an acceptance tester, the interviewee placed high value in having an outside party verify the installation:

> *"You got to have a third party come in and certify the project. Because if you don't, it's just a conflict of interest. You have the contractor pencil whipping their paperwork, saying, "Yeah, it's all done and it's correct." And if we want to establish integrity in the industry and the process that we're trying to accomplish here, then it should be third party review all the way down the line.*

One limitation to this is that hiring a third party to conduct the inspection would add project costs to the contractor, which could impact which businesses have the capacity to bid on certain projects.

Finally, contractors shared the cost of bidding on projects that utilize new technology. Not only are there costs associated with taking personal time to learn how the technology functions and what is required for a quality installation, but there may be other unforeseen difficulties. One of the contractors encountered equipment that did not have a complete wiring diagram sent from the manufacturer.

> *I called technical support because the wiring diagram was not correct, and they asked me to figure out what was missing. I noticed that they left out part of the wiring. We went back and forth about how to correctly install the equipment, but it took a couple days to complete.*

This incident led to delays in the installation and extra labor costs to identify a solution for the install. The contractor billed the extra unforeseen labor costs to the client who provided the equipment, but they agreed to pay for only 50% of the $52,000 in extra costs. The uncovered labor costs meant that rather than making a profit on the project, the contractor barely broke even. Without the intrinsic motivation to perform a quality install, the contractor could have maintained a profit on the project if they had not taken the extra time to work with the manufacturer to identify a solution. They articulated that other contractors may try to move quickly on projects and play it safe, which "reduces the energy efficiency savings…I pride myself in doing it as smart as you can."

Another HVAC contractor echoed difficulties with technology documentation and factory support:

> *The biggest challenge is really getting factory support because each manufacturer is putting stuff in there now that is so esoteric, the documentation is so poor that when a technician runs into a problem on a piece of equipment, they have to call factory support. And factory support is very thinly staffed, so they could be waiting on a phone for an hour or longer.*

Similar to the lighting industry, individuals must be motivated to seek out solutions to perform quality installs, but technicians face challenges with incomplete documentation and delays in receiving assistance from manufacturers that cannot only increase the overall cost of performing the project but also technicians' willingness to pursue support in the future.

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[52] California Lighting Technology Center. "Lighting Controls Acceptance Testing." California Energy Commission, October 13, 2016. https://www.energy.ca.gov/sites/default/files/2020-10/Lighting%20Controls%20Acceptance%20Testing%20CLTC%20FS_ada.pdf.

7.5.2 WORKFORCE STANDARDS RULING AND IMPLEMENTATION PROCESS

Staff members were asked about their experiences with the roll-out of D.18-10-008. Generally, the IOU staff appreciated that the decision was not prescriptive in how they were expected to implement Workforce Standards in their portfolios. One IOU staff member shared,

> *We find the best success when we are given the latitude to find the best means to get the information, I would feel very differently about it if the rule came in and said, on every single incentive project, you have to attach the document that shows that this person has a license and it must be done in this way. You know, it's like the more prescriptive that it gets, the harder it gets, because it adds time to every single project and you've now weakened the incentive, frankly, because you've now added a little extra bit of labor on every single instance.*

Other IOU staff similarly articulated that for requirements that "impact pricing and the savings associated with it…[they] may make a program not be as feasible as it once was." Furthermore, staff emphasized the importance of having sufficient time to integrate the new requirement into contracts, implementation plans, etc.,

> Having enough time to work through whatever those aspects are so that we can then provide insight of when's the best time to introduce that term. Is it mid-program or is it better off when [we are] rebidding a brand-new program? Which would probably be, it's a lot easier to start a contract fresh with terms in it than trying to introduce new terms mid-cycle within a program.

Some of the success of IOU staff's implementation of Workforce Standards was how it dovetailed with 3P requirements. IOU contract staff had sufficient time to integrate the Workforce Standards language into the new 3P contracts and were not required to retroactively apply the standards to existing programs.

While the IOU staff appreciated the flexibility of the ruling to allow them to adapt their own approaches to implementing Workforce Standards, some IOU staff reflected on the importance of having consistency across the 3P implementers, and IOUs:

> *I think that there needs to be a way to report on it that's created statewide for all the IOUs to be consistent. And then, we can all hold the contractors accountable for reporting out the same metrics statewide. And then with the third-party programs, IOUs have something that they can actually point towards, and then we could be responsible for collecting that information. And because it shouldn't be something where we're all collecting different things.*

A staff member from SCE echoed the importance of communication between key stakeholders in implementing and enforcing Workforce Standards, "With all major decisions and so forth, there just has to be continued communication to make sure that we're not being too overlapping between trying to achieve the same requirement." One suggestion was to have a centralized database with the credentials that would make Workforce Standards requirements easy to verify, "What would be good is to have all this in one place that the state could create a website and we just have to click on it and the person is there… you have to validate on the backend, so that [contract managers] don't have to." Another staff member from SCE was skeptical about the ability to verify and enforce Workforce Standards at all,

> *You don't know who's on the site every day. Unless you want to have the state of California or each county or whatever send people out and just show up on a site and go, 'Let me see your permit…on a person-by-person level.' I mean otherwise I don't know how you could fully do that.*

Another IOU staff member also shared concerns not only about enforcement, but also the limited impact of Workforce Standards on providing quality installs across California:

> *But if you take these programs and incentives out of the equation, then you have no idea who's doing what anyway. You want to make sure that people who are applying for incentives, I guess in theory, that their workers all have the proper, I'm just going to call it credentials or certifications. But there's a lot of projects going out there where people aren't applying for incentives or they're only doing onesy-twosy work. You're never going to be able to track that because they're not applying for incentives, right?*

While Workforce Standards only apply to a specific subset of projects, there appears to be support for a broader responsible contractor policy and consumer protection guidelines which remain under development by the CEC.

7.5.3 WORKFORCE STANDARDS IMPACT ON KEY STAKEHOLDERS

In our interviews, many of the IOU staff did not experience any pushback in having implementers bid and sign contracts that included Workforce Standards requirements. In terms of customer satisfaction, one of the IOU staff reflected on the prevalence of customer complaints for the programs they manage, "We really haven't heard a lot of complaints. I can't really think of any complaints that related to the operation of the equipment after the fact that indicated that somebody was not trained properly."

IOU staff members believed that the overall lack of pushback around the implementation of Workforce Standards was related to the existing stringent Title 24 limitations on who can bid on projects with incentives in California. They discussed how contractors pursuing incentives are used to the overall expectation of providing regulatory documentation. However, as the documentation required to receive incentives increases with additional Title 24 or Workforce Standards requirements, it can negatively affect contractors' willingness to participate in publicly funded EE programs. In some cases, the incentive a contractor would receive for a project isn't going to compensate them for "all of the information that has to be supplied." Furthermore, at least one contractor shared that "[his company] actively avoids these [incentivized] projects because there are so many regulations. Title 24 is very limiting."

The Workforce Standards requirements have additional complexity within the pay-for-performance 3P model. First, for some of the programs, the 3P implementers are not directly hiring contractors to perform the work. As a result, the program operates more as a midstream program in which the implementer is several degrees removed from the people who are actually doing the work. IOU staff shared, "you could have a Trade Pro contractor who is buying their stuff from the distributor. And either they're doing it and they're not related to the distributor; they're just buying product from them versus a distributor doing everything in-house. Then either way though, you could have additional subs and subs of subs, right?" The staff member continued hypothesizing that the complexity could make tracking and reporting "burdensome if it's an extra piece [3P implementers] need to collect every year."

The level of burden on the 3P implementer appears to be closely tied to the size of the business and their level of experience working with IOUs. One of the implementers we interviewed identified as a small business with limited experience working with the IOUs. A major barrier to participation in the pay-for-performance model is the available capital to sustain delayed payments. A staff member who used to work for an IOU shared the differences in her experiences as part of the pay-for-performance model,

> *With the IOU implementing programs, that wasn't the case. We'd basically sign up a customer, we basically had the funding right then and there to implement the programs where on the flip side, we don't have the funding until a project is submitted and closed and approved by the IOU. So that's where there's that lag. And, like I said, it may take us another couple months to be able to get projects in the system working with the IOU before we can see any type of payment.*

This is particularly difficult for smaller firms who do not have as great of a capacity to front funds for the program. As a result, the executive director of the small firm shared, "It's actually less equitable than before frankly…small firms cannot compete." While the CPUC aimed to ensure there were equal opportunities for a mix of implementers, the staff

recognized the advantage that larger firms have in securing and implementing programs, "…the larger companies know how to do it. They've been working with the IOUs for so long and really know the intricacies of implementing a program. I think there just should be some kind of allowances [especially for small businesses] if the CPUC does want to continue with the [3P programming]."

As for contractors, all but one interviewed found Workforce Standards limiting their pursuit of energy efficiency programs. One lighting contractor said that CACLTP helped their company stay updated on building code developments, which helps their business avoid regulatory issues. While having the certification does not necessarily earn them more projects, it supports their continued knowledge of industry technologies and increases their quality of work. Other contractors said that the credential requirements do not harm their businesses, but they are not related to increased revenues or overall business success.

Another HVAC contractor anticipated frequent updates to credential requirements like Workforce Standards that reflect technological innovations. As a result, the contractor believed that more training will be required for their workers that they cannot afford to attend. However, the pace of innovation in the industry is faster than their workforce can handle. An example this contractor gave was low-emission refrigerants. Their company cannot train their workforce fast enough to implement these new refrigerants appropriately.

Other contractors, both union and non-union, agreed that Workforce Standards provided significant limitations to bidding for incentivized projects. These standards frequently add monetary costs for non-union contractors by forcing them to pursue additional training courses. Training employees to meet standards also takes time away from the company's other profitable opportunities. One non-union HVAC contractor said that the pursuit of credentials entirely "depends on the amount of time it takes to get the [installer} trained, how many we could get trained, and what the cost of it would be." A union HVAC contractor viewed these requirements as unnecessary hoops to jump through for employees who have already proven themselves qualified through experience in the field. The contractor emphasized that Workforce Standards were not beneficial to them because they do not make projects with incentives more accessible or make their business more money.

8. CONCLUSIONS AND RECOMMENDATIONS

Below we summarize all the conclusions and recommendations that emerged from our review of policy decisions, evaluation of the current credentialing criteria, assessment of the implementation and enforcement of Workforce Standards, and examination of the current available data to track and verify the impacts of Workforce Standards.

- **Conclusion 1:** As of April 2023, the Responsible Contractor Policy (SB 350) has yet to be funded. While the CEC is actively working towards securing funding in the next year, implementation has not been initiated.
  - **Recommendation 1:** We recommend that the CEC review the findings in this report to help inform the development of the Responsible Contractor Policy and Consumer Protection Guidelines.
- **Conclusion 2:** Currently, CALCTP provides two individual-level training credentials: 1) installer technician training and 2) Acceptance Test Technician (ATT) training. Decision 18-10-008 does not specify which credential is required. Currently, the installer technician training is designed to train licensed electricians on advanced lighting control installation techniques. In contrast, the ATT training requires individuals to either 1) hold a CALCTP Installer Technician Certification or 2) be an industry professional (e.g., electricians, C-10 electrical contractors, architects, engineers) with at least three years of experience. Notably, individuals who have completed the installer technician training are able to skip two of the three ATT modules (i.e., Lighting Controls Systems and Codes and Standards) due to their coverage in the Installer Technician Training. These individuals are only expected to complete the final 16-hour module on acceptance test procedures and documentation that aims to ensure individuals can complete acceptance tests in accordance with Title 24 requirements. Currently, CALCTP

staff maintain an internal list of individuals with both installer technician and ATT certifications; however, a list of only the ATT-certified professionals and installer contractors (i.e., employers) is publicly available on the CALCTP website.

- Recommendation 2: We recommend that the CPUC clarify its preference for the CALCTP installer technician training program as the ALC certification for Workforce Standards as it 1) serves licensed electricians who may be responsible for installing the technologies and 2) can serve as a pre-requisite for the more advanced ATT training program. IOUs should direct 3P implementers to collect the certification number of individuals, and other relevant information (e.g., technician name, contractor name) needed to verify certifications with CALCTP. The CPUC should then direct the IOUs to coordinate with CALCTP staff to verify the validity of the certifications based on key information (e.g., name, contractor, certification number, date of certification).

- **Conclusion 3: Our review of HVAC credentials that satisfy the Workforce Standards requirements revealed a lack of consistent and uniform standards.** One clear example is the number of years of experience required for the various credentials. An individual with as little as one year of experience in an apprenticeship program would satisfy the Workforce Standards requirement. However, journeyworkers[53] require at least five years of hands-on experience, and C-20 contractors need at least four years of journey-level work in the past ten years. Outside of the inconsistency between the level of experience that individuals will have, there are no uniform exam requirements for certification for the apprentice and journeyworker. Furthermore, while there are databases of registered apprentices and journeyworkers, accessing the information requires knowing the technician's full name and the last 4-digits of their social security number. This makes it difficult for 3P implementers or IOU staff to verify individuals who hold these credentials. Currently, the C-20 trade exam appears to be the most robust, transparent, and regularly updated exam; however, since technicians do not qualify to take the C-20 licensing exam, the C-20 certification does not fully align with the Workforce Standards in D.18-10-008.

  - Recommendation 3A: While certification is not traditionally within the purview of the CPUC, they have a vested interest in ensuring the development of a qualified workforce to maximize energy savings and greenhouse gas emission reductions. We recommend that the CPUC collaborate with the California Department of Industrial Relations (DIR), California State License Board (CSLB), California Workforce Development Board, HVAC manufacturers, HVAC Distributors, Unions, California Community Chancellor's Office, and other relevant agencies to identify the best pathway forward for an HVAC technician exam that can be used for Workforce Standards.

  Recommendation 3B: We recommend that the CPUC ensure that the IOUs require the collection of necessary information (i.e., certification numbers for contractors and installation technicians and individuals' last names and last four digits of SSN for apprentices) to support verification for Workforce Standards enforcement.

- **Conclusion 4:** Our analysis of the HVAC apprenticeships in California found that no federally accredited apprenticeship programs or non-union state-accredited programs were actively recruiting individuals. Non-union contractors indicated that there is a gap in the quality and availability of training depending on a company's union affiliation. Non-union companies cannot send their employees to union-sponsored apprenticeship training offerings, so they view the requirement of a completed apprenticeship in Workforce Standards as a significant barrier to accepting EE projects.

[53] Note: While "Journeyman," "journeyperson," "journeyworker, and journey-level worker" are interchangeable terms, the California Apprenticeship Council has identified "journeyworker as the preferred designation. As such, we utilize "journeyworker" throughout the report.
See California Department of Industrial Relations (2021). California Code of Regulations, Title 8, Section 205. Definitions. Retrieved from https://www.dir.ca.gov/t8/205.html.

- **Conclusion 5:** Contractors mentioned the need for more equitable credentialing standards for technicians, specifically identifying language and learning disabilities as barriers to pursuing credentials that require written examination for some of their employees.
  - **Recommendation 5:** As stated in D.18-10-008, the CPUC is "concerned that these requirements [do] not create barriers to disadvantaged workers participation in the programs." Following this guidance, we encourage the CPUC to provide a memo to sister agencies, DIR and CSLB, and training provider CALTCP that draws attention to requests uncovered in this research for training and examination opportunities in multiple languages and providing additional accommodation options for individuals with disabilities, such as additional time for examinations or allowing frequent breaks to make them accessible to a broader community of installers.
- **Conclusion 5:** In alignment with the 2018 decision, the IOUs integrated the language and requirements into any program contract that began on or after July 1, 2019. Due to the shift to 3P programs, the IOUs were no longer responsible for implementing the program and instead passed that responsibility on to the 3P implementers. Third-party implementers were required to develop an implementation plan that included how they would implement, track, and report on Workforce Standards. However, many of these programs were programs in which implementers were not responsible for hiring contractors or performing the work. To account for this, many of the 3P implementers focused on including Workforce Standards language and requirements in their contracts with program customers, associated contractors, and subcontractors. As a result, the final onus of responsibility for implementation fell on customers, which is not what the CPUC envisioned in 2018 when the CPUC established these standards.
  - **Recommendation 5:** Instead of 3P program designs allowing customers to hire their own contractor when participating in a program, we recommend that 3P program designs integrate the use of a preferred qualified contractor network. To develop this network, program staff would recruit and vet contractors and technicians to ensure that the installers meet the associated Workforce Standards requirements. Staff would then provide a list of these vetted installers for customers to choose from. The utilization of a preferred contractor/technician network in existing 3P programs (e.g., Trade Professional Alliance Network) can be beneficial to 1) ensure individuals and their teams hold the desired qualifications required by the CPUC and 2) streamline the process of submitting necessary program documentation.
- **Conclusion 6:** The standardized terms and conditions provided in Appendix B of D.18-10-008 directed the IOUs to request a demonstration of Workforce Standards compliance at least once a year from implementers; however, none of the PAs interviewed believed it was their responsibility to enforce or police Workforce Standards. As a result, there has been minimal enforcement of Workforce Standards since they were enacted in 2019. Currently, PG&E has the most robust approach to ensuring that 3P implementers are implementing and enforcing Workforce Standards, but they are asking for the credentials only from the contractor and not the technicians on-site. Our interviews with the 3P implementers revealed they used a similar approach and highlighted the challenges and lack of feasibility of collecting reliable data at the technician level. As a result, neither 3P implementers nor PG&E currently request the correct information to verify that projects satisfy the Workforce Standards requirements. One potential reason relates to data availability and tracking. From our credentialing analysis, we found that, except for Acceptance Test Technicians, there is no public database that can verify the credentials of installer

technicians for HVAC or ALC.[54] Furthermore, IOU staff shared the difficulty of tracking credentials at the installer/technician level instead of the contractor level.

- Recommendation 6: We recommend that the CPUC formally designate the IOUs as the entity responsible for enforcing Workforce Standards and provide explicit guidance on what that means for the PAs in their interactions with 3P implementers. The CPUC historically and currently holds the IOUs accountable for achieving desired outcomes (e.g., energy savings), and thus, the IOUs are responsible for ensuring all their programs are successful in accomplishing these goals even if they are outsourcing the design and implementation of these programs to third-party implementers. As stated in D.18-10-008, "The Commission does not have experience with the practical implications of requiring workforce standards." While this report provides evidence of some challenges in implementing workforce standards, we recognize that everyone is learning. As the IOUs take on the responsibility of enforcing Workforce Standards, the IOUs should present lessons learned and recommendations on how to make it work to the CPUC in an ongoing dialog.

- Conclusion 7: Due to the timing of Workforce Standards and the shift in IOU portfolios to include more 3P programming, we found that the role of IOU program managers shifted from managing the program's implementation to managing the contract and ensuring that 3P implementers meet performance deadlines. While not part of the initial investigation, several 3P implementers shared their experiences as the first wave of implementers participating in the new 3P program model. From the 3P implementers' perspective, IOUs were not as invested in the success of 3P programs as they were when they managed their own EE programs. Several 3P implementers experienced strict enforcement of their contracts despite delays caused by IOU review and approval processes, challenges receiving resources to recruit program participants, and a lack of flexibility regarding the KPIs and data collection structures to accommodate more innovative program design elements.[55] While the 2017 Responsible Contractor Study[56] reflected on how the size and capacity of a contracting firm can affect its ability to track and comply with workforce requirements, we found that in the new 3P pay-for-performance model, there is a need to consider the size and capacity of the firm as well. Smaller firms that secured contracts to implement EE programs faced difficulties due to their lack of experience working with IOUs and insufficient capital to cover the upfront program implementation costs. These challenges are exacerbated when the 3P implementers are responsible for implementing and enforcing requirements such as Workforce Standards. The implementers recommend that the CPUC consider updating the structure, execution, and standardization of EE programs across California, such as adjusting the pay-for-performance payment structure to support implementer cash flow, identifying opportunities to promote IOU investment and support of 3P programs, centering customer experiences on shorter review and payment processes, and standardizing the data collection and verification process for KPIs across the IOUs. Finally, all the implementers interviewed were thankful for the opportunity to provide feedback on their experiences implementing 3P programs. They requested future opportunities to provide feedback on these programs and draft CPUC decisions that may impact the success of their programs.

  - Recommendation 7: While the CPUC aimed to ensure that there were equal opportunities for implementers to secure contracts to implement 3P programs, we recommend that the Procurement Review Group (PRG) explore

[54] While there is a public database to look up contractors with C-20 licenses since installers are not technically eligible to apply for a C-20 license, this does not help track credentials. Additionally, there is a public database to look up current HVAC apprentices; however, it requires individuals' full names and the last four digits of their social security number which is not readily available information. See DIR Apprenticeship Status and Safety Training Certification.

[55] These contracts followed the standard terms and conditions and guidelines outlined in 18-10-008 and 19-01-003. The CPUC since has issued Decision 23-02-002 to address challenges 3P implementers experienced during the solicitation and contract negotiation stages. The decision updated new 3P program solicitation processes and standardized terms and conditions.

[56] Opinion Dynamics Corporation. "Responsible Contractor Policy for EE Programs: Market Intelligence Study." CALMAC, December 2017. https://www.calmac.org/publications/Responsible_Contractor_Policy_Study_Report_FINAL.pdf.

additional opportunities to support 3P implementers—especially smaller firms—with the data collection and verification requirements associated with Workforce Standards. This may include but is not limited to discussions around the proportion of contracts associated with pay-for-performance models, utilization of fixed fees to support the ramp-up phase of the program, and additional support mechanisms during the contract negotiation process. Additionally, we recommend that the CPUC develop a regular feedback mechanism to solicit 3P implementer feedback on program effectiveness and challenges and integrate implementer feedback into updates to the contracting process, program design, or measurement and verification processes.

- **Conclusion 8:** In identifying projects that triggered Workforce Standards, we identified discrepancies in the measure descriptions provided and their relevance to lighting control measures to determine whether Workforce Standards would be triggered. Upon closer examination of the measure packages (a.k.a. workpapers) associated with all projects that we could match in the CEDARS database, we found that most measure packages do not explicitly state whether the measure included a lighting control feature or was compatible with a lighting control system. Additionally, interviews with 3P implementers shared that IOUs have different definitions of what types of measures constitute advanced lighting controls. Going forward, it appears that fewer programs will incent general lighting measures. However, if lighting controls continue to be incentivized by programs and trigger Workforce Standards, there is a need to ensure the IOUs are consistently differentiating between general lighting measures (e.g., light fixtures, lamps, and ballasts) and advanced lighting controls.
  - **Recommendation 8:** We recommend that the CPUC ensure that there is a standardized definition for what constitutes "lighting controls". We recommend that the CPUC consider using the definition developed by the CALCTP Board to include: 1) occupancy and photosensors for both indoor and outdoor applications; 2) low and line voltage dimming systems; 3) demand response control systems, including Energy Management and Control Systems (EMCS) with Direct Response (DR) functionality/modules; 4) track lighting systems including current limiting devices; and 5) time-based scheduling systems, including automatic time switches, programmable lighting control panels, and part-night lighting.[57] Additionally, the CPUC should direct all the IOUs to utilize this definition when recording project measures in the CEDARS database. We recommend that there be a filter or flag for lighting controls within CEDARS.
- **Conclusion 9:** At the time of this retrospective study, there was insufficient data to measure the impact of Workforce Standards on project quality and energy savings. Moving forward, a retrospective impact analysis of Workforce Standards will not be possible until 1) a standard definition of what constitutes lighting controls that is utilized by the IOUs and tracked in the CEDARS database, 2) a statewide HVAC technician certification that can be used for Workforce Standards, 3) the ability for IOUs and 3P implementers to obtain certification information from credentialing providers to verify that HVAC and ALC installers meet Workforce Standards requirements, and 4) improved IOU and 3P implementer capacity to track installers on qualifying projects.
- **Recommendation 9:** We recommend that the CPUC take the following actions to better support the implementation and evaluation of Workforce Standards: 1) direct the IOUs to develop a process to enforce Workforce Standards using the lessons learned codified in this report and the findings from the discussions called for in Recommendation 3A and 3B above, 2) ensure a standard definition of what constitutes lighting controls is defined and utilized by the IOUs and tracked in the CEDARS database, 3) continue to collaborate with other state agencies (e.g., CWDB, CSLB, DIR) on relevant workforce certifications for HVAC and lighting technicians.

[57] CALCTP. *CALCTP Acceptance Testing Handbook*, November 17, 2022. https://calctp.org/content/CALCTP-AT_Handbook_Version_23_2022_cycle_11-17-22.pdf.

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