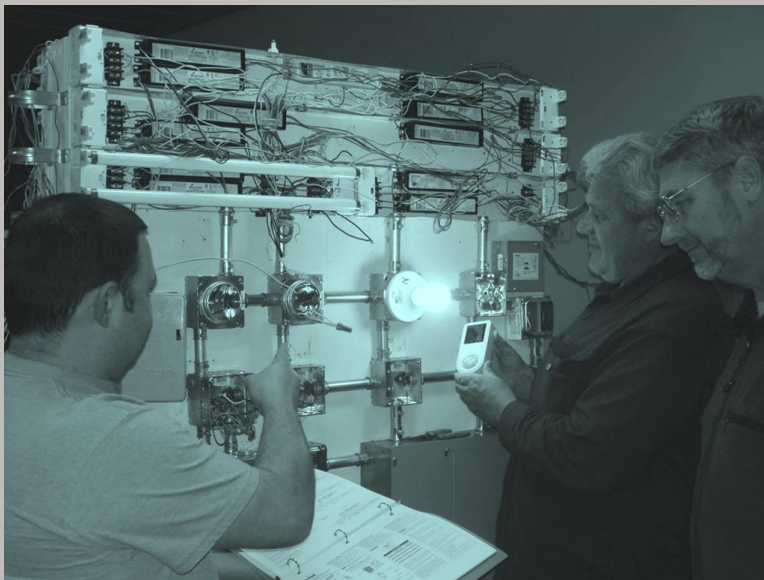


Workforce Issues and Energy Efficiency Programs

A Plan for California's Utilities

DONALD VIAL CENTER ON EMPLOYMENT IN THE GREEN ECONOMY
Institute for Research on Labor and Employment
University of California, Berkeley

2014



Workforce Issues and Energy Efficiency Programs: A Plan for California's Utilities

MAY 2014

AUTHORS

Donald Vial Center on Employment in the Green Economy, UC Berkeley

Carol Zabin, Ph.D.

Jessica Halpern-Finnerty

Megan Emiko Scott

Betony Jones

Robin Walther, Ph.D.

Estolano LeSar Perez Advisors, LLC

Cecilia Estolano

Alex Paxton

Cynthia Guzman

Career Ladders Project

Linda Collins

Anjana Richards

Peter Simon

Acknowledgements

We wish to extend our thanks to the many people who gave their time and effort to this project. We offer particular thanks to the following individuals:

RESEARCH ASSISTANCE AND EXPERT ADVICE

- Ferheen Abbasi and Rachel Gold — *UC Berkeley*
- Theresa Rowland — *Career Ladders Project*
- Doug Avery — *Consultant*

EDITING AND PRODUCTION

- Jenifer MacGillvary — *UC Berkeley*

IOU STAFF

- Lisa Shell and Robert Marcial — *Pacific Gas & Electric Company*
- Rodney Davis and Alma Williamson — *Southern California Gas Company*
- Ellery Stahler, Lianna Rios, and Bonnie Moreno — *San Diego Gas & Electric Company*
- Nina Perez, Jake Huttner, and John Fasana — *Southern California Edison*

STAKEHOLDER ADVISORY GROUP

- David Delatorre — *Laborer's International Union of North America Local 261*
- Denise Fairchild — *Emerald Cities Collaborative*
- Diane Ravnik and Glen Forman — *California Division of Apprenticeship Standards*
- Eddie Ahn and Josh Arce — *Brightline Defense Project*
- Elizabeth Klebaner — *Adams Broadwell Joseph & Cardozo, on behalf of the CA Construction Industry Labor-Management Cooperation Trust*
- Erik Emblem — *International Association of Sheet Metal, Air, Rail & Transportation Workers*
- Jim Caldwell — *California Community Colleges Chancellor's Office*
- Jim Hussey — *Marina Mechanical and Sheet Metal Workers Local 104 JATC*
- Kayla Race — *Environmental Health Coalition*
- Lara Ettenson — *Natural Resources Defense Council*
- Lisa Paulo and Tory Francisco — *California Public Utilities Commission Energy Division*
- Mike Massey — *Piping Industry Progress & Education Trust Fund*
- Ryan Young — *The Greenlining Institute*
- Tim Rainey and Amy Wallace — *California Workforce Investment Board*
- Uyen Le — *International Brotherhood of Electrical Workers Local 11*

LEADERSHIP BRIEFING GROUP

- Commissioner Andrew McAllister — *California Energy Commission*
- Commissioner Catherine Sandoval — *California Public Utilities Commission*
- Carol Brown, on behalf of Commissioner Mike Peevey — *California Public Utilities Commission*
- Diane Ravnik — *California Division of Apprenticeship Standards*
- George Katsufraakis — *San Diego Gas & Electric Company*
- Gillian Wright — *Southern California Gas Company*
- Janice Berman and Paola Benassi — *Pacific Gas & Electric Company*
- Jeanne Clinton — *California Public Utilities Commission and Advisor to the Governor on Energy Efficiency*
- Jim Caldwell, John Dunn, and Chris McCullough on behalf of Van Ton-Quinlivan — *California Community Colleges Chancellor's Office*
- Lisa Paulo and Jaclyn Marks — *California Public Utilities Commission Energy Division*
- Mark Wallenrod — *Southern California Edison*
- Patrick Henning — *Office of the Governor*
- Tim Rainey — *California Workforce Investment Board*

Special thanks to all who were interviewed for this project. We appreciate the time each of you took to answer our numerous questions and share your knowledge with us.

Also special thanks to Lisa Shell, contract manager, for her thoughtful guidance and support in organizing the many facets of this project.

All errors, editorial decisions, and conclusions are the sole responsibility of the lead authors.

Contents

EXECUTIVE SUMMARY	1
I. OVERVIEW	1
II. BACKGROUND	3
III. ENSURING HIGH-QUALITY WORK IN IOU ENERGY EFFICIENCY AND DEMAND-SIDE PROGRAMS	4
IV. USING IOU WE&T RESOURCES TO BUILD THE SKILLED WORKFORCE NEEDED FOR EE GOALS.....	8
V. INCLUSION OF WORKERS FROM DISADVANTAGED COMMUNITIES.....	11
VI. EVALUATION, MEASUREMENT AND VERIFICATION.....	12
VII. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS.....	15
INTRODUCTION	17
I. OVERVIEW	17
II. REGULATORY HISTORY AND PROGRESS TO DATE.....	20
III. SCOPE OF WORK.....	23
IV. ORGANIZATION OF GUIDANCE PLAN	24
V. METHODOLOGY.....	25
CHAPTER 2: INCREASING ENERGY SAVINGS THROUGH WORKFORCE INTERVENTIONS IN IOU EE PROGRAMS:	
DEMAND-SIDE STRATEGIES	26
I. OVERVIEW	26
II. PROBLEM STATEMENT	31
III. RECOMMENDATIONS.....	49
IV. RATIONALE	50
V. STAKEHOLDER FEEDBACK.....	59
VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS.....	61
VII. IMPLEMENTATION TIMELINE	62
CHAPTER 3: WORKFORCE EDUCATION & TRAINING PROGRAM MODIFICATION: SUPPLY-SIDE STRATEGIES.....	63
I. OVERVIEW	63
II. PROBLEM STATEMENT	67
III. RECOMMENDATIONS.....	82
IV. RATIONALE	83
V. STAKEHOLDER FEEDBACK.....	100
VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS.....	101
VII. IMPLEMENTATION TIMELINE	104

CHAPTER 4: LABOR DEMAND STRATEGIES TO PROMOTE INCLUSION OF DISADVANTAGED WORKERS	105
I. OVERVIEW	105
II. PROBLEM STATEMENT	110
III. RECOMMENDATIONS	116
IV. RATIONALE	116
V. STAKEHOLDER FEEDBACK.....	122
VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS	124
VII. IMPLEMENTATION TIMELINE	125
CHAPTER 5: EM&V PLAN FOR GUIDANCE PLAN RECOMMENDATIONS	126
I. OVERVIEW	126
II. PROBLEM STATEMENT	126
III. REGULATORY DIRECTION AND RECENT DEVELOPMENTS.....	128
IV. PROGRAM THEORY, OUTCOMES, AND SUCCESS METRICS FOR RECOMMENDATIONS.....	130
V. ISSUES RELATED TO INCORPORATING WORKFORCE ISSUES INTO EM&V FOR IOU EE PROGRAMS.....	134
VI. RECOMMENDATIONS FOR EM&V PLANS.....	139
VII. RATIONALE	140
VIII. STAKEHOLDER FEEDBACK.....	145
IX. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS.....	146
X. IMPLEMENTATION TIMELINE	147
CHAPTER 6: SUPPORTING ACTIVITIES.....	148
I. OVERVIEW	148
II. RECOMMENDATIONS FOR SUPPORTING ACTIVITIES.....	148
III. STAKEHOLDER ENGAGEMENT	148
IV. DEVELOPMENT OF A JOINT IOU WE&T WEBSITE.....	152
BIBLIOGRAPHY	156
GUIDANCE PLAN TEAM	171

List of Exhibits

GUIDANCE PLAN

Exhibit 1.1 WE&T Goals and IOU Roles	19
Exhibit 2.1 Current Process Ignores Work Quality.....	37
Exhibit 2.2 Decision Tree for Determining Worker Skills Standards and Inspection Process for Programs	57
Exhibit 2.3 Implementation Timeline for Demand-Side Strategies: Energy Savings.....	62
Exhibit 3.1. Key Workforce Institutions for EE Career Pathways.....	74
Exhibit 3.2. WE&T Skills-Building Program Components.....	85
Exhibit 3.3. Priority Occupations.....	88
Exhibit 3.4 Need for Skills Upgrades.....	90
Exhibit 3.5 Implementation Timeline for Supply-Side Strategies: Energy Savings and Inclusion.....	104
Exhibit 4.1 Implementation Timeline for Demand-Side Strategies: Inclusion.....	125
Exhibit 5.1 Objectives and Expected Outcomes for Guidance Plan Recommendations.....	131
Exhibit 5.2 Logic Model with Skills Building for the Statewide WE&T Centergies and Connections Sub-Programs	135
Exhibit 5.3 Implementation Timeline for EM&V Plan.....	147

APPENDICES

Exhibit 2C.1 Examples of U.S. Energy Efficiency Programs Requiring Certification.....	33
Exhibit 3C.1 Logic Model with Skills-Building for the Statewide WE&T Centergies and Connections Sub-Programs 49.....	49
Exhibit 3E.1 Criteria for WE&T Skills-Building RFPs–Energy Savings.....	60
Exhibit 3E.2 Criteria for WE&T Skills-Building RFPs–Inclusion.....	62
Exhibit 3F.1 Occupational Groups Affected by Energy Efficiency Related Investment and Estimated Percentage of Workforce.....	63
Exhibit 3F.2 Energy Efficiency Job Projections by Occupational Group with Training Needs.....	65
Exhibit 4A.1 Thresholds for Targeted Hire Requirements.....	96
Exhibit 4B.1 Estimated Cost Impact of Raising ESA Wage Floor.....	98
Exhibit 5B.1 Suggested Framework for WE&T Issue Areas, Data Needed to Measure Progress, and Data Collected to Date.....	108

ACRONYM GLOSSARY

ACRONYM	DEFINITION
AABC	Associated Air Balance Council
ACCA	Air Conditioning Contractors of America
AF	Authorization Form
ANSI	American National Standards Institute
AP	Accredited Professional
ARRA	American Recovery and Reinvestment Act
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
BA	Building Analyst
BIG	Build It Green
BOC	Building Operator Certification
BPC	Building Performance Contractor
BPI	Building Performance Institute
CAA	Career Advancement Academies
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CAF	Customer Authorization Form
CALCTP	California Advanced Lighting Controls Training Program
CARE	California's Alternative Rates for Energy
CAZ	Combustion Appliance Zone
CCA	Community Choice Aggregators
CCCCO	California Community Colleges Chancellor's Office
CCLLI	California Community College Linked Learning Initiative
CCSE	California Center for Sustainable Energy
CDE	California Department of Education
CEC	California Energy Commission
CEWO	Clean Energy Works Oregon
CEWP	Clean Energy Works Portland
CFL	Compact Fluorescent Lamp/Light
CGBP	Certified Green Building Professional
CLCATT	Certified Lighting Controls Acceptance Test Technician
CLEESP	California Long Term Energy Efficiency Strategic Plan
CLTC	California Lighting Technology Center
CLWDA	California Labor and Workforce Development Agency
CPA	California Partnership Academies
CPUC	California Public Utilities Commission
CSD	California Department of Community Services and Development
CSG	Conservation Services Group
CSU	California State University
CTE	Career and Technical Education
CWA	Community Workforce Agreement
CWIB	California Workforce Investment Board
DAS	Division of Apprenticeship Standards
DG	Distributed Generation

DIR	Department of Industrial Relations
DLSE	Division of Labor Standards Enforcement
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DR	Demand Response
DSM	Demand-Side Management
DVC	Donald Vial Center on Employment in the Green Economy
EBCx	Existing Building Commissioning
EDD	Employment Development Department
EDR	Energy Design Resources
EE	Energy Efficiency (in this document also is used to cover DG and DR)
EM&V	Evaluation, Measurement, and Verification
EPIC	Electric Program Investment Charge
ESA	Energy Savings Assistance
ETCC	Emerging Technologies Coordinating Council
ETP	Employment Training Panel
EUC	Energy Upgrade California
EWSS	Energy Workforce Sector Strategy
FTA	Federal Transit Administration
GED	General Educational Development
HUD	Housing and Urban Development
HVAC(R)	Heating, Ventilation, and Air Conditioning (and Refrigeration)
IBEW	International Brotherhood of Electrical Workers
IHACI	Institute of Heating and Air Conditioning Industries, Inc.
IOU	Investor-Owned Utilities
ISO	International Organization for Standardization
JATC	Joint Apprenticeship and Training Committee
KSA	Knowledge, Skills, and Abilities
LADWP	Los Angeles Department of Water & Power
LATTC	Los Angeles Trade–Technical College
LEA	Local Educational Agency
LEED	Leadership in Energy and Environmental Design
LETf	Labor Enforcement Task Force
MCCC	Multi-Craft Core Curriculum
M&V	Measurement and Verification
ME&O	Marketing, Education & Outreach
MITC	Minimum Industry Training Criteria
MOU	Memorandum of Understanding
MUSH	Municipalities, Universities, Schools, and Hospitals
NATE	North American Technician Excellence
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NREL	National Renewable Energy Laboratory
NYSERDA	New York State Energy Research and Development Authority
ODC	Opinion Dynamics Corporation
OSHA	Occupational Safety and Health Administration
PAG	Program Advisory Group

PCR	Project Completion Report
PEPMA	Proposal Evaluation and Proposal Management Application
PFS	Project Feasibility Study
PG&E	Pacific Gas and Electric Company
PIP	Program Implementation Plan
PLA	Project Labor Agreement
PRG	Peer Review Group
PSA	Project Stabilization Agreement
QA	Quality Assurance
QI	Quality Installation
QM	Quality Maintenance
R&D	Research & Development
REN	Regional Energy Network
RENEW	Retrofits for Energy Efficiency Works
RFP	Request for Proposal
ROCP	Regional Occupational Centers and Programs
RSES	Refrigeration Service Engineers Society
RSI	Related and Supplemental Instruction
SCE	Southern California Edison
SCG	Southern California Gas Company
SDG&E	San Diego Gas and Electric Company
SEER	Seasonal Energy Efficiency Ratio
SELAC	Southeast Los Angeles Crenshaw
SMART	International Association of Sheet Metal, Air, Rail and Transportation Workers
SME	Subject-Matter Expert
SMUD	Sacramento Municipal Utility District
SNEW	Sierra Nevada Energy Watch
SWH	Solar Water Heater
TABB	Testing, Adjusting and Balancing Bureau
TSP	Technical Skills Panel
UA	United Association of the Plumbing and Pipe Fitting Industry
UC	University of California
UPCT	Department of Water and Power Utility Pre-Craft Trainee
WE&T	Workforce Education and Training
WIA	Workforce Investment Act
WIB	Workforce Investment Board
WMDVBE	Women-, Minority- or Service-Disabled Veteran-Owned Business Enterprise

Workforce Issues and Energy Efficiency Programs: A Guidance Plan for California's Utilities

EXECUTIVE SUMMARY

I. OVERVIEW

California has charted an ambitious course for building a clean energy economy, with energy efficiency as a key strategy for achieving the state's goals. The Investor-Owned Utilities (IOUs), directed by the California Public Utilities Commission (CPUC), administer the great majority of the state's energy efficiency and other demand-side¹ incentives and rebate programs serving the residential, commercial, industrial, and agricultural sectors. These programs dominate California's investments in early-stage adoption of energy efficiency, and play a critical role in preparing the market for widespread adoption of clean energy resources.

IOU ratepayer investments in energy efficiency are guided by the CPUC's Long Term Energy Efficiency Strategic Plan, which acts as a roadmap for achieving energy efficiency (EE) targets in California through the year 2020 and beyond.² In the EE Strategic Plan, the CPUC recognized the critical importance of a well-prepared workforce, and directed that "by 2020, California's workforce is trained and fully engaged to provide the human capital necessary to achieve California's economic energy efficiency and demand-side management potential."³

In 2013, the CPUC directed the IOUs to hire an expert consultant to assist them in developing a comprehensive plan to address workforce issues in the IOU EE programs. This followed a period of significant attention to workforce issues by the CPUC, the IOUs, and external stakeholders who are parties to the CPUC proceeding. All agreed that further advice from workforce experts was needed to effectively pursue Strategic Plan goals and follow subsequent CPUC direction to that end. The University of California, Berkeley Donald Vial Center for Employment in the Green Economy (UCB-DVC) was hired as the consultant and produced the Guidance Plan summarized here.

For the CPUC and the IOUs they regulate, addressing workforce issues has two goals. The primary goal is energy savings. Realizing the potential energy savings from California's substantial ratepayer-funded EE programs requires that participating contractors and workers have the skills they need to ensure that equipment is properly installed, commissioned, and maintained, and that buildings are designed, constructed, and retrofitted consistent with best practice and technical specifications for energy efficiency. Developing an industry comprised of qualified contractors and workers is also key for longer-term market transformation so that

¹ For the purposes of this document, the term energy efficiency also includes other IOU demand-side programs such as demand response and distributed generation, except where otherwise noted.

² California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. Retrieved from: http://www.energy.ca.gov/ab758/documents/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf. Referred to as "the Strategic Plan" throughout the document.

³ *Ibid.* page 70.

customers can be confident that the EE work they invest in will be executed correctly. The secondary goal for addressing workforce issues is to secure the inclusion of workers from disadvantaged communities in rewarding careers in EE. This goal was included in the Strategic Plan but, as yet, the CPUC has not issued specific direction on inclusion that has quantifiable objectives or suggested strategies. We address both goals in this Guidance Plan.

The IOUs have two roles through which they influence workforce skills development: their investments in EE (over \$1 billion per year), which shape the jobs that are created and the skills that are required, and their investments in workforce training and education (about \$30 million of the overall \$1 billion per year). Because of their market share in EE, the demand for skilled labor is and will continue to be heavily influenced by the IOUs' incentive and rebate programs. The workforce education and training investments also influence workforce skills development, but on a smaller scale. The WE&T investments comprise only a narrow slice of California's rich training and education infrastructure for the key design and trades occupations that impact energy use. This broader infrastructure includes the community colleges, the state-certified apprenticeship system, colleges and universities, and other institutions.

California has successfully implemented many important but straightforward EE measures such as screw-in compact fluorescent lamps (CFLs). However, in order to achieve the very ambitious energy conservation targets set forth in the Strategic Plan and other policies, increasingly complex energy conservation measures and programs are needed. Energy efficiency jobs in the near future will require additional knowledge, skills, and abilities (KSAs) to complete this more complex work than were required for past EE success. Developing the EE workforce to meet this challenge will require a two-pronged approach that leverages the IOU roles on both sides of the labor market: the supply side, to ensure an adequate supply of workers qualified to perform the work; and the demand side, to ensure that the trained and skilled workers are in fact utilized in IOU EE programs and the broader EE market. To be effective, training investments should be driven by demand.

RECOMMENDATIONS

Our recommendations are for interventions to influence both the demand for skilled labor and the supply of skilled labor, and they address both the energy savings goal and the inclusion goal. They also include ways to channel ongoing advice and engagement from state workforce agencies and workforce experts. The recommendations are described in the Guidance Plan and are summarized in this document. The three broad recommendations are:

1. The IOUs should incorporate a set of contractor and workforce standards and other interventions into the program requirements for their EE incentive programs. These requirements can help ensure that ratepayer-subsidized EE measures are properly installed, operated, and maintained, and that the energy savings potential from ratepayer subsidies is fully realized. Such requirements also signal the state's training providers to develop or update curriculum in order to provide workers with necessary skills.
2. The IOUs should redesign their Workforce Education and Training programs to move toward greater alignment with, leveraging of, and influence over California's main training and education institutions, in order to incorporate EE-specific skills and knowledge in the broader skills set of workers in key occupations. We suggest the IOUs, with input from both energy and workforce experts, identify priority skills and

workforce needs, and then administer a competitive solicitation process to direct funding to organizations with core competencies in workforce training. Workforce preparation for workers from disadvantaged communities should also be funded.

3. The IOUs should create an inclusion program to broaden opportunities for workers from disadvantaged communities to enter rewarding careers related to EE. Complementing the skills-building efforts for disadvantaged workers, this program should leverage the IOUs' influence over EE jobs to help broaden access for disadvantaged workers and ensure that the jobs generated by ratepayer investment provide living wages and defined pathways for advancement.

II. BACKGROUND

This Guidance Plan follows the first workforce report called for by the CPUC, the 2011 California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation and Demand Response (Needs Assessment), also authored by the UCB-DVC. This Guidance Plan is designed to transfer the analysis and higher level recommendations from the UCB-DVC Needs Assessment into specific concrete actions that the IOUs can take to address workforce issues in their EE programs. The Needs Assessment provided research on labor demand and current training capacity to identify key gaps and opportunities for training investments and other workforce interventions. It also provided high-level recommendations on changes to both the IOU EE incentive programs and their WE&T programs.⁴ The Needs Assessment, with which this Guidance Plan is aligned, recommended the introduction of workforce standards, a reorientation of training programs, and specific programs to address inclusion.⁵

The IOUs began making programmatic changes based on the UCB-DVC Needs Assessment⁶ and further direction from the CPUC in the EE budget and policy proceedings.⁷ A number of parties to the proceeding were not satisfied with the IOUs' progress, asserting that the ability of the state to meet its energy efficiency goals could be compromised if remedial action were not taken.⁸ In November 2012, the CPUC expressed concern about its

⁴ California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047). Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/A08D84B0-ECE4-463E-85F5-8C9E289340A7/0/D0909047.pdf>. p. 221, 361.

⁵ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. Retrieved from: http://irle.berkeley.edu/vial/publications/ca_workforce_needs_assessment.html.

⁶ California Public Utilities Commission (2011, October 24 and approved on 28). *Additional Supplemental Joint Filing: 2010-2012 Statewide Workforce Education and Training (WE&T) Program Modifications based on Findings of WE&T Needs Assessment - SDG&E 2260-E-B/2041-G-B, SoCalGas 4249-B, SCE 2588-E, and PG&E3212-G-B/3852-E-B* (D.09-09-047).

⁷ California Public Utilities Commission (2013, July). *Energy Efficiency Policy Manual: Applicable to Post-2012 Energy Efficiency Programs, Version 5* (R.09-11-014). Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/7E3A4773-6D35-4D21-A7A2-9895C1E04A01/0/EEPPolicyManualV5forPDF.pdf>; PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plan, Workforce Education and Training.

⁸ Including EHC, CCILMCT, Greenlining Institute and Green for All, and Global Green USA. California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M034/K299/34299795.PDF>. p. 89-92.

own, as well as the IOUs', lack of core expertise in workforce development, and directed the IOUs to hire an expert consultant to help design a comprehensive approach and action plan to the myriad workforce issues inherent in the EE program portfolios.⁹ The UCB-DVC was once again selected as the expert consultant in a competitive solicitation process.¹⁰ This Guidance Plan is the product based on the team's approved scope of work and provides pragmatic and prescriptive recommendations, most of which can be implemented without further CPUC direction.

III. ENSURING HIGH-QUALITY WORK IN IOU ENERGY EFFICIENCY AND DEMAND-SIDE PROGRAMS

The IOUs' role in achieving the state's energy efficiency goals is to prime the market by subsidizing the cost of energy efficient equipment and retrofits and providing other forms of assistance to lower energy demand. Over time, measures supported by IOU voluntary incentives are codified as mandates in the state's building and appliances codes and standards or otherwise adopted by the market.

Given the IOUs' role in priming the market, it is critical that the measures and equipment they subsidize produce the intended results. While many factors influence end results, the quality of the work¹¹ performed by contractors participating in the IOU EE programs is a more important variable than has been recognized, both for meeting short-term savings targets and long-term energy efficiency goals. Persistent quality problems in Heating, Ventilation, and Air Conditioning (and Refrigeration) (HVAC) and other key building systems point to a need for greater efforts to ensure quality. Despite the common use of upfront workforce standards in other industries like health care, there is a notable lack of substantive qualifications required of contractors and workers who participate in most IOU programs. Reliance on upfront standards for participating contractors and workers can be particularly effective at promoting work quality because they attract high-performing contractors and screen out (or improve the quality of work of) lower performing contractors.¹²

In the EE policy and budget proceedings for 2013-2014, stakeholders representing workers, contractors, low-income communities, and environmental interests advocated for the adoption of such standards. The CPUC

⁹ Ibid.

¹⁰ UCB-DVC was also the author of the *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*, one of the foundational documents for this contract. After the Needs Assessment was completed, UCB-DVC provided technical assistance and expert advice to a number of WE&T stakeholders during the policy and budget proceedings for the IOUs' 2013-2014 energy efficiency programs. This included the IOUs, Energy Division, CWIB, Greenlining, Green for All, NRDC, the Emerald Cities Collaborative, and others. During this time, UCB-DVC was a paid consultant to the California Construction Industry Labor-Management Cooperation Trust, providing technical assistance and research relating to WE&T issues in the EE proceedings at the CPUC. In 2012, UCB-DVC was also a paid consultant to the California Division of Apprenticeship Standards and provided technical assistance for its efforts to develop a collaboration with the IOUs for reviewing and upgrading the EE skills in the state's apprenticeship programs.

¹¹ The terms "quality of work" and "work quality" are intended to summarize proper installation, commissioning and maintenance of equipment; design, construction, and retrofits consistent with best practices and technical specifications; and safe, effective, and reliable workmanship.

¹² Zabin, C. et al. (2011). p. 293.

ordered the IOUs to *consider* adopting standards in lighting and HVAC programs, but reported that it could not order the IOUs to *require* standards because there was not enough evidence on their costs and benefits.¹³

In order to help the CPUC and IOUs assess the value of standards and other workforce interventions and to take action in this arena, the research for Chapter 2 of this report addresses the following questions:

1. Is there evidence that work quality is a problem, what is the scale of the problem, and where is it prevalent?
2. How is work quality addressed in the current planning, approval, implementation, and evaluation processes for EE incentive programs, and does this sufficiently promote the correct installation, commissioning, and maintenance of EE measures?
3. What types of workforce standards and other workforce interventions have been used in other labor markets, and what is the evidence on their costs and benefits?
4. What types of standards or other workforce interventions could most effectively promote work quality in the IOU EE programs, and how should specific workforce requirements be determined for programs?

RESEARCH SUMMARY: EVIDENCE AND RATIONALE FOR DEMAND-SIDE RECOMMENDATIONS¹⁴

- A substantial body of research exists that documents work quality problems in HVAC, advanced lighting controls, whole-house measures, weatherization, and new construction.¹⁵
- A substantial body of research exists that documents persistently large gaps between reported and evaluated savings in IOU EE programs.
- Data to quantify the impact of poor quality work on the persistently large gaps between reported and evaluated savings is not collected, but given the body of evidence on quality problems and the ambitious state targets for reduction in energy demand, greater attention to quality is warranted.
- The current planning, approval, implementation, and evaluation process for resource programs neither rewards nor penalizes the IOUs based on the extent to which the measures they incentivize are installed, commissioned, or maintained properly.
 - The predicted and reported savings for many EE measures assume that equipment is installed to manufacturers' specifications.
 - IOU quality assurance practices are generally focused on fraud avoidance—assessing whether or not the measure has been installed at all, rather than whether it was installed properly and is functional.
 - Evaluations do not provide a timely or specific way to adjust IOUs' savings claims from a shortfall in savings caused by work quality problems.

¹³ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). Retrieved from: http://www.calmac.org/events/Decision_12-05-15.pdf. p. 282-283.

¹⁴ See WE&T Guidance Plan Chapter 2, Sections II and IV for discussion of evidence and rationale.

¹⁵ See Appendix 2B of the WE&T Guidance Plan.

- The process does not encourage the IOUs to improve the quality of installation, commissioning, and maintenance because there is currently no way to attribute improved results to specific interventions.
- Ensuring that contractors who install ratepayer-subsidized measures perform their work properly is often the responsibility of the customer, who does not have the tools or expertise to observe or evaluate work quality.
- IOU incentives that are based on “pay-for-performance” help ensure quality, but exclusive reliance on this type of market signal is inadequate because performance (i.e., energy savings) is difficult and costly to measure. Pay-for-performance programs, without upfront workforce standards, can hinder adoption of complex technologies with known installation challenges, such as advanced lighting controls.
- Workforce standards—such as licenses, skills certifications, and contractor requirements—are common practice in high-quality segments of the construction market and in many other sectors (health care, education, personal care, etc.).
- Contractors whose workforce is highly skilled and who compete in high-quality markets report that their ability to participate in IOU programs is undermined by the lack of standards.
- A review of research methodologies shows that the most rigorous labor economics studies measure the costs and benefits of standards *after* they are instituted, for comparison with a control group. We were unable to find or design a methodology to assess the impact of standards *before* they are adopted, making it impractical to provide evidence on specific costs and benefits of workforce standards in IOU EE resource programs prior to their adoption.
- A substantial body of research that uses statistical comparisons of projects with and without standards shows that stringent standards including prevailing wages, responsible contractor policies, and apprenticeship requirements do not lead to higher costs.
- Although there is only a modest body of research, several studies document the benefits of skills certifications and other standards on quality of installation of EE measures and customers’ willingness to invest in EE.

RECOMMENDATIONS FOR INCORPORATING WORKFORCE STANDARDS INTO IOU EE PROGRAM REQUIREMENTS

The evidence on the extent of work quality problems, the lack of incentives facing the IOUs to ensure work quality, and the well-documented cost-effectiveness of standards in the construction sector all support our recommendation to introduce, without further delay, workforce standards in IOU EE resource programs. The incorporation of standards will allow for an empirical, fact-based cost-benefit analysis comparing program outcomes after the introduction of standards with those from before.

Below we present our recommendations for incorporating workforce standards into program requirements. There are many types and levels of standards. In determining our recommendations we focused on key areas where significant energy savings can be achieved. We also recommend that the IOUs require specific skills certifications where there is expert consensus and present alternative approaches where they do not exist or there is lack of consensus. Our recommendations allow the IOUs to adopt U.S. Department of Energy or

California skills guidelines when/if they become available, and ensure that there is both a union and a non-union path to participation. We expect iterations on these specific workforce standards and associated thresholds after they are introduced in the field.

RECOMMENDATIONS: LABOR DEMAND STRATEGIES FOR ENERGY SAVINGS

	Specific Recommendations	Goal
A. Adopt a responsible contractor policy for use across all resource programs where contractors work directly with the IOU or where a customer receives an incentive for equipment or service.	1. Require and verify that all firms (and subcontractors) working on ratepayer-subsidized projects meet pre-established, clearly defined minimum standards relating to contractor responsibility, including: all applicable licenses, bonding and insurance (including workers' compensation), wage and labor law compliance, no OSHA violations, and permitting that includes passing code inspections.	Energy
	2. Pre-qualify all firms (and their subcontractors) meeting any of the following conditions: (1) have contract(s) with the IOU greater than \$1,000,000; (2) implement individual projects with total costs greater than \$100,000; or (3) participate in programs for which contractor pre-approval is required (e.g., HVAC QI/QM, EUC). In addition to the baseline requirements (A.1), pre-qualify firms based on: <ul style="list-style-type: none"> • <i>History of performance requirement:</i> (a) documented history of full compliance with state, health, safety, and work standards; and (b) references from five different clients for five similar past projects. • <i>Skilled workforce requirement:</i> 60 percent of jobsite workforce is comprised of journey persons or apprentices from a registered apprenticeship program in California, or other proof of skilled workforce. • <i>OSHA requirement:</i> 60 percent of jobsite workers are OSHA 10-hour General Industry Safety and Health Certified and at least one jobsite worker is OSHA 30-hour General Industry Safety and Health Certified. 	Energy
B. Adopt specific skills certification requirements in conjunction with quality assessment activities (see Exhibit 2.2 Decision Tree) for contractors and technicians working on ratepayer-subsidized EE projects.	1. <i>Advanced lighting controls systems:</i> Require California Advanced Lighting Controls Training Program (CALCTP) firm certification for contractors on all projects.	Energy
	2. <i>Energy Upgrade California Whole House:</i> Require BPI firm accreditation for all Advanced Path Whole House projects.	Energy
	3. <i>HVAC Quality Installation and Quality Maintenance:</i> Require graduation from a state-certified apprenticeship program, a 2-year degree in HVAC, or proof of comparable training and experience for jobsite HVAC technicians.	Energy
	4. Utilize US Department of Energy or the state of California skills standard and certification guidance, when/if available, to determine future skills standards and certifications for EE programs.	Energy
C. Implement changes in the resource program design, planning, implementation, and evaluation process to create stronger incentives for the IOUs to promote work quality.	1. Document the competencies of contractors and workers in field tests for new EE measures.	Energy
	2. In work papers, document contractor and worker competencies needed to meet savings assumptions used to estimate <i>ex ante</i> savings.	Energy
	3. In Program Implementation Plans (PIPs), describe contractor and worker competencies required for successful program implementation, and provide an explanation of how program design will ensure that participating contractors and workers meet competency requirements.	Energy
	4. Improve quality assessment processes. Assign highly skilled technicians or certified inspectors to inspect EE measures to see if they meet technical specifications (see Exhibit 2.2 Decision Tree).	Energy
	5. Track the results of inspections by both contractor and measure.	Energy

IV. USING IOU WORKFORCE EDUCATION AND TRAINING RESOURCES TO BUILD THE SKILLED WORKFORCE NEEDED FOR EE GOALS

This section provides recommendations on how the IOUs can most effectively invest their WE&T resources, currently funded at about \$30 million per year, to ensure that workers in EE-related occupations have the skills they need to perform their work effectively. The IOUs have two primary WE&T programs: the Centergies program and the Connections program. Centergies includes short open access, stand-alone classes, demonstrations, and other activities for people interested in learning about energy efficiency at the eight energy training centers across the state. Connections funds organizations that provide energy and environmental educational support for k-16 public schools. Both programs have historically focused on consumer and end-user education: Centergies through offerings designed to encourage end-users to invest in energy efficiency, and help builders and contractors persuade their clients to make energy efficient investment decisions; and Connections through a focus on school programs as a way to build broad public and consumer awareness about energy conservation for the future. We describe both approaches as “market-building activities,” and distinguish them from “skills-building activities” that focus on career technical competency-based training for the current and future workforce.

The California Long Term Energy Efficiency Strategic Plan set out two overarching goals for the IOUs’ WE&T programs: 1) to advance the state’s energy efficiency and demand-side goals by ensuring the training and engagement of workers with the proper skills to carry out the work; and 2) to assist workers from disadvantaged communities in gaining skills leading to employment and/or advancement in rewarding career track jobs in EE fields.¹⁶

Recognizing that market-building education is an essential function and core strength of the IOU WE&T programs, we recommend the IOUs restructure their WE&T portfolio to differentiate between their market-building program and a skills-building program. The Centergies in-house activities and the Connections school partnerships serve the market-building goals well and should continue.

The Guidance Plan also recommends a stronger emphasis on and redesign of programs dedicated to EE skills-building—i.e., to incorporate EE skills into the broader skills set of the professional and trades workers in occupations that most impact energy use. To achieve the goals identified in the Strategic Plan, the IOUs need to align with, leverage, and influence the rest of California’s rich workforce training and education infrastructure. In addition, they need to more systematically engage employers to ensure that trained workers use their newly acquired skills on the job. The skills-building program should be restructured in a way that best utilizes the IOUs’ core strength—energy efficiency expertise—while leveraging California’s other training and education resources to shape the future EE workforce. Among the options we considered, the skills-building program would be best carried out via IOU-administered competitive solicitations, whereby organizations with core expertise in workforce development can apply for ratepayer WE&T funds.

The competitive solicitations should support curriculum development, instructor training, and other strategic investments that drive the incorporation of energy efficiency knowledge, skills, and abilities (KSAs) into the skills

¹⁶ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

sets of the current and future EE workforce. This approach should incorporate best practices for workforce development, including increasing participation by the core post-secondary training institutions and obtaining ongoing input from state workforce development experts. Funded programs should be targeted to the main occupations that impact energy use, particularly the professional building and construction occupations such as engineers and architects (about one sixth of the EE workforce) and the skilled construction trades such as electricians, carpenters, sheet metal workers, plumbers, and others (about two-thirds of the EE workforce).¹⁷ Programs should specifically address each of the critical phases of training, including: skills upgrading for incumbent workers, incorporation of EE KSAs during workers' core post-secondary training, and basic workforce preparation for disadvantaged workers to create pathways into employment and/or further training.¹⁸

The following are recommendations for maximizing the impact of IOU WE&T resources:

RECOMMENDATIONS: LABOR SUPPLY STRATEGIES FOR ENERGY SAVINGS AND WORKFORCE INCLUSION

General Recommendations	Specific Recommendations		Goal
A. Create a dedicated skills-building portfolio targeting both energy savings and workforce inclusion goals.	1. Implement the skills-building portfolio via two RFPs: one for the goal of energy savings and one for the goal of inclusion. The RFPs should be based on a sector strategy and career pathways framework, and partnerships with core training and education institutions.	a. Administer RFP #1 to fund projects addressing EE skills-building. Projects to be funded include: <ol style="list-style-type: none"> i. Sector strategies targeted at incumbent workers, built on regional partnerships and engagement of multiple employers. Allowable activities include curriculum and certification development, instructor training, and piloting of training for incumbent workers. ii. Collaborations with core education and training institutions (high schools, community colleges, state-certified apprenticeships, 4-year colleges and universities). Allowable activities include curriculum and certification development, instructor training, and piloting of new courses. 	Energy
		b. Administer RFP #2 to fund training programs that connect disadvantaged workers to jobs and career pathways in EE. Projects to be funded include: <ol style="list-style-type: none"> i. Inclusion sector strategies that leverage Workforce Investment Board (WIB) and other resources. ii. 9-12 educational partnerships with a career-technical and career development focus. 	Inclusion
	2. Adopt a priority setting process based on needs and opportunities to impact energy savings and inclusion goals.	a. For energy savings, the process should identify priority occupations, skills gaps, skills standards and certifications, and intervention strategies, and prioritize interventions by energy savings potential and scale of impact.	Energy
	b. For workforce inclusion, the process should identify the demand for entry-level EE workers, career advancement paths, and regional need, and prioritize programs with strong job placement track records.	Inclusion	

¹⁷ Zabin, C. et al. (2011). Chapter 3, p. 37-88.

¹⁸ See WE&T Guidance Plan Chapter 3, Exhibit 3.2.

General Recommendations	Specific Recommendations		Goal
<p><i>(continued)</i></p> <p>A. Create a dedicated skills-building portfolio targeting both energy savings and workforce inclusion goals.</p>	<p>3. Engage a Peer Review Group of key workforce stakeholders and experts to advise the IOUs on the development of the skills-building portfolio</p>	<p>a. The role of the Peer Review Group (PRG) should be to:</p> <ul style="list-style-type: none"> • Participate in the design of the RFPs for the skills-building portfolio by identifying guiding principles and criteria for project selection; • Provide input on appropriate metrics of success; • Participate in review committee to select winning proposals; • Advise the IOUs on the selection of staff or consultants to administer the RFPs; • Provide ongoing input and feedback as needed throughout program implementation; and • Offer feedback on program effectiveness upon completion. 	Energy and Inclusion
		<p>b. Staff and/or consultants should have appropriate expertise, experience and relationships to administer the RFPs. Their role should be to:</p> <ul style="list-style-type: none"> • Draft RFPs based on the PRG's guidance and priority-setting; • Propose specific skills-building priorities for review by the PRG; • Oversee the administration and review of the RFPs; and • Support implementation, including helping to convene regional training partnerships, identifying opportunities to leverage other efforts, providing technical assistance, and carrying out field reviews. 	Energy and Inclusion
	<p>4. Fund three phase-one programs that can begin in 2015. Dedicate unencumbered resources (we suggest approximately \$4 million for each phase-one program).</p>	<p>Program #1: Issue an RFP for projects to enhance EE content in the core curricula for accredited degree programs for architects and engineers.</p>	Energy
		<p>Program #2: Carry out a program to enhance and verify EE skills for the key trades in the state-certified apprenticeship system, via a partnership with the Community College Chancellor's Office of Apprenticeship and the California Division of Apprenticeship Standards.</p>	Energy
		<p>Program #3: Issue an RFP for projects to support inclusion via pre-apprenticeship bridge programs to prepare entry-level EE workers or job-seekers for opportunities in higher skilled and higher wage employment in MUSH (municipalities, universities, schools, and hospitals) sector EE work, other skilled construction jobs, and/or further training. Model the RFP after the CWIB's Prop. 39 RFP.</p>	Inclusion
	<p>B. Modify WE&T program for market building.</p>	<p>1. Modify Centergies market-building class design and delivery.</p>	<p>a. Develop market-building offerings in coordination with ME&O, skills-building portfolios, and resource programs.</p>
<p>b. Target classes to specific market-building audiences.</p>			Energy
<p>c. Lower ratepayer costs by charging fees for classes where feasible, recording and broadcasting classes via an IOU joint WE&T website, and lowering administrative expenditures.</p>			Energy

V. INCLUSION OF WORKERS FROM DISADVANTAGED COMMUNITIES

The primary goal of the IOUs' EE programs is to conserve energy, but they also serve as a significant source of job generation in the state. California's substantial investments in EE offer a promising opportunity to build middle class career pathways for low-income people and jobseekers with barriers to employment ("disadvantaged workers"). The California Long Term Energy Efficiency Strategic Plan included a goal to "ensure that minority, low-income and disadvantaged communities fully participate in training and education programs at all levels of the demand-side management (DSM) and energy efficiency industry."¹⁹ The CPUC has also acknowledged that training programs for disadvantaged workers are, on their own, not enough to achieve this goal, and recognized the importance of efforts to broaden access to jobs in the EE sector.²⁰

Interventions on the demand side of the labor market are critical to providing the job opportunities needed for graduates of training programs targeted to disadvantaged workers. Labor demand interventions for workforce inclusion include two interrelated strategies: 1) expanding entry into career track jobs for people from disadvantaged backgrounds, and 2) ensuring that entry-level jobs pay a living wage and offer defined pathways for advancement into higher skilled, higher wage jobs. Without these strategies to broaden access to good jobs, the workforce preparation programs for disadvantaged workers are unlikely to be successful.

In the public works sector, there are numerous targeted hire programs with strong track records of placing and supporting disadvantaged workers in apprenticeship programs and jobs in the skilled construction trades. Given the predominance of skilled construction trades jobs generated by ratepayer funds,²¹ these programs can be a model for the IOUs' EE programs. While a robust replication of these successful programs would require a significant redesign of the IOU non-residential EE programs, the Regional Energy Networks (RENs) are in a good position to advance this model, since they are already coalitions of local governments with an interest in job benefits of their programs. For the IOUs, we recommend a set of strong first steps for an IOU "workforce inclusion program."

The goal is to create a workforce diversity program that broadens access to living wage jobs and career pathways for a diverse EE workforce, with the following program elements:

¹⁹ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

²⁰ California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89-92 and p. 126-127 (Conclusions of Law #70 and 76).

²¹ The estimated one-sixth of jobs created by the IOUs' EE/DSM programs in professional and managerial occupations also provide rewarding middle class careers, but these are often harder to reach for disadvantaged Californians and require significant investment in creating pathways at the high school and community college level that can provide the building blocks to entry and success in four-year degree programs and eventually professional careers.

RECOMMENDATIONS: LABOR DEMAND STRATEGIES FOR WORKFORCE INCLUSION

General Recommendations	Specific Recommendations	Goal
A. Create a workforce inclusion program to broaden access to living wage jobs and career pathways in EE for workers from disadvantaged communities.	1. Add “workforce inclusion” as a factor in ranking proposals by third-party contractors in all EE solicitations.	Inclusion
	2. Adopt “first source” language in all EE contracts to create a formal link between training for disadvantaged workers and job opportunities through EE programs.	Inclusion
	3. Establish prevailing wages and targeted hire goals for all contractors and subcontractors that have a direct contracting relationship with the IOU or are pre-selected (e.g., Direct Install, government partnerships, third-party programs, and ESA programs).	Inclusion
	4. Guide and encourage government partnerships, 3P programs, and contractors serving the MUSH (municipalities, universities, schools, and hospitals) sectors to adopt prevailing wage, apprenticeship standards, and targeted hire policies, which together can provide meaningful job and training opportunities for disadvantaged workers.	Inclusion
B. Implement foundational activities to support the workforce inclusion program.	1. Adopt a specific definition of “disadvantaged worker” based on a combination of residence in a high unemployment zip code and/or meeting specific criteria of disadvantage.	Inclusion
	2. Collect data on job quality, workforce diversity, and hiring of disadvantaged workers (see Chapter 5. EM&V Recommendations).	Inclusion

VI. EVALUATION, MEASUREMENT AND VERIFICATION

Currently, evaluation, measurement, and verification (EM&V) processes for the IOU EE incentive and other resource programs have considered work quality and job quality issues only to a very limited extent. While reported savings are frequently found to be significantly greater than evaluated savings, prior impact evaluations have not considered the extent to which improper installations and poor maintenance contributes to this gap. Data needed to track the relationship between worker and contractor competency, work quality, and energy savings has not been available. Neither has data been collected to assess the workforce outcomes of IOU EE programs. Our interviews and document review did not identify any EM&V studies that addressed work quality, job quality, or inclusion in a systematic fashion. Resources have not been allocated to identifying indicators of such concepts as work quality, and indicators are necessary for evaluation studies.

This lack of attention has significant implications, particularly as the state’s reliance on EE as an alternative energy resource increases. The lack of EM&V studies addressing the extent to which poor work quality affects energy savings (and program, contractor, and customer costs) inhibits efforts to improve work quality. Likewise, the lack of EM&V studies addressing the impact of WE&T programs on skills acquisition and on the relationship of skills to work quality limits opportunities for improvement in these areas.

EXPECTED OUTCOMES AND SUCCESS METRICS

The Guidance Plan presents a comprehensive strategy to address workforce issues. Here we summarize key outcome metrics that provide a picture of “what success looks like.”

Demand Side—Energy Savings: As a result of our recommendations for requiring workforce standards and other interventions to support work quality, we expect an increase in energy savings due to increases in the proportion of measures properly installed and maintained, and a reduction in the costs to ratepayers, customers, and contractors that result from call backs and related problems. Suggested success metrics are:

- Increase in proportion of projects where EE measures are properly installed, maintained, and operated.
- Reduced number of call backs.
- Increase in customer satisfaction.
- Problems in work quality are quickly identified and rectified.
- IOU savings claims more accurately reflect actual energy savings.
- IOUs are rewarded for actions that ensure work quality.
- Information on WE&T needs are communicated and help set WE&T priorities.

Supply Side—Energy Savings and Inclusion: As a result of our recommendations for redesigning the IOU WE&T programs, we expect an increase in the skills acquisition of EE workers leading to increased energy savings as well as growth in the number of qualified EE workers from disadvantaged communities. Suggested success metrics are:

- Increase the EE skills of incumbent workers and entry-level workers in EE sector.
- Curriculum developed that incorporates EE skills into credentialed programs in core institutions (e.g., community college, apprenticeship trainings, four-year engineering and architectural programs).
- Co-funding of training from employers and other sources.
- Additional hours of EE skills-building instruction for both trainers and students.
- Increase in workers employed in EE sector with certifications and degrees.
- New EE skills applied on EE jobs, leading to increased work quality.

Demand Side—Inclusion: As a result of our recommendations for the development of a “workforce inclusion program,” we expect both an increase in the number of disadvantaged workers employed and improvements in the quality of the jobs held by disadvantaged workers. Success metrics are:

- Increases in number and proportion of qualified disadvantaged workers in good jobs and rewarding careers in EE sector.
- Improvements in the quality of jobs in the EE sector as defined by wages, benefits, working conditions, and career ladders.
- Greater recognition of opportunities provided through IOU EE programs through annual reporting of participation of disadvantaged workers.

The following are key elements for systematically addressing workforce issues in the EM&V plans for the IOU EE programs.

RECOMMENDATIONS: EVALUATION, MEASUREMENT & VERIFICATION (EM&V)

General Recommendations	Specific Recommendations	Goal
A. Collect job quality and work quality data essential for planning, implementation, and evaluation of workforce initiatives.	1. Select indicators of work quality, job quality, and inclusion based on a review of existing indicators and in consultation with labor force experts.	Energy and Inclusion
	2. Require all contractors and subcontractors that have a direct contracting relationship with the IOU and/or are pre-selected (e.g., Direct Install, Local Government Partnerships, third-party programs, and ESA programs) to report specified jobs and workforce data, via participation in a confidential online jobs reporting system based on certified payroll data.	Energy and Inclusion
	3. For contractors hired by customers, develop, test, and implement workforce data collection methods using "best practice" approaches.	Energy and Inclusion
	4. Collect data on indicators of work quality for measures and systems where quality assurance processes or demonstration and pilot projects have identified work quality problems.	Energy and Inclusion
	5. Develop "scorecard" reports on key program metrics using data from the online jobs reporting system and other sources and make them available to workforce stakeholders.	Energy and Inclusion
B. Evaluate the costs and benefits of standards.	1. Introduce workforce standards as requirements for EE resource programs, and carefully document and monitor the experience of initial introduction.	Energy
	2. Use "quasi-experimental" approaches in conjunction with the introduction of standards system-wide to evaluate the benefits and costs of workforce standards, including standards for advanced lighting systems and HVAC QI/QM.	Energy
C. Reform program planning, approval, and evaluation policies and processes to explicitly address work quality.	1. Support a policy task force (or a subgroup of a larger task force) to develop work papers and assess reported savings in a way that captures the impact of work quality on projections of energy savings.	Energy
	2. Monitor <i>ex post</i> program review to address work quality. As work quality is introduced in quality assessments and program evaluations, explicitly include work quality in <i>ex post</i> program review.	Energy
	3. Integrate and address inclusion as part of program reviews.	Inclusion
D. Develop full program theory, program performance metrics, and comprehensive EM&V plans after specific recommendations are incorporated into Program Implementation Plans.	1. Modify evaluation plans for EE resource programs to address indicators of quality of work and job quality, with priority given to those programs where poor work quality has been identified as an issue. Support explicit consideration of indicators of work quality for impact evaluations for the 2013-2014 program cycle.	Energy and Inclusion
	2. Review program evaluation plans for all skills-building projects whether implemented by IOU staff or third-party contractors. Ensure that all plans have appropriate data collection systems in place, have early feedback loops for program improvements, and include plans for attributing the results of programs to ratepayers when programs are jointly funded.	Energy and Inclusion
	3. Support an evaluation consultant pool and selection process that ensures that the selected consultants have the necessary expertise to evaluate the various workforce initiatives. This recommendation applies to the evaluations administered by the IOUs and by the CPUC Energy Division.	Energy and Inclusion

VII. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS

Almost all of the recommendations in this Guidance Plan can be implemented by the IOUs under current direction from the CPUC. The IOUs have stated that they are reviewing these recommendations and other internal and external program advice to inform future program planning, and have not yet committed to taking specific action. In addition, the IOUs have each expressed different concerns about specific elements of the Guidance Plan recommendations, making a unified IOU approach to the Plan challenging. Therefore, we recommend that the CPUC issue specific direction to the IOUs on the Guidance Plan. We also suggest that the CPUC should monitor the IOUs' progress on the implementation of the skills-building program, and consider an alternative administrator if progress is deemed insufficient.

In addition to overall CPUC direction on the implementation of the Guidance Plan, there are a number of areas where additional policy direction is needed.

IDENTIFICATION OF EE SKILLS STANDARDS AND CERTIFICATIONS AND EE TRAINING PRIORITIES

The Guidance Plan identifies a key challenge for the IOUs—and others—in building the workforce needed to achieve EE goals: the lack of robust and recognized skills certifications for EE work across the range of critical EE occupations. This makes it difficult for the IOUs to choose which workforce standards to incorporate into their EE program requirements and to set priorities for training investments. The Guidance Plan suggests actions that the IOUs can take, but this is a structural problem that would best be addressed at the state level for all ratepayer- and publicly-funded EE programs.

We recommend that the California Energy Commission, under AB 758 authority, establish a Statewide EE Workforce Steering Committee that involves the state's workforce and energy agencies and experts. See Appendix 3H for a full list of proposed steering committee member organizations. The committee should be responsible for:

- a. Providing guidance on the appropriate skills standards and certifications for EE work
- b. Establishing priorities for training investments in the EE workforce statewide.

INCLUSION

The CPUC has not issued directives to the IOUs on specific objectives to meet the workforce inclusion goals.²² Although the Guidance Plan workforce inclusion recommendations are unlikely to entail significant costs, we acknowledge that they are unlikely to contribute to energy savings in the short run. We recommend that the CPUC articulate specific objectives, benchmarks, and strategies for workforce inclusion in order to guide IOU resource allocation and to provide a framework for measuring progress. We also recommend that the CPUC, with the IOUs, explore over the longer run the feasibility of incorporating a robust targeted hire program modeled after the successful public sector targeted hire programs that have a strong track record of success in California.

²² See WE&T Guidance Plan Chapter 4, and California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89-92.

EM&V

The Guidance Plan offers a number of recommendations related to EM&V that implicate the CPUC. Since the CPUC Energy Division and the IOUs share responsibility for EM&V, coordination and collaboration between Energy Division and the IOU EM&V teams will need to be ongoing.

RECOMMENDATIONS FOR THE CPUC AND OTHERS

Area	Recommendation
All	The CPUC should direct the IOUs to implement the recommendations in this Guidance Plan.
Identification of EE skills standards and certifications, and EE training priorities.	<p>The California Energy Commission, under AB 758 authority, should convene a Statewide EE Workforce Steering Committee that includes the state’s workforce and energy agencies. See Appendix 3H for a full list of proposed steering committee member organizations. The Committee should:</p> <ol style="list-style-type: none"> a. Provide guidance on the skills standards and certifications for ratepayer and publicly funded EE work. b. Establish priorities for training investments in the EE workforce statewide.
Workforce Inclusion	<ol style="list-style-type: none"> 1. The CPUC should articulate specific objectives, benchmarks and strategies to guide IOU resource allocation for a workforce inclusion program. 2. The CPUC should encourage the Regional Energy Networks to adopt a public sector targeted hire policy for MUSH customers. The CPUC should work with the IOUs to explore the feasibility of replicating this for IOU programs serving MUSH customers.
EM&V	The CPUC Energy Division should work with the IOU EM&V teams to implement the EM&V plan, since both groups share responsibility for EM&V.

INTRODUCTION

I. OVERVIEW

California has charted an ambitious course for building a clean energy economy, with energy efficiency as a key strategy for achieving the state’s goals. The investor-owned utilities (IOUs), directed by the California Public Utilities Commission (CPUC), administer the great majority of the state’s energy efficiency and other demand-side²³ incentives and rebate programs serving the residential, commercial, industrial, and agricultural sectors. The IOU energy efficiency programs dominate California’s investments in early-stage adoption of energy efficiency, and play a critical role in preparing the market for widespread adoption of clean energy resources.

IOU ratepayer investments in energy efficiency are guided by the CPUC’s Long Term Energy Efficiency Strategic Plan, which acts as a roadmap for achieving energy efficiency (EE) targets in California through the year 2020 and beyond.²⁴ In the EE Strategic Plan, the CPUC recognized the critical role of a well-prepared workforce in achieving the potential of these investments in energy efficiency, in promoting market transformation, and ultimately in meeting the state’s energy savings goals. The CPUC included workforce education and training (WE&T) as a critical component of its Strategic Plan, with the vision that “by 2020, California’s workforce is trained and fully engaged to provide the human capital necessary to achieve California’s economic energy efficiency and demand-side management potential.”²⁵

In 2013, the CPUC directed the IOUs to hire an expert consultant to assist them in developing a comprehensive plan to address workforce issues in the IOU EE programs. This followed a period of significant attention to workforce issues by the CPUC, the IOUs, and external stakeholders who are parties to the CPUC proceeding. All agreed that further advice from workforce experts was needed to effectively pursue Strategic Plan goals, and follow subsequent CPUC direction to that end. Pacific Gas and Electric Company (PG&E), on behalf of the four IOUs, issued a competitive solicitation for the expert entity (see Appendix 1A for PG&E’s Statement of Work). The UC Berkeley Donald Vial Center for Employment in the Green Economy (UCB-DVC) was chosen and produced this Guidance Plan.²⁶

²³ For the purposes of this document the term energy efficiency also includes other IOU demand-side programs such as demand response and distributed generation, except where otherwise noted.

²⁴ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*.

²⁵ *Ibid.* p. 70.

²⁶ UCB-DVC was also the author of the *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*, one of the foundational documents for this contract. After the Needs Assessment was completed, UCB-DVC provided technical assistance and expert advice to a number of WE&T stakeholders during the policy and budget proceedings for the IOUs’ 2013-2014 energy efficiency programs. This included the IOUs, Energy Division, CWIB, Greenlining, Green for All, NRDC, the Emerald Cities Collaborative, and others. During this time, UCB-DVC was a paid consultant to the California Construction Industry Labor-Management Cooperation Trust, providing technical assistance and research relating to WE&T issues in the EE proceedings at the CPUC. In 2012, UCB-DVC was also a paid consultant to the California Division of Apprenticeship Standards and provided technical assistance for its efforts to develop a collaboration with the IOUs for reviewing and upgrading the EE skills in the state’s apprenticeship programs.

The recommendations included in this Guidance Plan are guided by the overarching policy objectives for the IOU energy efficiency (EE) programs to meet both the state’s growing energy needs and its clean energy goals. This includes the pursuit of all immediate practical and cost-effective energy efficiency opportunities,²⁷ market transformation leading to longer term energy savings,²⁸ and “rewarding careers” for all workers in California, including the disadvantaged.²⁹ Since adopting the EE Strategic Plan in 2008, the CPUC has consistently signaled its support for considering workforce development in the pursuit of these policy objectives.

For the CPUC and the IOUs they regulate, addressing workforce issues has two goals. The primary goal is energy savings. Realizing the potential immediate energy savings from California’s substantial ratepayer-funded EE programs is the CPUC and the IOUs’ highest priority for the EE programs. Achieving it requires that participating contractors and workers have the skills they need to ensure that equipment is properly installed, commissioned, and maintained, and that buildings are designed, constructed, and retrofitted consistent with best practice and technical specifications for energy efficiency. Developing an industry comprised of qualified contractors and workers is also critical to market transformation and longer term energy savings so that customers can be confident that the EE work they invest in will be executed correctly. The goal of leveraging EE programs to advance the inclusion of workers from disadvantaged communities in rewarding careers (good jobs) also clearly requires attention to workforce issues. Though inclusion was discussed and included in the Strategic Plan it was and remains secondary to the energy efficiency goals; as yet, the CPUC has not issued specific direction on inclusion that has quantifiable objectives or suggested strategies.

The IOUs have two roles through which they influence workforce skills development and jobs: they make investments in EE (over \$1 billion per year³⁰), which shape the jobs that are created and the skills that are required, and they invest in workforce training and education (about \$30 million of the overall \$1 billion per year). Exhibit 1.1 illustrates four program objectives that arise from the intersection of the IOUs’ two roles and goals of energy savings and workforce inclusion.

²⁷ California Energy Commission and California Public Utilities Commission (2005, October). *Energy Action Plan II: Implementation Roadmap for Energy Policies*. The Energy Action Plan II (p. 2) states that “the loading order identifies energy efficiency and demand response as the State’s preferred means of meeting growing energy needs.”

²⁸ California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047). Conclusion of Law 10, p. 354. “Market transformation is long-lasting, sustainable changes in the structure or functioning of a market achieved by reducing barriers to the adoption of energy efficiency measures to the point where continuation of the same publicly-funded intervention is no longer appropriate in that specific market. Market transformation includes promoting one set of efficient technologies until they are adopted into codes and standards (or otherwise adopted by the market), while also moving forward to bring the next generation of even more efficient technologies to the market.”

²⁹ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

³⁰ In addition to the EE budget, over \$600 million was budgeted to distributed generation and demand response programs in 2013. This includes the 2013 budgets for the ESA program, at \$369 million, the electric portion of the Self-Generation Incentive Program (SGIP) at \$79 million, and the California Solar Initiative (CSI), at \$159 million, respectively. See California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities’ 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 6; California Public Utilities Commission (2014, February). *Report to the Legislature in Compliance with Public Utilities Code Section 910*. p. 3.

Exhibit 1.1 WE&T Goals and IOU Roles

WE&T Goals			IOU ROLES
Energy Savings	Workforce Inclusion		
How can EE programs support workers to do high-quality work?	How can EE programs help create good jobs with opportunities for disadvantaged workers?	EE Incentive / Rebate Programs Demand for Labor	
How can the IOUs' WE&T investments best contribute to building the skilled workforce needed for EE goals?	How can WE&T resources best help prepare disadvantaged workers for long-term EE-related careers?	Workforce Education and Training Programs Supply of Labor	

Because of their market share in EE, the demand for skilled labor is and will continue to be heavily influenced by the IOUs' incentive and rebate programs. The WE&T investments also influence workforce skills development, but on a smaller scale relative to the IOU investments in EE retrofits and other EE work. The WE&T investments also comprise only a narrow slice of California's rich training and education infrastructure for the key design and trades occupations that impact energy use, including the community colleges, the state-certified apprenticeship system, colleges and universities, and other institutions.

California has successfully implemented many important but straightforward EE measures such as screw-in CFLs. However, in order to achieve the very ambitious energy conservation targets set forth in the Strategic Plan, increasingly complex energy conservation measures and programs are needed. Energy efficiency jobs in the near future will require additional knowledge, skills, and abilities (KSAs) to complete this more complex work.

Developing the EE workforce to meet this challenge will require that the IOUs use a two-pronged approach that leverages their roles on both sides of the labor market: the supply side, to ensure an adequate supply of workers qualified to perform the work, and the demand side, to ensure that the trained and skilled workers are in fact utilized in IOU EE programs and the broader EE market.

As the workforce skills required to achieve energy savings increase, a more highly skilled workforce is critical. It directly follows that the energy efficiency field must provide wages, working conditions, and advancement opportunities that support developing, recruiting, and retaining a skilled workforce.

In addition, if we want to ensure that the energy efficiency job market operates as efficiently as possible, training and employment opportunities must be accessible to everyone who has the interest and aptitude to pursue them. This often requires dedicated training efforts, but past experience shows that it also requires interventions such as targeted hire policies to encourage and ensure that people from disadvantaged communities have a fair chance at overcoming the barriers to employment that they face.

Creating the conditions to develop and support a skilled workforce will advance the state’s ability to meet its ambitious energy efficiency goals and will also lead to rewarding careers for workers, including those from disadvantaged communities. This comprehensive workforce development plan therefore addresses both the demand for skilled labor and the supply of skilled labor. This report provides practical guidance for implementing activities in both the supply and demand arenas, which work in concert to optimize results.

II. REGULATORY HISTORY AND PROGRESS TO DATE

The EE Strategic Plan recognized the importance of workforce education and training and articulated a vision for WE&T that “by 2020, California’s workforce is trained and fully engaged to provide the human capital necessary to achieve California’s economic energy efficiency and demand-side management potential.” It includes two specific workforce education and training goals for the state:

1. Establish energy efficiency education and training at all levels of California’s educational systems.
2. Ensure that minority, low-income and disadvantaged communities fully participate in training and education programs at all levels of the DSM and energy efficiency industry.³¹

The Plan established an ambitious role for the investor-owned utilities (IOUs), calling on them to “act as a catalyst to action” by sponsoring foundational activities such as an in-depth needs assessment, and aligning their EE and other demand-side management programs with a comprehensive, statewide WE&T strategy.³² In D.09-09-047, the CPUC approved funding for the needs assessment and ordered the utilities to “propose appropriate adjustments to the existing WE&T statewide program and existing training programs” consistent with the findings from the completed study.³³

The IOUs selected the UC Berkeley Donald Vial Center on Employment in the Green Economy to carry out that study as well. Completed in early 2011, the UCB-DVC WE&T Needs Assessment included in-depth analyses of the projected supply and demand for energy efficiency work in California and a review of the existing training infrastructure in California. The study considered the implications of the energy efficiency, demand response, and some distributed generation programs. The report provided recommendations to the IOUs as well as the CPUC and other agencies on the short-, medium-, and long-term workforce strategies needed to achieve the state’s ambitious energy efficiency goals.³⁴

The scope of the UCB-DVC Needs Assessment was for the whole EE sector across the state, but it focused on the IOUs’ particular role in affecting both the demand for and supply of EE services. Although the IOUs have traditionally addressed WE&T issues via educational and training programs (i.e., labor “supply” programs), the

³¹ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

³² Ibid.

³³ California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047). p. 221, 361.

³⁴ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley.

report established that training and education programs alone, no matter how good their content, cannot ensure that well-trained and educated workers will participate in the EE programs.³⁵

The UCB-DVC Needs Assessment recommended that up-front worker and contractor quality standards be incorporated in the IOU EE programs as a way to encourage the participation of high-performing contractors who invest in a skilled and stable workforce.³⁶ These kinds of standards can help cultivate a “high-road” market environment in which firms compete on quality rather than cost alone, compliance is high, and workers are supported to carry out quality work and rewarded for acquiring appropriate skills.³⁷ The report acknowledged that the IOUs cannot drive the entire marketplace for EE alone, but pointed out that the IOUs administer the largest source of investment in this sector in the state via the ratepayer-funded EE programs, and thus they wield significant influence in the market.³⁸

The report also included recommendations addressing the existing IOU WE&T programs, suggesting that they adopt a “sector strategy” approach to encourage employer involvement in training, and to leverage the state’s rich education and workforce development infrastructure.³⁹ The UCB-DVC Needs Assessment presented forecasts of job growth and predominant occupations to prioritize training investments, showing that the great majority of jobs impacting EE are in traditional professional and blue collar occupations linked to the building and construction industry, rather than in jobs that are solely devoted to energy efficiency. This highlighted the key role of the skilled construction trades such as electricians, HVAC technicians, carpenters, etc., and the importance of adding EE to the skills-set in these broader occupations. Although there will also be increasing demand for EE skills among professions like architects and engineers, they are outnumbered by the construction trades workers by a ratio of four to one.⁴⁰

The IOUs began making programmatic changes based on the UCB-DVC Needs Assessment in 2011. Shortly after the completion of the Needs Assessment, the IOUs submitted a joint advice letter responding to the report, which established a process and timeline to implement a sector strategy based on the report recommendations.⁴¹ In May 2012, the CPUC issued direction to the IOUs on several of the Needs Assessment’s key recommendations as part of the Guidance Decision for the 2013-2014 program cycle.⁴² In July 2012, the IOUs filed their 2013-2014 funding applications with detailed Program Implementation Plans (PIPs). In comments addressing the IOU applications for EE programs and budgets, a number of stakeholders reiterated support for the Needs Assessment recommendations and questioned the extent to which the IOUs had

³⁵ Ibid. p. 289.

³⁶ Ibid. p. 293.

³⁷ Ibid. p. 289.

³⁸ Ibid. p. 53, 289.

³⁹ Ibid. p. 294.

⁴⁰ Ibid. p. 74, 283.

⁴¹ California Public Utilities Commission (2011, October 24 and approved on 28). *Additional Supplemental Joint Filing: 2010-2012 Statewide Workforce Education and Training (WE&T) Program Modifications based on Findings of WE&T Needs Assessment - SDG&E 2260-E-B/2041-G-B, SoCalGas 4249-B, SCE 2588-E, and PG&E3212-G-B/3852-E-B* (D.09-09-047).

⁴² California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 280-283.

integrated them into the design of their 2013-2014 EE portfolios.⁴³ The CPUC provided additional direction and input on the IOU WE&T proposed plans in its decision adopting the EE programs and budgets for the 2013-2014 program cycle in November 2012 (EE Funding Decision).⁴⁴ Throughout the proceedings leading up to the 2013-2014 program cycle, workforce issues were a lively topic in comments by parties to the proceedings.

During the proceeding that followed the July IOU applications, the IOUs proposed additional modifications to their 2013-2014 EE PIPs. However, many stakeholders were not satisfied with the proposed modifications and made comments to that effect to the Commission.⁴⁵ In the November Funding Decision, the CPUC responded, saying, "We are greatly concerned, based on the comments from numerous parties, that the IOUs' efforts to date do not appear to represent sufficient attention to our directives in this area. Given the amount of funding devoted to energy efficiency programs in this state, and the level of unemployment in the economy in general, this is an area in dire need of more focused attention. This is not to say that there is anything wrong with the activities currently being undertaken by the IOUs; we simply expect a higher level of focus and attention on this important area."⁴⁶

The CPUC went on to suggest that one explanation for this lack of attention was that the IOUs as well as the Commission itself, may "suffer from a lack of expertise in this area." It directed the IOUs "to hire an expert entity to help design a comprehensive approach to the WE&T issues inherent in the energy efficiency portfolios." The CPUC also indicated that the California Workforce Investment Board and Division of Apprenticeship Standards "may be appropriate for consultation and assistance in this effort."⁴⁷ The CPUC explicitly indicated that it was in full agreement with recommendations from the stakeholders regarding specific issues to be addressed, including providing training and employment opportunities to disadvantaged workers and considering possible pilot programs to test new quality standards for EE projects. This Guidance Plan is the result of the Commission's November 2012 directive.⁴⁸

⁴³ Ibid. p. 275-277; California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89-92.

⁴⁴ Ibid. p. 127-128.

⁴⁵ Including EHC, CCILMCT, Greenlining Institute and Green for All, and Global Green USA. California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89.

⁴⁶ California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89.

⁴⁷ Ibid. p. 90.

⁴⁸ Ibid. Ordering Paragraph 34, p. 138-139.

III. SCOPE OF WORK

The IOUs' request for proposal (RFP)⁴⁹ for a WE&T consultant outlined a statement of work that contained seven strategic goals and detailed objectives for the Guidance Plan:

1. Forecasting Market Needs to Create Career Pathways and Improve Candidate Placement and Advancement.

We provide recommendations on how to modify the IOUs' WE&T programs to effectively contribute to building EE skills and support rewarding career pathways for workers in critical occupations that impact energy efficiency. We describe a process for tracking and prioritizing occupations, incorporating input from subject matter experts to identify key knowledge, skills, and abilities (KSAs) and certifications for EE work, and leveraging core training and education institutions to deploy new skills.

2. Accountability to Local Communities with Disadvantaged Populations and High Levels of Unemployment and Underemployment.

We offer specific guidance for the development of a workforce inclusion program that creates opportunities for disadvantaged workers to enter and advance in good careers in EE-related work. This includes mechanisms such as targeted hiring and job quality standards for ratepayer-funded programs as well as partnerships with local community organizations for workforce preparation.

3. Integrating Workforce Efforts with Resource Programs.

We describe a process for integrating workforce planning into resource program development, and offer specific recommendations on workforce standards and other strategies to improve quality of work, safety, and customer satisfaction, leading to short- and long-term energy benefits.

4. Supporting Sector Strategies.

We provide specific suggestions for how to improve the IOUs' existing sector strategy efforts and integrate our recommendations on sector strategies with our recommendations on how to modify the IOU WE&T programs, as addressed in our response to strategic goal 1.

5. Stakeholder Involvement and Ongoing Governance.

We present a plan for ongoing input and guidance on WE&T issues from key stakeholders and policymakers, including government agencies, education and training institutions, industry and labor groups, community organizations, and experts on EE technology.

6. Evaluation of Workforce Education and Training Programs.

We offer guidance on an evaluation plan for our recommendations, as well as appropriate success metrics for each recommendation.

7. Recommendation for Development of a WE&T Web Portal.

We make specific recommendations on a WE&T Web Portal which was proposed in the Strategic Plan.

⁴⁹ PG&E (March 2013). *Request for Proposal (RFP) No. 6264, For Workforce Education and Training (WE&T) Statewide Strategic Planning*. See Appendix 1A for Statement of Work.

IV. ORGANIZATION OF GUIDANCE PLAN

The organization of the report addresses strategic goals 1 through 4 using our analytic framework illustrated in Exhibit 1.1, which poses four critical questions about the IOUs' role in contributing to the state's goals for energy savings and workforce inclusion. Strategic goals 5, 6, and 7 are supporting activities for achieving both goals.

Chapter 2. Demand for skilled labor (strategic goal 3)

- Energy goal: How can the EE resource programs support workers to do high-quality work?

Chapter 3. Supply of skilled and diverse labor (strategic goals 1, 2, and 4)

- Energy goal: How can the IOUs WE&T investments best contribute to building the skilled workforce needed for EE goals?
- Inclusion goal: How can the WE&T investments help prepare workers from disadvantaged communities for rewarding careers in EE sectors?

Chapter 4. Labor demand interventions for inclusion (strategic goal 2)

- Inclusion goal: How can the EE resource programs help create good jobs with opportunities for disadvantaged workers?

Chapter 5. Evaluation, measurement and verification for recommendations (strategic goal 6)

Chapter 6. Stakeholder engagement and web communication (strategic goals 5 and 7)

Each chapter roughly follows the outline below:

1. OVERVIEW
 - A. Regulatory history and IOU actions to date
 - B. Scope of chapter
2. PROBLEM STATEMENT
 - A. Evidence of problem
 - B. Review of best practices
3. RECOMMENDATIONS
 - A. Summary recommendations table
 - B. Detailed explanation and justification of recommendations
4. STAKEHOLDER FEEDBACK ON RECOMMENDATIONS
5. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS
6. IMPLEMENTATION TIMELINE

V. METHODOLOGY

Our research and analysis for this Guidance Plan synthesizes information from a wide variety of sources. We made use of existing information where possible, drawing heavily on the UCB-DVC Needs Assessment and IOU program evaluations. For each chapter, we addressed the scope of work by first reviewing the relevant parts of the UCB-DVC Needs Assessment, CPUC direction, external stakeholder and IOU comments in the proceedings, and other relevant IOU or CPUC documents. We also reviewed applicable examples and cases from other states or sectors. We conducted reviews of the research literature where further validation of claims was needed.

We then collected and analyzed new information about the changes that the IOUs have made to their programs in response to the UCB-DVC Needs Assessment, recent evaluations, CPUC direction, and stakeholder input since 2011. We examined public and confidential IOU and CPUC documents and consultant reports that include information on recent changes and/or plans for the future related to program development as well as evaluation, measurement, and verification (EM&V). We reviewed recent process and impact evaluations for resource programs and the WE&T programs. In addition to analysis of recent reports and program information, new research for this project included interviews with IOU WE&T and resource program staff, state workforce and education agencies, high-level representatives and trainers from the major education and training institutions, industry experts, employers, and other stakeholders. A complete list of interviewees is in Appendix 1B. We completed site visits to at least one training center for each IOU, and worked closely with WE&T program leads to better understand their existing programs as well as the changes already underway.

We developed this Guidance Plan with a deep level of engagement from the IOUs and key stakeholders over the course of the contract. In addition to weekly check-in calls with the IOU WE&T team, we held monthly meetings with the stakeholder advisory group, where we provided updates on our progress, and received detailed and comprehensive feedback (both written and verbal) on preliminary findings and recommendations.⁵⁰ We also participated in a number of in-depth meetings with IOU staff and managers. We conducted several feedback sessions with the leadership briefing group, which included state agency and IOU leadership. Our complete stakeholder engagement process and proposal for post-contract engagement is described in Chapter 6.⁵¹ Each chapter also describes the specific approach to and activities that were involved in stakeholder engagement for developing that section of the Guidance Plan, and summarizes feedback on critical issues.

We hope the recommendations proposed in this Guidance Plan will be useful to the IOUS, the CPUC, and all stakeholders as we move forward with California's ambitious energy goals and create the workforce and market needed to bring them to fruition.

⁵⁰ See Appendix 1C for a complete list of participants in the Stakeholder Advisory Group and the Leadership Briefing Group.

⁵¹ See Appendix 1D—Attachment 1 for a compilation of stakeholder comments on draft recommendations and Guidance Plan.

CHAPTER 2: Increasing Energy Savings through Workforce Interventions in IOU EE Programs: Demand-Side Strategies

I. OVERVIEW

Realizing the potential energy savings from California’s substantial ratepayer-funded EE⁵² programs requires that equipment be properly installed, commissioned and maintained, and that buildings be designed and constructed (and retrofitted) consistent with best practices and technical specifications for energy efficiency, summarized in this document by the term “work quality.” High-quality installation and maintenance is also important for creating the positive customer experiences that support widespread market adoption. Finally, proper installation is necessary to ensure that ratepayer funds are being effectively spent, and that ratepayers and customers are receiving their anticipated return on investment.

This chapter presents the substantial evidence of improper equipment installation in energy efficiency work including retrofits and new construction. Such problems exist in both ratepayer-funded incentive programs and at large in projects failing to meet energy efficiency codes and standards. The full extent of this problem cannot be precisely determined given current data collection practices. It is clear, however, that lost energy savings, as a result of poorly executed work, carries high opportunity costs, with both short- and long-term implications for the EE programs.

Work done improperly in IOU programs is often attributed to workers having inadequate skills. Because workers can acquire the necessary skills to perform high-quality work through training and on-the-job experience, the common response to poor work quality continues to be support for additional training. Without greater demand for work quality, however, the return on these training investments—for both ratepayers and the trainees—is limited. Training alone fails to advance the larger energy savings objectives that underlie the programs.

This chapter focuses on direct “demand-side” activities that the IOUs can undertake to raise the quality of work performed in their incentive programs. By leveraging their market power in promoting early-stage energy efficiency measures, the IOUs can demand high-quality work within their incentive programs, thereby priming the market with not only promising new technologies, but also with the workforce capable of ensuring the savings of those technologies over their entire lifecycle.

Efforts like pay-for-performance and post-installation inspections are important and effective strategies that should continue and be strengthened where they are not cost-prohibitive. However, this study concludes that the most effective approach to increasing overall work quality and achieving the CPUC’s long-term workforce objectives is to establish, require, and verify standards for contractors and workers participating in IOU EE programs. Workforce standards include contractor qualification requirements, worker skills certifications, and other contractor and worker standards described in this report. Such standards are used

⁵² For the purposes of this document the term energy efficiency also includes other IOU demand-side programs such as demand response and distributed generation, except where otherwise noted.

extensively in other sectors, including health care and public works construction, but they are rarely employed in energy efficiency.

Workforce standards provide an effective means of directly addressing work quality problems within the IOU programs, while at the same time exerting greater influence on the labor market at large by establishing a quality assurance benchmark for ratepayer-funded energy efficiency work. The demand for skilled workers that would result from establishing labor standards in the IOU incentive programs would, in turn, trigger California's expansive education and training infrastructure to respond with appropriate offerings to meet changing work requirements of the clean energy economy.⁵³

To date, the IOU EE programs generally do not include rigorous workforce standards. While the IOU EE programs have introduced some requirements that are intended to promote better performance and improve program outcomes (e.g., contractor licensing requirements, customer information, and a handful of programs with competency requirements), these measures are weak compared to the much more robust workforce and related standards found in many other sectors in the economy, including in segments of the building and construction industry, which is the main industry for energy efficiency investments.

One reason for the lack of a greater focus on work quality is that the IOUs are neither rewarded for undertaking specific activities to ensure high-quality work, nor are they penalized for energy savings lost as specifically due to poor quality work. At present, work quality is not explicitly addressed in the planning, approval, implementation, and evaluation of ratepayer-funded energy efficiency programs. The CPUC approval process for new measures begins with the submission of "work papers" that provide information to substantiate the estimates of the energy savings of proposed rebated measures. In many instances, an assumption is made that the equipment will be properly installed consistent with the manufacturer's specifications. Preliminary savings claims by the IOUs for their shareholder incentives are based on these *ex ante* values. While these claims are adjusted and given a "haircut" if *ex post* evaluations show lower savings, evaluations are often delayed several years and do not assess the specific impact of work quality and proper installation on energy savings. The effects of work quality on energy savings are bundled together with other variables to calculate coarse discounts to the IOUs claimed savings. Thus the incentive for the IOUs to ensure that installed EE measures meet technical specifications is attenuated at best, and program design does not routinely consider how required skills standards for contractor or workers could reduce the rate of improper equipment installation.

Currently, when measures are installed, the customer or other entity hiring the installation contractor is responsible for ensuring the proper installation of the equipment. Under this arrangement, the IOUs are seldom, if ever, responsible for ensuring work quality. As a result, although ratepayer funds are used to subsidize energy efficiency work, responsibility for the proper installation of the equipment is assigned to the customer. In many cases, an end-user's ability to manage the project and determine quality of performance is limited.

The IOUs have quality assurance procedures in place to ensure that the ratepayer-subsidized equipment was actually installed. However, inspections to determine that the equipment was installed correctly, was properly

⁵³ IOU ratepayer investments also have a role to play in shaping the training response, as described in Chapter 3.

commissioned, and is functional according to specifications are not common.⁵⁴ Follow up studies to assess whether the equipment is being properly maintained are even less common.

In many cases, program evaluations have found that actual savings are substantially below projected savings, resulting in a persistent and significant gap between reported and evaluated savings across the IOU EE portfolio.⁵⁵ There are a number of possible explanations for these differences, but studies are seldom undertaken to investigate the specific reasons for the gap. In the absence of such studies, it is impossible to determine the relative significance of work quality problems on energy savings outcomes. However, the lack of data does not indicate a lack of a problem, nor should it rationalize inaction.

We know that improper installation can be an important variable affecting the difference between expected and actual savings. This report and the sources cited herein support action by the IOUs to implement many activities available to improve work quality, including establishing workforce standards. We found no evidence to suggest that such activities would negatively affect cost-effectiveness; on the contrary, they present potential for substantial direct program benefits in energy savings outcomes. Given the size of the portfolio, even very small increases in realized energy savings resulting from improved work quality would be worth tens of millions of dollars.

This chapter focuses on the direct energy efficiency program benefits of IOUs' incorporation of workforce standards and other interventions to promote work quality. Such benefits include: greater energy savings, improved customer satisfaction leading to increased customer participation, reduced call-backs and equipment failures due to ineffective installation or maintenance, improved safety, more accurate planning and projections of energy savings, accelerated market adoption, and improved compliance with codes and standards. Interventions that support a highly skilled workforce are particularly important at this juncture due to three trends affecting California's ongoing energy efficiency program efforts: the increasing complexity of technologies and systems; the growing need for more comprehensive approaches to energy efficiency improvements;⁵⁶ and the need to improve compliance with the increasingly stringent state's energy efficiency and building code standards (Title 24). Better training and career path outcomes for the workforce are often ancillary benefits of the demand-side interventions we recommend, but our focus in this chapter is on the energy benefits.

A. REGULATORY HISTORY AND RECENT DEVELOPMENTS

The CPUC and the IOUs have addressed concerns about work quality in the IOU EE programs by investing in training.⁵⁷ However, the Strategic Plan's WE&T vision—"by 2020 California's workforce is trained and fully engaged to provide the human capital necessary to achieve California's economic energy efficiency and

⁵⁴ IOU and CPUC Energy Division interviews.

⁵⁵ California Public Utilities Commission (2011, January). *Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period*. p. 28.

⁵⁶ Navigant Consulting Inc. (2013, November 26). *2013 California Energy Efficiency Potential and Goals Study*. The 2013 Navigant Potential Study (2013) shows that overall savings potential increases when IOU program incorporate whole-building initiatives, indicating that more comprehensive offerings lead to more energy savings.

⁵⁷ In addition to the WE&T chapter in the Strategic Plan, the HVAC Chapter addresses training for technicians, installers and building code officials, and the Commercial Chapter contains a strategy for expanded building operator certification training and integrated training of architects and engineers for the design of zero net energy buildings.

demand-side management potential” —recognizes that worker engagement must accompany worker training to achieve the state’s energy efficiency objectives.

1. UCB-DVC Needs Assessment Findings and Recommendations

The 2011 UCB-DVC Needs Assessment found that unlike many sectors in the economy, a definitive system of skills certifications for workers, strong competency-based licenses, and other contractor and worker standards has not yet developed in the energy efficiency sector and exists only in some segments of the related construction market sector (such as public works). The study found that this lack of a structured labor market has two implications. It can lead to “low-road” market conditions where contractors compete on price rather than quality, and it can send confusing and uncertain signals to the training community about the type of skills that need to be incorporated into existing programs to prepare workers to competently perform energy efficiency work.

The UCB-DVC Needs Assessment also carried out case studies of the residential, HVAC, and lighting sectors and identified linkages between low-road labor markets and poor quality outcomes.⁵⁸ The Needs Assessment also identified the connection between developing and retaining a skilled workforce and rewarding workers as they acquire skills so that they do not depart for more remunerative positions. Based on the experience and studies from the human resources field in general, energy efficiency work must provide good jobs if the industry seeks to attract and retain competent workers. The investments in training are lost when there is high employee turnover.

The UCB-DVC Needs Assessment also highlighted the role of the IOU resource programs in shaping the demand for skilled labor, and suggested that the introduction of skills standards, contractor requirements, and other labor standards would likely increase energy savings to a degree that the cost effectiveness of the programs would improve, or at least not be reduced.⁵⁹

2. EE Proceedings for the 2013-2014 Program Cycle

In the EE proceeding (R.09-11-014), a number of stakeholders representing workers and contractors, and environmental justice and low-income advocacy groups supported the UCB-DVC Needs Assessment recommendations on contractor and workforce standards. The CPUC Guidance Decision (D.12-05-015) recognized:

[T]wo roles that the IOUs can play in carrying out the high road vision: (1) “supply–push” strategies, such as training and certification programs, which produce the high road workforce needed to meet our clean energy goals, and (2) “demand–pull” strategies, such as

⁵⁸ I.e., low wages lead to high turnover and fewer incentives for workers and employers to invest in training.

⁵⁹ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. p. 118.

*skills standards and certification requirements for utility incentive programs, which create the demand for and sustain high-road jobs and companies.*⁶⁰

In addressing demand-pull strategies, the CPUC directed the IOUs to support the California Advanced Lighting Controls Training Program (CALCTP) sector strategy program and develop a commercial HVAC sector strategy that included the identification of a skills standard for commercial HVAC by the end of 2013. In both cases the CPUC asked the IOUs to explore and, if appropriate, pilot certification requirements or “kickers” for IOU advanced lighting controls and commercial HVAC programs.⁶¹

While the CPUC acknowledged the potential value of requiring standards in IOU resource programs, and urged their due consideration by the IOUs, it also asserted that insufficient data existed to quantify the costs and benefits of standards and asked for further research on this issue before it could consider a stronger directive on standards for the broader portfolio.

3. IOU Efforts to Date

To date, the IOUs have not proposed a comprehensive approach to fully explore the potential benefits and possible costs of skills standards. After extensive discussions with stakeholders, PG&E launched a very small advanced lighting controls pilot program that includes larger rebates for customers using CALCTP-certified contractors. Southern California Edison (SCE) continues to explore alternatives for introducing CALCTP certification requirements. In the HVAC sector, the IOUs have developed some training requirements for contractors for a statewide HVAC Quality Maintenance (QM) program, but these are much less stringent than the worker certification requirements proposed by some industry participants.⁶² Recent preliminary evaluations also show that quality problems persist in the QM program despite the additional requirements.⁶³

In general, the IOUs have not proposed the kind of requirements for contractors participating in the EE resource programs as were recommended by the UCB-DVC Needs Assessment. For example, until SB 454 was passed in 2011 (over opposition from the IOUs, who argued they are not in a position to act in any enforcement capacity), recipients of utility incentive dollars did not have to warrant that they utilized contractors with state licenses, or that the work was performed with the legally required building permits.⁶⁴ Our review of resource programs found that only a handful of the EE programs had incorporated contractor requirements or worker skills standards. In addition to the CALCTP pilot and the new HVAC QM programs, there are few programs that require a specific training (e.g., PG&E Pool Pump rebates, a solar water heating program that is part of the California Solar Incentive (CSI) program). The only other program we identified that requires a skills certification is Energy Upgrade California (EUC), which requires Building Performance Institute (BPI) building analyst certification for Advanced Home Upgrades. EUC was implemented in

⁶⁰ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 277

⁶¹ Ibid. p. 278-279.

⁶² Interviews with union and non-union HVAC contractors who participated in the design of the HVAC QM program.

⁶³ Western HVAC Performance Alliance (2013, November 7). *Work Order 32: Standard 180 Maintenance Programs*.

⁶⁴ PG&E stated they had adopted this requirement before SB 454.

collaboration with an American Recovery and Reinvestment Act (ARRA)-funded California Energy Commission (CEC) program with explicit job creation goals (see Appendix 2A for a list of requirements for resource programs).

In sum, the IOUs' response to the UCB-DVC Needs Assessment demand-side recommendations has been limited. One IOU structural problem that serves, in part, to explain the limited response is that the WE&T program staff responsible for considering and implementing the Needs Assessment recommendations are not responsible for the EE programs where demand-side strategies must be incorporated.

B. SCOPE OF DEMAND CHAPTER

This chapter focuses specifically on the demand side of a comprehensive approach to WE&T issues. It addresses Strategic Goal 3 of the RFP by answering the question, "How can IOUs integrate workforce efforts with resource programs?" The RFP requested a process to identify skills requirements for effective program implementation and to ensure that skilled workers participate in EE programs. This chapter presents our recommendations and rationale concerning:

1. What specific standards could be applied to which programs or types of programs in the EE portfolio, recognizing a one-size-fits-all approach is not feasible?
2. What other interventions can improve work quality and drive demand for training activities, either instead of or in combination with standards?

In addition, given the concerns raised by the CPUC in D. 12-05-015⁶⁵ that there was not sufficient evidence upon which to base policy decisions that mandate standards, we carried out further interviews and literature reviews to address the following questions:

1. How extensive is the problem of inadequate work quality? Is there research that documents problems with improper installation, operation, and maintenance of energy efficiency measures, technologies, materials or systems and the consequent impact on energy savings?
2. How is work quality addressed in the current planning, approval, implementation, and evaluation processes for EE incentive programs, and is it sufficient to ensure that measures are installed correctly? Can customers sufficiently ensure quality?

II. PROBLEM STATEMENT

In order to assist the IOUs in assessing the value of standards and other workforce interventions and to take action based on this assessment, we carried out an in-depth review of quality problems and opportunities in the energy efficiency arena. We studied current IOU and CPUC processes for designing, approving, implementing, and evaluating ratepayer programs in order to understand the obstacles to and opportunities for considering work quality. We drew from cases in other sectors to evaluate approaches to ensuring high-quality work and to

⁶⁵ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 282

understand the costs and benefits of those approaches. We based our analysis and recommendations on a review of the literature and interviews with subject matter experts, industry actors, and utility and CPUC Energy Division staff.

A. QUALITY PROBLEMS

Numerous studies have documented a critical “gap” between energy efficiency programs’ expected savings and the savings actually realized when evaluated.⁶⁶ In 2009, the most recent program cycle for which there is complete data on reported vs. evaluated savings, evaluated GWh savings were between 51 and 63 percent of reported savings.⁶⁷ A recent assessment of four IOU program evaluations documented similar gaps in savings in 129 commercial, public buildings, and industrial projects conducted from 2006-2008. Realization rates were reported by measure type; average realization rates were 40 to 105 percent depending on the measure, with 9 of 12 categories of measures below 90 percent.⁶⁸

Reported savings use *ex ante* values, which are based on predictions of typical operating conditions and baseline usage. Studies of the gap between reported and evaluated savings do not generally disaggregate data in a way that isolates work quality from other reasons for a gap in savings, like improper baseline selection and erroneous assumptions in engineering models. Although there is no portfolio-wide assessment of the scale of the quality problem, numerous studies have specifically documented the negative impact of poor quality work in key sectors such as residential and commercial HVAC, commercial lighting, weatherization, and residential “whole house” measures, which account for most of the energy use in buildings. The persistent gap, and the substantial body of work that documents quality problems, underscores the importance of investigating all the reasons, including work quality, for this gap in order to identify effective ways of capturing the lost energy savings.⁶⁹

We summarize the research that documents work quality issues in Appendix 2B, and present highlights here.⁷⁰

1. Evidence of Work Quality Limiting Savings from Complex Technologies

Poor work quality poses a threat to achieving the potential energy savings in applications involving more complex technologies or systems of technologies that interact with each other to achieve the realized

⁶⁶ Nadel, S. (ACEEE) & K. Keating (Bonneville Power Administration) (1991). *Engineering Estimates vs. Impact Evaluation Results: How Do They Compare and Why?*; Kaufman N., K. Palmer (2010, April). *Energy-Efficiency Program Evaluations: Opportunities for Learning and Inputs to Incentive Mechanisms*. Resources for the Future; Lutz, A. & V. Tirumalashett (2012). *Measure by Measure: the Real Reasons for Gaps in Claimed and Evaluated Savings*. Itron. ACEEE Summer Study Proceedings; KEMA, Cadmus, Summit Blue (2010, February 10). *EM&V of the California Public Utilities Commission HVAC High Impact Measures and Specialized Commercial Contract Group Programs*. 2006-08 Program Year, Volume 1 and 2.

⁶⁷ California Public Utilities Commission (2011, January). *Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period*.

⁶⁸ Lutz, A. & V. Tirumalashett (2012). *Measure by Measure: the Real Reasons for Gaps in Claimed and Evaluated Savings*. Itron. ACEEE Summer Study Proceedings.

⁶⁹ Greater attention to work quality is also warranted because research on the persistent energy efficiency gap has focused largely on consumer behavior and neglected exploring the impact of the suppliers of energy efficiency equipment and services. See Blumstein and Taylor (2013).

⁷⁰ Full annotated bibliography available on request.

savings. These technologies, particularly advanced lighting control systems and HVAC systems, represent significant savings potential—a potential that won't be realized unless quality issues are addressed.

Advanced lighting control systems are the frontier of energy savings potential in lighting, which represents a significant end use of energy consumption in buildings. While based on a limited number of projects, a study of the commercial lighting sector demonstrates that when properly installed, lighting controls could reduce commercial buildings' energy use for lighting by 24 to 38 percent.⁷¹ Effective advanced lighting control systems require proper design, placement, installation, and calibration of interacting technologies, including day-lighting and occupancy sensors, dimmable ballasts, and control mechanisms to adjust, from moment to moment, the light provided by the grid offset by the light provided by the sun, and according to the level of light required by occupants. These systems are so complex that in demonstration projects a manufacturer's own installers failed to install them properly.⁷²

An evaluation of Title 24 acceptance testing effectiveness found that automatic day-lighting controls failed in seven out of seven tests, and occupancy sensors failed in two out of three tests. All of the failures were due to design, installation, or calibration issues.⁷³ SCE validated this finding in a recent response to CPUC Energy Division questions, where it noted that, "over the years, IOU incentive programs for lighting controls have had relatively low participation rates, in large part due to the poor performance of the control systems, which has been linked to substandard installation, inadequate commissioning, and lack of proper maintenance. As a result of the poor performance, many customers were not willing to invest in the systems—even with an incentive."⁷⁴ The IOUs continue to support CALCTP, but have not made CALCTP certification a requirement for incentives, and uptake of lighting controls remains slow. Title 24 updates require the installation of the component pieces of these systems, but not that the systems function as an integrated whole.⁷⁵ There is still an opportunity for the utilities to realize significant savings from advanced lighting controls by structuring incentives around the CALCTP-installed integrated systems rather than the simpler individual components of these systems.

A working group of HVAC industry professionals convened by the CEC to draft the Strategic Plan to Reduce the Energy Impact of Air Conditioners found that increases in the energy efficiency of air conditioners would not significantly increase energy savings unless quality control problems were addressed.⁷⁶ These quality control challenges led to lower-than-expected savings results in the 2006-2009 HVAC installation and

⁷¹ Jackson, C. (CALCTP), D. Avery (Southern California Edison), & M. Ouellete (ICF) (2012). *California's Advanced Lighting Controls Training Program: Building a Skilled Workforce in the Energy Efficiency Market*. ACEEE Summer Study Proceedings.

⁷² Interview with Doug Avery (February 20, 2013).

⁷³ Tyler, M., J. Farley, & E. Crowe (2011, September). *Evaluation of Title 24 Acceptance Testing Enforcement and Effectiveness*. PECl.

⁷⁴ PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plans, Workforce Education and Training. See SCE p. 343.

⁷⁵ Interviews with lighting subject matter experts.

⁷⁶ Messenger, M. (2008). *Strategic Plan to Reduce the Energy Impact of Air Conditioners*. California Energy Commission Staff Report. CEC-400-2008-010.

maintenance programs in California.⁷⁷ As a result, the CPUC Energy Division has recognized that poor installation quality is a primary barrier to the realization of energy efficiency savings in the HVAC sector.⁷⁸

Poor quality installation is endemic in the small commercial and residential HVAC sector. A study for the CEC reported that 30 to 50 percent of new HVAC systems and up to 85 percent of replacement systems were installed incorrectly, resulting in substantial unrealized energy savings.⁷⁹ Research from studies found that technicians participating in the commercial HVAC Quality Maintenance program “lack tools, training, and procedures to correctly identify faults and perform repairs to achieve energy savings,” with 92 percent of technicians exhibiting these deficiencies.⁸⁰

The IOUs have invested more than \$9 million in HVAC technician training in the 2010-2012 cycle alone.⁸¹ The impact evaluation of the IOU WE&T programs for the 2006-2008 program cycle estimated that 44 percent of HVAC market actors in the state of California had participated in IOU energy center classes.⁸² This training investment combined with the evidence of improper installations and lost energy savings is potent evidence that training alone is not enough to ensure work quality.

Interviews with contractors whose workforce is highly skilled and who compete in high-quality markets report that their ability to participate in IOU programs is undermined by the lack of standards.⁸³ Low standards may be acceptable for achieving energy savings with simple low-skill measures like screw-in CFLs, but the increasing complexity of energy conservation measures and programs indicates a growing need for higher skilled workers.

2. Evidence of Work Quality Limiting Comprehensiveness

IOU programs increasingly emphasize the importance of comprehensive retrofits because evidence shows deeper retrofits lead to greater long-term energy savings.⁸⁴ Whole-house programs branded under Energy Upgrade California are designed to achieve energy savings across a range of building systems, addressing air sealing, insulation, water heating, HVAC, and other measures. A number of recent U.S. Department of

⁷⁷ Hunt, M., K. Heinemeier, M. Hoeschele & E. Weitzel (2012). *HVAC Energy Efficiency Maintenance Study*. Davis Energy Group and Western Cooling Efficiency Center. CALMAC Study ID SCE0293.01; KEMA, Cadmus, Summit Blue (2010, February 10). *EM&V of the California Public Utilities Commission HVAC High Impact Measures and Specialized Commercial Contract Group Programs*. 2006-08 Program Year, Volume 1 and 2.

⁷⁸ Interviews with CPUC Energy Division staff.

⁷⁹ Messenger, M. (2008). *Strategic Plan to Reduce the Energy Impact of Air Conditioners*. California Energy Commission Staff Report. CEC-400-2008-010. p. 20.

⁸⁰ Mowris, R., R. Eshom, & E. Jones (2013). *Lessons Learned from Field Observations of Commercial Sector HVAC Technician Behavior and Laboratory Testing*. Robert Mowris & Associates, Inc., IEPEC Conference Proceedings.

⁸¹ Compiled from "Program Costs & Impacts" worksheet from each IOUs' 2010-2012 Monthly Energy Efficiency Program Report. Retrieved from: <http://eega.cpuc.ca.gov/Documents.aspx>.

⁸² Opinion Dynamics Corporation, Wirtshafter Associates, Inc. Jai J. Mitchell Analytics, and Summit Blue Consulting (2010, March). *Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program (2006-2008)*. p. 58.

⁸³ Interviews with contractors.

⁸⁴ Navigant Consulting Inc. (2013, November 26). *2013 California Energy Efficiency Potential and Goals Study*. The study shows that overall savings potential increases when IOU program incorporate whole-building initiatives, indicating that more comprehensive offerings lead to more energy savings.

Energy (DOE) studies have identified problems with work quality in the home performance sector, including safety and energy performance gaps.⁸⁵ An interim impact evaluation noted that correct installation of insulation, CAZ (combustion appliance zone) testing, carbon monoxide testing, and identification of possible asbestos in ducts were areas often missed by contractors.⁸⁶ The evaluation also found inaccurate assessment of insulation coverage and quality, poor specification of insulation R-values, problems with air sealing, and inaccurate duct leakage testing. Although the study’s sample size was small and some of these issues are being addressed, it demonstrates how comprehensive retrofits require more sophisticated contractors who employ staff with advanced technical and professional skills sets, as compared to single “widget” EE measures, where technicians only need to know how to install a single technology.

Whole house, deep retrofits, or multiple system upgrades are critical approaches to meeting the state’s energy savings targets, but they require more highly trained contractors and technicians, who can optimize the energy efficiency of an entire system or building, troubleshoot, and think critically about potential adverse interactions between measures (such as combustion appliances and air sealing effects on indoor air quality).

3. Evidence of Work Quality Slowing Market Adoption

Work quality problems affect not only the ability of energy efficiency programs to maximize cost-effective energy savings, but they can also inhibit market transformation. The solar water heating experience in the 1980s provides an example of the impact of poor work quality on the voluntary adoption of measures. Solar water heating technology was largely abandoned in California by the end of the 1980s as a result of poor installations and abuse of market subsidies. A lingering perception of poor reliability caused the collapse of the industry for the next two decades, with sales dropping from \$1 billion a year in 1982 to \$30 million a year in the late 2000s.⁸⁷ A study of the international experience with solar water heaters cautions that abandoning quality assurance measures is “extremely hazardous especially during market launch and potentially associated with long- lasting negative effects.”⁸⁸

Work quality is also related to compliance with building codes, which identify the minimum quality standards for the building and construction industry. There is a well-documented history of non-compliance with building codes in both residential and commercial sectors. Evidence from the past 30 years suggests that code compliance rates vary widely both by region⁸⁹ and by measure.⁹⁰

⁸⁵ See Appendix 2B; Annotated bibliography available upon request.

⁸⁶ ASW Engineering and SBW Consulting, Inc. (2012, May 1). *Interim Findings and Recommendation from the Whole House Process Evaluation—SCE Contractor Training Assessment*. Whole House Process Evaluation Interim Report Workbook.

⁸⁷ Nemet, G., A. Grubler, F. Aguayo, K.S. Gallagher, M. Hekkert, K. Jiang, L. Mytelka, L. Neij, & C. Wilson (2012). Solar Water Heater Innovation in the US. Historical Case Studies of Energy Technology Innovation in: Chapter 24, *The Global Energy Assessment*. Cambridge University Press: Cambridge, UK.

⁸⁸ Hack, S. (2006). *International Experiences with the Promotion of Solar Water Heaters (SWH) on Household-level*. Prepared for Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.

⁸⁹ Williams, A., E. Vine, S. Price, A. Sturges, & G. Rosenquist (2013, April). *The Cost of Enforcing Building Energy Codes: Phase 1*. Lawrence Berkeley National Laboratory.

⁹⁰ Khawaja, M. Sami Ph.D. Allen Lee, Ph.D. Michelle Levy. *Statewide Codes and Standards Market Adoption and Noncompliance Rates*. Quantec, for Southern California Edison, 2007.

Proper installation of equipment according to code can be buttressed by “acceptance testing” in codes like California’s Title 24, which helps to ensure that building systems are functioning in conformance with the code. A recent site evaluation of eight contractors found that approximately half the acceptance tests could not be performed without a moderate or substantial level of coaching, and that the contractors’ knowledge of the tests exceeded their actual ability to perform the tests.⁹¹ The expressed role of IOU programs is to “seed” the market for market transformation. “Getting it right” during the phase of early adoption promoted by the IOU incentive programs is critical to successful market adoption through compliance with building codes later on.

B. PROCESS PROBLEMS

Why has there been limited attention to work quality issues, given the research summarized above and the expressed concern among subject matter experts and a number of our interviewees in the IOUs and the CPUC Energy Division? In our review of the steps in the process used to plan, approve, implement, and evaluate IOU EE programs, which is required of all incentive programs, we found that work quality issues are not specifically addressed. There is currently no way to document or track contractor and worker competencies, and link them work quality and then to energy outcomes. As a consequence, the IOUs are neither rewarded for undertaking specific activities to ensure high-quality work, nor are they penalized for energy savings lost as specifically due to poor quality work.

1. Quality Considerations Absent in Program Lifecycle

As Exhibit 2.1 illustrates, each major step in the process neglects opportunities to address work quality and corresponding workforce issues.

Program Design and Requirements: This lack of attention to workforce and quality issues begins at the first step of the planning process for IOU incentive programs. As the IOUs conduct demonstration projects and field trials that are used to test measures that can be incorporated into incentive programs, they rely on some of the most highly qualified contractors in the field.⁹² Such contractors invariably contribute to a project’s success, but there is no documentation of the qualifications, training, or experience of the workforce participating in demonstration or pilot projects.⁹³ As technical specifications for equipment are reviewed and resource programs are designed, there is no determination made regarding the requirements for contractors and workers who install that equipment, because no information about necessary qualifications has been collected or passed on from the previous step.

Program Approval: After resource programs are designed they must be approved by the CPUC. The IOUs present work papers for deemed measures and Program Implementation Plans. According to our review of documents and interviews with IOU and CPUC Energy Division staff, the underlying assumption frequently

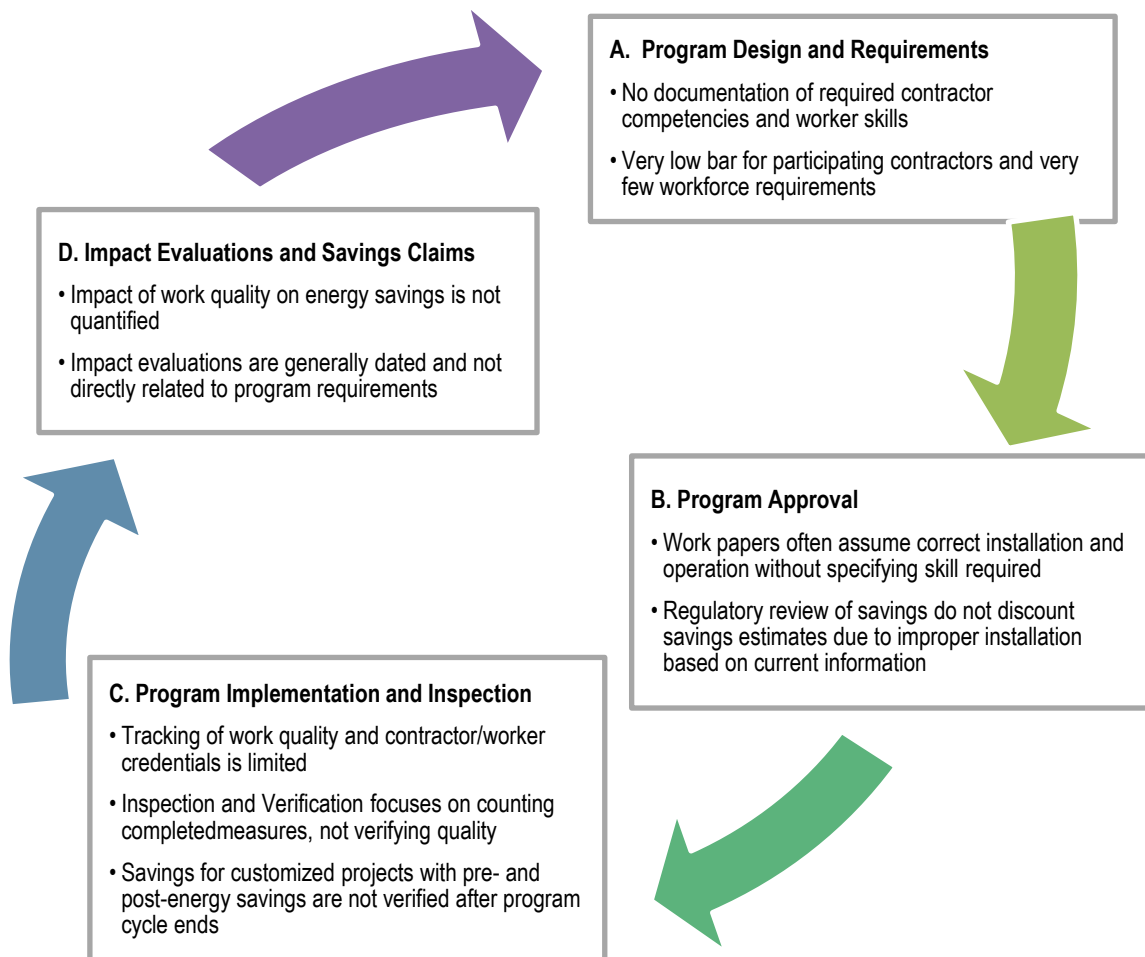
⁹¹ Tyler, M., J. Farley, & E. Crowe (2011, September). *Evaluation of Title 24 Acceptance Testing Enforcement and Effectiveness*. PECL.

⁹² Interviews with current and former IOU staff and contractors who have participated in such activities.

⁹³ ETCC reports consistently fail to document this information. Expert contractors interviewed for this project have claimed that the workforce recommendations they provided to the IOUs have been routinely ignored.

used in work papers is that the equipment will be installed to manufacturers' specifications.⁹⁴ In contrast, technology variables, building types, climate zones, base case assumptions, useful life of a measure, etc. are all explicitly considered in the engineering assessments used to estimate savings (work papers), but workforce influence on energy outcomes is implicitly assumed to be uniform despite a very wide range of contractor and worker qualifications and experience. Program Implementation Plans (PIPs) describe how the savings goals will be met through program design, but they don't specify the contractor and worker qualifications necessary to meet savings goals nor do they provide explanations of alternative activities to guarantee work quality.

Exhibit 2.1 Current Process Ignores Work Quality



Program Implementation and Inspection: As EE measures are installed, a percentage of them are inspected. Ideally, inspection would ensure that measures are installed according to technical specifications. However, the current inspection and verification practices are mostly limited to confirming that installation has

⁹⁴ This is not true for the pay-for-performance programs that are based on pre- and post- inspections.

occurred (to prevent fraudulent applications for rebates) rather than evaluating work quality or providing real-time mentoring to improve it.⁹⁵ Inspections conducted by the IOUs or third parties are costly and increase program friction for customers.⁹⁶

Impact Evaluations: Finally, evaluations are conducted to quantify savings and make any needed adjustments to the savings claims that the IOUs are credited. Ideally, impact evaluations would serve as a timely feedback mechanism whereby any gaps between reported and evaluated savings could be traced to a specific source, such as usage levels, quality of work, engineering estimate errors, etc. Currently, impact evaluations do not document the impact of work quality on energy savings, much less the contractor and workers characteristics that affect work quality. So while the CPUC uses evaluations to apply reductions (“haircuts”) to the IOU-claimed energy savings when *ex ante* savings estimates are not realized, these reductions do not isolate the effects of different program requirements or workforce standards. The program evaluation process does not provide timely feedback that would support iterative or continuous improvements to program design.

In sum, since work quality is not routinely addressed, the existing IOU EE program planning and CPUC design, approval, implementation, and evaluation processes neither reward nor penalize the IOUs for their influence over work quality and its impact on energy savings.

The lack of rewards or penalties for the IOUs to ensure the quality of work that they incentivize is an important obstacle to both immediate energy savings and market transformation. IOU staff seem to assume that stricter program requirements would negatively impact cost effectiveness (increased costs without increased benefits) and contractor participation. Since energy savings claims for much of the portfolio are based on assumptions that installation is carried out according to manufacturers’ specifications and data is not collected to verify this, there is little incentive for EE program managers to either propose to the CPUC or voluntarily adopt higher contractor and workforce standards or more rigorous quality assessments.

Fixing these processes is not a simple task and is not the sole responsibility of the IOUs. The present process used to plan, implement, and evaluate EE measures, programs, and portfolios have developed over many years. Many of the assumptions required to screen programs for cost-effectiveness and estimate energy savings are specified in CPUC decisions. There are numerous stakeholders who have specific interests in the present imperfect approach and are likely to be resistant to recommendations to modify the process.

2. The Burden of Ensuring Energy Savings is on the End-User

If the IOUs are not responsible for ensuring the quality of installation of measures that ratepayers subsidize, who is? Except for the EE programs carried out by third parties (who are contractually responsible for ensuring work quality), the current process puts the responsibility for ensuring quality on the customer. Relying on customers to assure work quality is unrealistic in most cases because they often lack both specific expertise and capacity to manage and evaluate the work performed. Correct installation, operation, and maintenance are often not observable to customers. Requiring customers to certify that contractors are

⁹⁵ IOU interviews.

⁹⁶ IOU and CPUC Energy Division interviews.

licensed and have pulled the applicable building permits (as is required by SB 454) is a start, but contractor licenses are a low bar for competency and permit acquisition does not substitute for either complying with or exceeding code requirements.

In addition, given the small proportion of overall customer expenditures used on energy, energy savings is not of primary concern. As long as there is enough light to read by we are insensitive to over-lighting. As long as we are not too hot or too cold, we don't think about the sizing or efficiency of HVAC systems. As long as a restaurant's produce stays fresh in the walk-in cooler, the chef doesn't particularly care if the fan circulating cool air runs constantly. As long as people aren't suffocating from carbon monoxide poisoning, it doesn't particularly matter if parking garage ventilation systems run constantly or only when needed. Many contractors, in responding to customer demand, are able to satisfy customers without addressing or maximizing energy efficiency opportunities. Because energy conservation is not a primary concern for customers, it is also not a primary concern for contractors. As a result, not all contractors and their technicians have the skill or will to maximize energy savings of the equipment or systems they install or service, particularly when energy savings opportunities are not obvious or observable.

Without clear mechanisms (e.g., contractor pre-selection, skills certification requirements for participating contractors, third-party quality inspections) to provide customers assurances that quality work will be or has been performed, they may be reluctant to invest in energy efficiency at all, knowing that they are unqualified to assess or measure performance.⁹⁷ This has been documented by several studies showing both higher "conversion rates" from audit to retrofit and higher customer satisfaction with programs that use comprehensive third-party Quality Assurance and Quality Control.⁹⁸ To be successful with both short-term energy savings and long-term market transformation, IOU incentive programs must ensure performance either through stricter program requirements or more rigorous quality assessments or both. While we may not see the safety disasters that killed the solar hot water heater market for a generation, the IOUs will be unable to optimize energy efficiency investments without greater attention to workmanship.

C. INTERVENTIONS TO IMPROVE ENERGY OUTCOMES

The evidence presented above on the extent of work quality problems and the weakness of current mechanisms to promote work quality point to the need for strong interventions to increase the likelihood that EE measures are installed, operated, and maintained according to technical specifications. In principle, there are a variety of ways to promote proper installation, maintenance, and operation of energy efficient equipment and systems. We review the following interventions: pay-for-performance, post-installation performance verification, technical standards that include specified work practices, and contractor and workforce standards. While we identify and endorse ways to improve each of these, we conclude, based on the available evidence, that the single most powerful change the IOUs can make to improve work quality and ultimately energy outcomes is to implement upfront contractor requirements, worker skills certifications, and other labor standards. Given the IOUs' concerns that rigorous standards will raise costs and/or lower participation rates, we review the literature

⁹⁷ Giraudet, L., & S. Houde (2013). *Double Moral Hazard and the Energy Efficiency Gap*. International Association for Energy Economics, First Quarter.

⁹⁸ Barger, N. (2012). *Ensuring Quality Work When the Work is Hard to See: The Importance of Quality Assurance/ Quality Control Protocols in Energy Efficiency Programs*. Clean Energy Solutions, Inc. ACEEE Summer Study Proceedings.

on the impact of standards in the construction and energy efficiency arenas. This analysis supports our recommendation that the IOUs should proceed to widely utilize contractor and workforce standards in the EE resource programs.

1. Pay-For-Performance

Some of the IOUs' programs (e.g., customized incentives, demand response, savings by design) follow a pay-for-performance model, whereby the customer receives a rebate after energy saving measures are installed and functional. Paid incentives are based on the actual energy savings achieved from the measure installed or activity undertaken, as determined by inspections, models, and, occasionally, metering. The pay-for-performance model provides assurances that ratepayer funds are used responsibly, and therefore solves one of the fundamental problems we highlighted earlier.

However, these programs do not guarantee high-quality work or maximal energy savings. For example, our interviews uncovered an instance in which an advanced lighting control system was installed as part of a comprehensive retrofit package. Upon post-installation inspection, however, the advanced lighting control system was not functioning as designed, and it was removed from the rebate application (rather than reinstalled properly) so as not to delay rebate processing. The IOUs and the CPUC do not measure these foregone savings, but they are likely substantial.⁹⁹ In pay-for-performance systems, low-quality work can leave significant cost-effective energy savings untapped. Ratepayers did not pay for savings that weren't achieved, but an opportunity for cost-effective energy savings was lost.

Furthermore, such a scenario leaves the customer having paid for energy efficiency equipment without realizing its benefits. This can slow or stop the adoption of promising new technologies.¹⁰⁰ It is important that IOU programs are designed to avoid foregone savings due to poor work quality. Program requirements based on appropriate labor standards, used in conjunction with pay-for-performance, will not only promote prudent use of ratepayer funds, but will also protect customer investments and avoid dismissal of promising new technologies due to work quality issues.

In addition, the pay-for-performance model, as currently implemented for EE programs, does not address issues regarding savings after the initial test period. The measurement of actual energy savings is based on information for a relatively short period of time compared to the expected life of the measure or system. Long-term monitoring is necessary to measure performance over the "expected useful life" of the measure. For example, even if the component parts of an advanced lighting control system are installed correctly, calibration issues could result in less than optimal performance or customer overrides down the road, resulting in lost savings.

Finally, pay-for-performance requires expensive pre- and post-inspections, and therefore is not feasible across the entire EE portfolio. This may change over time with new metering and measurement

⁹⁹ See Giraudet, L., & S. Houde (2013). *Double Moral Hazard and the Energy Efficiency Gap*. International Association for Energy Economics, First Quarter.

¹⁰⁰ Nemet, G., A. Grubler, F. Aguayo, K.S. Gallagher, M. Hekkert, K. Jiang, L. Mytelka, L. Neij, & C. Wilson (2012). Solar Water Heater Innovation in the US. Historical Case Studies of Energy Technology Innovation in: Chapter 24, *The Global Energy Assessment*. Cambridge University Press: Cambridge, UK.

technologies, and when it does it will create a more powerful market signal that can help screen out low-performing technologies or indicate installation problems. However, it is unrealistic to rely solely on this strategy for the entire portfolio at the current time.

2. Post-Installation Inspection and Verification

During the implementation process, the IOUs utilize post-installation inspections of EE measures. Such IOU inspections however, rarely assess the functional performance of installed equipment; they are more aimed at detecting fraud. Verification of performance is difficult because it requires on-site inspections by highly trained inspectors. Inspectors actually require a higher level of training than installers. Field inspections verifying that measures were properly installed are expensive for the program and disruptive for the customer, discouraging participation in EE programs, by increasing “program friction.”¹⁰¹ In addition, since performance verification occurs after installation, it is only useful if there is a strong feedback loop of carrots or sticks that impact those with an economic stake in the work performed.

Field inspections that verify installation and functional performance are important quality assurance mechanisms, but proactive strategies, like the incorporation of workforce standards, can reduce reliance on expensive post-installation inspections. When used in conjunction, more stringent workforce standards (particularly third-party skills certifications of firm accreditations)¹⁰² should, over time, require less frequent and rigorous inspection activities.

As business expert Edward Deming asserted, “It is better to cease dependence on mass inspection. Instead, design and build in quality.”¹⁰³ Researchers at the Precourt Energy Efficiency Center at Stanford University drew a similar conclusion. They describe how when the quality of installation is not readily observable by customers, contractors under-perform. Because under-performance results in significant opportunities for energy savings left untapped, and because the costs of verifying quality by third-party measurement of actual energy savings are prohibitive, workforce standards with the appropriate level of stringency can guarantee a certain level of quality, thus optimizing energy savings investments.¹⁰⁴

3. Technical Standards

Some IOU programs, such as the HVAC Quality Maintenance program, have introduced technical standards that identify work practices needed to ensure a level of work quality consistent with energy savings assumptions.¹⁰⁵ “Standard 180” is used in the commercial HVAC QM and was developed by American National Standards Institute (ANSI), American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), and Air Conditioning Contractors of America (ACCA). Standard 180 details necessary

¹⁰¹ IOU and CPUC Energy Division interviews.

¹⁰² Third-party certifications provide quality assurance activities in order to protect the association of their brand with quality performance.

¹⁰³ Reference for Business (n.d.). *Quality Gurus: Dr. W. Edwards Deming*. Encyclopedia of Business, 2nd Edition.

¹⁰⁴ Giraudet, L., & S. Houde (2013). *Double Moral Hazard and the Energy Efficiency Gap*. International Association for Energy Economics, First Quarter.

¹⁰⁵ PG&E (2012, August 26). *Non-Residential HVAC RTU Quality Maintenance*. PG&E Work Paper: PGECOHC138.

inspection and maintenance procedures for commercial HVAC systems and includes a series of checklists that specify minimum tasks to be performed.¹⁰⁶

Standard 180 is a technical standard intended to establish a system maintenance protocol, but it is not a worker skills standard.¹⁰⁷ Skills standards are derived from technical standards, but identify the knowledge, skills, and abilities (KSAs) needed to carry out tasks. Using an analogy from cooking, technical standards are akin to a recipe, but some recipes require the cook to have specific previous knowledge, skills, and abilities. A trained chef with a lot of practice (skills standards) with making soufflés will have a higher success rate than someone who just follows a recipe (technical standards). Quality problems persist in the HVAC QM program, despite adherence to the requirements identified in Standard 180.

There are program benefits of requiring established, industry-recognized protocols. However, there are significant costs associated with relying on technical standards. Contractors participating in the HVAC QM programs have indicated (through interviews) that their technicians spend more time completing the required paperwork than performing HVAC maintenance functions. Expert contractors will ensure their technicians perform at a high level with or without a regimented technical standard and the accompanying paperwork. Since technical standards alone cannot guarantee consistent high-quality work, standards such as rigorous contractor pre-qualification and, when possible, worker skills certifications present lower cost, higher benefit options to promote work quality.

4. Workforce Standards and Pre-Qualification

Workforce standards are effective in improving work quality because they help to screen out unqualified contractors while encouraging participation by qualified contractors. Such standards have the indirect benefit of raising the bar for work in a particular sector and, over time, improving the performance of all contractors in that sector. By establishing and enforcing criteria for contractor and worker eligibility in the incentive programs, the IOUs can support quality work, thus increasing energy savings and more effectively utilizing ratepayer subsidies. The IOUs can also drive demand for higher performance standards in energy efficiency construction and over time contribute to the development of a high-performing EE industry that inspires consumer confidence after incentives are no longer offered.

a. Types of Workforce Standards

There are a number of different kinds of workforce standards used in different fields. In some fields, such as health care, each job classification has an associated skills certification, which is often required by law to obtain a license. Skills certifications are also common in design occupations; licensing for architects and engineers requires educational credentials, work experience, and the completion of competency tests. In the public construction sector, contractors are selected based on performance history, bonding and insurance requirements, demonstrated compliance with wage mandates (Davis

¹⁰⁶ See ACCA (2014). *Inspection & Maintenance of Commercial HVAC Systems*.

¹⁰⁷ Goldstein, B. (2014, March 14). *U.S. Department of Energy: Federal Recognition for Workforce Standards and Credentials in the Energy Efficiency Sector*. Presentation (by phone) to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

Bacon prevailing wage¹⁰⁸ requirements), health and safety requirements, and skills certifications, and workers are selected based on applicable skills credentials which may include graduation from or enrollment in state-certified apprenticeship programs.

In short, workforce standards include skills certifications, contractor selection criteria, and compensation standards (such as a living or prevailing wage standard). Each of these types of standards are effective in establishing a bar for performance in a particular field. More stringent standards lead to higher performance. It often doesn't matter if the standard is a skills certification, contractor selection criteria, or minimum compensation requirement; they drive the same outcomes. For example, high-performing contractors hire skilled workers and compensate them for their skills and investment in training. Likewise, higher wages attract higher skilled workers.

b. EE Workforce Standards

There are multiple industry-based contractor and worker skills certifications in the energy efficiency field; however, unlike the accreditation process that exists in higher education, there is no process in place to evaluate the quality of the certifications. Given the range of technologies currently offered, and the ever-changing technological environment, it is difficult to establish, maintain, and enforce appropriate, specific worker skills standards for every technology, measure, and program in the IOU portfolio. The United States Department of Energy has embarked on an initiative to create guidelines for energy efficiency skills standards and to support a robust national certification system.¹⁰⁹ In the meantime, for most programs, there is nothing in place that the IOUs could use to verify the quality and determine the appropriate function and application of these certifications.

CALCTP and BPI are skills standards for which there is widespread expert and industry acceptance. Such standards can be an effective eligibility requirement for technicians and contractors. In the absence of agreed upon energy efficiency skills standards, however, there are other mechanisms for selecting high-performing contractors and a qualified workforce that have been shown to improve quality workmanship. Such mechanisms and eligibility requirements include responsible contractor policies, contractor pre-selection, and broader workforce occupational credentials like educational degrees or apprenticeship journey cards. Compensation standards, which govern wages and benefits, are also an effective way to improve performance.¹¹⁰ It has been shown that higher wages can improve

¹⁰⁸ The prevailing wage rate is the basic hourly rate paid on public works projects to a majority of workers engaged in a particular craft, classification or type of work within the locality and in the nearest labor market area (if a majority of such workers are paid at a single rate). Department of Industrial Relations (2014). *Frequently Asked Questions - Prevailing Wage*. Retrieved from: http://www.dir.ca.gov/OPRL/FAQ_PrevailingWage.html.

¹⁰⁹ Goldstein, B. (2014, March 14). *U.S. Department of Energy: Federal Recognition for Workforce Standards and Credentials in the Energy Efficiency Sector*. Presentation (by phone) to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

¹¹⁰ Mahalia, N. (2008). *Prevailing Wages and Government Contracting Costs: A review of the research*. EPI Briefing Paper #215.

performance because firms can hire and/or train and retain more highly skilled workers.¹¹¹ Such firms offset higher wage and benefit costs with higher and more efficient performance.

c. Costs and Benefits of Contractor and Workforce Standards

IOUs have expressed concern about the impacts of requiring workforce standards (including contractor pre-qualification, skills certifications, and compensation standards) on program cost-effectiveness and participation.¹¹² We carried out a comprehensive review of the literature on the costs and benefits of various types of standards in the construction industry, and, where available, the energy efficiency sector. There are not enough examples of the use of contractor and workforce standards in the California IOU energy efficiency programs to develop a sufficient data set for evaluating the impact of standards on cost-effectiveness. There are also no robust research methodologies for evaluating and predicting the impact of standards before they have been applied in the field under real world market conditions.¹¹³ Therefore, our recommendations rely on research from the broader construction industry, which includes energy efficiency construction, and the small number of EE programs in California and elsewhere where standards have been implemented.

There is ample research on the impact of contractor and workforce standards in public works construction and the impacts of best value contracting across a wide range of construction project types. Because California state and federal law requires several types of standards (skills and job standards, prevailing wage standards, and contractor pre-qualification) for public works projects, we rely on this research to address the likely impacts of contractor and worker skills standards on EE programs.

i. Costs

Significant research has been conducted regarding the impacts of public works standards on construction costs. This includes studies on the impact of project labor agreements (which include apprenticeship standards, contractor pre-qualification standards, and prevailing wages) and studies on the impact of prevailing wages by themselves. These studies compare the costs of construction with and without standards, using large data sets of construction projects and controlling for other factors that affect costs. The vast majority of the studies find no statistically significant difference in the costs between projects with and without standards. For example, comprehensive research on the impact of project labor agreements on school construction costs in Massachusetts concluded

¹¹¹ Ton, Z. (2012, January-February). Why “Good Jobs” are Good for Retailers. *Harvard Business Review, The Magazine*; Chapman, J. and Thompson, J. (2006, February 15). *The Economic Impact of Local Living Wages*. Economic Policy Institute, Briefing Paper #170; Greenwald, B. and J. Stiglitz. (1988). Pareto inefficiency of market economies: search and efficiency models. *American Economic Review*. Vol. 78, No. 2, pp. 351-55; Akerlof, G. and J. Yellen. 1990. The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*. Vol. 105, No.2, pp. 255-83.

¹¹² IOU interviews.

¹¹³ This will be discussed in Chapter 5 which addresses EM&V. The current approach of the EM&V teams is to evaluate the change in the skills of electricians and electrical contractors due to participating in the CALCTP training program. In our view, it is not necessary to evaluate the before-and-after competency levels of participants in the CALCTP training program, but rather the differences in energy savings between advanced lighting control projects done with and without CALCTP certified contractors and workers.

that project labor agreements did not impact costs.¹¹⁴ Another study on project labor agreements in New York State found no evidence of increased construction costs and identified direct and indirect cost savings potentially attributable to project labor agreements.¹¹⁵

The Economic Policy Institute (EPI) completed a comprehensive literature review on the costs of prevailing wage in 2008¹¹⁶ and found no evidence of a cost impact associated with the implementation of this standard. The two studies that did find higher costs associated with prevailing wage failed to account for the variation in building size and project complexity. The EPI study suggested a number of reasons why a compensation standard like prevailing wage does not result in higher costs. These reasons include:

- Labor costs are not the dominant costs in government construction contracts. Even including benefits and payroll taxes, labor costs are roughly 20 to 30 percent of construction contracts, according to the Census of Construction.¹¹⁷ For example, if labor costs are 25 percent of total costs and prevailing wage rules raise wages by 10 percent, the impact on contract costs would be no more than 2.5 percent. Thus, even if there is an increase in contract costs, it is likely to be small.
- Higher wages might be offset by a rise in productivity. Prevailing wages can attract better-skilled, more productive workers, or firms may rely on higher managerial productivity or invest in labor-saving technologies to offset higher labor costs.¹¹⁸
- Contractors not subject to prevailing wage laws might retain the money they save in wages as higher profits rather than passing the savings on to the government.¹¹⁹

Arizona State University's Performance Based Studies Research Group has tracked hundreds of projects across 41 industries that have used their best value contracting tools and has found consistent cost savings and added value over traditional delivery models.¹²⁰

¹¹⁴ Belman, D., R. Ormiston, R. Kelso, W. Schriver, & K.A. Frank (2010, January). Project Labor Agreements' Effect on School Construction Costs in Massachusetts. *Industrial Relations*, Vol. 49, No. 1.

¹¹⁵ Kotler, F.B. (2009, March). *Project Labor Agreements in New York State: In the Public Interest*. Cornell University School of Industrial and Labor Relations.

¹¹⁶ Mahalia, N. (2008). *Prevailing Wages and Government Contracting Costs: A review of the research*. EPI Briefing Paper #215.

¹¹⁷ Philips, P. (1998, February 20). *Kansas and Prevailing Wage Legislation*. Prepared for the Kansas Senate Labor Relations Committee. Note that the total cost of construction contracts in this calculation excludes land acquisition, architectural design, or management fees.

¹¹⁸ Philips, P. (1996, September 6). *Square Foot Construction Costs for Newly Constructed State and Local Schools, Offices, and Warehouses in Nine Southwestern and Intermountain States: 1992-1994*. Prepared for the Legislative Education Study Committee of the New Mexico State Legislature.

¹¹⁹ Belman and Voos (1995) cite an unpublished 1990 study for the Arizona District Council of Carpenters. The authors of the report found that, of the \$271,000 to \$350,000 saved in wages and benefits, only \$100,000 was passed on to the contracting agency.

¹²⁰ Kashiwagi, D. (2011). Case Study: Best Value Procurement/Performance Information Procurement System Development. *Journal for the Advancement of Performance Information and Value*, 3(1).

ii. Participation Rates

Similarly, studies show no adverse effects of prevailing wage requirements on participation rates. A recent study compared public works projects in five San Francisco Bay Area cities with and without prevailing wage laws, providing the first empirical evidence examining the effects of prevailing wage regulations on contractor participation and bidding behavior.¹²¹ The data show that the presence of prevailing wage regulations does not decrease the number of bidders nor alter the bidding behavior of contractors. Furthermore, the presence of prevailing wage regulations neither discourages the participation of non-union contractors nor reduces their chances of winning work in a heavily unionized area.

d. Evidence on the Impact of Standards Used in Energy Efficiency Programs

There is only a modest amount of literature on the impacts of contractor and workforce standards on energy efficiency work. The reason for the dearth of conclusive data is that too little attention has been paid to investigating the impact of labor market characteristics on the energy savings gap.¹²² As a result, the evidence on the costs and benefits of labor market standards in energy efficiency is largely anecdotal. In the following paragraphs we summarize the most relevant studies and findings for the purpose of the IOU incentives programs.

In the HVAC sector, a preliminary NATE (North American Technician Excellence) study found that systems installed by certified technicians achieve 10 percent better field-adjusted energy efficiency compared to uncertified technicians.¹²³ Another study showed that projects performed by a NATE-certified HVAC contractor generate 12.9 percent fewer callbacks than projects performed by an uncertified contractor and cost 6.8 percent less than projects performed by an uncertified contractor due to billing efficiency.¹²⁴

A study on contractor and technician behavior prepared by Energy Market Innovations, Inc. (EMI) showed worker certification helps ensure high-quality maintenance work. This study included a covert field study of 13 technicians performing maintenance duties, and found that certified technicians performed more maintenance and service tasks than uncertified technicians, and executed them correctly more often.¹²⁵

The CALCTP training and certification program for advanced lighting controls in commercial buildings presents an example of an improved benefit-cost ratio for standards. Evidence from six pilot studies

¹²¹ Kim, J., C. Kuo-Liang, & P. Philips (2012, October). The Effect of Prevailing Wage Regulations on Contractor Bid Participation and Behavior: A Comparison of Palo Alto, California with Four Nearby Prevailing Wage Municipalities. *Industrial Relations*, 51(4).

¹²² Blumstein, C., & M. Taylor (2013, May). *Rethinking the Energy-Efficiency Gap: Producers, Intermediaries, and Innovation*. Energy Institute at Haas Working Paper Series, EI @ Haas WP 243, Berkeley, California.

¹²³ Messenger, M. (2008). *Strategic Plan to Reduce the Energy Impact of Air Conditioners*. California Energy Commission Staff Report. CEC-400-2008-010. p. 19

¹²⁴ Michel, M. (2006). *NATE Impact Study*. Service Roundtable. Prepared for NATE. p. 8.

¹²⁵ Energy Market Innovations, Inc., Western Cooling Efficiency Center at UC Davis, Verified®, Inc., and Better Buildings, Inc. (2012, September 14). *Contractor & Technician Behavior Study*. p. 62.

indicates customer cost savings in the range of 10 to 30 percent for the installation of advanced lighting controls by CALCTP-certified contractors versus non-certified contractors.¹²⁶ Lower costs are attributed to CALCTP training, which enables more accurate bids, faster installation, and higher initial system performance as a result of greater familiarity and expertise with advanced lighting controls.^{127,128} SCE recognized the value of CALCTP in its Program Implementation Plans filed in July 2012, stating that “because CALCTP training translates into high-performance operation and maintenance, operational data on CALCTP-installed systems to date, indicates an extremely low rate of installation difficulties, callbacks, re-works, changes, etc.”¹²⁹

Another relevant example of an improved benefits-cost ratio resulting from the use of labor standards is a PG&E Local Government Partnership. The Sierra Nevada Energy Watch (SNEW) Program serves 14 counties of the Sierra Nevada region. Through the program, local contractors conduct energy efficiency retrofit programs for small businesses, local governments, special districts, and non-profits within the 9-county service area.¹³⁰ SNEW is the only ratepayer-funded program with a requirement that participating contractors pay a specific wage.

Contractors participating in SNEW pay all employees a living wage of at least \$35.00 per hour for licensed electricians and at least \$17.00 per hour for apprentices for time spent on SNEW work.¹³¹ Betony Jones, the former Director of Program Development (and one of the expert consultants selected by the IOUs to help prepare this report), observed that the SNEW Program wage standard helped increase program effectiveness because it attracted solid, reliable contractors that delivered timely installations, fewer glitches, happier customers, and better partnerships in the community.¹³²

While it is not possible to isolate the SNEW Program wage standard from overall program design and implementation decisions to determine the impact on costs, participation rates, and energy savings, the SNEW Program has been shown to be cost-effective on an overall program basis. In the 2010-2012 energy efficiency program funding cycle, the SNEW Program had a total resource cost (TRC) of 1.55, exhibiting greater cost-effectiveness than 13 of the 18 Local Government Partnerships operating in the

¹²⁶ Office of the Future Landmark Square Pilot Results (SCE Design and Engineering Services, October 2010); Office of the Future 25% Solution Assessment (Emerging Technology Associates, December 2010) ; Advanced Lighting Controls System Assessment (Emerging Technology Associates 2010); Advanced Office Lighting Systems (Bisbee 2011); High Efficiency Office, Low Ambient/Task Lighting Pilot Project: Large Office Site Report (Heschong Mahone Group 2009); High Efficiency Office, Low Ambient/Task Lighting Pilot Project: Small Office Site Report (Heschong Mahone Group 2009).

¹²⁷ SCE (2011). *Energy Management Success Story: Brookfield Office Properties*.

¹²⁸ PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plans, Workforce Education and Training. See SCE p. 343-344 and PG&E Reply Comments (9/21/12), Attachment B.

¹²⁹ PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plans, Workforce Education and Training. See SCE p. 344.

¹³⁰ Local Government Commission (n.d.). *Local Government Energy Efficiency Best Practices Case Studies*.

¹³¹ Sierra Nevada Energy Watch Contractor Letter (February 26, 2010). This rate is based on prevailing wage tables for the five original SNEW counties (Alpine, Calaveras, Mariposa, Sierra, and Tuolumne) and “Inside Wireman, Technician” classification.

¹³² Interview with Betony Jones, former Program Manager, Sierra Business Council (2013, February 1).

PG&E service area during that cycle. The program also exceeded its energy savings goal by 30 to 35 percent.¹³³ According to Steve Frisch, Executive Director of the Sierra Business Council, the program's biggest indicator of success was the expansion from five to nine counties in a hard-to-serve region of the state.¹³⁴

Another relevant example of a positive benefits-costs ratio of contractor and workforce standards is the Seattle 2030 District-Community Power Works Rebate program. This program incorporates standards through a partnership with Emerald Cities, an organization that establishes workforce standards and reporting requirements through community workforce agreements (CWAs) developed with each grant recipient. Contractors and subcontractors participating in this program were required to compensate workers at the Davis Bacon commercial prevailing wage rate for projects funded through ARRA.¹³⁵

The wage standards did not increase the cost of the first project completed with a CWA as part of the Seattle 2030 District-Community Power Works Rebate program. The project exceeded the 15 percent goal for apprenticeship utilization, with over one-third of construction hours performed by apprentices at an average wage of \$21.52 per hour.¹³⁶ The balance of the work was performed by journey-level workers at an average wage rate of \$37.42 per hour.¹³⁷ The total construction labor represented only 10.6 percent of the total project cost, well below the average labor cost of 20 to 30 percent.¹³⁸ According to Steve Gelb, Local Director of Emerald Cities Seattle, "The concern that CWAs increase the cost of projects is probably not true at all due to the use of apprentices."¹³⁹ New projects under the CWA will be completed soon, providing valuable data for analysis.

The preliminary and anecdotal evidence presented above suggests positive benefit-costs outcomes for contractor and workforce standards in energy efficiency construction. However, the recommendations in this Guidance Plan rely on the more rigorous literature available on the construction sector at large. In the absence of more extensive studies on the costs and benefits of labor market standards focused specifically on energy efficiency work, the studies cited in this section (c. Costs and Benefits of Contractor and Workforce Standards) provide estimates of the likely impact of contractor and workforce standards on program cost and participation rates in EE programs in the non-residential sectors.

e. Evaluating the Impacts of Standards

A review of research methodologies shows that it is not feasible to evaluate the costs and benefits of standards before they are implemented. Moreover, because the vast majority of IOU-administered energy efficiency programs lack contractor eligibility and workforce skills standards, a controlled

¹³³ Communication with Greg Jones, Vice President/Chief Operating Officer, Sierra Business Council (2013, February 19).

¹³⁴ Interview with Steve Frisch, Executive Director, Sierra Business Council (2013, February 1).

¹³⁵ Communication with Steve Gelb, Local Director, Emerald Cities (2013, February 7).

¹³⁶ Emerald Cities Seattle and Washington Athletic Club Workforce Tracking (2012, July 2). *Community Workforce Agreement Compliance Report for Washington Athletic Club*.

¹³⁷ Ibid.

¹³⁸ Ibid. and Philips, P. (1998, February 20). *Kansas and Prevailing Wage Legislation*. Prepared for the Kansas Senate Labor Relations Committee.

¹³⁹ Communication with Steve Gelb, Local Director, Emerald Cities (2013, February 7).

experiment with a treatment group and a control group is not feasible at this time. Instead, a quasi-experimental approach implemented *after* standards have been implemented is appropriate, as discussed in Chapter 5.

Low-quality work puts EE program performance at risk by slowing market transformation and impeding energy savings. **We found no credible evidence that contractor and workforce standards raise costs that are not offset by benefits.** The significant body of evidence on which this report relies shows that many of the concerns about the impact on costs and participation rates of the kind of standards we recommend are unfounded.

III. RECOMMENDATIONS

RECOMMENDATIONS: LABOR DEMAND STRATEGIES FOR ENERGY SAVINGS

General Recommendations	Specific Recommendations	Goal
<p>A. Adopt a responsible contractor policy for use across all resource programs where contractors work directly with the IOU or where a customer receives an incentive for equipment or service.</p>	<p>1. Require and verify that all firms (and subcontractors) working on ratepayer-subsidized projects meet pre-established, clearly defined minimum standards relating to contractor responsibility, including: all applicable licenses, bonding and insurance (including workers' compensation), wage and labor law compliance, no OSHA violations, and permitting that includes passing code inspections.</p>	Energy
	<p>2. Pre-qualify all firms (and their subcontractors) meeting any of the following conditions: (1) have contract(s) with the IOU greater than \$1,000,000; (2) implement individual projects with total costs greater than \$100,000; or (3) participate in programs for which contractor pre-approval is required (e.g., HVAC QI/QM, EUC). In addition to the baseline requirements (A.1), pre-qualify firms based on:</p> <ul style="list-style-type: none"> • <i>History of performance requirement:</i> (a) documented history of full compliance with state, health, safety, and work standards; and (b) references from five different clients for five similar past projects. • <i>Skilled workforce requirement:</i> 60 percent of jobsite workforce is comprised of journey persons or apprentices from a registered apprenticeship program in California, or other proof of skilled workforce. • <i>OSHA requirement:</i> 60 percent of jobsite workers are OSHA 10-hour General Industry Safety and Health Certified and at least one jobsite worker is OSHA 30-hour General Industry Safety and Health Certified. 	Energy
<p>B. Adopt specific skills certification requirements in conjunction with quality assessment activities (see Exhibit 2.2 Decision Tree) for contractors and technicians working on ratepayer-subsidized EE projects.</p>	<p>1. <i>Advanced lighting controls systems:</i> Require California Advanced Lighting Controls Training Program (CALCTP) firm certification for contractors on all projects.</p>	Energy
	<p>2. <i>Energy Upgrade California Whole House:</i> Require BPI firm accreditation for all Advanced Path Whole House projects.</p>	Energy
	<p>3. <i>HVAC Quality Installation and Quality Maintenance:</i> Require graduation from a state-certified apprenticeship program, a 2-year degree in HVAC, or proof of comparable training and experience for jobsite HVAC technicians.</p>	Energy
	<p>4. Utilize U.S. Department of Energy or the state of California skills standard and certification guidance, when/if available, to determine future skills standards and certifications for EE programs.</p>	Energy

General Recommendations	Specific Recommendations	Goal
C. Implement changes in the resource program design, planning, implementation, and evaluation process to create stronger incentives for the IOUs to promote work quality.	1. Document the competencies of contractors and workers in field tests for new EE measures.	Energy
	2. In work papers, document contractor and worker competencies needed to meet savings assumptions used to estimate <i>ex ante</i> savings.	Energy
	3. In Program Implementation Plans (PIPs), describe contractor and worker competencies required for successful program implementation, and provide an explanation of how program design will ensure that participating contractors and workers meet competency requirements.	Energy
	4. Improve quality assessment processes. Assign highly skilled technicians or certified inspectors to inspect EE measures to see if they meet technical specifications (see Exhibit 2.2 Decision Tree).	Energy
	5. Track the results of inspections by both contractor and measure.	Energy

IV. RATIONALE

The evidence on the extent of work quality problems, the lack of incentives facing the IOUs to ensure work quality, and the well-documented cost-effectiveness of standards in the construction sector all support our recommendation to introduce without further delay workforce standards in IOU EE resource programs. The incorporation of standards will allow for an empirical, fact-based cost-benefit analysis comparing program outcomes after the introduction of standards with those from before.

The Problem Statement presented the argument concerning the need for and benefits of standards and other interventions that promote work quality. Here we present our reasons for choosing the particular standards and process changes that we recommend. There are many types and levels of standards and choosing the ideal standard is subject to a variety of considerations. We base our specific recommendations on the following guidelines:

- Focus on key areas where significant energy savings can be achieved;
- Prioritize recommendations that can be implemented quickly and are likely to yield benefits that outweigh costs or risks;
- Prioritize recommendations that can be evaluated and adjusted over time in an iterative manner;
- Raise the bar over the current program requirements, but not necessarily to the maximum stringency that some stakeholders have suggested;
- Require specific skills certifications where they exist and where there is expert consensus, and present alternative approaches where there is lack of consensus;
- Prepare for the adoption of U.S. Department of Energy skills guidelines which are being developed, or California-based guidelines if they become available;
- Focus on energy efficiency programs, but apply to other demand response and distributed generation programs where equipment incentives are offered;

- Leverage the IOUs' role in influencing the demand for workers through EE programs as a critical element of a comprehensive WE&T strategy; and
- Ensure that all workforce standards can be met by both union and non-union contractors.

A. RESPONSIBLE CONTRACTOR POLICY

We recommend implementing responsible contractor language across the IOU energy efficiency portfolio as a baseline standard that can be combined with more specific standards in some programs. Responsible contractor policies have been widely used over the last decade to improve work quality and increase competition for contracts.¹⁴⁰ These policies are effective because they screen out companies with histories of committing fraud, violating workplace laws and other important regulatory protections, or lacking the proper licensure or experience. Several energy efficiency programs (e.g., NYSEERDA,¹⁴¹ Delaware Sustainable Energy Utility, Clean Energy Works Oregon) use responsible contractor policies to pre-qualify contractors eligible to participate in energy efficiency programs.

Responsible contractor policies eliminate unfair competition and allow contractors to distinguish their firms by committing to high-quality installation standards, safe work practices, and customer satisfaction. These policies encourage and can expand participation by more highly qualified contractors, who know they can compete on a level playing field under these conditions.

The diversity of IOU resource programs may preclude establishing a single responsible contractor policy that would effectively address quality problems in all programs. Smaller, simpler projects will not command the same level of contractor performance as larger, more complex projects or projects with persistent quality problems requiring a broader and deeper set of skills.

In developing our recommendations, we mapped the resource programs by delivery mechanisms, target market, and technology in order to identify the simplest and most effective approach to establishing labor standards, given the existing IOU program structure. We selected two tiers of a responsible contractor policy. The first tier identifies baseline contractor criteria that apply across all IOU resource programs where contractors participate and customers receive incentives. The second tier applies to programs or projects above particular dollar figure thresholds or meeting other design criteria.

The first tier of contractor requirements incorporates the same standards currently required by SB 454: that contractors have the legally required licenses to do the work and that they comply with applicable permitting requirements. Insurance, including workers' compensation and bonding, are required for contractors to maintain their licenses in California. In addition to the requirements of SB 454, we recommend that compliance is verified by either the IOUs or a third party.

As administrators of ratepayer dollars, IOUs should ensure that ratepayers are not facilitating noncompliance with licensing and code requirements. The IOUs can, at a minimum, verify that codes are being observed and

¹⁴⁰ Madland D., K. Walter, P. Sonn, & T. Gebreselassie (2010, March). *Contracting that Works: A Toolkit for State and Local Governments*.

¹⁴¹ New York State Energy Research and Development Authority.

that contractors are eligible to work on projects for which incentives are received by requiring customers to provide the name of the contractor and a copy of the signed final inspection for applicable permits. This information would then allow the IOUs to validate contractor licenses through the Contractor State License Board website, before rebates are paid out.¹⁴²

Unlike many states and jurisdictions, California has no continuing education requirements for contractors, and tests for licensing are poor measures of competency in HVAC and some other sectors. Therefore, a contractor's license alone cannot ensure work quality. Our second and higher tier of requirements adds criteria for contractor pre-qualification, including evidence of a trained workforce, Occupational Safety and Health Administration (OSHA) certification, and past performance as determined by interviews with past clients.

Licenses for trades workers are not required in California, except in the case of electricians. Therefore it falls to the employer or contractor to ensure that his or her workers are trained for the tasks they are performing. As noted earlier, there is no clear government- or industry-recognized skills certifications (with a few notable exceptions) that verify key skills for energy efficiency work. Where EE-specific certifications do not exist, basic credentials should be required. For the design professions (architects and engineers) there is a recognized and enforced credential and licensure system, so the IOUs do not need to verify skills for these professions. In contrast, for the construction trades, the IOUs have no way to verify skills unless they require participating contractors to demonstrate that their workers have those skills.

For projects meeting Tier 2 criteria, we recommend that the IOUs require state-approved apprenticeship certification or proof of training of an equivalent quality. State-certified apprenticeship is a very useful requirement because it is a state-recognized standard of quality training in California, it is applicable to all the trades, it provides the greatest scope and depth of training for skilled construction workers, and it graduates the largest number of trades workers of any post-secondary institution in California each year.¹⁴³ Other educational programs or employer-sponsored training may be equally effective at providing workers with the skills and experience they need to perform high-quality work. Proof of training from a program comparable in quality and content to a state-certified apprenticeship program provides added flexibility for participating contractors and workers.

OSHA certification is an industry standard for worksite safety. OSHA standards do not fully address the critical health and safety problems associated with energy efficiency, but they are the only standard that currently exists.¹⁴⁴ The requirement of past experience is important because past performance provides the most reliable indicator of future performance. For projects and programs meeting Tier 2 criteria, these requirements provide a level of assurance of contractor responsibility to ensure prudent use of ratepayer and customer funds.

¹⁴² See <http://www.cslb.ca.gov/>.

¹⁴³ Zabin, C. et al. (2011). p. 219. Apprenticeship programs graduate over 5,000 journey-level trades workers per year in California.

¹⁴⁴ Wilson, M. (2012, July 24). *The Role of Training in Protecting Worker Health and Safety in the Energy Efficiency and Retrofit Industry*. Labor Occupational Health Program. UC Berkeley.

B. SKILLS STANDARDS AND CERTIFICATIONS

The diversity of IOU EE resource programs, the services they provide, and the technologies or measures they incentivize require a more fine-grained approach to workforce requirements than can be achieved with contractor requirements alone. Whereas responsible contractor policies screen for or improve performance at the firm or employer level, skills standards and third-party occupational certifications focus on the tasks performed in fulfillment of program goals.

Because, as discussed above, California does not require a license for most trades workers, and, unlike many states and jurisdictions, has no continuing education requirements for contractors, third-party certifications can contribute to professionalizing both contractors and workers in the construction trades related to energy efficiency.

Third-party certifications are offered by a number of credentialing organizations that should be accredited by an accreditation organization such as the ANSI, or by a federal or state board.¹⁴⁵ Certifications are used to demonstrate an individual's proficiency with a set of job tasks as evidenced by passing a written and sometimes practical exam. They also require a clear skills base prerequisite. For example, only certified electricians can be trained and certified to become CALCTP-certified electricians. Firm certification or accreditation conveys adherence to a set of industry-recognized best practices, encompasses certification requirements for workers, sometimes allows certification of projects by the certifying body, and often provides tools for quality assurance (to support those holding certifications and uphold the quality brand of the certification).

As consumers, we accept the value of certifications or licenses for many people who offer us services. Most health care workers must be licensed by an approved government entity or industry group. It is often noted in energy forums that hair stylists and manicurists cannot practice in California without a license, but there are no such requirements for many of the occupations that are integral to energy efficiency work. A few energy efficiency policies and incentive programs require that contractors and their workers meet specific skills and competency requirements (see Appendix 2C Examples of U.S. Energy Efficiency Programs Requiring Certification), but it is not a widespread practice in the U.S.

Throughout Europe, however, energy efficiency and distributed generation programs require national skills certifications. The Green Deal scheme in the UK, which provides rebates for efficiency and renewables, requires that energy assessments and installations are undertaken by individuals with specific nationally-accredited certifications.¹⁴⁶ All individuals meeting the training requirements are listed on the National Skills Academy Register¹⁴⁷ for easy verification. Customers wishing to receive incentives under the Renewable Heat Incentive program must also use installers certified at the appropriate level under an industry-led, nationally-accredited certification scheme.

¹⁴⁵ Goldstein, B. (2014, March 14). *U.S. Department of Energy: Federal Recognition for Workforce Standards and Credentials in the Energy Efficiency Sector*. Presentation (by phone) to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

¹⁴⁶ The National Skills Academy (n.d.). *The Green Deal*.

¹⁴⁷ See <http://www.nsaet.org.uk/public-register/>.

For the European Union (EU) in general, energy programs are driving demand for qualified individuals who possess accredited certifications. The profession of “installer” is a regulated profession. Installer certification training incorporates both practical and theoretical components, and trainees must meet education and/or experience prerequisites. In addition, EU requirements state, “At the end of the training, the installer must have the skills required to install the relevant equipment and systems to meet the performance and reliability needs of the customer, incorporate quality craftsmanship, and comply with all applicable codes and standards, including energy and eco-labeling. The training course shall end with an examination leading to a certificate of qualification.”¹⁴⁸ The policy further clarifies that installer certification must be time-restricted, so that continuing education is required for certification renewal. Training providers must offer (in addition to the initial training) shorter refresher courses on topical issues, including new technologies, to enable life-long learning as technologies and practices change. These requirements are consistent with best practices in workforce education and training.

1. Benefits of Skills Certifications

Due to an absence of applicable recognized third-party, national, or state EE skills certifications, broader post-secondary occupational credentials and responsible contractor requirements can be applied in the short-term. However, skills certification development should continue to be supported by the IOUs. Requiring a particular third-party or national skills certification for program participation is a simpler, more easily enforceable, and more efficient endeavor than assessing multiple training programs or using more general skills standards or other indicators to identify whether or not participating workers have the knowledge, skills, and abilities required for each task relevant to the energy efficiency program portfolio.

Third-party or national certifications indicate a worker or firm’s attainment of certain knowledge, skills, and abilities for particular tasks or bodies of work. Third-party certifications frequently require continuing education and recertification to stay current. Leadership in Energy and Environmental Design (LEED) AP credentials require 30 hours of continuing education every two years¹⁴⁹ and BPI certifications require 30 hours of continuing education credits or proof of experience to qualify for recertification every three years. In addition, certifications themselves get updated as skills required in the market change or new critical tools become available. Utilizing third-party skills certifications allows the IOUs to leverage these investments rather than managing such updates themselves.

Another benefit of third-party certifications is that they often require prerequisites—basic knowledge and/or experience in a particular trade. In this way, certifications are, not alternatives to, but complements to more basic training. For example, a licensed electrician can stack a CALCTP certification on top of their journey card or electrician’s license to demonstrate training specific to advanced lighting control system. To apply for a LEED AP credential, one must have experience working on a LEED-registered project within the past three years.

¹⁴⁸ Directive 2009/28/EC of the European Parliament and of the Council (2009, April 23).

¹⁴⁹ U.S. Green Building Council. (2014). *Maintain your LEED-AP credential*.

Because verification of certified individuals or firms is often simple through online searchable directories, certifications are easily verifiable.¹⁵⁰ Additionally, third-party certifications allow IOUs to outsource some level of quality assurance to the certifying body, and the quality assurance program administered by certifying bodies can be more educational than punitive. For example, the National Environmental Balancing Bureau (NEBB) and the Testing, Adjusting and Balancing Bureau (TABB) both have Quality Assurance Programs for commercial and industrial HVAC to provide quality assurance for participating contractors.¹⁵¹

Appropriately selected and enforced skills certifications ensure that firms and workers have the required skills for work quality. A key benefit of this is that IOU programs with skills certification requirements may mandate less rigorous field inspection and assessment of work performance, especially after an initial period, while obtaining the same level or higher level of work quality. Energy Upgrade California (EUC) is a program that has required both a skills standard/certification (BPI building analyst) and extensive field verification. Although this is good practice for a new program, it created a lot of friction for customers, which also posed a challenge for contractors who were the customers' main point of contact.¹⁵²

Efficiency First California makes the case that there are more effective quality assurance processes than what EUC required, which "underestimates the professional caliber of BPI-credentialed home performance contractors, creates a time and cost burden for the homeowner and contractor, and has suffered from inconsistent and arbitrary protocol implementation and inspector quality across programs." Instead they outline "an open market system for quality assurance (QA) services based on a recognized industry standard, such as the BPI Quality Assurance Program."¹⁵³

The concept of lower inspection rates for qualified contractors and workers was also embedded in the 2010 proposed federal Home Star legislation. It called for a lower inspection rate for BPI-accredited contractors with workers possessing home performance certifications from the Laborers' International Union of North America, NATE, or BPI. If the program had been signed into law, 10 percent of the retrofits performed by accredited contractors would have been randomly subjected to field verification by an independent quality assurance provider, compared to a 15 to 20 percent inspection rate, depending on the type of retrofit work, for other qualified contractors.¹⁵⁴

¹⁵⁰ For example, CALCTP certified contractors are listed at <https://www.calctp.org/find-contractor>.

¹⁵¹ National Environmental Balancing Bureau (2014). *Quality Assurance Program*; International Certification Board & Testing, Adjusting and Balancing Bureau (n.d.). *TABB Quality Assurance Program*.

¹⁵² Asper, C. (2012, August). *Efficiency First California and California Building Performance Contractors Association Comments on California Energy Commission Staff Report: Comprehensive Energy Efficiency Program for Existing Buildings Scoping Report* (CEC-400-2012-015-Docket No. 12-EBP-1).

¹⁵³ Ibid.

¹⁵⁴ U.S. House of Representatives (2010, May 7). *An Act to Provide for the Establishment of the Home Star Retrofit Rebate Program, and for Other Purposes* (HR 5019 RFS). p. 40, 49-50.

In addition to the above-described benefits of certifications, DOE has identified an extensive list of benefits related to certification for employers and contractors, home energy workers, homeowners and consumers, training centers, and utilities and efficiency program administrators.¹⁵⁵

2. How to Identify Skills Standards

Given the role of the IOUs in administering EE programs to deliver cost-effective energy efficiency, requiring that workers demonstrate the knowledge, skills, and abilities (KSAs) necessary to provide program services is critical to supporting the demand and supply of a workforce that can deliver these services. However, we were unable to produce a comprehensive list or mapping of relevant certifications for the IOUs because there currently is no way to definitively assess the quality of the multiple certifications that exists in the marketplace.¹⁵⁶ In Chapter 3, we recommend that the CEC convene an interagency steering committee for providing guidance on the identification and use of skills certifications in EE work in California. Until the DOE or California develops its skills standard guidelines for all the key occupations, and until certifications can be assessed against these standards, the IOUs and/or the CPUC, with the assistance of the IOUs, industry experts, and stakeholders, may determine which certifications are best to use.

Exhibit 2.2 presents a decision tree to guide the IOUs on identifying and incorporating skills certifications as requirements for participation in resource programs. When there are guidelines from the state or consensus among subject matter experts around an industry skills standard and its appropriate application within resource program tasks, the standard should be required. The process of introducing these standards should be closely monitored and evaluated, and revised as appropriate.

There may also be cases where there are no third-party certifications or skills standards for a particular task. When there are not defined KSAs or there is a lack of subject matter expert consensus around the most appropriate certification, the utilities can combine broader occupational credentials such as evidence of graduation from a state-certified apprenticeship program, a 2-year degree, or alternative proof of skills. This approach, when combined with responsible contractor screening for past performance *and* enhanced inspections for functional performance of installed technology, can assure the same level of quality (or higher) as a stringent third-party skills certification.

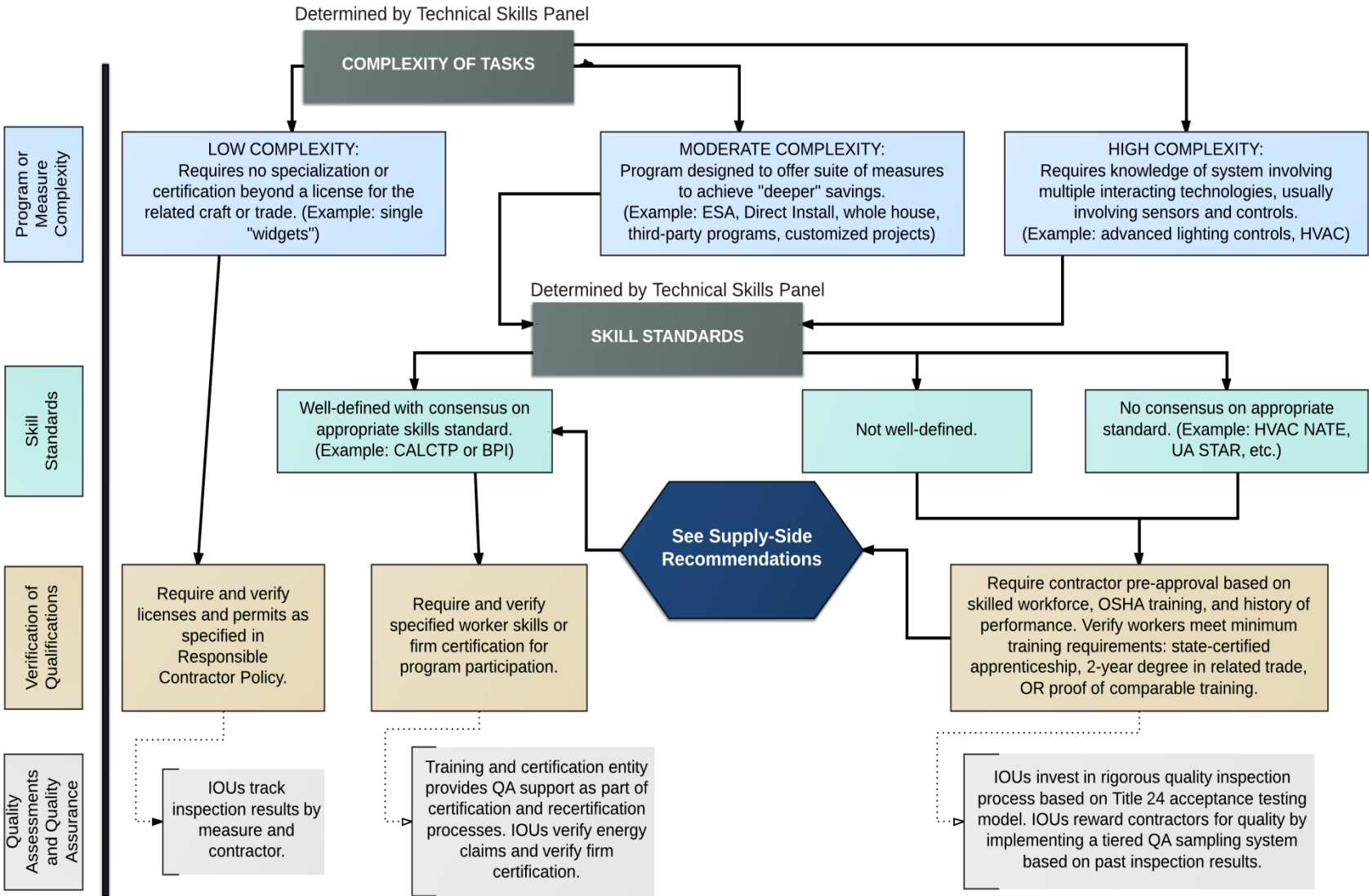
C. PROCESS IMPROVEMENTS

In addition to the upfront standards that we have recommended above, we also recommend a series of process improvements in the resource program design, approval, implementation, and evaluation process (illustrated in Exhibit 2.1) to create a stronger incentive structure to help ensure proper installation and maintenance of energy efficiency measures. These recommendations are expected to reduce the risk of savings left on the table caused by installation problems for custom measures, and the large gaps between *ex ante* estimates and *ex post* evaluations for deemed measures.

¹⁵⁵ For list of benefits, see U.S. Department of Energy, Energy Efficiency & Renewable Energy, Weatherization & Intergovernmental Program (n.d.). *Guidelines for Home Energy Professionals - Project Benefits* (accessed 2013, March 28).

¹⁵⁶ See Chapter 3 for more discussion on this issue.

Exhibit 2.2 Decision Tree for Determining Worker Skills Standards and Inspection Process for Programs



These process improvements require substantial changes to existing evaluation, measurement and verification (EM&V) processes and assumptions, and may require modifications to prior CPUC decisions. This is discussed further in Chapter 5.

1. Document Worker Skills Requirements in Field Tests for New Measures

Contractor competencies and worker skills requirements should be documented as part of the assessment and screening of emerging technologies in preparation for incorporation into resource programs. In assessing the market potential of emerging technologies, the 2013 Potential and Goals Study considers the availability of trained contractors to be a factor contributing to the certainty with which an emerging technology can be expected to deliver energy savings.¹⁵⁷ However, the worker skills required to effectively work with a new technology are not routinely assessed or documented in emerging technology studies.¹⁵⁸ Additional skills that may be required to achieve the promised savings are either unknown, or are simply not relayed to either resource program staff, who could incorporate that information into program design or program requirements, or WE&T staff who could direct resources toward training for those skills.

2. Incorporate Skills Requirements in Work Papers

Work papers should document contractor and worker competencies needed to meet savings assumptions used to estimate *ex ante* savings for deemed measures.

Work papers are a collection of the evidence and engineering assessments of the energy savings associated with a particular technology and delivery mechanism. Work papers include highly specific information including climate zones, net-to-gross rates, technology specifications, or labels (e.g., Energy Star), but work papers never document the technician competencies required to achieve the estimated energy savings. Worker skills assumptions should be made explicit so that these assumptions can be tested and validated. Making technician competencies explicit in the work papers can also provide the IOUs an additional quality control mechanism for the installation of measures. If data on technician competencies is unavailable, this should be indicated.

3. Incorporate Choice of and Justification for Work Quality Interventions in Resource Program Implementation Plans (PIPs)

In Program Implementation Plans, program implementers should describe the activities they will undertake to ensure work quality, including the contractor and worker competencies required for successful program implementation. PIPs should explain how program design will ensure that participating contractors and workers meet competency requirements. IOUs and their implementation partners can draw on this guidance document to consider and determine the activities that will work best for their program. Some programs may opt for compensation standards, others for stringent contractor selection processes, and others may choose to identify and enforce skills standards. Post-installation inspections and testing for

¹⁵⁷ Navigant Consulting Inc. (2013, November 26). *2013 California Energy Efficiency Potential and Goals Study*. p. 41

¹⁵⁸ Statement based the review of reports posted on ETCC website.

function or pay-for-performance are also valid approaches as long as they provide detail on how to overcome the barriers or problems associated with these approaches, as described above.

4. Improve Quality Assessments

Programs without certification requirements need more rigorous inspection of work quality. Inspections should assess the performance of installed equipment—not just whether or not it was installed as is the case with many current IOU programs. For customized projects, in which rebates are based on before-and-after review, quality assessments should document installation quality not only for measures qualifying for ratepayer incentives, but also for those measures that fail to qualify because of improper installation. In other words, inspection results should answer the question, “What was attempted and what was achieved?”

An additional consideration for quality assessments is the technical skill of the inspection team. Title 24 acceptance testing requires acceptance tester certification. Recognizing that it is often more difficult to assess the functional performance of equipment than it is to install it, inspectors should hold a higher skills credential than is required of installers.

5. Track Inspection Results by Measure and Contractor

Inspection results are currently tracked by contractor. This is important for enforcing the anti-fraud “three-strikes” rule adopted by most IOUs, but it presents a lost opportunity for tracking problematic technologies. Inspection results should be tracked by contractor and by measure in order to collect information on what measures pose installation challenges. This information can feed into the skills standard identification process associated with different technologies. If inspections are made more rigorous, and certain measures consistently fail performance tests, tracking this data will give the IOUs insight on where they are likely to most greatly benefit from establishing skills standards.

V. STAKEHOLDER FEEDBACK

This Guidance Plan reflects the combined expertise and opinions of the IOUs, firms implementing IOU programs, policy and subject matter experts, CPUC Energy Division staff, labor and contractor advocates, environmental organizations, low-income advocates, and the consultant team.¹⁵⁹ Throughout this project’s review process, many useful suggestions have been made by these stakeholders and incorporated by the consultant team.

This feedback was provided both verbally and in written form, in monthly meetings with the Stakeholder Advisory Group and the IOUs, several sessions with the Leadership Briefing Group, and during many other meetings with the IOUs. We also organized a broader stakeholder session and asked the IOUs and the Stakeholder Advisory Group to invite EE contractors who would be interested; we obtained written and verbal

¹⁵⁹ See Appendix 1B for a complete list of interviewees. See Appendix 1C for a complete list of participants in the Stakeholder Advisory Group and the Leadership Briefing Group. All written feedback, except for IOU comments inserted in Guidance Plan drafts, is contained in Appendix 1D—Attachment 1.

feedback from these participants as well. The contractors who provided feedback were supportive of our recommendations.¹⁶⁰

As with all the recommendations in this Guidance Plan, the IOUs have stated that they are reviewing these recommendations and other internal and external program advice to inform future program planning, and have not committed to taking specific action.

A. DEMAND-SIDE INTERVENTIONS

There is strong support from the PRG and from contractors participating in the feedback session for demand-side interventions but mixed support from the IOUs. The PRG, including the Director of the California Workforce Investment Board and the California Division of Apprenticeship Standards support the notion that the IOUs are in a strong position to influence the demand side of a comprehensive WE&T policy.

In general, the IOUs continue to emphasize the role of supply-side strategies (training and education) in enhancing the skills of the workforce participating in their programs, while downplaying their role in driving demand for such skills. SCE states this problem succinctly in writing that “the concept [of work quality] is not operational

B. PROCESS IMPROVEMENTS

The PRG unanimously agreed with the process improvement recommendations described in this document; however, they also unanimously agreed that process improvements, alone, do not go far enough—workforce standards are critical. The IOUs had concerns about the process improvements for a variety of reasons. SCE voiced concerns with some of the process improvement suggestions because of the difficulty and expense of obtaining the needed data and because they may have implications that should be addressed in the EE incentive proceeding. PG&E was generally receptive to process improvement suggestions to improve work quality.

C. WORKFORCE STANDARDS

Both written and oral PRG and external stakeholder feedback supports adopting workforce standards, including responsible contractor policies. Stakeholders generally wanted more stringent workforce standards than those recommended in this document. The California Workforce Investment Board (CWIB) and Division of Apprenticeship Standards (DAS) expressed strong support for workforce standards because they can provide clear signals to the state’s training institutions about what training is needed.

IOUs generally support the utilization of third-party skills certification requirements, but have concerns that we recommend “overly prescriptive” definitions of what the requirements should be. IOUs agree that skills standards are useful for programs, but suggest that manufacturers’ trainings are often sufficient. PG&E wants to consider the costs and prevalence of particular certifications in their target market, and both SCE and PG&E have indicated that their existing contractor and worker requirements sufficiently promote work quality. PG&E and SCE are interested in exploring the responsible contractor requirements.

¹⁶⁰ This feedback session was a webinar and we did not obtain a full list of participants.

We have thoroughly reviewed existing program requirements for contractors and workers. The recommendations in this Guidance Plan are intended to improve quality and performance outcomes that would benefit the IOU programs beyond what they are currently able to achieve. We included only those standards that are most impactful and least burdensome. To achieve their promise, however, we do intend them to be implemented as a package, not piecemeal.

VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS

The CPUC should provide direction to the IOUs about how and when to act upon the following demand-side recommendations, explained in detail in this chapter:

1. Incorporate contractor and workforce standards into IOU EE program requirements including a responsible contractor policy and adoption of recommended skills standards.
2. Implement modifications in the resource program design, approval, implementation, approval, and evaluation process in order to systematically address workforce issues and improve the accuracy of savings estimates.

Most of the recommendations we have presented can be voluntarily implemented by the IOUs without direction from the CPUC. However, CPUC direction could validate the IOUs' efforts, mitigate any perceived risk of acting on the recommendations, and provide clarification on what is feasible within the current regulatory environment. At present, the IOUs do not have an incentive to take actions to improve work quality because in many programs, savings claims are based on assumptions that measures are installed according to manufacturers' specifications and the energy benefits of these recommendations are not measurable within the existing EM&V framework. It is important for the CPUC to either commit to measuring and crediting the IOUs with the benefits of these policies and/or provide temporary regulatory cover in order to lower the IOUs' perceived risk.

The CPUC should modify resource program approval processes and work with the IOUs to coordinate their modifications to the resource program design, approval, implementation, and evaluation processes, and ensure that all changes are in line with CPUC direction.

This should be carried out via the Task Force proposed in Chapter 5.

The CEC should convene a Statewide EE Workforce Steering Committee to create a broader venue to determine the appropriate skills standards and certifications for ratepayer and other EE programs in the state.

This is described in Chapter 3.

VII. IMPLEMENTATION TIMELINE

Exhibit 2.3 presents a recommended schedule for implementing the recommendations included in this chapter.

Exhibit 2.3 Implementation Timeline for Demand-Side Strategies: Energy Savings

Time	Actor	Action
2014	IOUs	In Program Implementation Plans (PIPs), describe contractor and worker competencies required for successful program implementation, and provide an explanation of how program design will ensure that participating contractors and workers meet competency requirements.
2014	IOUs	Document competencies of contractors and workers in field tests for new EE measures.
2014	IOUs	In work papers, document contractor and worker competencies needed to meet savings assumptions used to estimate <i>ex ante</i> savings.
Q4 2014	IOUs	Develop in-house system or contract with an outside firm to verify participating contractors meet responsible contractor policy requirements.
Q4 2014	IOUs	Develop in-house system or contract with an outside firm to pre-qualify contractors for selected programs (>\$1 Million), projects (>\$100K), and programs requiring pre-approved contractors (HVAC, EUC, etc.).
Q3 2014	IOUs	Notify contractors and customers of responsible contractor policy requirements to take effect in 2015.
2015	IOUs	Implement responsible contractor policy, verifying that all <i>current and future</i> contractors meet the requirements (history of past performance, proof of skilled workforce, and 30-hour OSHA training).
2014	IOUs	Begin requiring CALCTP certification for advanced lighting control systems and following other steps for applying skills certifications and quality assessment processes outlined in the Decision Tree.

CHAPTER 3: Workforce Education and Training Program Modification: Supply-Side Strategies

I. OVERVIEW

This chapter presents our analysis of the IOUs' current portfolio of WE&T programs. It provides recommendations on how the IOUs can most successfully invest their limited WE&T resources, currently funded at about \$30 million per year, to ensure that workers in to EE-related¹⁶¹ occupations have the skills they need to perform their work effectively. The IOUs' primary WE&T programs are Centergies, based at the eight IOU Energy Centers across the state, and Connections, which funds organizations that provide support for energy efficiency and sustainability enrichment programs in k-16 public schools. Centergies offers equipment testing and technical consultations, energy efficient technology demonstrations, classes, workshops, educational seminars, interactive training exhibits and a tool lending library.¹⁶² Connections funds programs that provide teaching materials and other supports for public schools and colleges, with the purpose of educating students on energy, water, renewable energy, demand response, distributed generation, and climate change. The objectives of these programs are to influence day-to-day decisions of students and their families, to promote energy conservation at school facilities, and to promote green career development.¹⁶³

The California Long Term Energy Efficiency Strategic Plan¹⁶⁴ set out two overarching goals for the IOUs' WE&T programs: (1) to advance the state's energy efficiency and demand-side goals by ensuring the training and engagement of workers with the proper skills to carry out the work; and (2) to assist workers from disadvantaged communities in gaining skills leading to employment and/or advancement in rewarding career track jobs in EE fields.¹⁶⁵ This chapter addresses both goals.

The Strategic Plan's goals and strategies for WE&T represent a significant departure from the historical role for the IOU education and training programs, which was to encourage building owners and managers ("end users") to invest in energy efficiency, and to help builders and contractors ("market actors") convince their clients to choose energy efficient options and/or invest in EE retrofits. The Strategic Plan highlighted the need to focus on developing the skills of the people who design, install, and maintain energy efficiency work (the "workforce"), not just on building the market for energy efficiency through education for end users and market actors.

¹⁶¹ For the purposes of this document the term energy efficiency also includes other IOU demand-side programs such as demand response and distributed generation, except where otherwise noted.

¹⁶² For a detailed description of the program, see Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PGE0317.01. p.7.

¹⁶³ Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume II: Connections*. Report ID# PGE0317.02. p. 6.

¹⁶⁴ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. Referred to as "the Strategic Plan" throughout the document.

¹⁶⁵ *Ibid.* p. 70.

The WE&T chapter of the Strategic Plan called for the WE&T Needs Assessment,¹⁶⁶ which would serve as a roadmap for identifying and addressing critical needs for training and other EE workforce strategies. Produced by the UC Berkeley Donald Vial Center in 2011, the *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response* (“UCB-DVC Needs Assessment”) provided an analysis of anticipated EE-related labor demand and the capacity of California’s workforce development infrastructure to prepare workers for that demand. It recommended significant changes to the IOUs’ approach to workforce development in order to leverage the expertise and resources of the state’s workforce development infrastructure and engage employers so that EE skills attained by workers are used in the field.

In response to the Strategic Plan and the UCB-DVC Needs Assessment, the IOUs have begun to reorient their programming to increase the focus on workforce skills-building. However, most programs still serve both market builders and the non-managerial workforce, and the UCB-DVC Needs Assessment’s core recommendations for program changes have not been broadly implemented.

This chapter reviews the strengths and ongoing shortfalls in the IOUs’ approach to WE&T and provides recommendations on how to redesign the programs to increase the impact of ratepayer investments on workforce skills development. We propose that the IOUs separate their offerings for market builders from their offerings intended for workforce skills building. We suggest they develop a dedicated skills-building program portfolio administered largely through a competitive solicitation process, whereby organizations with core expertise in workforce development can apply for funds under strict criteria designed to meet the WE&T programs’ energy savings and/or workforce inclusion goals. The portfolio should support the incorporation of EE-specific knowledge and skills into the broader skills set of current and future workers in the key occupations that impact the demand for energy in California homes and businesses. To leverage other sources of training investments and build partnerships, the solicitation should require matching funds from employers and/or post-secondary training institutions and other workforce organizations.

The chapter is organized as follows. We first review the regulatory history, the UCB-DVC Needs Assessment findings and recommendations, and recent IOU WE&T program changes. We then analyze the current IOU programs and, based on this analysis, we present recommendations that describe how to implement a major redesign of the programs. We then report on stakeholder feedback from both the IOUs and external stakeholders, and identify the points of consensus and disagreement. We finally also present recommendations for the CPUC and other policymakers.

¹⁶⁶ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. We refer to this as “the UCB-DVC Needs Assessment” throughout this document.

A. REGULATORY HISTORY, UCB-DVC NEEDS ASSESSMENT RECOMMENDATIONS, AND IOU ACTIONS TO DATE

The Strategic Plan, which was adopted by the Commission in D.08-09-040,¹⁶⁷ brought renewed attention to WE&T issues and the critical importance of ensuring a well-trained workforce to carry out the increasingly large-scale and complex work involved in pursuing all cost-effective energy efficiency.¹⁶⁸ The Strategic Plan called upon the IOUs to “act as a catalyst to action ... [to] review their existing programs, and better align them within the context of a comprehensive WE&T strategy” and to spearhead a coordinated statewide strategy in collaboration with the California Labor and Workforce Development Agency, educational institutions at all levels, industry and labor groups, career technical training institutions, and community based organizations.¹⁶⁹

Decision 07-10-032 and the consequent Strategic Plan placed tremendous importance on market-building activities in the Marketing, Education & Outreach (ME&O) Program, but also requested that the IOUs develop a distinct strategy and action plan to address *workforce* education and training.¹⁷⁰ The close historical connection between ME&O and WE&T is important to understand because most WE&T programs are still primarily “market building” activities rather than skills-building for the workforce.

1. UCB-DVC Needs Assessment

As noted earlier, the Strategic Plan called for a comprehensive needs assessment for EE training in the state. The 2011 UCB-DVC Needs Assessment analyzed both the demand for labor generated by investment in energy efficiency, demand response, and distributed generation, and the supply of labor available for this work. On the supply side, the Needs Assessment included an inventory of the state’s training programs that prepare the workforce for EE-related jobs, a comparison of the outcomes and success rates of different types of training programs, and identification of critical career pathways. The recommendations addressed best practices, including sector strategies and career pathways for worker advancement and skills acquisition. Sector strategies are workforce development collaborations among employers, training organizations, and other stakeholders designed to meet the skills needs of employers while helping workers find career track jobs and/or advance in their careers.¹⁷¹

2. IOU Advice Letter

At the direction of the CPUC,¹⁷² the IOUs submitted a joint advice letter in 2011 describing their proposed WE&T program changes based on the UCB-DVC Needs Assessment. The IOUs endorsed the general principles of the Needs Assessment, and outlined their anticipated approach and timeline for addressing

¹⁶⁷ The January 2011 Update to the Strategic Plan was adopted in D.10-09-047.

¹⁶⁸ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

¹⁶⁹ *Ibid.* p. 70-72.

¹⁷⁰ California Public Utilities Commission (2007, October 19). *Interim Opinion on Issues Relating to Future Savings Goals and Program Planning for 2009-2011 Energy Efficiency and Beyond* (D.07-10-032). p.57-58, 68.

¹⁷¹ See Appendix 3A for a detailed explanation of sector strategies.

¹⁷² California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047). Ordering Paragraph 36, p. 383-384.

some of its recommendations for the Centergies program, including sector strategies, partnering with construction trades workforce, and structuring more classes in series and supporting certifications.¹⁷³

3. WE&T in the General EE Proceeding for the 2013-2014 Program Cycle

In the 2013-2014 Energy Efficiency Policy and Budget Proceedings, workforce issues played a much more prominent role than in previous EE proceedings. They were the subject of CPUC direction, stakeholder comments, and IOU responses. In the CPUC's May 10, 2012, Guidance Decision,¹⁷⁴ the Commission addressed several of the UCB-DVC Needs Assessment's recommendations. Specifically, it called on the IOUs to continue supporting the California Advanced Lighting Controls Training Program (CALCTP) as a model sector strategy, and to submit a plan to test the sector strategy approach for the commercial HVAC sector.¹⁷⁵ The CPUC also directed the IOUs to explore partnership opportunities with training and educational institutions, resulting in shared resources and/or co-funding training.¹⁷⁶

A number of stakeholders endorsed some or all of the UCB-DVC Needs Assessment recommendations in their comments on the EE proceeding, including the Natural Resources Defense Council, the California Construction Industry Labor-Management Cooperation Trust, the Greenlining Institute, the Ella Baker Center, Green for All, and the Environmental Health Coalition, among others.¹⁷⁷ Several of these organizations specifically advocated for the Needs Assessment's recommendation to support state-certified apprenticeship programs as key partners to address both skills upgrade and the inclusion of workers from disadvantaged communities.¹⁷⁸ A few of these groups were also parties to the Energy Savings Assistance (ESA) proceeding and supported the UCB-DVC Needs Assessment recommendations in that proceeding as well.¹⁷⁹

In response to the Guidance Decision and stakeholder comments in the proceeding, the IOUs submitted Program Implementation Plans in summer 2012 incorporating proposed changes to WE&T. These included the development of a sector strategy for the non-residential HVAC sector in collaboration with the California

¹⁷³ California Public Utilities Commission (2011, October 24 and approved on 28). *Additional Supplemental Joint Filing: 2010-2012 Statewide Workforce Education and Training (WE&T) Program Modifications based on Findings of WE&T Needs Assessment - SDG&E 2260-E-B/2041-G-B, SoCalGas 4249-B, SCE 2588-E, and PG&E3212-G-B/3852-E-B (D.09-09-047)*.

¹⁷⁴ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 272-283.

¹⁷⁵ *Ibid.* Ordering Paragraphs 105-112.

¹⁷⁶ *Ibid.* Ordering Paragraph 106.

¹⁷⁷ California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 90.

¹⁷⁸ Including CCILMCT, NRDC, Ella Baker Center, and Greenlining. See California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 275.

¹⁷⁹ California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities' 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 173-176.

Division of Apprenticeship Standards, continued support for CALCTP, and the other modifications to course content and delivery described in the advice letter.¹⁸⁰

As noted earlier, several parties to the proceeding were not satisfied with IOUs' proposed modifications or progress in responding to the UCB-DVC Needs Assessment. The CPUC concluded that both the CPUC and the IOUs needed additional guidance from workforce experts and directed the IOUs to hire an expert entity to develop a comprehensive approach to workforce issues. This Guidance Plan is the result of that direction.¹⁸¹

B. SCOPE OF SUPPLY CHAPTER

The RFP for this WE&T Strategic Planning Project called on the consultant to provide guidance on how the IOUs' WE&T programs can best support "both the EE and workforce development goals of the Strategic Plan" ("Strategic Goal One" in the RFP). The IOUs requested that the consultant to describe the process for determining the role of the WE&T programs in relation to other training providers in the state, and to provide a methodology for tracking critical occupations and the knowledge, skills, and abilities (KSAs) needed to successfully carry out EE work.¹⁸² They also asked that the Guidance Plan include recommendations on WE&T program modification—or new strategies—to help entry-level and incumbent workers advance along career pathways and obtain industry-recognized certifications. Our approved scope of work for this Guidance Plan delineated the following tasks related to modifying the IOU WE&T programs to meet energy and inclusion goals:

1. Target the most effective and efficient use of IOU WE&T resources, identify components of a balanced WE&T portfolio that best reflect the IOUs' strategic roles in meeting both energy and workforce goals, and provide concrete and practical steps to modify the IOUs' WE&T programs.
2. Identify a process to track labor supply and demand in critical occupations, and assess gaps in their knowledge, skills, and abilities (KSAs), certifications, and training programs.
3. Identify opportunities for the IOUs to more effectively leverage other state, federal, and private WE&T investments.
4. Identify how WE&T investments can be aligned to support, augment, and fill gaps in the existing labor supply infrastructure to promote inclusion and advancement of disadvantaged workers in long-term EE careers.

II. PROBLEM STATEMENT

The Strategic Plan and the UCB-DVC Needs Assessment called on the IOUs use their WE&T investments to influence the direction of workers' skills set development in the key occupations that affect energy use in

¹⁸⁰ PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plans, Workforce Education and Training. See for example PG&E p. 31-37, and 100-101, which describe the IOUs' proposed changes to the statewide WE&T program for the 2013-2014 cycle.

¹⁸¹ California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). Ordering Paragraph 34, p. 138-139.

¹⁸² See page 4 of Appendix 1A. RFP Statement of Work.

California’s homes and businesses. Although the IOUs have made progress in reorienting some of their WE&T programming towards this goal, our analysis of the actions taken by the IOUs since 2011 has led us to conclude that the IOU response will continue to be inadequate without a significant redesign that incorporates on-going collaboration with and input from workforce development experts, practitioners, and organizations. While the Centergies program provides a delivery model that is generally suitable for providing information and training to end users who invest in energy efficiency and contractors and managers who sell energy efficiency, this delivery model is far less effective for building the skills of the professional and trades workforce who execute the work, or for influencing the core post-secondary training institutions that most of these workers attend. In addition, neither the Centergies nor the Connections programs are effective in preparing disadvantaged workers for career track jobs in EE-related fields.

The UCB-DVC Needs Assessment identified priorities and provided recommendations for the best use of ratepayer investment in skills building, for both the energy goal and the inclusion goal. In this section we provide a recap of that material; document recent changes in IOU programming, ongoing problems, and missed opportunities; and report on the limited progress on key Needs Assessment recommendations.

A. UCB-DVC NEEDS ASSESSMENT ANALYSIS OF TRAINING INVESTMENT PRIORITIES

The UCB-DVC Needs Assessment provided a foundation of research on current jobs and projected job growth from ratepayer, public, and private investments in EE, identified the occupations that will be most impacted by a growing demand for EE skills in California, and assessed the current capacity of the state’s workforce development infrastructure to prepare workers with critical EE skills.

This analysis showed that the vast majority of the jobs that impact energy use across the economy are in traditional professional and blue-collar occupations related to the building and construction industry, where EE knowledge and skills are only one component of a much broader occupational skills set. Very few of these jobs are specialized jobs where the main skills set can be reduced to EE. Approximately two-thirds of the direct jobs generated by EE investments in California are projected to be in the building and construction trades—e.g., electricians, sheet metal workers, plumbers, carpenters, stationary engineers, and others. Around one-sixth of the jobs created are projected to be for professionals such as architects and engineers. Only 2 percent of the jobs are projected to be in specialized EE occupations like energy auditor.¹⁸³

A comprehensive inventory of the training infrastructure in California for the key EE-related occupations found ample training programs compared to the number of available and anticipated jobs. It also assessed the current capacity of the various training programs, including completion and job placement rates and scope and depth of training. For professional workers, the UCB-DVC Needs Assessment found robust career training pathways because there are clear educational credentials (bachelor’s and master’s degrees in architecture and engineering) and a state professional license requirement based on education, work experience, and a test of competency. This clear career pathway does not exist in the construction trades, where licenses are limited to business owners (contractors not workers) and the license sets a low bar for competency for some key industry actors such as HVAC contractors. With the exception of electricians, the state does not require a certification for

¹⁸³ See Appendix 3F for estimates of the prominent occupations from the Needs Assessment; Zabin, C. et al. (2011). p. 75.

trades workers, and there are few voluntary skills certifications that have achieved broad recognition across the market. The UCB-DVC Needs Assessment highlighted the particularly strong performance of the state-certified apprenticeship programs in preparing workers for long-term careers in the building trades, but noted the lack of such training pathways for trades workers outside of the apprenticeship system.¹⁸⁴ It also pointed out that most workers in the residential construction sector do not go through any formal training but rather learn on the job, which creates challenges for any effort to upgrade these workers' skills en masse.

This analysis also identified a clear need for ratepayer investment, in spite of the abundance of training programs for the prominent occupations related to EE. Because the knowledge, skills and abilities (KSAs) related to energy efficiency are only one component of a much broader overall skills set used in the key occupations, training programs and employer investments in on-the-job training can overlook skills needs specific to energy efficiency. The goal is *not* to train a specific number of EE-only workers, but rather to influence the skills development of a broad set of workers who often are not (and do not think of themselves as) specialized EE workers, but whose actions impact energy use. For example, architects and HVAC workers both have a significant impact on the energy use in buildings, but may not have sufficient EE-specific training to incorporate EE best practice in their work. Ratepayer investment in ongoing training to develop and upgrade the EE skills for workers in key occupations is therefore needed and justified.

In this context, the UCB-DVC Needs Assessment recommended strategic investments to incorporate EE skills into the broader skills sets of workers in the prominent occupations. It emphasized the need to influence the core post-secondary training institutions that have the greatest role in training the future workforce, as well as to upgrade the skills of incumbent workers. The Needs Assessment also pointed out that, aside from some longstanding partnerships with community colleges and certain continuing education providers,¹⁸⁵ the IOUs' in-house, stand-alone classes are isolated from the broader workforce development infrastructure, and often from employer-supported, work-based training as well.

The UCB-DVC Needs Assessment made the following recommendations to increase the impact of ratepayer WE&T investments on skills development for workers in the prominent occupations that affect energy use:

- The IOU WE&T investments should be modified to incorporate critical EE skills in the skills set of incumbent workers, using a sector strategy approach to ensure the commitment of employers to utilize the newly acquired skills of workers who are trained.
- IOUs should support the incorporation of EE specific KSAs in post-secondary training for key occupations, through curricula development and train-the trainer programs, in the key accredited training institutions, including colleges and universities, state-certified apprenticeship, and community colleges, in order to ensure that the next generation of workers has EE knowledge and skills are part of their broader skills set.

¹⁸⁴ Zabin, C. et al. (2011). p. 218-223.

¹⁸⁵ Including the American Society of Heating, Refrigerating and Air-Conditioning Engineers; US Green Building Council; American Institute of Architects; Building Performance Institute; Home Energy Rating System; and North American Technician Excellence.

- Trainings supported by the IOUs should follow best practices for workforce training, incorporating prerequisites to ensure that learners have a similar baseline of skills, and embedding classes in an occupational pathway that can lead to stackable credentials.
- The IOUs should collaborate with employers who have demonstrated commitment to ongoing investments in training, such as those participating in apprenticeship programs, so that ratepayer funds build from already acquired skills and leverage industry investments in training.¹⁸⁶

B. RECENT CHANGES IN IOU PROGRAMMING

In response to the Strategic Plan, the UCB-DVC Needs Assessment, CPUC direction, and recommendations from process and impact evaluations, the IOUs have begun to put more emphasis on workforce skills development in their WE&T programs. The logic model for 2013-14 now makes a distinction between the WE&T program's goal of influencing end user EE investment decisions and its goal of workforce skills acquisition.¹⁸⁷ This new logic model will set the stage for future impact evaluations to assess the specific contribution of classes on skills acquisition and the impact of skills acquisition on energy savings. Past impact evaluations have focused on the impact of class participation on end-users' decisions to invest in EE.

The IOUs estimate that, in aggregate, 45 percent of their programs are now aimed at workforce skills building, and 55 percent at market-building, up significantly from only 25 percent and 75 percent respectively in the last cycle.¹⁸⁸

Some of the promising changes that the IOUs have made for programs that can serve the workforce include:¹⁸⁹

- More classes in stackable series, some with prerequisites and/or screening of participants to target specific audiences.
- Incorporation of preparation for industry-recognized credentials into more class offerings.¹⁹⁰
- A number of new collaborations with community colleges.
- Support for CALCTP training (this was explicitly ordered in D.12-05-015).¹⁹¹

¹⁸⁶ Zabin, C. et al. (2011). p. 295.

¹⁸⁷ Draft logic model provided to authors by the IOUs.

¹⁸⁸ Joint IOU document provided to the authors entitled: "Existing WE&T in New Framework." This estimate is in line with the Centergies process evaluation for 2010-2012, which found that 55% of participants in Centergies programs in 2010-2012 were company owners, managers or supervisors, 37% were non-managerial workers, and 8% were unemployed. See Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PGE0317.01. p. 48-49.

¹⁸⁹ IOU interviews.

¹⁹⁰ While the IOU staff self-reported that few classes directly prepare students for a certification (ranging from 1-16% of classes), the IOUs self-reported that from 23-91% of their classes had a "clear relationship" to a certification. See Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PGE0317.01. p. 52.

¹⁹¹ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015).

- Two class series that require employer commitment to use newly acquired skills of their participating workers (Building Operator Certification [BOC] and retro-commissioning series).¹⁹²
- Efforts to garner input on training priorities from a wider set of industry associations and employers, beyond the traditional base of industry partners and people who participate in IOU offerings.
- Efforts to develop sector strategies.
- More consistent identification of learning objectives for classes.

C. IOU STRENGTH IN MARKET-BUILDING EDUCATION

This Guidance Plan recognizes the importance of both market-building education and workforce skills building. The IOUs have developed a portfolio of offerings designed to encourage end users to invest in energy efficiency and to help contractors and managers convince their clients to invest in energy efficiency. The evaluations of these programs show a positive impact on the behavior of end users; the 2006-2008 Indirect Impact Evaluation found that, as a result of participation in energy center courses 77 percent of commercial survey respondents took actions to save energy at their facilities and 43 percent of residential end-users took actions to save energy in their homes.¹⁹³

The IOUs bring key expertise and resources to their in-house programs for market-building via the Energy Centers. We make several suggestions for improving the effectiveness and efficiency of these offerings, but in general support the IOUs' ongoing approach to market-building activities.

Our suggestion that the IOUs separate market-building activities from skills-building activities in their trainings can help improve both program areas. The needs of buyers and sellers of EE are quite different from the needs of those executing the work, and the strategies for addressing these needs are distinct. Independent programming can allow for tailored approaches for program delivery to each target audience, and thereby strengthen both sets of offerings.

There is of course a blurry boundary between the educational content needed for market-building and skills building. Contractors, facility managers, and other executive decision-makers are important segments of the EE workforce. Increasing their professional effectiveness involves both skills-building and market-building activities, since their occupational skills set includes marketing, sales, financial analysis, and other skills necessary for influencing clients' investment decisions. However, in terms of the best training delivery models, managers and business owners have different needs and opportunities than the rest of the workforce. Program design should address these differences. The delivery format of the IOUs' in-house training offers unique benefits for educating managers, contractors, and end users, whose time is limited and who have little need for continuing education credits or other credentials. Public training funds and programs are also less available for end users and business owners, so the IOUs' in-house, stand-alone classes serve a unique niche. As we will show in the next section, the in-house, stand-alone, open-access delivery model of Centergies is less effective for skills-building programs for the non-managerial workforce.

¹⁹² See Appendix 3A.

¹⁹³ Opinion Dynamics Corporation, Wirtshafter Associates, Inc. Jai J. Mitchell Analytics, and Summit Blue Consulting (2010, March). *Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program (2006-2008)*. p. 74.

D. SHORTFALLS IN WE&T SKILLS-BUILDING PROGRAMS FOR ENERGY SAVINGS

The current IOU approach to skills building now comprises about 45 percent of all their Energy Center offerings.¹⁹⁴ These programs have serious shortfalls that cannot be adequately addressed with minor adjustments such as those suggested for the market-building program in this document and in past Impact Evaluations.¹⁹⁵ Many of the changes that the IOUs have made are positive, but do not represent a coordinated or comprehensive overall approach to workforce skills development.

Most Centergies resources still go to in-house, open-access, one-off lecture-style classes. These offerings do not draw on best practices for skills-building program design and delivery. They are not designed to move workers up from their current skills level to the next recognized standard of competency, do not engage workers' employers, and do not leverage or align with the state's substantial training infrastructure. They do not systematically connect to career pathways or core training institutions for the key occupations that impact energy use, and thus have a limited reach into the EE workforce. The IOUs' training resources have been called upon to advance EE skills for the occupations that are key to meeting the state's ambitious energy goals, but the serious flaws in their current approach to skills building call into question the fundamental design of their programs.

We see the following problems and missed opportunities.

1. Class Design

Best practices for workforce training include clear prerequisites and learning outcomes for each class; classes that are sequenced and build upon each other; competency testing at class completion; links to recognized, stackable credentials; and hands-on learning. All of these features improve the likelihood that workers will successfully gain competency in a new set of skills as a result of training. Although the IOUs have integrated elements of these practices into some Centergies courses, the vast majority of classes do not include these features.

In the process evaluation for the 2010-2012 Centergies program, Opinion Dynamics Corporation (ODC) found that the classes emphasize information about technologies that can help better explain options to clients rather than skill-based outcomes, and that, "most of the courses offer general energy efficiency information but do not necessarily have hands-on components that are useful in helping participants to develop workplace relevant skills."¹⁹⁶ The process evaluation recommended that the offerings employ more in-depth and hands-on learning opportunities, and focus more on improving the competency of workers who apply skills in the field. This outcome is more achievable when participants have similar baseline skills, so that teachers can build upon a common level of knowledge.

¹⁹⁴ Information provided by the IOUs.

¹⁹⁵ Impact Evaluations have only assessed the impact of the programs on EE investment decisions, and have not assessed the impact of these offerings on skills acquisition by participants or on the impact of participants' newly acquired skills on the performance of their employers.

¹⁹⁶ Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PG&E0317.01. p.11.

2. Career Pathways

Best practices in workforce development emphasize the importance of identifying and supporting career pathways.¹⁹⁷ Career pathways should allow workers flexibility to advance in directions that complement their particular interests and strengths, but be sufficiently clearly defined so that the steps along the pathway build off one another in terms of skills acquisition (and compensation). Trainings should be customized for each occupational pathway, as well as for specific steps along the pathway, in order to ensure that they are appropriately matched to a workers' current skills level, and that they are relevant for workers' professional advancement.

The UCB-DVC Needs Assessment identified the very distinct career pathways and training opportunities for the three broad categories of workers executing EE work: professionals, non-residential trades workers, and residential trades workers. Most of the IOUs' current classes lump multiple categories of occupations and stages of career development together. The classes do not align or link with the training and education organizations that typically provide the training for each category of occupations at each career stage, creating a huge missed opportunity for these trainings to contribute to workers' educational and professional advancement. Exhibit 3.1 shows the training pathways for new and incumbent workers across the three categories of occupations that most impact EE. Working within these pathways provides the best opportunity for training the workforce with skills necessary to realize California's energy goals.

3. Sector Strategies

Sector strategies are industry training partnerships that include employers, training and education institutions, labor and community stakeholders, and others. They are designed to meet employers' need for skilled workers and workers' need for employment and career advancement.¹⁹⁸

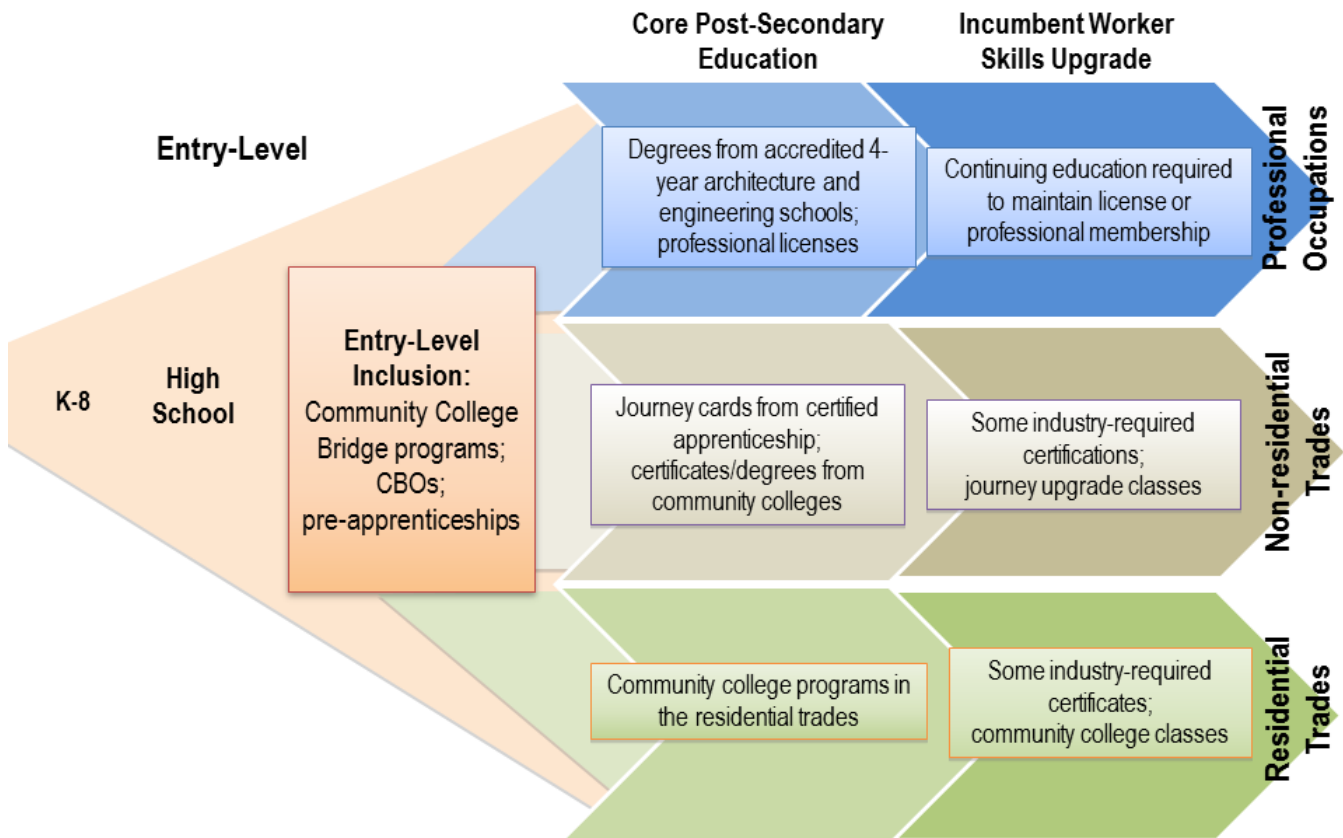
CALCTP is an acclaimed sector strategy in the EE field that created a skills upgrade curriculum and third-party certification for advanced lighting control systems. Over the past five years, CALCTP has trained and certified over 2,200 electricians and awarded firm certification to 90 electrical contractors (with 250 more in the pipeline). Although the IOUs provided seed funds for the development of the curriculum, the vast majority of funding for CALCTP has come from industry and public training funds, including the U.S. Department of Labor, the California Employment Training Panel, the California Community Colleges, and the National Electrical Contractors Association and International Brotherhood of Electrical Workers (NECA/IBEW). CALCTP demonstrates the particular contribution the IOUs can make to overcoming

¹⁹⁷ Training is most effective when it is sequenced for different phases in a career path, starting with basic and foundational skills that are applicable to multiple career pathways, and more specialized skills as people continue their training. An effective career pathway framework comprises a series of structured and connected education programs and support services that enable students to advance over time to better jobs and higher levels of education and training. Each step on a career pathway is designed explicitly to prepare students to progress to the next level of employment and/or education. They are organized around a sequence of credentials that lead learners in attainable steps towards higher levels of education and work. Career pathway certificates and degrees are aligned to skills sets needed in a given industry or occupational sector and have relevance, credence, and currency with employers. Career Ladders Project (2013). *High Impact Pathways* ©.

¹⁹⁸ For analysis of successful sector strategies, see for example, Freely, J., Clymer, C., Conway, M., & Schwartz, D. (2010). *Tuning in to local labor markets: Findings from the Sectoral Employment Impact Study*. Public/Private Ventures.

skills- based barriers to energy savings, since they played a critical role in identifying the need for skills upgrading, convening technical experts to determine the appropriate skills standard, and funding the development of the curriculum.

Exhibit 3.1 Key Workforce Institutions for EE Career Pathways



The IOUs all recognize the value of the CALCTP model and have stated that they support the sector strategy framework. Since 2011, they have devoted considerable effort to initiating and developing programs using this comprehensive approach, including PG&E’s Energy Workforce Sector Strategy (EWSS, an umbrella sector strategy for commercial workers) and the statewide non-residential HVAC sector strategy.

Appendix 3A provides our detailed analysis of the IOU sector strategy efforts, which thus far, apart from CALCTP, have had limited success. Challenges include a lack of consensus among industry partners about purpose, focus, and direction; unfamiliarity among IOU staff with the range of implementation tools and strategies that sector strategy practitioners have developed in other industries; and a lack requirements for specific commitments from employers. In addition, there has not been a dedicated allocation of resources for sector strategies other than PG&E’s consulting contract to develop EWSS.

PG&E has made the most progress on sector strategies through their EWSS, but the pace of progress is much slower than for CALCTP, and the program continues to lack clear focus and an identified industry champion.

The results from the EWSS thus far are an executive sales seminar¹⁹⁹ for C-level business professionals, a class series on energy auditing at San Francisco City College that was cancelled due to the college's accreditation crisis, and a "train the trainer" initiative for community college instructors to upgrade their knowledge of changes in Title 24 building code, to be launched in 2014. One on-going challenge facing the EWSS efforts is that partnerships with employers who commit to employing trained workers (or sending their employees to the training) have not been developed. Employer commitment is a critical element of successful sector strategies because it ensures that new skills will be used on the job.

The HVAC sector strategy, initiated in response to CPUC direction, has faced a number of challenges. According to several interviewees, including IOU staff, the HVAC Sector Strategy became mired in gridlock due to contention about focus among the participating HVAC contractors. In 2011, the California Division of Apprenticeship Standards proposed that the IOUs develop a sector strategy in partnership with the state's apprenticeship programs. The IOUs included this proposal in their 2013-2014 Program Implementation Plans and suggested starting the project with HVAC apprenticeships, but they have not yet been able to carry this initiative forward, either in conjunction with the HVAC Sector Strategy or independent of it.²⁰⁰ DAS and the IOUs have continued conversations, however, and are looking to re-boot their partnership in coordination with the recommendations of this Guidance Plan. In early 2014 SCE took over statewide leadership of the HVAC Sector Strategy, and the IOUs are now re-assessing the initial approach.

The IOUs recently produced a document that sets forth guidelines for the development of IOU WE&T sector strategies, attached here as Appendix 3B "Joint IOU Sector Strategy Foundational Document." This document was authored by PG&E with input from the other IOUs, the California Community Colleges Chancellor's Office, the California Workforce Investment Board, CALCTP, UCB-DVC and others. The document includes a detailed definition of sector strategies, including an outline of expected deliverables and outcomes. Most importantly, it provides criteria by which to judge what constitutes a sector strategy and can be used by the IOUs or others to assess which projects fit the sector strategy definition.

In order to make real and timely progress on sector strategies, the IOUs must develop their internal capacity and dedicate more resources to these efforts. Although it is clear that the IOUs have much to contribute in the way of technical expertise, industry credibility, and resources, there are organizations throughout California with expertise and a track record in sector strategies that may be in a better position to lead such work.

One particular problem we have seen is that the IOUs are very wary of adopting any strategy that can be perceived as excluding some industry players, and instead have attempted to find solutions that work for all industry players who respond to their sector strategy outreach efforts. In our opinion this has compromised their ability to focus on a specific solution to a specific problem for a group of employers who are willing to commit resources and collaborate with other businesses (who may be competitors in the market). By definition, sector strategies require specific commitments from employers and specific voluntary partnerships among multiple employers. In the case of CALCTP, although SCE did outreach to a wide range

¹⁹⁹ While the seminar is extremely promising and may not have developed without the industry convening of the EWSS, it is a market-building program, not a sector strategy as defined by the IOUs.

²⁰⁰ DAS contracted with the UC Berkeley Donald Vial Center to help develop this collaboration and observed the process.

of electrical contractors, the National Electrical Contractors Association responded and took a leadership role, rallying resources and commitments from their members. SCE worked with this group even though it represented only a particular segment of the broader industry. This “exclusion” was temporary, as CALCTP is now an industry-wide certification and training is available at a number of community colleges and the IOU energy centers.

Refer to Appendix 3A for a fuller analysis of the IOU sector strategy efforts to date.

4. Setting Priorities for WE&T Skills Building

In order to maximize the effectiveness and efficiency of WE&T investments’ contributions to the state’s energy savings goals, decisions about which occupations and skills to focus on must be based on a priority-setting process that identifies the areas of greatest need and potential opportunity. The IOUs lack a systematic approach to setting priorities for their WE&T investments that is data-driven, that aligns with other current training initiatives, and that is validated by industry, technical, and workforce experts. Each IOU presently has an informal process for prioritization, relying mostly on feedback from current IOU WE&T participants, current industry partners, and resource program staff. While the UCB-DVC Needs Assessment provided the raw material for systematic priority setting, it did not provide specific guidelines on how to interpret or act on this information. Ensuring the return on ratepayer investment in training requires a clear, transparent process for determining program prioritization and making judgments about critical needs.

In our recommendations, we lay out a process for WE&T program prioritization that uses available information, generates new information where needed, validates information by industry and experts, and identifies ways to align and coordinate with existing training organizations.

5. Workforce Expertise

Collectively, the IOUs’ WE&T staff have a tremendous wealth of expertise on EE technologies and consumer education. However, the weaknesses discussed above show a lack of internal capacity to independently design and execute a workforce skills-building portfolio with robust institutional partnerships. WE&T staff acknowledge that their programs would benefit from additional guidance about how to develop robust institutional partnerships and how to improve their skills-building offerings.²⁰¹ The CPUC’s November 2012 Final Decision approving the EE programs and budgets drew the same conclusion,²⁰² when it directed the IOUs to hire an expert entity to help design a comprehensive approach to WE&T. The CPUC noted that the state’s Labor and Workforce Development Agency, including the Division of Apprenticeship Standards, should advise and assist this effort.²⁰³ The result of this direction is this Guidance Plan, which offers specific recommendations, including recommendations for a process that engages workforce experts in ongoing WE&T program design and delivery. We suggest that ongoing input from these entities should not end with

²⁰¹ IOU interviews.

²⁰² California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 90.

²⁰³ Ibid.

the release of the Guidance Plan, and that this input is critical to the long-term success of the IOU WE&T programs.

6. Accountability

We agree with the CPUC’s conclusion that a lack of internal expertise on workforce issues at the Commission undermines its ability to assess progress on workforce issues. This is an ongoing issue of accountability that we believe requires an ongoing, structural solution. All other major funding streams for workforce education and training have strong boards representing workforce stakeholders and experts. These boards usually have decision-making power over the allocation of funds or approval of programs. This includes the California Workforce Investment Board, the Division of Apprenticeship Standards, and the Employment Training Panel. Educational institutions also have many layers of accountability. In comparison, the CPUC’s oversight of the IOUs for their investments in the WE&T programs is minimal.

In this chapter we also propose a policy-level remedy to the general problem of a lack of coordination and alignment of training resources for the clean energy sectors in the state. This problem goes beyond the purview of the IOUs and even the CPUC, but its existence undermines the IOUs’ ability to set clear WE&T priorities that align with state goals. We propose a steering committee that brings energy and workforce experts together to foster collaboration and alignment between California’s energy and workforce agencies in order to address workforce issues inherent in the state’s clean energy initiatives, including the IOUs’ programs.

E. SHORTFALLS IN WE&T PROGRAMMING FOR THE GOAL OF INCLUSION

This section addresses the goal of inclusion of workers from disadvantaged communities and documents progress to date and remaining challenges. The Strategic Plan specifically calls for training opportunities for workers from minority, low-income, and disadvantaged communities in order to help them advance into “rewarding careers in the energy services fields.”²⁰⁴ The CPUC has a long tradition of considering—and sometimes acting on—opportunities to promote equity and inclusion while at the same time meeting their main mission of energy savings. The removal of barriers for workers from disadvantaged communities not only contributes to equity, but also increases the pool of trained workers to execute EE work, and the diversity of that pool. Career access, advancement, and mobility improve the efficiency of the labor market by ensuring workers have the opportunities to provide their highest value.

The IOUs have also expressed commitment to the goal of preparing and placing disadvantaged workers in career track jobs or training that can lead to job placement. To date their efforts have been limited, however, and a number of staff have acknowledged their lack of expertise in this area.²⁰⁵

1. UCB-DVC Needs Assessment Recommendations for Inclusion

Connecting disadvantaged workers with career track jobs requires specific efforts to overcome challenges on both the demand and supply sides of the labor market. On the demand side, addressed in Chapter 4, it is

²⁰⁴ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

²⁰⁵ IOU interviews.

critical to ensure that jobs are accessible to disadvantaged workers and provide living wages and advancement opportunities. In this chapter (supply side), we examine strategies to prepare workers so that they can take advantage of job opportunities when they arise. This requires deep engagement with workers—providing career matching, screening, and other support, as well as integrated skills training that includes technical training, basic skills, and job readiness in each sector.

The energy efficiency sector can draw from a significant body of work on building pathways out of poverty in other sectors, including the construction industry.²⁰⁶ The UCB-DVC Needs Assessment²⁰⁷ reviewed this work and describes the following elements as critical to building successful pathways:

- Extensive recruitment and screening of candidates;
- Training for soft skills, basic skills, and technical skills;
- Effective adult learning strategies including contextualized learning, cohort-based bridge programs, and schedule accommodations;
- A comprehensive package of services such as case management and career counseling, transportation and child care assistance, etc., that can often be provided through other public funding;
- Stackable, portable, and industry-recognized certifications and credentials;
- On-the-job training or other workplace-based learning;
- A sustainable funding source to ensure support is uninterrupted; and
- Measurement of outcomes, including job placement and retention, is important for evaluating the success of a program.

The UCB-DVC Needs Assessment highlighted *pre-apprenticeship programs that are linked to state-certified apprenticeship programs* as a model with a strong track record for moving workers from disadvantaged communities into middle class, career track construction jobs. Once participants graduate from a pre-apprenticeship program, they can then enter an apprenticeship program that provides an ongoing, learn-while-you-earn pathway in which wages rise as skills are acquired.

Because of the comprehensive set of services required to successfully address inclusion goals, the UCB-DVC Needs Assessment recommended that the IOUs work with organizations that follow these best practices and have a track record of success in placing disadvantaged workers in career track jobs and/or further training. It also suggested that the IOUs allocate funds to support this goal.

²⁰⁶ See, for example, Giloth, R. (2004). *Workforce Intermediaries for the 21st Century*. Philadelphia, Pa.: Temple University Press.; Fitzgerald, J. (2006). *Moving Up in the New Economy: Career Ladders for U.S. Workers*. Ithaca: Cornell University Press.; or Maguire, S., J. Freely, C. Clymer, D. Schwartz, & M. Conway (2010). *Tuning in to Local Labor Markets: Findings from the Sectoral Employment Impact Study*. Philadelphia: Public/Private Ventures.

²⁰⁷ Zabin, C. et al. (2011). p. 272-274.

2. Recent IOU Efforts for Inclusion

WE&T offerings lack cohesive programming to target skills development for disadvantaged workers and remove barriers facing disadvantaged communities. Although IOU WE&T staff support the inclusion goal, they have not established a program with clear objectives or strategies.²⁰⁸ In interviews, IOU staff attributed this delay to two main obstacles. The IOUs have addressed inclusion in both Centergies and Connections. In Centergies, they have made an effort to offer classes in locations that are accessible to participants from low-income communities.²⁰⁹ Without also offering the types of comprehensive services identified above, accessible locations of classes will not lead to positive outcomes for workers from disadvantaged communities. Some Centergies have collaborated with organizations serving disadvantaged communities; for example PG&E formed a strong partnership with the Center for Employment Training to support inclusion goals. However, these partnerships are ad hoc, rather than based on a systematic outreach to organizations serving disadvantaged communities, clear criteria upon which to choose partners, or clear program objectives.²¹⁰ The 2010-2012 Centergies Process Evaluation found that, in spite of a will to do so, the Energy Centers have not reached disadvantaged workers.²¹¹ Overall the Centergies inclusion efforts are not effective because they do not incorporate activities that are necessary to successfully improve outcomes for disadvantaged workers, in particular evidence-based best practices or leverage established workforce partnerships, pathways, resources, and institutions.

The IOUs have addressed inclusion through the Connections programs as well, by targeting some of their K-14 partnerships to schools serving low-income youth. Such efforts provide enrichment to students who otherwise would not be exposed to energy efficiency. For example, PG&E's Energenius program, which is funded through Connections, conducts targeted outreach to Title I schools (those with at least 40 percent of the student population eligible for Free and Reduced Lunch) and indicates that 60 percent of Energenius schools are Title I.²¹² This intentional targeting represents the IOUs' most effective use of resources to support low-income students, but it doesn't address the specific goal of helping disadvantaged youth gain access to career-track jobs or further training that leads to rewarding careers. The Connections programs mostly focus on broad energy education and awareness, and are lacking in the career technical education needed to help disadvantaged students make a successful transition from school to career track work or to post-secondary career training.

Connections programs such as PEAK, LivingWise, and PowerSave instill energy-savings awareness more akin to consumer education than career development. Even the 9-12 program Green360, which is focused on green career exploration, lacks the linkages needed to provide pathways into careers for disadvantaged

²⁰⁸ IOU interviews.

²⁰⁹ IOU Interviews.

²¹⁰ For example, PG&E has formed a strong partnership with the Center for Employment Training (CET) to support inclusion goals and create opportunities for career ladders for underserved populations. According to CET, the relationship was developed after a student attended a PG&E course and took the initiative to develop a relationship with the Pacific Energy Center.

²¹¹ Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PGE0317.01. p. 49-50.

²¹² IOU interviews.

students. Although it does provide a portal for students to connect directly with industry professionals, much of this program is focused on education about energy fundamentals, climate protection, and energy efficiency systems as a strategy to mitigate climate change and promote sustainability. Such exposure to EE topics at an early age can provide a foundation for future interest in careers in EE, but the connection between broad awareness and career exploration is lacking.

For career preparation and successful school-to-career transition, the IOUs would have more impact if they supported efforts to promote and implement energy efficiency skills building linked to articulated career pathways. This could be done via collaborations with existing initiatives such as the California Partnership Academies²¹³ (CPA), the California Linked Learning Initiative,²¹⁴ and the new \$250 million California Career Pathways Trust.²¹⁵ The first two programs have already demonstrated success in linking 9-12 education with viable post-secondary professional pathways such as apprenticeship, college certificates, and degrees. These initiatives are based on widely accepted best practices²¹⁶ that strengthen education and student success. Such practices are more effective in engaging and preparing students for future careers by first finishing high school and then transitioning to jobs or further education. These programs show a higher high school graduation rate, which is necessary for college entry and most good jobs: 95 percent of CPA students graduate compared to 85 percent statewide.²¹⁷ Linked Learning students have shown improved performance in teamwork, problem solving, using information and technology, and presentation skills.²¹⁸ Students engaged in sector-based experiential learning are more likely to understand their career options and to have motivation to explore careers.²¹⁹ Aligning the IOU Connections funding with these efforts would signify incorporation of these best practices. It would likely increase the impact of IOU funds on the career trajectories of participating students, compared to what the current Connections enrichment programs can do on their own. PG&E has used shareholder funding (not Connections funding) to invest \$1 million in five New Energy California Partnership Academies, recognizing the value of these pathway initiatives to support energy careers.

²¹³ Career Advancement Academies (CAA) were designed to establish pipelines to college and high-wage careers for young adults facing multiple barriers to post-secondary education. In place since 2007, CAAs serve 27 college sites with \$31 million funding by the California Community College Chancellor's Office to date. The California Community College Career Advancement Academy Phase III grant cycle will award up to \$6 million in SB 1070 (Steinberg) Career Technical Education Pathways Program funding over three years, including \$4 million FY 13-14 budget, with potential renewal of up to a total \$2+ million for FY 14-15. These renewal grants will aim to both scale and institutionalize CAAs and their key elements under four previously-funded regional consortia.

²¹⁴ Career Ladders Project (2013). *California Community College Linked Learning Initiative*. See <http://www.careerladdersproject.org/initiatives-programs/california-community-college-linked-learning-initiative-cccli-2/>

²¹⁵ The California Department of Education Career Pathways Trust (AB 86) allocates \$250 million for 2014-2016 to establish regional consortia of K-12 and community college districts for "the purpose of developing regional plans to better serve the educational needs of adults." Included in the list of target areas: A) Short-term career technical programs with high employment potential and B) Programs for apprentices. See <http://www.cde.ca.gov/ci/ct/gi/ccptinfo.asp>.

²¹⁶ The James Irvine Foundation (2013). *Evidence (for Linked Learning)*; ConnectEd: The California Center for College and Career (2010). *Why Pathways? A better approach to transforming high school education in California*.

²¹⁷ Dayton C., C.H. Hester, D. Stern (2011, October). *The California Partnership Academies 2009-2010*. California Department of Education.

²¹⁸ Linked Learning Alliance. (n.d.). *Evidence of Effectiveness*.

²¹⁹ Conway, M. and Blair, A. (2006). *Skills to Live By: Participant Reflections on the Value of their Sectoral Training Experience*. The Aspen Institute.

The Connections programs also serve K-8 via programs that emphasize energy awareness. Although some have suggested that these program could also serve a career exploration function, at this early stage of educational development the key tools that are related to eventual careers in EE are general science and math curriculum that is project-based, experiential, and aligned with K-12 standards.²²⁰ For career development, K-5 should focus on getting students ready for middle school and 6-8 should focus on getting students ready for high school. The Connections programs can add enrichment within this framework but EE-specific curriculum should not be considered essential to career development for EE occupations at the K-8 levels.

3. Insufficient Expertise and CPUC Direction for Inclusion Goals

A main reason for the IOUs' weaknesses on inclusion efforts is the same as their weaknesses on skills-building programming for energy savings: a lack of internal expertise on workforce development best practices and failure to leverage existing infrastructure and resources in the state. Our findings suggest that IOU WE&T staff and managers will need ongoing, structured input from workforce development agencies, experts, and stakeholders in order to develop the internal expertise and relationships to create successful systematic collaborations with the state's key workforce training institutions. Our recommendations on this topic can help improve WE&T efforts for energy savings and inclusion, because workforce experts can offer insight on the effectiveness of programming for skills acquisition as well as worker career advancement. In addition, successfully engaging disadvantaged workers in training programs will require that the IOUs develop a specific program to support inclusion. This program needs goals and a strategy to achieve them, a dedicated budget, and metrics to measure outcomes. This document provides the guidance necessary to develop such a program, which is described in greater detail in Chapter 4.

Another critical reason that the IOUs have not made progress on inclusion is that they lack clear direction from the CPUC. IOU staff voiced concerns about how much to prioritize these activities since they are unlikely to have a positive impact on energy savings in the short term.

²²⁰ Harris, B.W. (2013, August). *Career Technical Education Pathways Initiative*. California Community Colleges Chancellor's Office.

III. RECOMMENDATIONS

RECOMMENDATIONS: LABOR SUPPLY STRATEGIES FOR ENERGY SAVINGS AND WORKFORCE INCLUSION

General Recommendations	Specific Recommendations		Goal
<p>A. Create a dedicated skills-building portfolio targeting both energy savings and workforce inclusion goals.</p>	<p>1. Implement the skills-building portfolio via two RFPs: one for the goal of energy savings and one for the goal of inclusion. The RFPs should be based on a sector strategy and career pathways framework, and partnerships with core training and education institutions.</p>	<p>a. Administer RFP #1 to fund projects addressing EE skills building. Projects to be funded include:</p> <ul style="list-style-type: none"> iii. Sector strategies targeted at incumbent workers, built on regional partnerships and engagement of multiple employers. Allowable activities include curriculum and certification development, instructor training, and piloting of training for incumbent workers. iv. Collaborations with core education and training institutions (high schools, community colleges, state-certified apprenticeships, 4-year colleges and universities). Allowable activities include curriculum and certification development, instructor training, and piloting of new courses. 	Energy
		<p>b. Administer RFP #2 to fund training programs that connect disadvantaged workers to jobs and career pathways in EE. Projects to be funded include:</p> <ul style="list-style-type: none"> iii. Inclusion sector strategies that leverage Workforce Investment Board (WIB) and other resources. iv. 9-12 educational partnerships with a career-technical and career development focus. 	Inclusion
	<p>2. Adopt a priority setting process based on needs and opportunities to impact energy savings and inclusion goals.</p>	<p>c. For energy savings, the process should identify priority occupations, skills gaps, skills standards and certifications, and intervention strategies, and prioritize interventions by energy savings potential and scale of impact.</p>	Energy
		<p>d. For workforce inclusion, the process should identify the demand for entry-level EE workers, career advancement paths, and regional need, and prioritize programs with strong job placement track records.</p>	Inclusion
	<p>3. Engage a Peer Review Group of key workforce stakeholders and experts to advise the IOUs on the development of the skills-building portfolio</p>	<p>a. The role of the PRG should be to:</p> <ul style="list-style-type: none"> • Participate in the design of the RFPs for the skills-building portfolio by identifying guiding principles and criteria for project selection; • Provide input on appropriate metrics of success; • Participate in review committee to select winning proposals; • Advise the IOUs on the selection of staff or consultants to administer the RFPs; • Provide ongoing input and feedback as needed throughout program implementation; and • Offer feedback on program effectiveness upon completion. 	Energy and Inclusion
		<p>b. Staff and/or consultants should have appropriate expertise, experience and relationships to administer the RFPs. Their role should be to:</p> <ul style="list-style-type: none"> • Draft RFPs based on the PRG's guidance and priority-setting; • Propose specific skills-building priorities for review by the PRG; • Oversee the administration and review of the RFPs; and • Support implementation, including helping to convene regional training partnerships, identifying opportunities to leverage other efforts, providing technical assistance, and carrying out field reviews. 	Energy and Inclusion

General Recommendations	Specific Recommendations		Goal
<p><i>(continued)</i></p> <p>A. Create a dedicated skills-building portfolio targeting both energy savings and workforce inclusion goals.</p>	<p>4. Fund three phase-one programs that can begin in 2015. Dedicate unencumbered resources (we suggest approximately \$4 million for each phase-one program).</p>	<p>Program #1: Issue an RFP for projects to enhance EE content in the core curricula for accredited degree programs for architects and engineers.</p>	Energy
		<p>Program #2: Carry out a program to enhance and verify EE skills for the key trades in the state-certified apprenticeship system, via a partnership with the Community College Chancellor's Office of Apprenticeship and the California Division of Apprenticeship Standards.</p>	Energy
		<p>Program #3: Issue an RFP for projects to support inclusion via pre-apprenticeship bridge programs to prepare entry-level EE workers or job-seekers for opportunities in higher skilled and higher wage employment in MUSH (municipalities, universities, schools, and hospitals) sector EE work, other skilled construction jobs, and/or further training. Model the RFP after the CWIB's Prop. 39 RFP.</p>	Inclusion
<p>B. Modify WE&T program for market building.</p>	<p>1. Modify Centergies market-building class design and delivery.</p>	<p>a. Develop market-building offerings in coordination with ME&O, skills-building portfolios, and resource programs.</p>	Energy
		<p>b. Target classes to specific market-building audiences.</p>	Energy
		<p>c. Lower ratepayer costs by charging fees for classes where feasible, recording and broadcasting classes via an IOU joint WE&T website, and lowering administrative expenditures.</p>	Energy

IV. RATIONALE

We recommend that the IOUs restructure their WE&T programs in order to separately address market building and skills building, and to improve the effectiveness of both sets of activities. Our recommendations for the skills-building programs represent a significant departure from the IOUs' current strategies. We suggest a full program redesign with increased participation and input from state workforce development experts and institutions. In contrast, the modifications we propose for the market-building programs are modest.

A. CREATE A DEDICATED SKILLS-BUILDING PORTFOLIO THAT TARGETS BOTH ENERGY SAVINGS AND WORKFORCE GOALS

We propose that the IOUs create a dedicated skills-building portfolio, with distinct goals, program design, and a dedicated budget, separate from the market-building offerings. This represents a significant restructuring of the IOUs' approach to skills building in the WE&T program, which will improve its overall effectiveness and alignment with the Strategic Plan's vision for workforce development in energy efficiency. The program theory for this new skills-building initiative, with goals, activities, and outcomes, is illustrated in the new logic model in Chapter 5. The skills-building portfolio should address both energy savings and inclusion goals.

ENERGY SAVINGS GOALS:

- Upgrade the EE skills of incumbent workers currently employed in jobs that impact energy use in buildings, industry, and agriculture.
- Incorporate EE skills in the main training and education institutions that prepare the future workforce in priority occupations that impact energy use.

INCLUSION GOALS:

- Support the preparation of workers from disadvantaged communities for career track jobs in EE-related occupations through training, job placement, and support services.

The skills-building program will leverage the state’s core accredited education and training institutions, promote best practices for workforce development, including (but not limited to): the identification and use of skills standards and certifications, employer commitment to hiring and utilizing trained workers, and support for specific activities to prepare workers from disadvantaged communities for employment and further training in EE-related careers.

1. Implement the Skills-Building Portfolio via Two Coordinated RFPs: One for the Goal of Energy Savings and One for the Goal of Inclusion

We recommend that the IOUs administer the skills-building portfolio through a state-wide competitive solicitation (RFP) to regionally-based workforce development practitioners and partnerships. The IOUs should base the development of the solicitation on the priority-setting process described below (A.2. Develop a Clear Process for Prioritizing Activities), with input from the Peer Review Group (recommendation A.3.). The PRG and IOUs may determine that it is appropriate to hire expert consultants or new staff with workforce experience and expertise to guide and support the RFP process.

An RFP is a strategic procurement process, which has a number of benefits that can overcome the problems we identified in the IOUs’ current skills-building program, and can support both energy and inclusion objectives. RFPs can channel funds to organizations with core competencies and on-going roles in the implementation of training programs. Such a procurement policy does not preclude IOU-led current or future efforts, but does require that they meet the same criteria as other winning proposals and fit into the overall prioritization scheme. An RFP process is now used to administer the Connections program, so this is a familiar mechanism for the IOUs. It is a tried-and-true formula for sector strategy training partnerships and is utilized by the California Workforce Investment Board, the U.S. Department of Labor, the California Community College Chancellor’s office and many other workforce development agencies. It allows flexibility in the choice of lead organizations, including workforce intermediaries who specialize in building workforce development sector strategies. This flexibility is a beneficial feature since the capacity of key partners may differ by region, sector, or targeted participant group. Core post-secondary training and educational institutions, other training organizations, and sector strategy intermediaries are all accustomed to responding to RFPs and often use such funding opportunities as a way to introduce new curricula, engage new sets of employers, or serve specific populations.

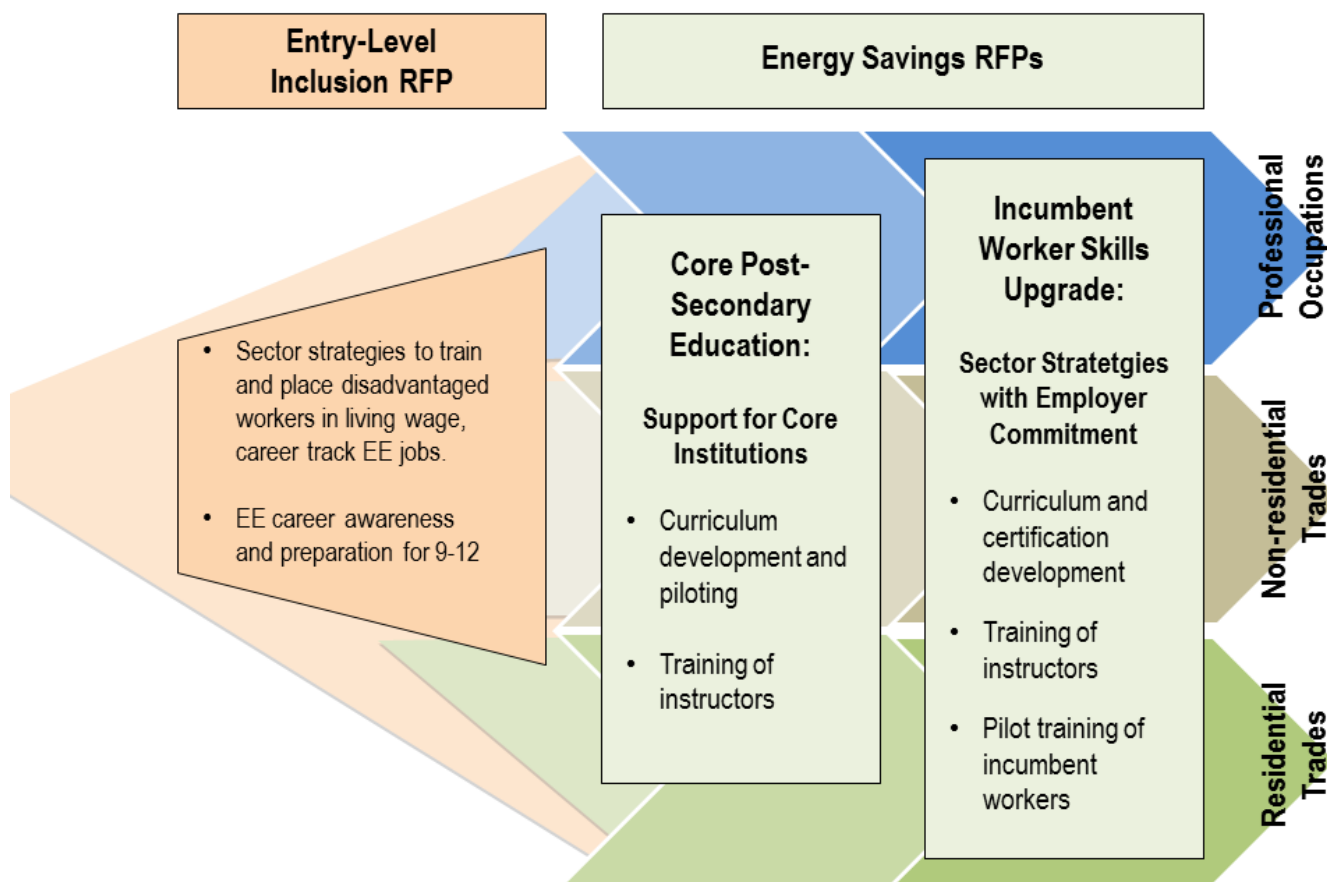
An RFP process will open up competition to a greater number of eligible and quality applicants, and create opportunities to leverage funds via the requirement for co-funding. The procurement process should clearly outline the functions, activities, and outcomes to be achieved, and align these with specifically identified skills and job needs as determined by the funder and employers. Since applicants will be required to track specific metrics, this will allow for a transparent analysis of program/training provider effectiveness and performance and allow normal IOU and CPUC EM&V processes to proceed. RFP-based projects also are able

to conform to whatever funding cycle length is set since the burden is placed on the applicant to plan what they can do within a particular budget and time period.

The RFPs should include best practice criteria for workforce development such as alignment with existing training institutions and infrastructure, a career pathways framework, engagement of employers through sector strategies, and regionally-based partnerships.²²¹ The RFPs should require matching funds and rank proposals by the level of matching funds from employers and/or training institutions. They should also ensure distribution of funds across IOU territories. Finally, the IOUs should work with EM&V groups to ensure that appropriate performance metrics are included as a requirement for funding.

We recommend the skills-building program include two RFPs to be issued at the same time: one for workforce skills development *for energy savings*, and one for workforce skills development for *inclusion*. The skills-building portfolio components and the details of the two RFPs are shown in Exhibit 3.2, and described in greater detail in Appendix 3E. We anticipate that individual grants would range from \$500,000 to \$5,000,000 depending on the scale of the program and the specific activities to be funded.

Exhibit 3.2 WE&T Skills-Building Program Components



²²¹ See Appendix 3E for a complete list of our recommended criteria for the skills-building RFPs.

The reasons for two separate RFPs are that different organizations are likely to apply, and different expertise is required for design of the RFP, review of submittals, and selection of winning proposals. The review committee (members of the PRG, described below) for the Workforce Development–Energy Savings RFP should include technical subject matter experts, workforce experts, and leaders from the core training institutions, as well as labor and industry representatives. The review committee for the Workforce Development–Inclusion RFP should also include low-income advocacy groups and experts on inclusion of disadvantaged workers.

The Workforce Development–Energy Savings RFP should address skills building directly related to energy savings. It should include funds for:

- Sector strategies targeted at incumbent workers, with the goal of measurable improvements in quality of work performed by contractors whose workers receive training. The sector strategies should be built on regional partnerships among industry and educational institutions, on specific commitments from employers to co-fund training and/or use new skills in the field, and on leveraging other funding sources. Allowable activities would include curriculum and certification development, instructor training, and piloting of training for incumbent workers for a limited time period.
- Core education and training institutions (4-year colleges, community colleges and state-certified apprenticeship programs), with the goal of incorporating EE skills into credentialed programs for professionals and trades workers. Allowable activities would include curriculum and certification development, instructor professional development, and piloting of new courses for a limited time period. When there is a central leadership body with a regulatory role over somewhat autonomous local institutions, like the DAS or the California Community College Chancellor’s Office’s role over individual apprenticeship programs and colleges, the IOUs should partner with this body to design the RFP and carry out any development work necessary to issue the RFP to local or regionally-based programs.

The Workforce Development–Inclusion RFP should be dedicated to skills-building activities linked to career pathways for workers from disadvantaged communities. It should include funds for:

- Sector strategies comprised of regional partnerships of employers, community colleges, workforce investment boards (WIBs), and labor and community-based organizations that leverage WIB and other funding sources to train and place disadvantaged workers in state approved apprenticeship programs or living wage, career track jobs in EE-related occupations.
- Core 9-12 education institutions (California Partnership Academies, Linked Learning, high schools, Regional Occupation Programs) to incorporate EE skills into standards-aligned career technical curriculum and to articulate career technical education with employment opportunities or post-secondary training. The RFP should provide funding for curriculum development and implementation, faculty training, industry engagement, work-based learning, and articulation efforts.

2. Develop a Clear Process for Prioritizing Activities

We recommend establishing specific processes for identifying the priorities for the RFPs. The priorities for energy savings and those for inclusion must be set separately; in the first case they will be based on assessments of which workforce development efforts will have the greatest impact on energy savings, and in the second case the priorities will be based on an assessment of which efforts will do the most to move disadvantaged jobseekers into rewarding EE careers.

The IOUs should lead the priority-setting processes with significant input from the PRG. Priorities will evolve over time, and will require that the IOUs make adjustments as needed. Since some of the data needed to set priorities is not yet collected, for this Guidance Plan we focused on identifying the process that the IOUs should follow to set WE&T priorities, rather than producing a comprehensive and detailed set of priorities for the next three to five years. However, we did develop proposals for Phase One projects based on the priority setting process explained here using information from the UCB-DVC Needs Assessment. This will allow the IOUs to launch the redesign of the skills-building program in 2015 instead of delaying action until the longer cycle that is proposed to start in 2016. Phase One projects are presented in Section 4.

a. Priority-Setting for the Workforce Development–Energy Savings RFP

The IOUs should lead the priority-setting process for the energy savings skills-building portfolio because they have internal energy expertise, and/or can access the appropriate energy subject matter expertise to determine priority areas for skills development. However, they also need to access labor market and workforce development experts for key components of the process described below.

i. Identify Priority Occupations

The first level of prioritization is based on estimates of the number of current and future jobs generated by EE investments, by occupation. The IOUs can start with the UCB-DVC Needs Assessment’s projections of jobs and prominent occupations. We recommend a simplified update to these projections every five years, carried out by labor market experts. In addition to the overall numbers of jobs and workers in key occupations, the occupations should be ranked based on their energy impact, since some occupations have a greater impact on energy savings than others.

Exhibit 3.3 is a summary of the priority occupations based on the UCB-DVC Needs Assessment job projections, categorized by sector and building system (see Appendix 3F for the full list of job projections from the Needs Assessment).²²² These occupations include:

²²² Since the Needs Assessment methodology focused on direct jobs generated by investments in energy efficiency, we added in building operations due to input by IOU staff, SMEs and research reports such as the PECEI report that showed that improvements in the operation of building systems, such as HVAC and lighting, can reduce energy consumption by an estimated 5 to 20 percent for an existing commercial building. See Portland Energy Conservation, Inc. (1999, September). *Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations*. p.1.

- The professional occupations that affect the use of energy across the economy such as architects and engineers, as well as facility managers; and
- The building and construction trades that install, maintain, and operate key building systems such as lighting and HVAC, and, to a lesser extent, trades that work on building envelopes.

Exhibit 3.3 Priority Occupations

Sector	Occupation	Professional or Trade	Building System	Accredited Occupational Credential	EE Certification
Commercial	Architect	Professional	Envelope, Mechanical and Electrical	4-yr degree, license	multiple
	Engineer	Professional	Envelope, Mechanical and Electrical	4-yr degree, license	multiple
	Facilities Manager	Professional	Mechanical and Electrical	4-yr degree	multiple
	Electrician	Trade	Electrical	Journey card; community college certificate or degree	CALCTP
	Sheet Metal Workers, Plumbers, and HVAC technicians	Trade	Mechanical	Journey card; community college certificate or degree	multiple
	Building Operators/ Stationary Engineers	Trade	Mechanical and Electrical	Journey card; community college certificate or degree	BOC*
	Carpenters, Laborers, Glaziers, Insulators, etc.	Trade	Envelope	Journey card; community college certificate or degree	
Residential	Whole House Performance	Trade	Envelope		BPI
	HVAC installer/technician**	Trade	Mechanical	Community college certificate or degree	multiple
	Carpenters, Laborers**	Trade	Envelope		

*BOC requires a less-developed set of skills than a journey card for stationary engineers.

**There are a small number of apprenticeships in the residential trades and a small number of community college programs in residential building envelope trades, but these have a limited impact on the market due to scale.

As noted earlier, the UCB-DVC Needs Assessment estimated that about two-thirds of the jobs generated by EE investment are in the trades, and one-sixth are in the design professions; the remaining are in administrative and other jobs that require no specialized EE knowledge or skills. These broad occupational categories are not likely to shift dramatically as California progresses toward its long-term EE goals, however new technologies, shifting state policies, changes in the IOU portfolio and in market conditions are all likely to affect which are the most critical specific skills within these occupations.

The prioritization of occupations needs to consider not just the share of each occupation in EE jobs but also their impact on energy savings. The American National Standards Institute (ANSI) has proposed a rigorous method of assessing the energy efficiency content of occupations through an analysis of the energy impact of each of the tasks in a particular occupation (“job task analysis”).²²³ However, because job task analyses are not yet available for most of the key occupations, we suggest that the IOUs rank occupations based on input from IOU staff, subject matter experts (SMEs), and industry, using their knowledge of energy use by building system. The list of occupations and building systems must be divided by residential and non-residential sectors (or subsectors thereof) because of differences in the detailed occupational job classifications by sector, as well as the energy impact of each classification. As our recommendations for data collection proposed in Chapter 5 are implemented, more refined data on the energy impact of specific occupations in specific market segments will become available.

ii. Identify Priority Areas for Skills Upgrades

The second level of prioritization identifies the priority areas for skills upgrade investments among the critical occupations. See Exhibit 3.4 for an illustration of the multiple potential causes of skills gaps. Currently, there are no processes or data collection protocols to easily capture the areas in which skills upgrades will be needed; our recommendations for data collection in Chapters 2 and 5 begin to remedy this. Critical data needs include documentation of measures with high incidences of non-conformity with technical specifications, and documentation of contractor and worker competencies for emerging technologies as they are incorporated into resource programs. Until this information is available, the IOU staff and PRG members leading the priority-setting process should gather data from a variety of sources and SMEs and use this information to prioritize critical skills upgrade needs for the RFP solicitation.

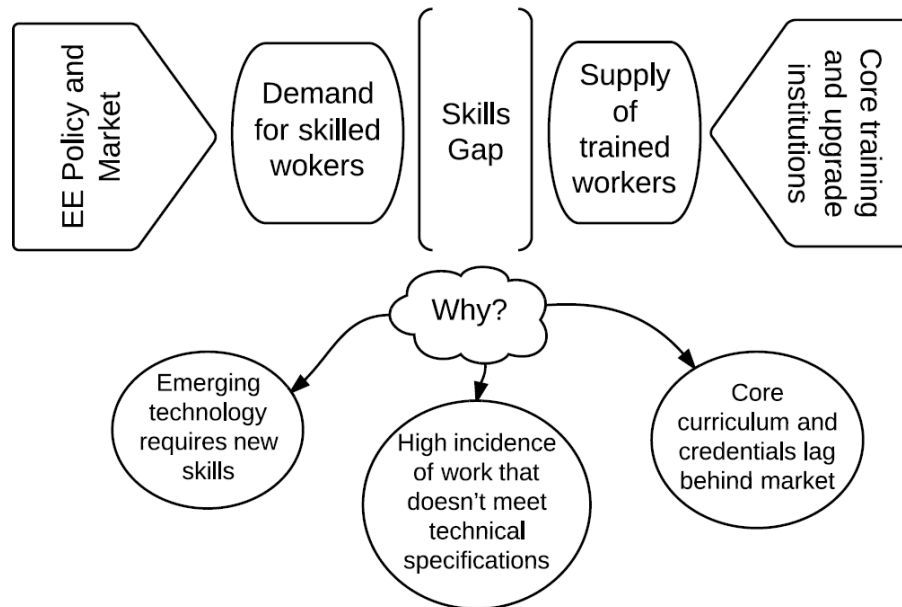
As part of the process of determining priority areas for skills upgrades, it is essential to identify the existing credentials and training most closely related to these skills, and to then build on these training programs, rather than create new specialized programs divorced from broader credentials. Likewise, it is important to target skills upgrade training first to the set of workers with the strongest skills base to build on. Ratepayer-funded efforts to upgrade EE skills should build from the skills sets of already trained workers and “top off” their skills, rather than attempt to train all workers regardless of their base skills level. A key feature of CALCTP’s success is that it provides skills upgrade training to already highly skilled electricians, who are required to have the California electrical certification.²²⁴ CALCTP identified a clear baseline of skills, and upgrade efforts built upon this strong foundation. This strategy does not exclude workers or contractors with lower skills, but requires that they acquire skills up to the baseline before entering upgrade programs. In contrast, with HVAC work, where quality problems have been well documented, IOU efforts to upgrade skills

²²³ Energy Efficiency Standardization Coordination Collaborative of the American National Standards Institute (2014, January). *Standardization Roadmap: Energy Efficiency in the Built Environment*. Version 1.0, Draft for Public Comment. p. 152.

²²⁴ See Appendix 3A on sector strategies for an analysis of CALCTP.

have notably *not* focused on workers with the highest skills set who would require the least amount of new training investment. Rather, they have attempted to accommodate all industry players in a single training strategy.²²⁵ This approach is not an effective ratepayer training investment.

Exhibit 3.4 Need for Skills Upgrades



The identification of priority skills upgrade needs also should include an assessment of the current supply of trained workers and the current output of existing training programs that address these skills, relative to market demand for these skills. This is necessary to avoid the over-supply of trained workers and duplicative training programs. Although CALCTP is a model training and certification program, it still faces a demand challenge. Because the IOUs have not made CALCTP certification a requirement in IOU incentive programs that includes advanced lighting controls, demand is weaker than was anticipated when ratepayer, industry and public training investments in CALCTP were made. Currently there are CALCTP-certified contractors and electricians who are not using their training.

iii. Identify and Use Skills Standards

The identification of skills standards—the knowledge, skills, and abilities (KSAs) to perform a job effectively and safely—must derive directly from technical specifications. There is an established and rigorous process used in many industries to develop skills standards from technical

²²⁵ Authors' observations of the IOU HVAC sector strategy meetings.

specifications through an analysis of the key job tasks and associated knowledge and skills needs.²²⁶ One commonly used method to develop skills standards is DACUM (Developing A Curriculum), a quick, effective, and relatively low-cost process for analyzing jobs and occupations that has been used worldwide for more than 40 years.²²⁷ The DACUM process produces a chart that lists the duties, tasks, and related information about a particular job; this information can then be translated into a description of the skills and knowledge needed to perform the job. It also serves as a basis for certifications as well as curriculum development and review. The U.S. Department of Energy and the National Renewable Energy Laboratory have produced a number of job-task analyses with associated KSAs that the IOUs or others can use as a model for how to do this.²²⁸

Energy efficiency work continues to suffer from a lack of well-developed skills standards. Skills certifications, which are meant to test an individual's competency for a specific skills standard, are prolific for EE work, but their quality cannot be easily assessed objectively. Many existing certifications are not accredited by recognized entities such as ANSI, which verify that certification bodies follow accepted procedures to ensure validity, fairness and transparency. There has been a recent national effort to map certifications in order to begin to create a clearer picture of which certifications should be used where. This was initiated by ANSI's Energy Efficiency Standardization Coordination Collaborative, in cooperation with the U.S. Department of Energy (DOE), but later abandoned because they could not assess the quality of the certifications, in terms of either their substantive content or their procedures.²²⁹

The DOE is in the process of developing national skills standards for key energy efficiency occupations; it hopes to have skills standards for key commercial facility management and building operation occupations by the end of 2015.²³⁰ These national skills standards will provide a basis for choosing amongst certifications and will greatly reduce the chaos that currently exists. When these are available, the IOUs should use them to help guide priority-setting for the identification of appropriate certifications and key workforce investments.

Until there are robust national skills standards and corresponding certifications across the spectrum of key occupations related to EE, the IOUs and other EE program administrators must set priorities for ratepayer investment in workforce development using the best available data and following the advice of subject matter and workforce experts. In Chapter 2, we provided a decision tree for the

²²⁶ Goldstein, B. (2014, March 14). *U.S. Department of Energy: Federal Recognition for Workforce Standards and Credentials in the Energy Efficiency Sector*. Presentation to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

²²⁷ For example, see Center on Education and Training for Employment at The Ohio State University (n.d.). "DACUM and SID Training Information."

²²⁸ For examples of how to develop KSAs for specific occupations, see <http://www.nrel.gov/docs/fy14osti/60447.pdf> and http://www1.eere.energy.gov/buildings/commercial_initiative/pdfs/energy_manager_jta_comment.pdf. These two reports address required KSAs for a Multi-family Energy Auditor and Energy Sustainability Manager, respectively.

²²⁹ UC Berkeley Don Vial Center served on the workforce committee of the ANSI EESCC in 2013. See Energy Efficiency Standardization Coordination Collaborative of the American National Standards Institute (2013). *EESCC Inventory Database: Conformance Programs and Rating & Labeling Systems*.

²³⁰ Goldstein, B. (2014, March 14).

incorporation of skills standards and certifications in IOU EE programs, noting that when no adequate skills standard exists, WE&T investments should fund their development. In Section 5 of this chapter, we recommend that the California Energy Commission convene a steering committee to provide guidance on skills certifications (and other issues).

Skills standard development should be guided by technical skills panels composed of guided by recognized subject matter experts (SMEs) in the relevant building systems and technologies. The process requires the following steps:

- Gain consensus within the technical skills panel on the key technical standards relevant to the particular building system, new technology, or measure with persistent quality issues.
- Use the DACUM or a similar tool to develop occupation-specific KSAs to address existing quality issues or new technology, working with the technical skills panel, curriculum specialists, and leading employers.

In our view, the IOUs can either lead the skills standard development process or solicit proposals from qualified applicants to do so as part of the RFPs. In the case of CALCTP, Southern California Edison convened the technical skills panel that determined the KSAs, and workforce and industry partners developed the curriculum and certification, and carried out the training.

iv. Determine the Appropriate Intervention Type

Once priority skills upgrade needs are identified, the IOUs, with input from the PRG, should determine the appropriate strategies for intervention. These interventions can include any of the following activities: skills standard development, curriculum review, modification, or development; skills certification modification or development; training of instructors; and finally, training of workers. The appropriate strategy depends on whether or not skills standards, certifications, and curricula already exist. If any of these don't already exist, the IOUs should prioritize their development rather than invest immediately in training. If the skills gap is very small, it should simply be incorporated as an update to existing curricula and certifications. To the extent possible, ratepayer funds should be used to add energy efficiency content to broad occupational training provided by other training institutions. Funding actual training may also be necessary given the need to prime the market and encourage adoption of EE measures before they are in high demand in the market. However, co-funding from employers or training institutions should be encouraged even in the short run, and in the longer run training organizations and/or employers should be expected to seek non-ratepayer funds for training. Key partners here include community and four-year colleges and universities, state-certified apprenticeship programs, and other accredited training organizations that offer core occupational training.

v. Prioritize Interventions by Energy Savings Potential and Scale of Impact

The priority-setting process described above will identify a number of key opportunities for WE&T investments which are likely to have the greatest impact on energy savings, both in terms of the estimated energy savings impact of the particular skills upgrade (i.e., for one worker), and the

potential scale of the intervention (including both direct program reach and ability to scale up). There is no rigid formula for determining the exact portfolio of priority workforce development investments, but the process outlined above will provide overall guidance. Input from the PRG and SMEs is critical here, and can help the IOUs take into consideration factors that affect the potential scale of program impact, alignment with the existing workforce infrastructure, and ability to leverage funds from other sources. The RFP process will also allow organizations that apply for funds to bring forth other ideas about potential needs and opportunities.

Using the prioritization process detailed above, the IOUs, with input from the PRG, should develop guidelines and selection criteria for the RFPs. We offer more detail on developing criteria for the Workforce Development–Energy Savings Skills-Building RFP in Appendix 3E.

b. Priority-Setting for the Workforce Development–Inclusion RFP

The portfolio of skills-building programs for workforce inclusion requires a different process for setting program priorities, because the overall objective is to promote the participation and advancement of disadvantaged workers in EE-related careers. This cannot be expected to have a direct impact on energy savings in the short run, although in the long run inclusion will help build the supply of trained and qualified workers. Like the energy savings skills-building portfolio, prioritization for the inclusion skills-building portfolio should consider foremost the projected demand for EE-related jobs. For inclusion, however, this should focus on an analysis of the demand for entry-level jobs with long-term advancement opportunities. This type of labor demand analysis is straightforward and involves an assessment of the new entry-level jobs that will be created by investments in EE, as was carried out in the UCB-DVC Needs Assessment. It also requires an assessment of other sources of labor supply that typically access these jobs, including a consideration of the capacity of existing workforce preparation programs and their ability to place graduates in career track jobs. To the extent possible, the IOUs should fund existing successful programs rather than new ones, in order to avoid duplication and oversupply.

Following an analysis of demand and supply, the criteria for inclusion skills-building activities should emphasize best practices for workforce development—in particular, strong ties between training and job placement, and advancement potential—as well as regional needs and opportunities. Input from the workforce experts on the PRG will be critical in guiding the program priorities and overall balance of the portfolio.

3. Engage a Peer Review Group (PRG) of Key Workforce Stakeholders and Experts to Advise the IOUs on the Development and Review of the RFPs

We recommend that the IOUs form a Peer Review Group (PRG) to provide ongoing input into the statewide RFP process for the skills-building portfolio and help the IOUs' access expertise on workforce development best practices and how to leverage the state's existing training infrastructure.²³¹

²³¹ The CPUC has proposed a longer “rolling” cycle for the energy efficiency portfolios, to replace the current three year cycle and regulatory proceeding format. It has not yet determined how stakeholder involvement will be organized. As the

The members of the PRG should be the same or similar to the Stakeholder Advisory Group overseeing the design and execution of this Guidance Plan contract, which includes state agencies such as the CWIB, DAS, and California Community Colleges Chancellor's Office (CCCCO), and leading advocates for environmental, labor, and low-income groups throughout the state. Other workforce development experts and SMEs can be added. The state agencies may determine that their participation is less critical in this forum once a Statewide EE Workforce Steering committee is established, as described below.

The role of the PRG should be to:

- Participate in the design of the RFPs for the skills-building portfolio by identifying guiding principles and criteria for project selection;
- Provide input on appropriate metrics of success;
- Participate in the review committees to select the winning bids;
- Advise IOUs on the selection of staff or technical consultants to administer the RFPs, including subject matter experts;
- Provide ongoing input and feedback as needed throughout program implementation; and
- Offer feedback on program effectiveness upon completion.

Staffing for Skills-Building Portfolios

The IOU staff/consultants who administer the RFPs should have workforce development expertise, experience, and good working relationships with the core education and training institutions for each energy savings and inclusion initiative. The roles of staff/consultants administering the RFPs will be to:

- Draft RFPs based on the PRG's guidance and priority-setting process outlined here;
- Propose workforce skills-building priorities for review by the PRG for each occupational category;
- Oversee the administration of the RFPs, including coordinating review processes; and
- Support implementation, including helping to convene regional training partnerships that can apply for funds; identifying opportunities to leverage funds and/or align efforts; providing technical assistance to applicants and grant recipients; and carrying out field reviews.

4. Phase One Skills-Building Programs

In addition to the development of the RFPs for the program cycle starting in 2016, the IOUs can initiate activities in 2014. We recommend the following Phase One WE&T skills-building programs as specific WE&T initiatives that the IOUs should begin in 2014-2015, with the RFP development process occurring in 2014

stakeholder process for the rolling cycle for the IOUs' energy efficiency programs develops, the PRG should be incorporated or modified as appropriate to align with this broader effort.

and funds from the 2015 cycle allocated for this use. These programs are “low-hanging fruit” in that they address critical near-term needs and opportunities, they have clear parameters and goals, and they have broad support among stakeholders. The Phase 1 RFPs are:

Workforce Development–Energy Savings RFP

1. Funds for projects to enhance EE content in core curricula for accredited university degree programs for architects and engineers.
2. Funds for a statewide program to enhance and verify EE skills for key trades in the state-certified apprenticeship system via a partnership between the Community Colleges Chancellor’s Office Apprenticeship Program and the California Division of Apprenticeship Standards.

Workforce Development–Inclusion RFP

3. Funds for an RFP for inclusion sector strategies. This should be based on a pre-apprenticeship bridge program model that prepares entry-level EE workers or job seekers for opportunities into higher skilled and higher wage employment in municipalities, universities, schools, and hospitals (MUSH) sector EE work, other building trades employment, and/or further training. This should be modeled on the CWIB’s Proposition 39 solicitation.²³²

We followed the basic outlines of the priority-setting process described in Section A.2 (Develop a Clear Process for Prioritizing Activities) to develop Phase One projects. We based our ranking of key opportunities on the priority occupations from Exhibit 3.3. When a comprehensive priority-setting process using more complete data is implemented, as outlined in Section A.2., a more detailed set of priorities can be identified for the EE budget cycle starting in 2016.

Until this comprehensive priority-setting process occurs, the list of occupations in Exhibit 3.3 provides a “rough cut” of where to focus ratepayer WE&T skills-building programs for 2015. The list of occupations is based not only on each occupation’s share of the estimated jobs generated by EE investments, but also each occupation’s impact on energy savings. It was informed by input from IOU staff and other SMEs, as well as information on the energy savings potential from different EE measures.²³³ For example, for the commercial sector we identify the key energy using building systems, lighting and HVAC, and link them to occupations. The professional occupations that design and operate these systems are architects, engineers, and facility managers. In the trades, lighting jobs are carried out by electricians; HVAC jobs are carried out by sheet metal workers, plumbers and pipefitters, and HVAC technicians; and building operations are carried out by stationary engineers/building operators. As noted by IOU staff, design professionals impact energy use beyond their share in the workforce since they are the ones specifying how new building construction or retrofits should be executed.

²³² California Workforce Investment Board (2014, February). *Proposition 39 Pre-Apprenticeship Support, Training and Placement, Request For Applications*.

²³³ California Public Utilities Commission (2013, March 26). *CPUC Energy Efficiency Policies and Investor-Owned Utility (IOU) Programs: Presentation for WHPA Executive Committee*. Slide 36.

The *Phase One Workforce Development–Energy Savings* projects focus on this list of critical professional and trades occupations that affect the key building systems in commercial buildings. We balance the needs of professional workers (who have a critical role on EE greater than their share of the workforce) with the needs of the trades workers (who outnumber the professional workers by a factor of four to one) by recommending funding for both sets of occupations with no rigid caps on the share of funds for either.

The *Phase One Workforce Development–Energy Savings projects for architects and engineers* were formulated with input gathered through our interviews with SMEs, IOUs, and trainers for this project, each of which pointed to a clear need to align core training for architects and engineers, and enhance content on EE and building science in architecture programs in particular. Our conversations with stakeholders from the architecture community yielded a specific suggestion to direct IOU resources and expertise to projects that will develop curricula and programming for 4-year accredited architecture programs in California universities.

The *Phase One Workforce Development–Energy Savings projects for trades workers* engage the Division of Apprenticeship Standards and Community College Chancellor’s Office, along with SMEs, to review and enhance EE skills in the core apprenticeship curricula for the trades. Based on the needs identified in this effort, DAS/CCCCO will issue RFPs for local Joint Apprenticeship and Training Committee (JATC) and community college partners to design and execute curricula upgrades, training of instructors, and pilot incumbent journey worker upgrade training. The RFP structure will allow for tailoring of content and strategies in order to meet the needs of different apprenticeship programs and most effectively take advantage of local resources and partnerships.

We did not include a *Phase One Workforce Development–Energy Savings* project for the residential sector. In the recent past, there has been an oversupply of training programs for residential retrofit workers and contractors, and job placement rates have been disappointing.²³⁴ Until demand is more robust and results of evaluations of Energy Upgrade California WE&T programs are available,²³⁵ we do not see a clear opportunity for “low-hanging fruit” projects in the residential sector.

We include a *Phase One Workforce Development–Inclusion* project specifically dedicated to promoting inclusion and advancement for disadvantaged workers, per the CPUC’s direction and stakeholder input in this area. The Phase One inclusion project provides funding pre-apprenticeship programs with a clear link to apprenticeship, since these have shown a strong track record of success in placing disadvantaged workers in career track jobs in the skilled construction trades, including those that have a strong impact on energy use, such as electricians, sheet metal, and pipe trades. We suggest that the IOUs leverage their relationships with construction contractors who participate in IOU programs, to help develop pathways for participants into EE-oriented construction jobs, as described in Chapter 4.III. We also suggest that the IOUs align their

²³⁴ Interviews with training providers.

²³⁵ These are expected to be available in May 2014.

inclusion project with the California Workforce Investment Board,²³⁶ which is using Proposition 39 funding to support pre-apprenticeship programs via a recently released RFP.²³⁷

Appendix 3G describes the Phase One projects and the rationale for each in greater detail. Due to the CPUC regulatory framework for the next period, which is not yet completely determined, the RFP should solicit proposals for 2015 for one-year projects. The IOUs should dedicate unencumbered WE&T resources for 2015 to initiating these three projects; we suggest that each Phase One projects be allocated approximately \$4 million dollars. This would comprise their skills building budget for 2015, and equal about 40 percent of their total budget if budgets remain the same. Once the policy parameters beyond 2015 have been determined, the IOUs should launch a fully-funded RFP process for a 3- to 5-year funding cycle, if CPUC direction allows.

B. MODIFY MARKET BUILDING PROGRAMS TO IMPROVE EFFECTIVENESS AND REACH, AND TO LOWER RATEPAYER COSTS

The IOUs' traditional and ongoing market-building offerings have a valuable role in EE market development. We offer modest recommendations for improving and streamlining market-building offerings that can be adopted by the IOUs through their normal program planning process:

1. Set Priorities for IOU Market-Building Education in Coordination with ME&O, Resource, and Skills-Building Programs

The IOU market-building portfolio should develop a more systematic, consultative, and transparent priority-setting process for their market-building programs. Consultations with staff from the Marketing, Education and Outreach (ME&O) program,²³⁸ the EE resource programs, and the WE&T skills-building programs, and informants from end user and market actor businesses can provide insight on key opportunities for market-building education programs and ensure alignment with other efforts to build the EE market. The ME&O program now is focused on promoting behavioral changes by energy consumers. It is now managed by the Center for Sustainable Energy (CCSE), which has expressed interest in more systematic coordination with the IOUs' WE&T programs. There are also opportunities for tighter coordination with the EE resource programs. The Food Service Technology Centers presents a model for tight integration between market-building and resource programs focused on a particular end user, the food service industry. Likewise Savings by Design (a resource program targeting new construction) and the WE&T programs are aligning their training and information dissemination efforts, to mutual benefit. This type of coordination should be expanded.

2. Target Classes to Specific Market-Building Audiences

Most WE&T classes are still open to anyone who wants to attend; we believe that screening participants in order to target specific audiences with similar needs would increase class effectiveness. In open-access classes, teachers are unable to assume any common base of knowledge limiting their ability to tailor classes

²³⁶ California Workforce Investment Board (2010). *Initiatives*. Retrieved from: <http://cwib.ca.gov/Initiatives.htm>.

²³⁷ California Workforce Investment Board (2014, February). *Proposition 39 Pre-Apprenticeship Support, Training and Placement, Request For Applications*.

²³⁸ California Center for Sustainable Energy (2013). *Energy Upgrade California 2013-2014 Marketing Plan*.

to specific needs. The IOUs should target their offerings to the following audiences, and others identified in the priority-setting process described above:

a. C-Level Executives

Until recently, the IOU programs have not created specific offerings that exclusively serve “C-level” executives, who are critical to energy savings because they have the ultimate authority to make decisions about energy efficiency investments. These C-level executives include both end users such as building owners and property managers, and executives of commercial sector construction firms. In 2013, PG&E held two 8-hour Executive Sales seminars to reach this high-level audience. The SME who taught the classes is convinced that for this audience, it is imperative to limit participation. He asserts that charging a fee and using a typical C-level executive venue, rather than an Energy Center, would actually reach a greater number of these executives.²³⁹

b. Contractors with Ongoing Investments in Training

The UCB-DVC Needs Assessment recommended specific and priority outreach for market-building activities to contractors who have made an ongoing and significant investment in training for their workforce, such as those participating in state-certified apprenticeships. As a number of state workforce officials have noted,²⁴⁰ it makes sense to prioritize the participation of contractors who already employ highly trained workers.

c. Women- and Minority-Owned Businesses

Woman and minority contractors often face barriers to entering and succeeding in the EE market. As part of the Southern California Regional Energy Network (SoCalREN), Los Angeles County, the Emerald Cities Collaborative, and Citi Community Development have developed an E-Contractor Academy to prepare small, women and minority contractors to bid on and successfully execute energy efficiency retrofit projects in public buildings in the county. In November 2013, the first class of 42 contractors completed the training. The E-Contractor Academy is designed to prepare these contractors to compete for other work in the MUSH sectors as well. The IOUs should look to the E-Contractor Academy as a model for advancing the skills of women and minority business owners to promote their participation in EE sectors.

3. Charge Fees for Classes

The IOUs should explore ways to charge for their classes, unless there is a specific economic or other barrier that would impede a targeted group from attending.²⁴¹ Market actors and high-level professionals are unlikely to be deterred by a fee that covers costs, and may be more likely to value offerings if they have

²³⁹ Interview.

²⁴⁰ Diane Ravnik, Chief, California Division of Apprenticeship Standards; Tim Rainey, Executive Director, California Workforce Investment Board; and Amy Wallace, Assistant Director for Workforce Innovation, California Workforce Investment Board.

²⁴¹ There may be some regulatory barriers but the IOU WE&T staff have already begun to explore their options.

“skin in the game” and know that their participating peers do as well. This could also help class planning, since “no-shows” for classes commonly reach 20 to 30 percent for at least some of the IOUs.²⁴²

4. Record and Broadcast Classes via Web Portal

Many of the short, lecture-style classes could easily be converted into online videos or webinars. This would not only save money, but also could be a more effective way to reach busy managers and professionals whose travel time might be considerable, and who may profit from greater flexibility in scheduling. We heard feedback from several market actors that travel to the Energy Centers for training was often too costly and time consuming.

5. Adopt California State Practices Limiting Expenditures on Food and Beverages

The Energy Centers should adopt the California state government rules about expenditures on food, beverages, and travel. Since most market-building class participants are managers, business owners, and high-level professionals, there is also an equity concern about providing a free meal versus other potential investments.

C. INCORPORATING THE CONNECTIONS PROGRAM INTO THE NEW FRAMEWORK

As delineated in the IOU WE&T 2013-2014 logic model for the Centergies program, the market-building goals and programs have been separated from the skills-building goals and programs. We suggest that it also makes sense to separate out the two functions in the Connections program. The current main goal for Connections is broad consumer education about the importance of energy management and sustainability. The strategy is to reach future consumers who are now students, in addition to reaching current consumers through their children. This goal clearly aligns closely with the IOUs’ market-building program. We therefore suggest that the current K-8 Connections programs should be considered part of the market-building programs. We recommend that K-8 programs continue to emphasize energy awareness and that they do not attempt to specifically address career development.

We also recommend that some of the 9-12 programs be re-oriented to focus on career technical education as part of the RFP for the skills-building program. 9-12 career development programs are key to helping youth, particularly youth from disadvantaged communities, gain entry into jobs or continue their career technical training in post-secondary institutions. The current 9-12 Connections program is a stand-alone career exploration program that exposes students to industry professionals, but misses an opportunity to support a stronger skills-building approach that has a clear link to viable career pathways.²⁴³ It would be strengthened if it incorporated the criteria we have laid out for the inclusion RFP for program cycle starting in 2016.

²⁴² IOU interviews.

²⁴³ Interviews with IOU program managers.

V. STAKEHOLDER FEEDBACK

This Guidance Plan reflects the combined expertise and opinions of the IOUs, firms implementing IOU programs, policy and subject matter experts, CPUC Energy Division staff, labor and contractor advocates, environmental organizations, low-income advocates, and the consultant team.²⁴⁴ Throughout this project’s review process, many useful suggestions have been made by these stakeholders and incorporated by the consultant team.

This feedback was provided both verbally and in written form, in monthly meetings with the Stakeholder Advisory Group and the IOUs, several sessions with the Leadership Briefing Group, and during many other meetings with the IOUs. We also hosted a feedback session for the state’s leading workforce development experts, labor agency and community college chancellor’s office leadership, key training providers, and IOU WE&T staff. We obtained written and verbal feedback from many of these participants as well.

As with all the recommendations in this Guidance Plan, the IOUs have stated that they are reviewing these recommendations and other internal and external program advice to inform future program planning, and have not committed to taking specific action.

Approach to Skills Building and Workforce System Alignment

There is general agreement among the stakeholder advisory group with our recommendations for improving WE&T skills-building activities. Some of the IOU WE&T staff did not agree that market-building education should be approached differently than skills building and thought that the current WE&T programs did not need the redesign that we recommend. There was support from both the stakeholder advisory group and the IOUs for our description of best practices, identification of program priorities that target future and incumbent workers and career pathways and sector strategies framework.

Most participants in the stakeholder feedback session—including leadership from the state’s workforce and education agencies—were supportive of our strategies to align and leverage IOU WE&T investments with the state’s training infrastructure, and offered useful suggestions for how to accomplish this. Some feedback from the IOUs exhibited concern that they would be held responsible if workforce partners did not perform adequately.

Most external stakeholders and the workforce and education agencies are supportive of the recommendation to execute the skills-building portfolio via competitive solicitation. Several IOUs acknowledged their lack of internal expertise on workforce issues and expressed openness to using competitive solicitation for pieces of the portfolio, while others are much less open to significant changes to their programs.

Phase One Proposals

IOU staff suggested that we identify specific “low-hanging fruit” project proposals that the IOUs could successfully implement in the near-term. The Community Colleges Chancellor’s Office, the California Division of Apprenticeship Standards, and the California Workforce Investment board all supported these phase one

²⁴⁴ See Appendix 1B for a complete list of interviewees. See Appendix 1C for a complete list of participants in the Stakeholder Advisory Group and the Leadership Briefing Group. All written feedback, except for IOU comments inserted in Guidance Plan drafts, is contained in Appendix 1D—Attachment 1.

proposals. We communicated closely with Community Colleges Chancellor’s Office Apprenticeship Program and the California Division of Apprenticeship Standards about how to best structure a partnership between their agencies and the IOUs. The Dean of the UC Berkeley College of Environmental Design also provided significant input about how to structure an RFP for university architecture programs to address energy issues.

Some IOU staff had concerns about the timing of these proposals in relation to the new EE cycle timeline, and emphasized the importance of achieving concrete outcomes in 2015, keeping overall WE&T budgets flat. They also expressed concerns about commitments they have already made that limit the amount of unencumbered funds that are available. We incorporated many of their suggestions and feedback about how to make the Phase One proposals specific, clear and feasible. We also integrated some of their suggestions about content, such as including engineers along with architects as targets of the skills-upgrading project at universities.

Recommendations on External Advice, Oversight, and Accountability

There is divergence among stakeholders and the IOUs on the appropriate degree and structure of input and oversight from workforce agencies and advocates. Some IOUs expressed openness to forming an advisory body for the skills-building programs, similar to the one used to guide development of this Guidance Plan, but most were opposed to anything stronger than that. The IOUs wish to retain as much autonomy and independence over their WE&T programs as possible, but acknowledge that the programs may benefit from some guidance from outside experts with better knowledge of and access to the state’s key training institutions.

The state workforce and education agencies and most stakeholder advisory group members agree that there is a strong need for increased input and oversight of the WE&T skills-building program from workforce experts. A number of them were in favor of exploring the idea of transferring administration over these funds to the CWIB (including the CWIB itself), and in forming a strong steering committee to review and approve programs. The CPUC Energy Division clarified the legal parameters and precedent for establishing different models of advisory or governing entities. Some stakeholders suggested a collaborative approach with a strong review/advisory body, similar to the stakeholder engagement model that is being developed for the EE rolling cycle.

We considered the feedback from the IOUs, CPUC Energy Division, and other stakeholders, and propose a compromise that leaves options for state policymakers to consider. We suggest retaining IOU administration of the WE&T skills-building program at least initially, with deep engagement of a PRG for input on program development, implementation, and review. We also offer several recommendations for state policymakers to consider, including the option of transferring administration to the CWIB. These are described in more detail in the following section.

VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS

This section identifies CPUC or other state policy direction that may be needed to support improved WE&T efforts over time. The IOUs, without new CPUC direction, can implement the recommendations we have made for WE&T program changes in this chapter, because they all fall within current regulatory parameters. This includes the development of a dedicated skills-building program and its components: RFPs, stronger alignment with the state’s workforce infrastructure, and a venue for substantive input from the state’s workforce agencies and experts. However, the IOUs have expressed concern about many of the components of our

recommendations. Moreover, there is significant divergence of opinion about the recommendations among the IOUs, which will slow down the development of a statewide skills-building program.

We therefore suggest the following policy direction.

1. The CPUC should direct the IOUs to adopt the recommendations and implementation timeline for the skills-building portfolios described in this Plan.
2. The California Energy Commission, under AB 758 authority, should establish a Statewide EE Workforce Steering Committee of the state's workforce and energy agencies and experts to determine the appropriate skills standards and certifications for EE work, track and evaluate data related to the costs and benefits of these standards, establish guiding priorities for training investments in the EE workforce statewide, and identify areas to improve alignment and leveraging of training resources.
3. The CPUC or legislature should periodically review the IOUs' progress in implementing the recommendations and should consider another administrator for ratepayer WE&T funds, such as the California Workforce Investment Board or a non-profit organization, if progress is not deemed adequate.

Recommendations 2 and 3 address the underlying issue of a lack of IOU and CPUC expertise on workforce issues. These go beyond the scope of recommendations for IOU action but represent potential solutions that may be more effective in the long run in achieving energy and workforce goals, particularly if progress by the IOUs remains limited. They are described in more detail below.

1. The CEC Should Convene a Statewide EE Workforce Steering Committee that Involves the State Agencies and Experts on Labor, Education, and Energy

There is a clear need to improve state policy and program alignment in the energy and workforce arenas. This issue is not limited to oversight over the IOUs' WE&T programs. In the context of AB 758, there is also a critical need for a venue to determine the appropriate skills standards for EE work, track and evaluate data related to the costs and benefits of these standards, and establish guiding priorities for training investments in the EE workforce statewide.

The CEC is the appropriate entity to convene this group, given its role in establishing codes and standards, and developing regulations related to AB 758. It should work in partnership with the Labor and Workforce Development Agency. The Steering Committee should include all relevant state energy, workforce, and education agencies, in addition to SMEs from the national labs and the University of California/California State University Energy Research Centers.

The Statewide EE Workforce Steering Committee should be responsible for:

- Determining preferred skills standards and certifications for EE work;
- Tracking and evaluating data related to the costs and benefits of standards;
- Establishing guiding priorities for statewide EE training investments; and
- Identifying areas to improve alignment and leveraging of training resources.

The creation of a Statewide EE Workforce Steering Committee will address the lack of expertise about workforce issues among IOU staff and the CPUC. It can both identify skills certifications that should be required in IOU programs, and encourage alignment among the state's various workforce programs around these certifications. It can also strengthen oversight over the ratepayer skills-building programs through its AB 758 authority. As stated earlier, much greater levels of oversight exist for all the other major workforce development funding streams in the state.²⁴⁵

A Statewide EE Workforce Steering Committee will provide a more appropriate forum for the leadership of the state's workforce and education agencies to engage with these issues than currently exists. The directors of the CWIB and DAS have been extremely valuable participants in the Stakeholder Advisory Group for this project, but as agency heads there are many competing priorities for their time. Instead of being seen as partners with the CPUC with distinct but interrelated state policy objectives, the workforce agency leaders are put in the same position as any other interested stakeholder. We suggest that a more effective use of their expertise and more appropriate role in the long run would be in a higher level steering committee with other agency heads and policymakers from energy, education, and labor. The Statewide EE Workforce Steering Committee will address the full spectrum of issues related to workforce standards and training in the EE sectors in California; it would not be limited to the IOUs' investments. Serving on the Statewide EE Workforce Steering Committee would not preclude participation by agency leads in other stakeholder forums. To the extent that policy recommendations from the Statewide EE Workforce Steering Committee fall under the CPUC's jurisdiction, recommendations would have to be approved by the CPUC through its normal regulatory process.

See Appendix 3H for a full list of proposed steering committee member organizations.

2. The CPUC or Legislature Should Consider Transferring Administration of the Workforce Skills-Building Portfolio to the California Workforce Investment Board

We present an alternative administrator for the workforce skills-building portfolio as an option to be considered by the CPUC or the legislature. Because the IOUs' core expertise is in energy efficiency rather than workforce education and training, the recommendations for skills-building program modifications may be more effectively implemented through an entity dedicated to workforce development. The CWIB has indicated that it is willing to be the administrator of these funds. DAS and several other members of the stakeholder advisory group support this proposal.

There are both pros and cons to this option. On the one hand, WE&T is not a core competency of the IOUs, and this lack of internal capacity has slowed progress. On the other hand, the CWIB and other workforce organizations generally do not have expertise in energy efficiency and demand-side management. Successful leadership in this area requires expertise in both workforce development and energy, so both options have drawbacks, and capacity building is necessary for either to work. Alternative administration of ratepayer funds is becoming more common, but requires working through legal complexities in order to maintain

²⁴⁵ The CPUC energy division staff informed us of various obstacles that the CPUC would face in establishing any advisory body with external members that could oversee the IOU WE&T programs, so we opted against recommending a steering committee convened by the CPUC.

ultimate CPUC authority over ratepayer funds as required by law. Examples of entities that have been accorded full or partial administration of ratepayer funds include the CEC, which administers the ratepayer-funded Electric Program Investment Charge (EPIC) research and development program; the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA),²⁴⁶ which will play a role in EE financing; the California Center for Sustainable Energy, which now has the responsibility for EE marketing, education, and outreach; and Regional Energy Networks (RENs), which serve as regional coalitions of local governments to administer ratepayer EE programs.

Regardless of who is authorized to administer the ratepayer skills-building program, our recommendations for the design of the program can stand.

VII. IMPLEMENTATION TIMELINE

Exhibit 3.5 presents a recommended schedule for implementing the recommendations included in this chapter.

Exhibit 3.5 Implementation Timeline for Supply-Side Strategies: Energy Savings and Inclusion

Time	Actor	Action
2014	CEC	Convene the Statewide EE Workforce Steering Committee, and establish appointments, structure, and charter.
Q2 2014	IOUs	Identify unencumbered funds and modify program budgets for 2015.
Q3 2014	IOUs	Begin making recommended adjustments to market-building portfolio.
Q3 2014	IOUs, with Stakeholder Advisory Group	Select appropriate members for the WE&T skills-building PRG, and establish firm roles, responsibilities, structure, etc.
Q3 2014	IOUs, with PRG input	IOUs draft and issue RFPs and program components for Phase One projects. PRG provides feedback on terms. Applicants and program partners provide a budget and a timeline for activities through the end of 2015 in their proposals.
Q4 2014	IOUs, PRG	Proposals selected and implementation begins.
Q3 2014	IOUs, PRG	<ol style="list-style-type: none"> 1. Conduct a thorough review of the Centergies offerings and submit findings to the PRG via advice letter process; 2. Identify which programs are skills building vs. Market building; 3. Identify stand-alone courses intended to build worker skills that will be phased out or funded by participant fees or other funding; 4. Identify best practices among existing skills-building programs to be grandfathered in to the next portfolio, subject to review and approval by the PRG; and 5. For any programs that are not identified as best practices (but are not strictly stand-alone courses) the IOUs should consider phasing out or developing a modified program delivery structure to submit as a proposal in the skills-building RFPs in the next cycle.
Q1 2015	IOUs, PRG	Begin establishing priorities (and a budget, once possible) for WE&T Skills-Building Portfolio beyond 2015.
Q3 2015	CPUC, with input from PRG and Statewide EE Workforce Steering Committee	CPUC should assess the IOUs' progress in implementing Phase One projects and making other recommended changes to WE&T. The CPUC should consider whether moving skills-building program administration to the CWIB or other entity is necessary for achieving the state's energy and workforce goals.

²⁴⁶ California Alternative Energy and Advanced Transportation Financing Authority (2014).

CHAPTER 4: Labor Demand Strategies to Promote Inclusion of Disadvantaged Workers

I. OVERVIEW

The primary goal of the IOUs' EE²⁴⁷ programs is to conserve energy, but they also serve as a significant source of job generation in the state. California's substantial investments in energy efficiency and demand-side programs offer a promising opportunity to build middle class career pathways for low-income people and jobseekers with barriers to employment ("disadvantaged workers"). Although leaders and stakeholders recognize this opportunity, these investments have not yet been systemically leveraged to create the pathways. With the CPUC approving budgets of approximately \$1 billion per year for the 2013-2014 program cycle for energy efficiency programs and over \$600 million per year (for 2013) for other demand-side management and low-income programs,²⁴⁸ stakeholders are likely to keep pressing for evidence that job opportunities are being created for workers from disadvantaged communities.

The California Long Term Energy Efficiency Strategic Plan included a goal to ensure that minority, low-income and disadvantaged communities have an opportunity to enter rewarding careers in the EE industry, but it did not specify strategies or benchmarks.²⁴⁹ While recently reiterating support for its goal of inclusion, the CPUC also acknowledged that training programs for disadvantaged workers are, on their own, not enough to achieve this goal, and it recognized the importance of efforts to broaden access to jobs in the EE sector.²⁵⁰

Successful inclusion strategies require interventions both the labor supply side and the labor demand side. We discussed the IOUs' role in labor supply interventions for workforce inclusion in Chapter 3, Section II.E. This chapter addresses the IOUs' role in supporting workforce inclusion through labor demand interventions.

Labor demand interventions for workforce inclusion include two interrelated strategies: a) expanding entry into the workforce for people from disadvantaged backgrounds, and b) ensuring that these entry-level jobs pay a living wage and offer defined pathways for advancement into higher skilled, higher wage jobs.

It is likely that the lower wage jobs generated by ratepayer investment, such as those in the Energy Savings Assistance (ESA) program, already are filled by workers who come from disadvantaged communities. Although

²⁴⁷ For the purposes of this document the term energy efficiency also includes other IOU demand-side programs such as demand response and distributed generation, except where otherwise noted.

²⁴⁸ This includes the 2013 budgets for the ESA program, at \$369 million, the electric portion of the Self-Generation Incentive Program (SGIP) at \$79 million, and the California Solar Initiative (CSI), at \$159 million, respectively. See California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities' 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 6; California Public Utilities Commission (2014, February). *Report to the Legislature in Compliance with Public Utilities Code Section 910*. p. 3.

²⁴⁹ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

²⁵⁰ California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89-92 and p. 126-127 (Conclusions of Law #70 and 76).

there is no systematic data on workforce demographics, ESA contractors, many of which are non-profit organizations, affirm that they hire from the low-income communities that they serve. The challenge to inclusion in this program is therefore not access, but rather ensuring that these workers are paid living wages and have opportunities to move into a higher skilled and higher wage career path.

It is also likely that the higher wage professional and skilled trades jobs are less accessible to workers who come from disadvantaged communities, and here the challenge is to ensure that they have pathways into these jobs.

We offer recommendations for strategies that the IOUs can adopt to address both the challenge of job access and the challenge of low-wage jobs without opportunities for advancement. As noted earlier, two-thirds of the direct jobs generated by the IOUs' EE/DSM programs are in the construction trades.²⁵¹ Construction trades can provide a critical pathway to middle-skill and middle-income jobs that require less than a four-year college degree, which gives the IOUs an opportunity to successfully broaden career options for Californians from disadvantaged communities.²⁵² We focus our recommendations for creating pipelines into good jobs on the EE construction trades jobs. The estimated one-sixth of jobs created by the IOUs' EE/DSM programs in professional and managerial occupations also provide rewarding middle class careers, but the opportunities for disadvantaged workers without four-year degrees are far fewer, and the IOUs have less ability to expand these opportunities.

Our recommendations are guided by extensive research on best practices learned from similar initiatives in the construction sector. For example, on California public works projects, most workers secure these prevailing wage²⁵³ jobs through state-certified apprenticeship programs,²⁵⁴ which offer the best conduit for disadvantaged workers to move into skilled careers. Pre-apprenticeship training programs facilitate the successful entry of disadvantaged workers into apprenticeship programs. Model residential energy efficiency programs in other states use a combination of wage standards and targeted hire to improve entry-level residential retrofit jobs and ensure that disadvantaged workers have access to these jobs. These and other inclusion programs built on apprenticeship, prevailing wage standards, and targeted hire policies provide a relevant model for the IOUs' EE work.

A. REGULATORY HISTORY AND RECENT DEVELOPMENTS

In the EE Strategic Plan, the CPUC established workforce inclusion as one of the two key goals for IOU-funded workforce education and training:

²⁵¹ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. p. 71-75.

²⁵² The estimated one-sixth of jobs created by the IOUs' EE/DSM programs in professional and managerial occupations also provide rewarding middle class careers, but these are often harder to reach for disadvantaged Californians and require significant investment in creating pathways at the high school and community college level that can provide the building blocks to entry and success in four-year degree programs and eventually professional careers.

²⁵³ The prevailing wage rate is the basic hourly rate paid on public works projects to a majority of workers engaged in a particular craft, classification or type of work within the locality and in the nearest labor market area (if a majority of such workers are paid at a single rate). Department of Industrial Relations (2014). *Frequently Asked Questions - Prevailing Wage*. Retrieved from: http://www.dir.ca.gov/OPRL/FAQ_PrevailingWage.html.

²⁵⁴ See Appendix 4A for a detailed description of relevant best practices.

Goal: Ensure that minority, low-income and disadvantaged communities fully participate in training and education programs at all levels of the DSM and energy efficiency industry.

Goal Result: Individuals from the targeted communities take advantage of programs that specialize in energy disciplines at all levels of the educational system and successfully advance themselves into **rewarding careers** in the energy services fields.²⁵⁵

The Strategic Plan acknowledged that WE&T is not the core mission of the IOUs and concluded that coordination among the IOUs and other state agencies and workforce providers will be essential for realizing the CPUC’s comprehensive vision for WE&T. One of the key strategies suggested in the Plan was to align ESA workforce training with other energy efficiency training programs in the state. The CPUC noted that “This coordination should expand employment options for those in disadvantaged communities beyond the LIEE [now ESA] program itself.”²⁵⁶

1. UCB-DVC Needs Assessment Findings and Recommendations

The UCB-DVC Needs Assessment included a chapter on strategies and best practices for creating pipelines for disadvantaged workers that lead to job placement and retention in the EE sectors.²⁵⁷ It emphasized that investments in training alone are not enough to support disadvantaged workers in obtaining and keeping good jobs:

*[M]easures must also be taken to shape the labor market in such a way that the jobs created provide real opportunities for workers coming out of poverty. Workforce preparation programs...are most effective when married to demand-side programs such as high-road agreements and skills certifications that help ensure job quality and job access.*²⁵⁸

The report provided examples of successful initiatives for placing disadvantaged workers into good jobs in EE and public sector construction using high-road agreements that include both labor standards and targeted hiring requirements.²⁵⁹ It particularly highlighted the strong track record of community benefits and project labor agreements, which incorporate targeted hire requirements into the existing public works labor standards of prevailing wage and apprenticeship requirements. This facilitates the entry of graduates of pre-apprenticeship programs into state-certified apprenticeships and employment on public works construction.²⁶⁰

²⁵⁵ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 70.

²⁵⁶ Ibid. p.74.

²⁵⁷ Zabin, C. et al. (2011). See Chapter 16, p. 270-281.

²⁵⁸ Zabin, C. et al. (2011). p. 280.

²⁵⁹ Green for All defines a “high-road agreement” as “a multi-stakeholder agreement that lays out specific goals related to the quality and accessibility of economic opportunities associated with a particular project, investment, or initiative. The Agreement lays out strategies for advancing these goals (also known as High Road Standards), establishes a mechanism for implementing the agreement, and defines a process for evaluating progress towards goals.” Green for All (2012). *High Road Agreements: A Best Practice Brief by Green for All*. p. 5.

²⁶⁰ Zabin, C. et al. (2011). p. 275-279.

2. EE Proceedings for the 2013-2014 Program Cycle

Workforce inclusion was a focal point of stakeholder comments in the CPUC policy and budget proceedings for EE in the 2013-2014 cycle. A number of stakeholders representing low-income groups, labor, and contractors, advocated for leveraging ratepayer investments in energy efficiency to create access to employment for disadvantaged workers. They also reiterated that participation in training programs does not necessarily lead workers to employment in career track jobs. Furthermore, stakeholders expressed concerns about whether or not the jobs generated by ratepayer investments are high-road jobs that provide fair labor standards, living wages, and protection of workers' health and safety. They explicitly stated that initiatives to support training for disadvantaged workers must include a strategy to employ those workers in high-quality, career track jobs.²⁶¹

The Commission acknowledged the comments of Brightline Defense Project, the Greenlining Institute and Green for All, and addressed a number of issues pertaining to workforce inclusion in Decision 12-11-015. It endorsed several stakeholders' key points in its direction to the IOUs:

*The utilities should develop pilot approaches collaboratively with stakeholders to incorporate workforce diversity and inclusion goals into their third-party contractor selection process. In addition, as suggested by Greenlining and Green for All in their comments on the proposed decision, we also suggest a special focus on best practices for offering disadvantaged workers employment opportunities upon completion of training.*²⁶²

The Commission acknowledged the IOUs' lack of expertise with these issues and endorsed Brightline Defense Project's recommendations in its guidance for this WE&T Strategic Planning project:

The utilities should undertake a strategic planning approach ... [that] address the following elements:

- a. *Explore ways to leverage (with green jobs programs, community-based and non-profit organizations, educational institutions, the business community, and labor organizations, etc.) wherever possible and incorporate teaching minority, local low-income, disabled, displaced, and other disadvantaged communities the skills needed to meet energy-efficiency program needs, where feasible.*
- b. *Explore ways to leverage these same potential partners, wherever possible, to identify currently unemployed workers already equipped with the skills needed to meet energy-efficiency program needs, where feasible;*

²⁶¹ California Construction Industry Labor Management Cooperation Trust (CCILMCT) (2012, November 5). *Reply to Comments on the Proposed Decision Approving 2013-2014 Energy Efficiency Programs and Budgets.*; Daniel, K., & J. Arce (2012, May 30). *Brightline Defense Project and Green For All's Reply to Opening Comments on the Proposed Decision.*; Daniel, K. (2012, May 24). *Green For All Written Opening Comments to the Proposed Decision.*; Daniel, K., & J. Arce (2012, February 16). *Reply Brief of Green For All and Brightline Defense Project.*; Daniel, K., & J. Arce (2012, January 13). *Response of Intervenors Green For All and Brightline Defense Project to ALJ Kim's First Set of Questions.*; Gallardo E., & V. Truong (2012, May 30). *The Greenlining Institute's Reply Comments on the Proposed Decision.*; Gallardo E., & R. Young (2012, May 24). *The Greenlining Institute's Opening Comments on the Proposed Decision.*

²⁶² California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 89-92 and p. 126-127 (Conclusions of Law #70 and 76).

- c. Consider possible pilot programs during 2013-2014 to test new quality standards for energy efficiency projects accompanied by necessary training, increased pay for performance for contractors, and links to job placement for completing training.²⁶³

Finally, the CPUC also ordered the IOUs, in both the ESA and the broader EE programs, to collect data on the jobs and workforce outcomes of the programs.²⁶⁴ In Chapter 5, which addresses EM&V, we discuss shortfalls in current data collection efforts and present recommendations on future data collection.

3. IOU Efforts to Date

Historically, the IOUs have addressed equity and inclusion issues through two avenues: diversity in contracting and reduced utility costs for low-income households. The CPUC's Supplier Diversity Program, created as a result of General Order 156 (G.O. 156), requires the IOUs to increase contracting opportunities for women-, minority-, and service-disabled veteran-owned businesses (WMDVBE) by setting procurement goals for contracts and monitoring and reporting on outcomes. The CARE and ESA programs (ESA was previously called LIEE) help low-income households by reducing utility bills and subsidizing energy efficiency retrofits. Assembly Bill 1393 suggested a third approach through ESA implementation by establishing competitive bidding criteria including the bidder's ability to employ local residents, provide job training, and generally benefit the local low-income communities in which ESA is deployed.

While all of these programs promote inclusion of various kinds, they do not address disadvantaged workers' access to jobs with living wage standards and advancement opportunities. Focusing local hiring efforts on the ESA Program is insufficient, since those jobs are generally low-wage and low-skilled like most residential construction jobs, especially when compared to EE and construction jobs serving the large commercial and public sectors. To maximize outcomes, the IOUs will need to adopt strategies to increase local and disadvantaged hiring across the EE/DSM portfolio.

The IOUs have piloted some initial steps to address inclusion through labor demand mechanisms in EE programs beyond ESA.²⁶⁵

- The Sierra Nevada Energy Watch program is a Local Government Partnership between PG&E and the Sierra Business Council serving Sierra Nevada communities in PG&E territory. The program requires local contracting and hiring and a prevailing wage floor for workers, and it also scores highly on cost-effectiveness tests for local government programs.²⁶⁶
- The Sempra Utilities (Southern California Gas Company [SCG] and San Diego Gas & Electric Company [SDG&E]) have initiated a "first source" policy to create a pipeline to link trained

²⁶³ Ibid. p. 90-91.

²⁶⁴ California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities' 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 373-374; and California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (D.12-11-015). p. 91.

²⁶⁵ We discuss the IOUs' recent efforts in pursuit of labor supply approaches to workforce inclusion in Chapter 3.

²⁶⁶ See Chapter 2, Section II.C.4.d. "Evidence on the Impact of Standards Used in Energy Efficiency Programs" for more detail on Sierra Nevada Energy Watch.

disadvantaged workers to the jobs created by the IOUs' EE programs. They require that third-party contractors self-report on the number of jobs created as a result of their contract with the utility and notify the utility in advance of job openings. SDG&E partnered with a community-based job training program, the San Diego Workforce Partnership, to match skilled job seekers to those openings. The program is still relatively new; no outcomes have been reported yet.

Leadership on inclusion may come from the newest administrators of ratepayer EE programs, the Regional Energy Networks. In the Southern California Regional Energy Network (SoCal REN), which funds EE retrofits in public buildings, the County of Los Angeles is developing a pilot program to incorporate workforce inclusion through a targeted hire and apprenticeship framework. This could serve as a model for the IOUs. Implementation is still in early stages, but there are plans to include a community workforce agreement to establish pipelines for local, disadvantaged workers into apprenticeship positions created by the program.

B. SCOPE OF INCLUSION CHAPTER

This chapter addresses labor demand interventions that the IOUs can take to improve outcomes and inclusion for disadvantaged workers, addressing Strategic Goal 2 of the RFP. The RFP asked for recommendations to ensure “accountability to local communities with disadvantaged populations and high levels of unemployment and underemployment, articulating desired workforce goals such as targeted community hiring and fair labor standards.”²⁶⁷

This chapter presents our findings, recommendations, and rationale concerning:

- A practical definition of local, minority, low-income, and disadvantaged communities and how to collect and track inclusion outcomes;
- Models and best practices in workforce inclusion policies and implementation mechanisms, including connection to state-approved apprenticeship programs; and
- Policy and implementation options that can be applied to the IOUs' EE and DSM programs to increase inclusion, improve job placement rates upon completion of training, and create ladders of career opportunity for the target populations.

II. PROBLEM STATEMENT

Unemployment remains high in California, and construction and energy efficiency installation are among a limited number of paths to family-supporting careers for people with barriers to employment. However, the IOUs, which are investing substantial ratepayer funds in energy efficiency programs in the state, lack a consistent and integrated strategy to promote workforce inclusion. Current efforts in this arena have fallen far short of what will be required to achieve the Strategic Plan's vision for workforce inclusion. At present, the IOUs do not leverage their relationships with EE contractors to address inclusion goals, although they do have

²⁶⁷ PG&E (March 2013). *Request for Proposal (RFP) No. 6264, For Workforce Education and Training (WE&T) Statewide Strategic Planning*.

promising practices to build upon. In particular, the Supplier Diversity Program²⁶⁸ demonstrates that the IOUs are capable of achieving great success with inclusion efforts. In 2013, the Program hit a new procurement milestone, with each of the IOUs procuring over 40 percent of goods and services from WMDVBE firms.²⁶⁹

The Sierra Nevada Energy Watch Program and the emerging SoCal REN workforce pilot are both promising models for integrating successful, comprehensive workforce development initiatives into EE programs in California. While Sempra's First Source policy is a laudable first attempt to connect disadvantaged workers to EE jobs, it would be more effective if integrated into a comprehensive strategy that includes a stronger commitment from employers to consider hiring targeted workers and a fully-functioning pipeline of trained workers, as well as assurance that the jobs provide living wages.

The IOUs have traditionally viewed the ESA program as the primary arena in which workforce equity should be addressed, but this is unnecessarily limited. Equity issues, including providing career opportunities to disadvantaged workers, can and should be implemented across the portfolio. While best practices demonstrate that labor demand interventions in the procurement and contracting processes can create opportunities for disadvantaged workers to access higher skilled, higher wage EE jobs, our interviews suggested that the IOUs do not see their broader EE portfolio as a way of creating job opportunities for disadvantaged workers.

To achieve better outcomes, the IOUs need to expand their approach. In particular, they have a valuable opportunity to leverage their relationships with contractors who serve the higher skill, higher wage, mission-driven MUSH sector. Because of their scale and complexity, MUSH-sector projects tend to require a larger, higher skilled (and thus better paid) workforce, which, if properly structured, could increase opportunities for disadvantaged workers to advance. Public sector MUSH projects are also obliged to follow the California Public Contract Code, which requires prevailing wages and the use of apprentices enrolled in state-certified apprenticeship programs. As discussed in Chapter 3, apprenticeship is a proven learn-while-you-earn pathway to higher skills and wages in an industry with a high overall incidence of precarious jobs and employment law violation.²⁷⁰

In addition, supporting disadvantaged workers only to seek ESA jobs is not sufficient to meet the inclusion goal set forth in the Strategic Plan. There may be a few opportunities for advancement within some of the larger ESA contractors, but this career pathway is much more limited than the training and advancement opportunities of commercial and institutional EE work.

A. INCLUSION POLICIES AND IMPLEMENTATION MECHANISMS AND MODELS

A comprehensive approach to workforce inclusion requires that programs that prepare disadvantaged workers for EE work be coupled with policies that encourage or require employers to hire qualified workers from disadvantaged communities. Moreover, even dedicated efforts from both sides to improve job access can be ineffective in building pathways out of poverty if the only jobs that are accessible are low-paying and offer no career advancement. Inclusionary hiring policies are increasingly a focus of public agencies nationwide, and

²⁶⁸ Kang S., E. Delaney (2013, June). *2013 Supplier Diversity Report Card*. The Greenlining Institute.

²⁶⁹ California Public Utilities Commission (2014, March 6). *CPUC Supplier Diversity Program Hits Procurement Milestone*.

²⁷⁰ Zabin, C. et al. (2011). p. 106-108.

there is a body of field-tested best practices to build upon.²⁷¹ We carried out an extensive review of existing workforce inclusion policies, which we document in Appendix 4A.

Targeted hire and first source referral policies are two of the most widely-used elements of effective workforce inclusion strategies for the construction sector. In fact, the Section 3 program of the Federal Housing and Urban Development Agency has required housing developer grantees to prioritize a certain percentage of construction jobs for targeted workers since 1968. When, as in private residential work, prevailing wages are not required by law or policy, wage standards are a third important component of inclusion policies. Finally, a fourth component of inclusion policies is an identified pathway from entry-level jobs to higher skilled, higher wage jobs.

The following briefly summarizes these four components of inclusion policies and describes an example of an implementation mechanism and model for each.

1. Targeted Hire

A targeted hire²⁷² policy ensures that employers open job opportunities to workers from prioritized categories (“targeted workers”). It is not a requirement to hire any individual worker, or to hire an individual who does not possess the necessary qualifications. This policy requires a way to define the pool of disadvantaged workers to be targeted for hiring. In most targeted hire programs in California and elsewhere, this definition is based on defining broad criteria of disadvantage that can be tracked to the zip codes of workers (e.g., living in a low-income area) and/or individual circumstances of disadvantage that can be verified confidentially by a workforce development training or referral agency (e.g., lacking a high school degree or GED).

Implementation mechanism and model:

Targeted hire requirements ensure that a contractor receiving funding from an awarding organization makes a commitment to hire a certain percentage of workers from targeted groups. The requirements are stated as contract terms and are often implemented in public works projects that already have apprenticeship and prevailing wage requirements, often under a project labor agreement.²⁷³ Targeted hire policies are best suited for larger or bundled projects where the overall number of jobs is greater, and thus there are more opportunities to place a variety of workers. Exhibit 4A.1 in Appendix 4A shows the range of scale of work that different agencies determined was sufficient to support a targeted hire requirement.

Typically, these public works targeted hire policies will require that a certain percentage of the construction work hours on a project be reserved for targeted workers. For example, the Los Angeles Community Careers policies adopted by many local agencies require that 30-40 percent of the total project work hours and half of all apprentice hours be performed by people from high unemployment or high poverty zip codes. It also requires that 10 percent of the total hours be performed by jobseekers with barriers to employment such as

²⁷¹ Beach, B., K. Mulligan-Hansel, & S. Owens-Wilson (2013). *The Construction Careers Handbook*. Partnership for Working Families.

²⁷² Sometimes used interchangeably with “local hire,” although “targeted hire” can encompass demographic metrics other than location of residence.

²⁷³ A project labor agreement (PLA) is a collective bargaining agreement between building trade unions and employers that govern the terms and conditions of employment for all workers on a construction project.

being homeless or low-income. It is important that inclusion requirements are measured by work hours rather than by individuals hired because employers could evade the spirit of the policy by resorting to one-day hires to meet the percentages, rather than actually filling significant work assignments with the targeted workers. The Los Angeles policies also specify actions for the contractors to perform in order to increase success in meeting targets, and to have a safe haven from legal consequences in case they fall short. San Francisco, Los Angeles and other major California cities have strong targeted hire policies that impact billions of dollars of public works construction.

2. First Source Referral

“First source” is a system in which a referral entity or training program serving disadvantaged workers is used to refer job applicants to employers. Employers in turn agree to notify the referral agency when there are job openings and agree to look at its referrals as a first source in their review of job applicants. Unless it is used in conjunction with a targeted hire policy, there is usually no obligation for an employer to hire any referred disadvantaged workers. (One exception is Portland’s Clean Energy Works program, which requires contractors to hire the first 50 percent of their project employees from specified training programs.) Strong and specific “first source” language, with clearly defined roles and responsibilities for the contractors and the referral entity, simultaneously assists contractors in meeting their targeted worker requirements, helps increase disadvantaged worker job placement, and leverages ratepayer investment.

Implementation mechanism and model:

Like targeted hire requirements, first source referral strategies can be established through agencies’ procurement contracts. The critical factors in this type of program are early notification of job opportunities and the quality of the referral source. The earlier the referral source is notified of upcoming openings, the more time jobseekers will have to prepare and even train. Since the employer is not obligated to hire any targeted workers, the job candidates have to be as ready as—or more ready than—their competition. Consequently, the referral source has to be able to screen and prepare disadvantaged workers to the highest possible standard. A referral entity that regularly refers unprepared candidates will very quickly lose credibility with the employer. On the other hand, a referral entity that regularly refers qualified candidates will be considered a human resources boon to the employer. The City of San Francisco’s First Source Hiring Ordinance has had success in requiring contractors working with the city or building developments of a certain size to make a good faith effort to hire jobseekers prepared and referred by the city’s workforce development system.

3. Wage Standards

Weatherization and residential energy efficiency jobs are frequently low-skilled and poorly paid with few opportunities for advancement. Determining a “wage floor” will ensure that these workers are paid at least a living wage. There is considerable evidence that higher wages have a positive effect on productivity and

quality.²⁷⁴ Appendix 4A provides a detailed summary of various compensation standards in energy efficiency programs throughout California and in other states.

Some examples of programs with wage standards include the already mentioned Sierra Nevada Energy Watch, which requires that contractors pay their electricians based on prevailing wage standards for the counties in which the work is being performed; and the Community Power Works Program in Seattle, which instituted a tiered wage system comprised of a base rate of \$21.50 per hour (plus \$2.50 in wages or benefits), and a lower training rate of \$15.50 per hour, plus \$2.50 in wages and benefits. Similarly, trainees in the Los Angeles Department of Water & Power's (LADWP) Utility Pre-Craft Trainee Program earn an hourly wage of \$16 per hour plus benefits,²⁷⁵ and workers participating in Portland, Oregon's Clean Energy Works Program pilot program earn at least 180 percent of the state's minimum wage.

Implementation mechanism and model:

The cities of Portland, Oregon and Seattle, Washington developed residential efficiency programs that tied their goals of increased efficiency to goals of higher wages, better training, and more inclusion. The mechanism they used was a pre-qualified contractor list, whereby customers seeking subsidized efficiency retrofits were required to hire from among the contractors on the list. In return for being on the list or for certain procurement advantages, the contractors had to agree to pay prevailing wages and offer employee benefits, in addition to providing proof of technical qualifications and credentials. Because the contractors were guaranteed a steady stream of work, they could make the investments in workforce that met community goals and also achieved high efficiency outcomes. Cleveland/Cuyahoga County has just launched a similar program for municipal energy efficiency retrofits.

4. Identified Pathways to High-Road Careers

While most people understand the term “career ladder,” the rungs in particular industries are not always evident. In order for a lower skilled or entry-level worker to move up, he or she must understand what skills must be learned (including both soft and hard skills), where they are learned (e.g., in school or on the job), and how to build the necessary up-skilling into his or her life in terms of schedule, budget, and geography. Because the higher skilled segments of the construction industry, such as the commercial and MUSH sectors, offer far more opportunities for disadvantaged workers, understanding the career ladder is important. Equally important is for employers to understand the value of a trained workforce and to be willing to invest in that training. Apprenticeship programs are perfect examples of an articulated career ladder, defining how many hours of study and how many hours of work experience will take a participant up the rungs from first period apprentice to fourth period apprentice to journey-level worker.

²⁷⁴ For example, see Chapman, J. and Thompson, J. (2006, February 15). *The Economic Impact of Local Living Wages*. Economic Policy Institute, Briefing Paper #170. p.15; Cascio, W. (2006, December). *The High Cost of Low Wages*. *Harvard Business Review*. Adapted from Cascio, W. (2006, August). *Decency Means More than “Always Low Prices”*: A Comparison of Costco to Wal-Mart's Sam's Club. *Academy of Management Perspectives*; and Ton, Z. (2012, January-February). *Why “Good Jobs” are Good for Retailers*. *Harvard Business Review, The Magazine*.

²⁷⁵ Zabin, C. & E. Avis (2013). *Training for the Future*. UC Berkeley Labor Center. p. 11.

Implementation mechanism and model:

The apprenticeship model, involving clear steps via training and experience to increased wages and benefits, can be adapted to many contexts. The Los Angeles Department of Water and Power (LADWP) developed a “pre-craft utility worker” classification that allowed the utility to hire entry-level candidates who had been through the equivalent of a pre-apprenticeship program to do direct install residential efficiency work. After a period of time and on-the-job experience, the workers have the opportunity to move into more advanced positions at the utility, with a leg up in the civil service application process. While this particular program is designed for a municipal utility, the concept of residential efficiency jobs as a training ground rather than an endpoint for workers is valuable and could be replicated in the IOUs.

B. APPLICATION OF BEST PRACTICE MODELS TO THE IOUS

Early on in our stakeholder advisory group meetings, a number of members of the Stakeholder Advisory Group urged us to explore the possibility of implementing the public works inclusion model—based on prevailing wage, apprenticeship standards, and targeted hire policies—in a portion of the IOU portfolio. As noted above, this is the best practice model that has a proven track record in California and elsewhere.

To investigate the feasibility of this approach in the IOU context, we targeted the IOU programs that include the municipalities, universities, schools, and hospitals (MUSH) markets. These markets are usually subject to prevailing wage and apprenticeship requirements and include larger projects and more complex work requiring higher skills (and higher wages). They also provide a good target for deeper retrofits due to public or long-term ownership. Moreover, the large institutional customers in the MUSH market are likely to see the benefits of an inclusion policy because they, like the IOUs, are increasingly under pressure to show their positive economic benefit to low-income communities.²⁷⁶ In addition, if such an inclusion program could be created, it could potentially provide an avenue for advancement for ESA workers to move from weatherization to MUSH sector work.

Our research revealed that applying this model in the IOU context is easier said than done and we identified several major implementation challenges. Under the current IOU program structure, MUSH customers are served by a significant number of separate local government and institutional partnerships, third-party programs, and non-residential customized and deemed programs, each with different rules and processes. This makes it very difficult to address the MUSH sector as a whole, even though MUSH customers have many common attributes. While there may be pros (and cons) to this scattering of MUSH customers across many EE programs, this decentralized structure makes it harder to implement a targeted hire policy. Targeted hire policies require a certain scale because the projects that they cover need to provide a reasonable number of entry-level jobs. Since individual energy efficiency projects are often quite small, bundling multiple projects is a way to create enough job opportunities to warrant the development of an inclusion program. Portland’s Clean Energy Works and other inclusion programs bundle multiple projects. In addition, these other inclusion programs pre-select contractors who agree to the terms of an agreement, usually called a community benefits

²⁷⁶ Irwin, J., S. Rhodes-Conway, S. White, J. Rogers (2011). *Making M.U.S.H. Energy Efficient: Energy Efficiency in the Governmental and Institutional Sector*. Center on Wisconsin Strategy.

agreement or a high-road agreement, that includes targeted hire. This is a very different program structure than in the IOU EE programs serving the MUSH sector, where customers generally choose the contractors.

In our opinion, the public works targeted hire model could be implemented in the IOU EE programs, but only with significant changes to the IOU EE programs that include MUSH customers. Bundling of projects and pre-selection of contractors would be necessary. This would require putting together a number of MUSH programs in a particular region, and negotiating with customers to design a program that works for them. At the present time, the Regional Energy Networks (RENs) are in a better position to advance this model, since they are already coalitions of local governments. As stated earlier in this chapter (Section I.A.3 “IOU Efforts to Date”), the Southern California REN is launching a public works targeted hire program like those described as best practices here, and this effort should be carefully monitored.

III. RECOMMENDATIONS

RECOMMENDATIONS: LABOR DEMAND STRATEGIES FOR WORKFORCE INCLUSION

General Recommendations	Specific Recommendations	Goal
A. Create a workforce inclusion program to broaden access to living wage jobs and career pathways in EE for workers from disadvantaged communities.	1. Add “workforce inclusion” as a factor in ranking proposals by third-party contractors in all EE solicitations.	Inclusion
	2. Adopt “first source” language in all EE contracts to create a formal link between training for disadvantaged workers and job opportunities through EE programs.	Inclusion
	3. Establish prevailing wages and targeted hire goals for all contractors and subcontractors that have a direct contracting relationship with the IOU or are pre-selected (e.g., Direct Install, government partnerships, third-party programs, and ESA programs).	Inclusion
	4. Guide and encourage government partnerships, 3P programs, and contractors serving the MUSH (municipalities, universities, schools, and hospitals) sectors to adopt prevailing wage, apprenticeship standards, and targeted hire policies, which together can provide meaningful job and training opportunities for disadvantaged workers.	Inclusion
B. Implement foundational activities to support the workforce inclusion program.	1. Adopt a specific definition of “disadvantaged worker” based on a combination of residence in a high unemployment zip code and/or meeting specific criteria of disadvantage.	Inclusion
	2. Collect data on job quality, workforce diversity, and hiring of disadvantaged workers (see Chapter 5. EM&V Recommendations).	Inclusion

IV. RATIONALE

Our recommendations address the two interrelated objectives for comprehensive inclusion strategies: a) to ensure that people from diverse and disadvantaged backgrounds have entry into jobs; and b) to ensure that the jobs created by ratepayer investments provide a living wage floor and opportunities for higher wages as they acquire skills.

Based on our research and IOU and stakeholder feedback, we distilled our recommendations to strategies that the IOUs could implement without new direction from the CPUC or major reorganization of EE and DSM programs as they are now administered. We believe these are good first steps to broadening opportunities for disadvantaged workers.

At the same time, we believe that the more ambitious approach, i.e., the public works targeted hire model discussed above, could be achieved with clear policy direction and budget authority. This model also holds the most promise for a real and lasting positive impact on inclusion outcomes. We therefore recommend that the CPUC encourage the RENs to adopt a public works targeted hire program, and over the longer run work with the IOUs to replicate it in their own programs serving MUSH customers.

Targeted hiring, wage standards, and first source policies are “the next frontier” for the IOUs to address equity concerns, and they are likely to continue to be a major focus of stakeholders representing low-income and diverse constituencies.²⁷⁷ The strong track record of public agencies that have instituted policies to improve job access and ensure decent wages for workers from disadvantaged communities presents a clear model that can and should be applied to ratepayer-funded activities. These model programs, in addition to the IOUs’ own success implementing G.O. 156, indicate that a comprehensive targeted hiring and increased job quality initiative is within reach for the IOUs’ EE programs. In addition to adding value for the communities the IOUs serve, they can contribute to long-term energy efficiency goals by cultivating a broader pool of talented Californians for EE careers.

A. CREATE A WORKFORCE DIVERSITY PROGRAM THAT ENCOMPASSES TRAINING CONNECTED TO FAMILY-SUPPORTING CAREER PATHWAYS FOR A DIVERSE EE WORKFORCE

1. Add “Diversity of Workforce” as a Factor in Ranking Third-Party Contractors in All EE Solicitations

The IOUs should include a contractor’s “diversity of workforce” as a factor in weighing contractor qualifications by attributing extra points to contractors that can demonstrate that 20 percent of the total work hours on a project will be performed by disadvantaged workers (as defined later in this chapter). This will reward contractors who already have a diverse workforce and will incentivize contractors who do not. The percentage goal for number of work hours performed by disadvantaged workers can be increased over time as the IOUs and contractors gain familiarity with the system and are able to document success. It is important that this goal complement and not replace G.O. 156, as the WMDVBE preference contributes to overall inclusion, and WMDVBE businesses often employ disadvantaged jobseekers.

²⁷⁷ Interviews with low-income advocates.

2. Adopt “First Source” Language into All EE Contracts

The IOUs should implement uniform “first source” language in all EE new and renewed or renegotiated contracts. First source language will create a formal link between trained, disadvantaged workers and job opportunities in the IOUs’ EE programs.

This act requires no further CPUC direction. The Sempra Utilities’ existing language is a good template for the IOUs, with a few additions so that the referral program can properly prepare and select job candidates:

*The COMPANY is interested in developing linkages between employment opportunities and trained workers in energy efficiency. In the event that new job opportunities arise as a result of this SOW, Contractor shall provide advanced notice of job or internship opportunities **and the skills required for those positions** to COMPANY or COMPANY’s designee. Advanced notice should be provided at least two weeks before the job or internship opportunity is listed publicly. These opportunities should be shared with organizations **identified by the COMPANY** that provide EE workforce training.*

This language would require contractors to provide coordinators of the IOU-designated referral source specific information early enough to help disadvantaged workers get a first shot at job opportunities.

It is also critical that the IOUs develop a supporting infrastructure for this process:

- A notification procedure that is consistent, clear, and easy to follow;
- Education and monitoring of contracted employers so they understand and comply with the notice requirement; and
- A defined record-keeping requirement for contractors so that the IOUs can periodically monitor compliance with the procedure.

IOU staff should work with local partners, particularly the training programs funded by the RFP discussed in Chapter 3, to identify a source of jobseekers from targeted communities who can be prepared to successfully compete for job openings. Local partners should also advise the IOUs on appointing an appropriate liaison to troubleshoot any problems or miscommunications between employers, referral sources and targeted employees.

3. Establish Prevailing Wage as the Wage Floor for ESA, Direct Install, and Selected Third-Party Programs

The CPUC should focus initial efforts to establish a wage floor on the ESA, Direct Install, and third-party programs that rely on a pre-selected group of contractors. The IOUs have the ability to set contract terms, including wage levels, in these programs, and anecdotal evidence suggests that these jobs tend to be lower wage. The wage floor should be based on the residential and commercial state prevailing

wage standard as determined by the California Department of Industrial Relations (DIR).²⁷⁸ This ensures that the wage floor established by the Public Utilities Commission will match state public works standards, including an additional amount for health and welfare benefits if not provided by the employer, and varying appropriately by region, as there are variations in the cost of living throughout the state.

Appendix 4B details the likely increased cost of an ESA wage floor based on three wage scenarios ranging from \$15 to \$17 per hour. We used scenarios because the DIR would have to make a wage determination for this work by county across the state. We estimate that ESA costs will increase 2 percent if the wage floor is increased to \$15 per hour, less than 3 percent for a \$16 per hour wage floor, and less than 4 percent for a \$17 per hour wage floor.

There are a variety of other wage standards that could be considered, and each has pros and cons. We suggest using state prevailing wage standards for residential construction trades as it is the most universally accepted wage standard for construction, is regionally based, and can align with other publicly-funded weatherization programs.²⁷⁹ This is a state standard that covers many trades.

Stakeholders have expressed concern over whether or not the IOUs can set wage standards for the EE programs. The CPUC regularly considers wages for utility construction employees in its General Rate Proceedings. Recently, Decision 12-11-051 addressed a Total Compensation Study, which is used by the CPUC to determine a level of compensation that will “ensure that ratepayers are not burdened with paying compensation levels beyond that which is necessary for [a utility] to provide safe and reliable service at reasonable rates.”²⁸⁰

4. Guide and Encourage Large EE Customers and their Contractors to Adopt Comprehensive Inclusionary Policies, Particularly in the MUSH Sector

MUSH customers generally occupy their buildings long term and spend large sums on energy costs, so energy efficiency projects are prudent investments to make. However, these institutions often have multiple considerations when choosing how to allocate resources for any investment, including energy efficiency.²⁸¹ Many of these customers have constituents who press them to weigh the economic development or job creation outcomes of competing investments. In many jurisdictions, they are already required to pay prevailing wages and hire firms that employ state-registered apprentices for any

²⁷⁸ Department of Industrial Relations (2012). *General prevailing wage determinations: 2012-2 journeyman determinations*. Retrieved from: <http://www.dir.ca.gov/oprl/2012-2/PWD/index.htm>.

²⁷⁹ State prevailing wages will be required for projects that receive funding through AB 32 cap-and-trade auction proceeds, according to AB 1532 (2012) and other state laws governing appropriations by the California State Legislature. The Governor’s budget proposal for Fiscal Year 2014-15 (released January 10, 2014) proposed \$80 million in cap-and-trade auction proceeds go to weatherization programs administered through the Department of Community Services and Development.

²⁸⁰ California Public Utilities Commission (2012, November 29). *Decision on Test Year 2012 General Rate Case for Southern California Edison Company* (D.12-11-051). p. 438.

²⁸¹ See, for example, targeted hire and local contracting initiatives referenced in Exhibit 4A.1: Comparison of Thresholds for Targeted Hire Requirements in Appendix 4A. See also Beach, B., K. Mulligan-Hansel, & S. Owens-Wilson (2013). *The Construction Careers Handbook*. Partnership for Working Families.

capital projects. For these customers, the business case for investing in energy efficiency is more compelling for when the investments leverage opportunities address all three prongs of their triple bottom line²⁸² mandates, including jobs for disadvantaged workers.

The IOUs should support their MUSH customers and their contractors in implementing inclusion strategies focusing on the best practice elements described above: a **first source** policy, a **targeted hiring** policy, and where these are not already in place, **apprenticeship standards** and **prevailing wages**. With regard to targeted hiring, we recommend a conservative initial goal of 20 percent of total work hours to be performed by disadvantaged workers. Adopting a targeted hiring program requires a learning curve for employers and program administrators, and it is important to start with achievable targets.

B. FOUNDATIONAL AND SUPPORT ACTIVITIES

1. Define “Disadvantaged Worker” Meaningfully and Consistently

The IOUs need to adopt a common definition of “disadvantaged worker” for their workforce inclusion program so that they can target their activities consistently and track and report comparable outcomes.

We considered a number of different ways to define disadvantaged communities, including looking at definitions that are currently used for similar purposes. For example, California’s Alternative Rates for Energy (CARE) Program uses a set of criteria to identify low-income customers who are eligible for a discount on their gas and electric bills. IOUs can easily track the cumulative number of CARE-eligible households by zip code in their service areas and prioritize jobs for individuals living in those areas. Similarly, the California Communities Environmental Health Screening Tool (CalEnviroScreen)²⁸³ was created to identify low-income communities who are disproportionately affected by environmental hazards. CalEnviroScreen will be used to allocate a portion of California’s cap-and-trade revenue for investments directed to the identified communities. This tool identifies communities using a combination of environmental and socio-economic characteristics and creates a comprehensive “score” for every zip code in the state of California. Therefore, both CARE and CalEnviroScreen have the advantage of being a common metric with other goals.

While these definitions are useful for the applications for which they were designed, they are not used by other workforce inclusion programs, and they do not directly address criteria related to employment, such as unemployment rates or barriers to employment.

We propose a definition that has been used, with small variants, in other workforce inclusion programs that specifically address access to construction jobs. It relies on two sets of criteria: one based on the workers’ zip code of residence, and the other based on confidential personal characteristics that can be

²⁸² “Triple bottom line” includes economic, environmental, and equity benefits.

²⁸³ Office of Environmental Health Hazard Assessment (2014). *California Communities Environmental Health Screening Tool (CalEnviroScreen 1.1)*.

verified by the workforce partner organizations responsible for training and referring qualified disadvantaged workers.

We propose that the IOUs adopt the following joint definition of a “disadvantaged worker” for their workforce inclusion program:

1. An individual who meets one or more of the ***disadvantaged worker criteria***:
 - Household income is below 50 percent of Area Median Income (AMI);
 - Recipient of public assistance;
 - Lacking a GED or high school diploma;
 - Previous involvement with the criminal justice system;
 - Custodial single parent;
 - Chronically unemployed;
 - Emancipated from the foster care system; OR
 - Limited English Proficiency (LEP).

OR

2. An individual who is a resident of a ***high unemployment zip code***:
 - Where the unemployment rate is *either* 150 percent of the median unemployment rate for the county; *or* 150 percent of the median unemployment rate for the state.

This approach was supported by contractors and external stakeholders who are familiar or have worked with the same criteria in other programs.

2. Data Collection on Jobs, Workforce Diversity, and Hiring

The IOUs must establish a more comprehensive and structured approach to data collection in order to produce useful information on job creation and workforce inclusion.²⁸⁴ This will allow the CPUC to evaluate progress towards achieving the co-benefits of energy efficiency investments, which are of great interest to a number of stakeholders. We make recommendations on data collection methods in Chapter 5, which addresses EM&V.

²⁸⁴ See Appendix 5B: Recommended Changes to IOU WE&T Data Collection Practices.

V. STAKEHOLDER FEEDBACK

This Guidance Plan reflects the combined expertise and opinions of the IOUs, firms implementing IOU programs, policy and subject matter experts, CPUC Energy Division staff, labor and contractor advocates, environmental organizations, low-income advocates, and the consultant team.²⁸⁵ Throughout this project’s review process, many useful suggestions have been made by these stakeholders and incorporated by the consultant team.

This feedback was provided both verbally and in written form, in monthly meetings with the Stakeholder Advisory Group and the IOUs, several sessions with the Leadership Briefing Group, and during many other meetings with the IOUs. We also organized a broader stakeholder session on inclusion, in which a number of ESA contractors and low-income advocates participated.

As with all the recommendations in this Guidance Plan, the IOUs have stated that they are reviewing these recommendations and other internal and external program advice to inform future program planning, and have not committed to taking specific action.

1. Create a Workforce Inclusion Program

As with all the recommendations in this Guidance Plan, the IOUs have stated that they “are reviewing these recommendations and other internal and external program advice to inform future program planning.”²⁸⁶ Throughout the process, the IOUs generally reiterated that their program focus was on delivering EE measures for purposes of meeting energy efficiency goals rather than workforce outcomes. They were also concerned about recommendations which they felt could lower the cost-effectiveness of their programs.

Some of the low-income advocacy groups and labor representatives viewed this recommendation as consistent with the Energy Efficiency Strategic Plan and existing Commission policy, but agreed that it would be helpful for the Commission to issue specific directives regarding allocating program resources to support inclusion outcomes. They also expressed their view that there should be a requirement for inclusion, not just a ranking preference or first source outreach, and they supported a stronger redesign of MUSH programs to achieve this.

2. Wage Floor

The IOUs were generally opposed to the idea of a wage floor, stating that it might not reflect job quality or guarantee high performance. Moreover, the IOUs believed that a wage floor would likely lower program cost effectiveness and potentially lead to the elimination of some measures in order to meet cost effectiveness and administrative cost requirements.

Equity groups and labor were largely supportive of a wage floor, stating that the use of ratepayer funds should require family-supporting wages. One of the equity groups noted that ESAP contractors would have

²⁸⁵ See Appendix 1B for a complete list of interviewees. See Appendix 1C for a complete list of participants in the Stakeholder Advisory Group and the Leadership Briefing Group. All written feedback, except for IOU comments inserted in Guidance Plan drafts, is contained in Appendix 1D—Attachment 1.

²⁸⁶ IOU email communication to UC Berkeley Donald Vial Center.

to be allowed to adjust budgets and cost-effectiveness ratios to accommodate any potential increased costs of a wage floor.

There was some divergence of opinion about the wage floor amount. Initially, the WE&T consultant team proposed a \$16 per hour wage floor for all ESAP and Direct Install Programs, based on the wage paid by LADWP's Pre-Craft Trainee Program. Equity and labor groups preferred a region-specific floor to account for the varied costs of living throughout the state, with health and welfare benefits included. Labor and contractor groups supported a prevailing wage standard.

3. Guide and Encourage State and Local Government Partners, Third-Party and Direct Install Contractors, and Other Firms to Adopt Targeted Hire Policies along with Apprenticeship Standards and Prevailing Wages

The IOUs generally did not support the recommendation to aggregate MUSH projects in order to support targeted hiring policies. IOUs believe their current programs are designed in a way that effectively serves specific sectors and obtains buy-in from a diverse group of decision makers at state agencies, regional and local governments, local and state education institutions, and hospitals. They also stated their concern that aggregating contracts could reduce energy savings.

In contrast, equity groups expressed the belief that the MUSH sector is well-suited for implementation of targeted hiring due to the scale and direct contractual relationships with implementers.

Some environmental and labor groups added that a more targeted focus on the MUSH sector will help meet the needs of the unique markets of the sector and reach economies of scale beyond what is currently occurring with the standard (or custom) offerings now available. However, environmental groups expressed some concern over the idea of aggregating MUSH projects given the current restrictions on program funds as allocated by the statewide program categories. They suggested phasing this recommendation into what is achievable under current funding conditions (perhaps allocating a certain percentage of funding or kWh), and a long-term recommendation (developing an ideal approach for MUSH program design and delivery).

4. Disadvantaged Worker Definition

Some of the IOUs said that the "disadvantaged worker" definition proposed by the WE&T Consultant team was a reasonable starting point for obtaining input and comment by stakeholders. Another IOU suggested that a feasibility analysis must be performed in order to fully understand the potential impact of implementation.

Some of the equity groups expressed a preference for using only personal characteristics of disadvantage rather than high unemployment zip codes because they feared that zip codes were not specific enough to ensure that only disadvantaged workers benefited from that preference. Others, as well as the labor and contractor representatives, expressed support for keeping these definitions consistent with those currently in use on public works projects.

5. Data Collection

The IOUs stated that more contractor input and a feasibility analysis would be helpful in order to fully understand the potential administrative costs to contractors and the IOUs of a data collection requirement. They expressed some support for a phased and voluntary approach to data collection.

Equity groups referenced several Commission Decisions and directives that emphasized the need for workforce data, and asserted that the issue should no longer be debated. They also recommended several off-the-shelf products that can track worker data while ensuring worker privacy, and they supported the recommendation for an annual, public scorecard to record outcomes.

VI. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS

THE CPUC SHOULD PROVIDE DIRECTION TO THE IOUS TO CREATE A WORKFORCE INCLUSION PROGRAM

The recommendations in this chapter (and chapter 3) provide the IOUs with a roadmap for developing a comprehensive program to support disadvantaged workers to enter and advance in rewarding careers in EE-related work. Although the IOUs have demonstrated that they are interested in developing a more robust approach to workforce inclusion, they have not yet demonstrated leadership in this area. They have complied with specific CPUC direction on issues like workforce data tracking but have not yet taken designed a more ambitious and comprehensive program. IOU staff has acknowledged that this is not their core area of expertise, and requested further guidance. In addition, they are concerned with the impact of inclusion programs on cost-effectiveness. We believe the costs of the inclusion program that we recommend are very small, but we also acknowledge that these costs are unlikely to be offset by increased energy savings, at least in the short run. Since the CPUC has not yet given clear direction to the IOUs with specific targets for the goal of inclusion, the IOUs do not feel that they have CPUC support for a strong inclusion program.

We suggest that the CPUC to establish the objectives and scope of the IOUs' program for workforce inclusion. The CPUC established this type of high-level policy guidance along with specific objectives and reporting requirements for G.O. 156, which may have been a critical contributing factor to the IOUs' impressive progress in promoting supplier diversity. We address the need for a "scorecard" on workforce outcomes in Chapter 5.

In order to emulate the success of G.O. 156, we recommend that CPUC provide specific direction to the IOUs to create a workforce inclusion program that encourages contractors participating in IOU EE programs to expand opportunities for disadvantaged workers in living wage, career track jobs in the EE sector. This direction should address our recommendations for programmatic and foundational activities involved in the creation of a workforce inclusion program, including a timeline and metrics for success.

VII. IMPLEMENTATION TIMELINE

Exhibit 4.1 presents a recommended schedule for implementing the recommendations included in this chapter.

Exhibit 4.1 Implementation Timeline for Demand-Side Strategies: Inclusion

Time	Actor	Action
2014	CPUC	Issue specific guidance on inclusion goals, objectives, and scope.
Q2 2014	IOUs	Modify recommended budgets and plans for 2015 to address inclusion recommendations.
Q3 2014	IOUs	Add “diversity of workforce” as a factor in ranking proposals by third-party contractors in all EE solicitations.
Q3 2014	IOUs	Develop “first source” system to create a formal link between training for disadvantaged workers and job opportunities through EE programs.
Q4 2014	IOUs	Implement prevailing wage floor for ESA, Direct Install (DI), and third-party (3P) programs. Determine which 3P programs will apply wage floor.
Q3 2014	CPUC	Encourage the RENs to establish public works targeted hire programs.
Q3 2014	IOUs	<ul style="list-style-type: none"> • Guide and encourage State and Local Government Partners, 3P and DI contractors, and other firms with whom IOUs have direct contracting relationships—particularly those serving MUSH customers—to adopt apprenticeship standards, prevailing wage, and targeted hire policies, which together can provide meaningful job and training opportunities for disadvantaged workers. • Incorporate these program design elements into PIPs.
Q3 2014	CPUC	Encourage REN and CCA EE programs to adopt these inclusionary policies as well.
Q3 2014	IOUs, CPUC	Adopt a definition of “disadvantaged worker” which is based on both residence in a high unemployment zip code and meeting specific criteria of disadvantage.
Q4 2014	IOUs	Revise contracts with ESA, DI, and 3P providers to include “first source” and wage floor language and to require data reporting.
2015	IOUs	Track data related to goals of inclusion (hiring, wages and job quality, workforce diversity).
2015	IOUs	Develop an annual scorecard to report progress toward inclusion goals of 1) hiring disadvantaged workers, 2) wages and job quality, and 3) workforce diversity.

CHAPTER 5: EM&V Plan for Guidance Plan Recommendations

I. OVERVIEW

The primary objective of this section is to outline an evaluation, measurement, and verification (EM&V) plan for the recommendations contained in the other sections of this Guidance Plan.²⁸⁷ These recommendations include modifications to existing IOU EE and DSM programs and the IOU WE&T programs, which are part of the IOU EE program portfolios. Some of the recommendations also apply to the Energy Savings Assistance (ESA) program.²⁸⁸ This EM&V plan is limited to EE programs administered by the IOUs, and does not address demand response and distributed generation programs. The EM&V recommendations are also relevant to EE programs administered by the Regional Energy Networks (RENS) and Community Choice Aggregators (CCAs).

This chapter identifies program objectives and expected program outcomes in order to provide a picture of what success looks like for our recommendations. It also provides specific recommendations on an EM&V plan for the Guidance Plan recommendations. These provide first steps on how workforce issues can be incorporated into EM&V for the entire EE portfolio. We do not address all elements of a comprehensive plan, including market assessments and process evaluations.

The development of this EM&V plan is based on discussions and interviews with IOU staff and industry experts as well as a review of documents presenting “best practices” for EM&V studies, the results of selected EM&V studies, and the EM&V plans for California’s IOU-administered EE programs.²⁸⁹ Our review of EM&V studies has included both published studies and draft studies made available to the research team by the CPUC Energy Division staff and the IOUs’ staffs. The review of EM&V studies has been limited to energy efficiency (EE) programs and has been selective and focused on the WE&T programs and other programs where work quality has been identified as an issue.

II. PROBLEM STATEMENT

As is widely recognized, the success of DSM programs, including the success of the integration of various workforce initiatives recommended in this Guidance Plan, depends on rigorous and strategically focused EM&V. Prior EM&V studies addressing workforce issues for the IOU EE portfolio have included the process and impact evaluations for the IOU WE&T programs and the UCB-DVC Needs Assessment.

For the IOU EE incentive and other resource programs, work quality and job quality issues have been addressed only to a very limited extent. While projected (ex ante) savings are frequently found to be significantly greater

²⁸⁷ Shell, L. (2013, September 24). E-mail titled “Finalizing DVC EM&V Work Scope (New time proposed).” E-mail lists three bullets proposing a revised scope of work for Strategic Goal 6. The revised scope was discussed with representatives on the EM&V team and WE&T program team. There was also an agreement that the EM&V plan would be limited to EE and would not address distributed generation or demand response.

²⁸⁸ For purposes of this section, the set of programs classified as EE, DG, and DR are defined as demand-side management (DSM) programs.

²⁸⁹ See Appendix 5A for “best practices” references.

than evaluated (ex post) savings (the so-called energy efficiency gap), prior impact evaluations have not considered the extent to which improper installations and poor maintenance contributes to this gap.²⁹⁰ Improper installations and other work quality issues have been identified in selected studies, but in most cases the data available for addressing these issues have been quite limited at best. Thus, tracking the relationship between worker and contractor competency, work quality, and energy savings has not been possible. Our interviews and document review did not identify any EM&V studies that addressed work quality, job quality, or inclusion in a systematic fashion. Data on the job characteristics of EE work are neither collected systematically nor separately considered in addressing energy savings. Skills requirements and other factors affecting contractor performance have typically not been considered. In addition, the EM&V studies for the EE resource programs do not typically consider the costs and benefits of various approaches, such as skills requirements, for addressing improper installations and maintenance where problems are known to exist. Resources have not been allocated to identifying indicators of such concepts as work quality, which are needed to assess the importance of this issue in evaluation studies.

For the IOU WE&T programs, the EM&V studies have taken the objectives of these programs as given and have focused on two issues—strategic alignment and program effectiveness. The prior EM&V studies for the WE&T Centergies program did not distinguish the program objective of market building (informing participants of program opportunities and new technologies in order to influence their decision to invest in energy efficiency) from skills acquisition. The 2006-2008 Centergies impact evaluation focused only on the impact of participation in WE&T programs by end users (or contractors selling to end users) on end users' decisions to invest in energy savings.²⁹¹ To date, impact evaluations have not addressed the causal link between skills acquisition, improvements in work quality, and energy savings. The program theory as illustrated by the logic model for the Centergies program also did not address skills building as a separate objective in the July 2012 IOU applications (although this is remedied in the draft logic model for 2013-2014).²⁹²

Data tracking for the Centergies program also has not distinguished skills building from market building, and recent program evaluations for the WE&T programs have been limited by a lack of useful data. According to a February 2013 EM&V report, the data collected from participants in the WE&T Centergies program have been limited to contact information and do not include “. . . basic information on the demographics, decision-making potential, and possible buildings that might be affected by the participant's increased knowledge gained through training.”²⁹³

²⁹⁰ Alcott, H., & Greenstone, M. (2012, July 20). *Is There an Energy Efficiency Gap?*. Energy Institute at Haas Working Paper Series, EI @ Haas WP 228R, Berkeley, California. Blumstein, C., & M. Taylor (2013, May). *Rethinking the Energy-Efficiency Gap: Producers, Intermediaries, and Innovation*. Energy Institute at Haas Working Paper Series, EI @ Haas WP 243, Berkeley, California.

²⁹¹ Opinion Dynamics Corporation, Wirtshafter Associates, Inc. Jai J. Mitchell Analytics, and Summit Blue Consulting (2010, March). *Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program (2006-2008)*.

²⁹² PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plans, Workforce Education and Training. All four IOUs submitted very similar logic models for the WE&T programs as part of their July 2012 Applications. For example, see SCE (Exhibit SCE-4B in A.12-07-004), p. 360. The draft logic model for 2013-2014 was shared with us by the IOUs.

²⁹³ Opinion Dynamics Corporation (2013, February). *Education and Training Program—Evaluation Plan for Energy Savings Impact Study for 2013-2014*. p. 16.

In 2011, the UCB-DVC Needs Assessment also recommended that the IOU Energy Training Centers, a key component of the Centergies programs, “. . . begin to collect information from participants on occupation, prior education, and work experience.”²⁹⁴

This review shows that limited attention has been paid to work quality and job quality in recent EM&V studies for EE resource programs and WE&T programs administered by the IOUs. This lack of attention has significant implications, particularly as the state’s reliance on EE as an alternative energy resource increases.²⁹⁵ The lack of EM&V studies addressing the extent to which poor work quality affects energy savings and costs (including program, contractor, and customer costs) makes it difficult to assess the benefits and costs of contractor and worker skills requirements. Finally, the lack of EM&V studies addressing the impact of WE&T programs on skills acquisition and on the relationship of skills to work quality limits assessments of the value of the WE&T programs and initiatives to address work quality as part of EE resource programs.

Without an understanding of the benefits and costs of alternative workforce initiatives, California and the individual IOUs may consistently be overlooking opportunities to increase the cost-effectiveness of their energy efficiency portfolios. Moreover, the lack of data on jobs and workforce characteristics limits potential assessments of how the IOU programs are affecting the broader set of policy objectives, such as market transformation. Finally, at present, one cannot determine the extent to which, or even whether, the IOU programs are strengthening job opportunities and removing market barriers for disadvantaged workers.²⁹⁶

III. REGULATORY DIRECTION AND RECENT DEVELOPMENTS

EM&V has long been considered an essential element of EE programs, including those administered by the IOUs in California. Moreover, on multiple occasions the CPUC has recognized the importance of EM&V to verify energy savings and other outcomes, to improve the success of future EE programs, and to enhance the reliability of forecasted savings for resource planning purposes.²⁹⁷ In 2009, the CPUC restated the core objectives for EM&V activities:

²⁹⁴ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. p. 295.

²⁹⁵ The term “work quality” is used throughout to refer to proper installations, maintenance and operations of measures and systems of measures. The term “job quality” is used to refer to wages, benefits, working conditions, career ladders, employee turnover and retention, use of certifications and other factors indicating workforce competency.

²⁹⁶ A proposed definition for “disadvantaged worker” is presented in Chapter 4. While there is some overlap with the definitions used to administer the Utility Supplier Diversity Program (GO 156) program and the definition of “hard-to-reach” customers, the “disadvantaged worker” concept is distinct. The GO 156 definition is for eligible contractors, does not include any restrictions on income, and is designed to provide a more competitive market for IOU procurement. The “hard to reach” definition is designed to identify customers whose participation in IOU EE programs has been constrained, possibly by income, but also by language, geographic, and other considerations.

²⁹⁷ California Public Utilities Commission (2013, July). *Energy Efficiency Policy Manual: Applicable to Post-2012 Energy Efficiency Programs, Version 5 (R.09-11-014)*. p. 35.

- Savings measurement and verification;
- Program evaluation (includes program metrics and process evaluations);
- Market assessment;
- Policy and planning support; and
- Financial and management audit.²⁹⁸

Responsibility for these activities is shared between the IOUs and the CPUC Energy Division as outlined in the EM&V Plan (or Roadmap).²⁹⁹

In recent CPUC decisions for the 2013-2014 EE program cycle, the potential benefits of various workforce initiatives have been recognized along with the need for additional data to support these initiatives. In the May 2012 Guidance Decision (D.12-05-015), the Commission addressed the potential benefits of workforce standards and certification requirements for specific EE measures and services.³⁰⁰ The Commission refrained from mandating skills standards, saying they had insufficient evidence to justify doing so. The Commission did direct the IOUs to include in their applications specific information on the costs and benefits of skills standards.

In the Commission decision approving the 2013-2014 EE programs (D.12-11-015), the Commission directed the IOUs to emulate “the data collection protocols with respect to workforce initiatives recently adopted by the Commission for the low-income programs in D.12-08-044.”³⁰¹ The reference was to the data collection protocols adopted for the 2012-2014 Energy Savings Assistance (ESA) program. The Commission directed the IOUs to begin collecting more detailed and meaningful data in several WE&T areas. Seven specific areas dealing largely with job quality were identified.

These two requests by the CPUC for data and additional analyses on workforce address two separate issues. The first is concerned with the impact of workforce standards on energy savings and the potential impacts on customer costs and benefits and on program participation. The second is concerned with the jobs and workforce outcomes of EE and ESA program investments. This concern directly responded to stakeholder comments on the importance of leveraging ratepayer investments to meet the inclusion goal of the Strategic Plan (see Chapter 4).

These two research objectives are distinct and each needs to be addressed as part of a comprehensive EM&V plan.³⁰² The direction included in D.12-05-015 is focused on the benefits and costs associated with mandating

²⁹⁸ California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047).

²⁹⁹ California Public Utilities Commission (2013, August 5). *2013-2014 Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification Plan Version 2: Long Term Research Roadmap for HVAC*.

³⁰⁰ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 282-283.

³⁰¹ California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities’ 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). Ordering Paragraph 8, p. 373; California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p.91.

³⁰² Opinion Dynamics Corporation (2013, December 17). *Investigation into WE&T Critical Data Needs*. Memorandum to CA IOU WE&T M&E Team.

skills standards. The direction addressing the ESA program and the related direction in D.12-11-015 concerns issues largely related to assessing workforce needs for ESA and EE programs and inclusion of disadvantaged workers.³⁰³ The WE&T Work Order Proposal for the 2013-2014 program cycle has as its main objective a comprehensive evaluation of the IOU WE&T workforce standards but also includes a review of the IOU initial data collection efforts and suggestions for improvements.

In sum, the CPUC has requested in recent EE and ESA decisions for workforce issues to be a subject of data collection and workforce issues be incorporated into EM&V efforts. We come back to these concerns in Section E. We now describe the program theory, objectives, and expected outcomes for the recommendations we propose in this Guidance Plan.

IV. PROGRAM THEORY, OUTCOMES, AND SUCCESS METRICS FOR GUIDANCE PLAN RECOMMENDATIONS

The specific recommendations included in the body of this Guidance Plan call for modifications and new initiatives for the IOU energy efficiency programs. These recommendations are divided into the two broad categories of demand and supply and thus the EM&V plan addresses the IOU EE resources programs (demand) and the IOU WE&T programs (supply). The Guidance Plan recommendations address two broad goals, energy savings and inclusion, and so again, the EM&V plan addresses both energy savings outcomes and workforce inclusion outcomes.³⁰⁴

The demand recommendations are designed to increase work quality by placing requirements on contractors and workers participating in IOU EE programs and to increase employment opportunities for qualified disadvantaged workers. The supply recommendations include redesigning the IOU WE&T programs to increase their impact on the EE specific skills acquisition of workers in the key occupations that impact energy use, and to prepare disadvantaged workers for EE careers. These demand and supply recommendations are designed to work together in that the benefits of having trained workers with the requisite EE skills for performing quality work depend on there being markets where quality work is in demand. This synergy should be incorporated into the EM&V approach to our recommendations.

Exhibit 5.1 lists the Guidance Plan recommendations at the general level (“General Recommendations”) along with a brief summary of the program objectives and the expected outcomes. The outcomes are not distinguished by short term and long term but are designed to provide the basis for developing more specific program metrics.³⁰⁵

³⁰³ California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities’ 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 179.

³⁰⁴ The term “energy savings outcomes” refers to kWh savings and kW reductions associated with the IOU EE programs.

³⁰⁵ The definition of metrics of success is distinct from the definition of Program Performance Metrics (PPMs) adopted by the Commission. The PPMs approved by the Commission for the 2010-2012 program cycle are limited primarily to activities and short-term outcomes.

Exhibit 5.1 Objectives and Expected Outcomes for Guidance Plan Recommendations

Area	Sub-Area	General Recommendation	Goal	Objective	Expected Outcomes (Success Metrics)
DEMAND: Energy Savings	I. Incorporate workforce standards into IOU EE program requirements	A. Adopt a responsible contractor policy for use across all resource programs with contractor participation.	Energy	<ul style="list-style-type: none"> Contractors participating in IOU EE programs meet minimum standards. 	<ul style="list-style-type: none"> Increase in proportion of projects where EE measures are properly installed, maintained, and operated. Reduced number of callbacks. Increase in customer satisfaction.
		B. Adopt skills standards as proof of skilled workforce.	Energy	<ul style="list-style-type: none"> Workers conducting work for contractors or contractors participating in IOU programs meet minimum skills requirements. 	
		C. Develop and implement system to manage verification and enforcement of the skills standard and contractor qualification requirements.	Energy	<ul style="list-style-type: none"> Increase compliance with contractor and work requirements. 	
	II. Implement changes in the planning, approval, implementation, and evaluation processes for EE resource programs	A. Review and modify quality assurance processes to place greater emphasis on work quality.	Energy	<ul style="list-style-type: none"> Inspections and other QA processes verify work quality, not just that the measure has been installed. 	<ul style="list-style-type: none"> Problems in work quality are quickly identified and rectified. IOU savings claim more accurately reflect actual energy savings. IOUs are rewarded for actions that ensure work quality. Information on WE&T needs are communicated and help set WE&T priorities.
		B. Document competencies of contractors and workers for demonstration and pilot projects, in work papers, and Program Implementation Plans (PIPs).	Energy	<ul style="list-style-type: none"> Projections of energy savings include assumptions on contractor and worker competencies. Indicators of work quality and job quality are incorporated into program tracking systems. 	
DEMAND: Inclusion	III. Create workforce inclusion program	A. Develop and implement a workforce inclusion program that encompasses training connected to family-supporting career pathways for a diverse EE workforce, including disadvantaged workers.	Inclusion	<ul style="list-style-type: none"> Expand opportunities for disadvantaged workers through IOU EE contracting process and through IOU EE program requirements. 	<ul style="list-style-type: none"> Increases in number and proportion of qualified disadvantaged workers in “good jobs” in EE sector. Improvements in the quality of jobs in the EE sector as defined by wages, benefits, working conditions, and career ladders. Greater recognition of opportunities provided through IOU EE programs through annual reporting of participation of disadvantaged workers.
	IV. Support foundational activities for inclusion program	A. Adopt definition of disadvantaged worker based on a combination of high unemployment zip codes and meeting identified criteria of disadvantage.	Inclusion	<ul style="list-style-type: none"> Common definition of disadvantaged worker used by all IOUs allowing participation of disadvantaged workers to be tracked and reported. 	
		B. Collect ongoing data on job quality, workforce diversity, hiring of disadvantaged workers, and indicators of the costs and benefits of inclusionary policies.	Inclusion	<ul style="list-style-type: none"> Data collected from contractors for IOU EE programs allowing for the monitoring progress in achieving inclusion goals. 	

Area	Sub-Area	General Recommendation	Goal	Objective	Expected Outcomes (Success Metrics)
SUPPLY: Energy Savings and Inclusion	I. WE&T program modifications for skills building	A. Develop and manage a dedicated skills-building portfolio targeting both energy savings and workforce inclusion goals, based on career pathways framework, partnerships with core institutions, and sector strategies.	Energy and Inclusion	<ul style="list-style-type: none"> Comprehensive approach to skills building for EE WE&T programs. 	<ul style="list-style-type: none"> Increase the EE skills of incumbent workers and entry-level workers in EE sector.
		B. Implement the skills-building portfolio via two coordinated RFPs: one for the goal of energy savings and one for the goal of inclusion with systematic prioritization process.	Energy and Inclusion	<ul style="list-style-type: none"> Prioritization of skills-building activities based on identification of priority occupations, skills standards, and gaps, along with potential program interventions. Process considers two policy objectives: cost-effective energy efficiency and inclusion. Set of projects to address skills building for incumbents workers, core institutions, and disadvantaged workers. Sector strategies to be used for programs serving incumbent workers and disadvantaged workers. 	<ul style="list-style-type: none"> Curriculum developed incorporating EE skills for core institutions (e.g., Community College, Apprenticeship Trainings, four-year engineering and architectural programs). Financial support and in-kind contributions from employers and other sector strategy participants. Additional hours of EE skills-building instruction for both trainers and students. Increase in workers employed in EE sector with certificates and degrees and with skills-building experience. Inclusions of worker competencies and KSAs in EE programs. Workers available with EE skills, including areas where work quality problems have been identified as issue.
		C. Engage a Peer Review Group of key workforce stakeholders and experts to advise the IOUs on the development of skills-building portfolio.	Energy and Inclusion	<ul style="list-style-type: none"> Engaged Peer Review Group working closely with IOU staff on skills-building portfolio. 	<ul style="list-style-type: none"> Strong skills-building portfolio and support of workforce community based on input from stakeholders and experts.
		D. Assign or hire IOU staff and/or consultants to administer the RFPs.	Energy and Inclusion	<ul style="list-style-type: none"> Qualified staff to manage the development, review, and contract administration. 	<ul style="list-style-type: none"> Effective management of skills-building RFPs and resulting projects funded using RFP process.
		E. Fund three phase-one programs that can begin in 2015.	Energy and Inclusion	<ul style="list-style-type: none"> Implementation of projects or initial project phases as part of current funding cycle to increase emphasis on skills building in IOU WE&T programs. 	<ul style="list-style-type: none"> Accelerated development of core curricula for accredited degree programs, incorporation of EE skills building in state certified apprenticeship systems, and development of inclusion sector strategy.
	II. WE&T program modifications for market building	A. Centergies: Modify market building program class design and delivery with explicit coordination with Marketing, Education, & Outreach (ME&O), skills-building portfolio, and other EE programs. Target classes to specific audiences, and use ratepayer funds more effectively.	Energy	<ul style="list-style-type: none"> Increase the effectiveness of market-building portfolio. 	<ul style="list-style-type: none"> Coordination of WE&T Centergies program offerings. Modifications of existing classes to increase classes targeted for specific audiences. Reductions in program costs assumed by IOU program administrator. Evidence of added knowledge regarding IOU program offerings and new technologies by program participants.

A. DEMAND RECOMMENDATIONS

These demand recommendations are grouped into those recommendations focused on energy savings and those focused on inclusion.

The recommendations focused on energy savings include workforce standards for both contractors and workers along with verification and enforcement of requirements for participation in IOU EE programs, and changes in the design, implementation, and evaluation processes. The objectives of these recommendations are to ensure that contractors and workers have the necessary competencies for the EE work and that greater emphasis is placed on work quality in the various phases of developing, implementing, and evaluating programs. The expected outcomes are designed to both increase energy savings by increasing the proportion of measures properly installed and maintained, and to reduce the costs to ratepayers, customers, and contractors that result from call backs and related problems.

The recommendations focused on inclusion include the development of a workforce inclusion program along with the adoption of a common definition of disadvantaged workers and additional data collection. The workforce inclusion program as addressed in Chapter 4 includes a number of approaches for expanding work opportunities for qualified disadvantaged workers. The expected outcomes are an increase in both the number of disadvantaged workers employed and an increase in the quality of the jobs held by disadvantaged workers.

The basic program theory underlying these recommendations is that modifications to EE program requirements can both increase work quality, thereby increasing energy savings, and expand job opportunities for disadvantaged workers. To date, the program theory and logic models used to illustrate the theory for the various resource programs have not been modified to specifically address either work quality or inclusion.

There may be a tradeoff between the energy savings objective and the inclusion objective in the short-term because allocating resources to address inclusion is not likely to directly contribute to energy savings. Over the longer term, the opening up of opportunities for the disadvantaged could increase the availability of workers with the requisite skills and could result in lower costs and more widespread acceptance of energy efficiency in the market. How to weigh the short-term tradeoff between energy savings and inclusion goals is a policy decision that ultimately needs to be decided by the Commission in approving program plans and budgets, and possibly by the state in providing legislative direction to the Commission.

B. SUPPLY (SKILLS-BUILDING) RECOMMENDATIONS FOR WE&T PROGRAMS

The supply recommendations for the IOU WE&T programs are divided into program modifications for skills building and for market building. The Guidance Plan recommends a greater focus on skills-building activities and a redesign of the way they are delivered.

The existing WE&T programs include two major subprograms: Centergies and Connections. Centergies is largely focused on providing information on new technologies and available program offerings to customers, contractors, and professionals. The Connections program is focused on energy education for schools; the majority of the programs are for elementary and middle schools although some programs serve high schools and 4-year institutions.

To illustrate the program theory and how this increased focus on skills building could be integrated with the existing statewide IOU WE&T programs, we have prepared a logic model (Exhibit 5.2) which includes activities and outcomes. The outcomes are divided into short term (3-year program cycle), mid-term (two program cycles) and long term (could be 2020 or beyond). Due to resource limitations, we have not developed the corresponding tables addressing the links within the model as is generally done once program plans are in place. However, the model does illustrate how specific interventions are expected to contribute to the short-term, mid-term, and long-term outcomes.³⁰⁶

In Exhibit 5.1, we have summarized the key objectives and a number of the expected outcomes resulting from the skills-building activities. These outcomes include the development of curriculum incorporating EE skills, financial support from employers and core institutions for these activities, training of both instructors and students, the incorporation of skills requirements in EE programs, and an increase in the availability of workers with the EE skills required.

The recommendations for the WE&T market-building activities are more limited, primarily addressing improvement to the Centergies portion of the WE&T market-building programs. These recommendations support the recommendations incorporated in prior process evaluations for the WE&T programs. The emphasis is on greater coordination, on training targeted to specific program audiences, and on more effective use of resources.

V. ISSUES RELATED TO INCORPORATING WORKFORCE ISSUES INTO EM&V FOR IOU EE PROGRAMS

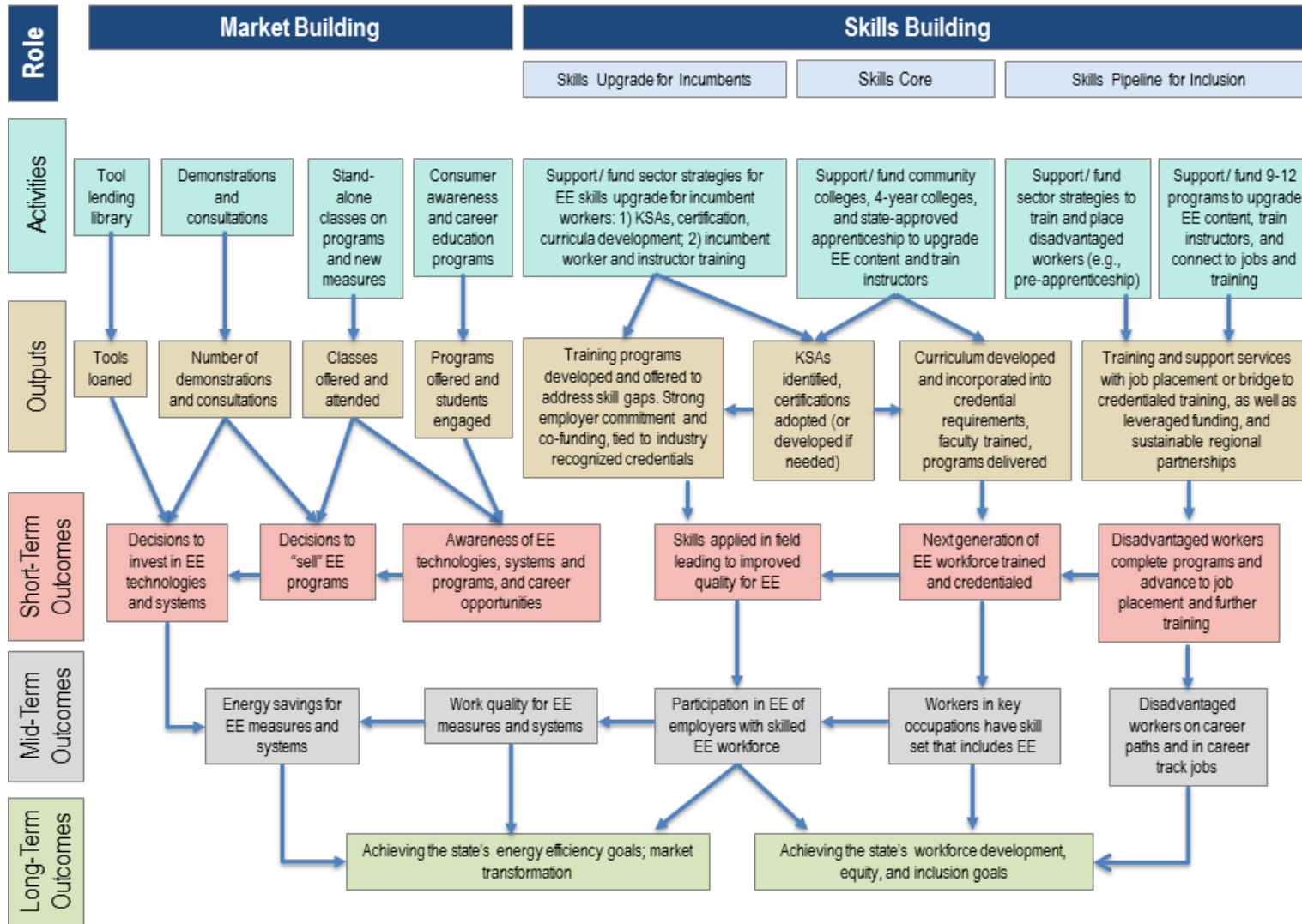
The prior section addressed the specific Guidance Plan recommendations outlining the program theory and suggesting outcomes, which provide the basis for developing specific metrics, in order to develop a picture of what success looks like. This section addresses issues common across these recommendations and relevant to a comprehensive incorporation of workforce issues into EM&V for the IOU EE programs. They include:

- Data collection on characteristics of EE contractors, workers, and jobs;
- Development of scorecards based on key program metrics to measure progress towards goals;
- Methods for evaluating the costs and benefits of workforce standards and other interventions to improve quality; and
- Modifications to the existing policies and processes for planning, implementation, and evaluation of EE measures, programs, and portfolios, in order to systematically address work quality.

For each of these issues, we have developed specific recommendations, which are addressed in the following section.

³⁰⁶ For support for program metrics for educational and training programs, see Negoita M., & K. Dunham (2013, June 30). *Designing a Performance Measurement System for Career Pathways*. Developed on behalf of the U.S. Department of Labor by Social Policy Research Associates.

Exhibit 5.2 Logic Model with Skills Building for the Statewide WE&T Centergies and Connections Sub-Programs



A. DATA COLLECTION ON JOB QUALITY, WORKFORCE DIVERSITY, AND HIRING FOR EE PROGRAMS

Only limited data are presently available on the characteristics of workers participating in the IOU EE programs. The same is true for the ESA program. Better data are essential in order to understand the skills of workers and contractors responsible for installation and maintenance of energy efficiency measures and systems, to consider the relationship of work quality to skills of workers conducting work, and to assess the influence of IOU programs on achievement of the CPUC's and the state's workforce objectives.

In 2012, the CPUC provided explicit direction for data collection for ESA and EE programs. For both the ESA and EE programs, the data collection was to address seven specific areas:

1. Contractor and subcontractor contract terms (competitive bid, direct award, etc.);
2. Contractor and subcontractor compensation schemes (hourly, piecemeal, salaried);
3. Number of inspection failures and the types of failures;
4. Level and type of IOU training;
5. Customer feedback for these contractors, positive and negative;
6. Demographic data on current ESA workforce; and
7. The IOUs' assessments of any other needs of the existing workforce to meet the current and future ESA program demands.³⁰⁷

Wage levels are notably missing from these data directives even though it was later recognized that this is a key variable. Initial efforts by the IOU program staff to respond to these problematic requests did not produce adequate results, as recognized by stakeholders and the IOUs. In a memo reviewing the experience of the initial data collection efforts, we identified three major deficits of the initial WE&T data collection implemented by the IOUs:

1. Exclusion of critical questions on wage levels and other key variables;
2. Failure to employ rigorous data collection methods, resulting in a variety of problems, including the failure to disaggregate data by job category in the initial survey of ESA program contractors; and
3. Reliance on self-reported data for some of the critical data needs such as employee compensation.

As part of this project, we have considered alternatives to the contractor surveys implemented by the IOUs in early 2013. Our research has led us to conclude that a more comprehensive approach to data collection is needed in order to produce useful baseline information on jobs and workforce.³⁰⁸ The IOUs' current approach will not provide useful workforce metrics to inform the CPUC's interest in exploring how best to address the inclusion and job quality goals of energy efficiency investments, which are of great interest to a number of stakeholders.

³⁰⁷ California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities' 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). p. 181, Ordering Paragraphs 8-10, pp. 373-374.

³⁰⁸ See Appendix 5B: Recommended Changes to IOU WE&T Data Collection Practices.

A promising option is the use of an electronic jobs reporting system, which uses certified payroll data to report key jobs and workforce data. These reporting systems provide accurate data because they rely on payroll data rather than contractor self-reporting. This approach could be combined with surveys for data not available through the electronic system. Annual “scorecard” reports focused on inclusion of disadvantaged workers could also be developed. While the IOUs have been reporting program metrics, metrics for the WE&T programs and other workforce issues are not readily available in summary form to the stakeholders who want to monitor progress on inclusion. We do note that while we have been reviewing and considering alternative data collections methods, the IOUs and the CPUC Energy Division have also been managing studies addressing related issues.

B. METHODS FOR EVALUATION OF WORKFORCE STANDARDS

In 2012, the potential role for skills standards and certification requirements in increasing energy savings for customers was explicitly addressed by the CPUC.³⁰⁹ The IOUs were to provide information on the following topics in their requests for funding for the 2013-2014 program cycle:

- Data or estimation of the incremental customer cost, if any, of requiring skills standards;
- Data or estimation of the average and range of permitting/compliance costs across permitting jurisdictions in the IOUs’ service territories;
- Data or estimation of the impacts, if any, mandatory skills standards would have on program participation rates;
- Data or estimates of the incremental energy savings and customer cost savings over the life of the equipment; and
- Any other potential benefits associated with higher standards, such as fewer call backs, lower frequency of customers overriding control systems, lower life-cycle costs, and increased consumer uptake of measures based on higher quality and certainty.

Since that time, the IOUs have explored alternative approaches for developing information and study methods to answer the CPUC’s questions. One of the issues to be addressed is the development and testing of indicators of work quality so that an explicit link between skills and work quality, and then work quality and energy savings, can be made. A preliminary set of metrics for work quality include: proper installation consistent with manufacturers’ specifications as determined by a skilled inspector; number of call backs required prior to installation of equipment being completed; and customer satisfaction with installation. Further investigation of potential indicators of work quality for specific measures is needed.

Determining how best to evaluate the costs and benefits of workforce standards, as requested by the CPUC, is not a simple task. There are now a number of efforts to develop methodologies to assess the costs and benefits of skills standards, including the CALCTP certification. We have reviewed the research literature and concluded that assessments of the impact of standards before the standards are adopted and tested under market

³⁰⁹ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 282-283.

conditions are not practical and are not capable of providing useful information on relative costs and benefits. The most rigorous studies of the impact of labor standards on project costs have used quasi-experimental approaches such as before and after comparisons as well as studies using regression techniques controlling for differences across program participants.

Frequently one sees reference to randomized control trials as being the “gold standard” for program evaluation. However, as is widely recognized, randomized trials require random assignment so that one group receives a treatment while the other group does not. They are generally not feasible for existing programs where participation has been voluntary. As an alternative, much can be learned from careful monitoring of interventions and what have come to be called “quasi-experimental studies.” These include before and after comparisons of program outcomes as well as studies using regression techniques controlling for differences across program participants.

At present, there are several ongoing “real life” efforts in California considering how best to assess the potential benefits and costs of using CALCTP-certified contractors and electricians for projects for advanced lighting systems, although these are somewhat limited due to their small sample size.³¹⁰

We suggest that the IOUs implement the standards recommended in this document, carefully monitor them, and conduct rigorous impact evaluations using a quasi-experimental approach implemented *after* standards have been implemented.

C. WORK QUALITY IS NOT SYSTEMATICALLY ADDRESSED IN PLANNING, APPROVAL, IMPLEMENTATION, AND EVALUATION OF IOU EE PROGRAMS

As discussed in Chapter 2, the processes used both to establish the IOU EE portfolios and to determine the savings associated with implementing these portfolios and the appropriate shareholder incentives seem to discourage consideration of proposals designed to address work quality and improve program outcomes. These issues are also relevant to this EM&V chapter both because the modifications to the policies and processes (e.g., development of energy savings assumptions, cost-effectiveness model) is part of “policy and planning support,” one of the five objectives identified for EM&V by the Commission (see Section III. “Regulatory Direction and Recent Developments” of this chapter), and because any modifications to these processes require assumptions built on valid data collection systems and rigorous EM&V studies.

The assumptions, models, and regulatory directives for these policies and processes have been developed over a number of years and are subject to multiple uncertainties. For example, the assumptions for establishing the IOU program portfolios (or the ex ante review process) include energy use for baseline and energy efficient

³¹⁰ The CEC has contracted with ICF and others to compare two sets of projects: one set of projects were installed with CALCTP-certified contractors and electricians while another set of projects were not. The two sets of projects are somewhat different so a number of assumptions will be required in order to identify the potential benefits of the use of CALCTP-certified contractors and electricians. The building samples are also small. We support the study as an initial first step in describing the types of projects where CALCTP-certified contractors and electricians have been used but we warn against the over interpretation of the results. Both PG&E and SCE have initiated pilot projects to assess the benefits of CALCTP certifications. The SCE project is still in the planning phase. As of late October, the PG&E project had been put on hold. The status of these projects is based on information from January 2014.

measures for given weather zones with specific assumptions on use, expected useful life of measures, the extent to which the adoption of measures is a result of the IOU program (i.e., the net-to-gross), the costs of the power generation that is avoided by the energy efficiency measures, and assumed discount rates. Many of the assumptions and models have been formalized in CPUC decisions with the result that any changes to these assumptions require modifications to existing decisions.

Our review of the assumptions and models upon which the planning and approval processes are based showed that assumptions on energy use do not include, as a general rule, information on skills required to install, maintain, and operate energy efficient measures. The program screening process does not lend itself to consideration of assumptions on work quality improvements resulting from either the introduction of standards or skills-building initiatives. While we have not identified a preferred approach for introducing work quality, we do believe that the policies and processes used to screen programs for inclusion in the IOU portfolios needs to be revisited to allow for analysis of the adoption of skills standards and other program initiatives.

VI. RECOMMENDATIONS FOR EM&V PLANS

RECOMMENDATIONS: EVALUATION, MEASUREMENT & VERIFICATION (EM&V)

General Recommendations	Specific Recommendations	Goal
A. Collect job quality and work quality data essential for planning, implementation, and evaluation of workforce initiatives.	1. Select indicators of work quality, job quality, and inclusion based on a review of existing indicators and in consultation with labor force experts.	Energy and Inclusion
	2. Require all contractors and subcontractors that have a direct contracting relationship with the IOU and/or are pre-selected (e.g., Direct Install, Local Government Partnerships, third-party programs, and ESA programs) to report specified jobs and workforce data, via participation in a confidential online jobs reporting system based on certified payroll data.	Energy and Inclusion
	3. For contractors hired by customers, develop, test, and implement workforce data collection methods using "best practice" approaches.	Energy and Inclusion
	4. Collect data on indicators of work quality for measures and systems where quality assurance processes or demonstration and pilot projects have identified work quality problems.	Energy and Inclusion
	5. Develop "scorecard" reports on key program metrics using data from the online jobs reporting system and other sources and make them available to workforce stakeholders.	Energy and Inclusion
B. Evaluate the costs and benefits of standards.	1. Introduce workforce standards as requirements for EE resource programs, and carefully document and monitor the experience of initial introduction.	Energy
	2. Use "quasi-experimental" approaches in conjunction with the introduction of standards system-wide to evaluate the benefits and costs of workforce standards, including standards for advanced lighting systems and HVAC QI/QM.	Energy

General Recommendations	Specific Recommendations	Goal
C. Reform program planning, approval, and evaluation policies and processes to explicitly address work quality.	1. Support a policy task force (or a subgroup of a larger task force) to develop work papers and assess reported savings in a way that captures the impact of work quality on projections of energy savings.	Energy
	2. Monitor <i>ex post</i> program review to address work quality. As work quality is introduced in quality assessments and program evaluations, explicitly include work quality in <i>ex post</i> program review.	Energy
	3. Integrate and address inclusion as part of program reviews.	Inclusion
D. Develop full program theory, program performance metrics, and comprehensive EM&V plans after specific recommendations are incorporated into Program Implementation Plans.	1. Modify evaluation plans for EE resource programs to address indicators of quality of work and job quality, with priority given to those programs where poor work quality has been identified as an issue. Support explicit consideration of indicators of work quality for impact evaluations for the 2013-2014 program cycle.	Energy and Inclusion
	2. Review program evaluation plans for all skills-building projects whether implemented by IOU staff or third-party contractors. Ensure that all plans have appropriate data collection systems in place, have early feedback loops for program improvements, and include plans for attributing the results of programs to ratepayers when programs are jointly funded.	Energy and Inclusion
	3. Support an evaluation consultant pool and selection process that ensures that the selected consultants have the necessary expertise to evaluate the various workforce initiatives. This recommendation applies to the evaluations administered by the IOUs and by the CPUC Energy Division.	Energy and Inclusion

VII. RATIONALE

A. DATA COLLECTION FOR JOB QUALITY AND WORK QUALITY

The most efficient and effective data collection strategies for EE programs differs depending on whether EE contractors and subcontractors have a direct-contracting relationship with an IOU, (e.g., the Direct Install, ESA, and selected third-party programs) or whether they are hired by the customer (e.g., building owner or manager). We present recommendations for each below.

1. Data Collection for EE Programs in Which Contractors Have a Direct Contracting Relationship with an IOU

Require all contractors and subcontractors with a direct-contracting relationship with an IOU, including contractors participating in the Direct Install, Energy Savings Assistance (ESA), and selected third-party programs, to use an electronic certified payroll reporting and labor compliance system to report specified jobs and workforce data. These electronic reporting systems are less expensive than most ratepayer-funded contractor surveys and are now sufficiently automated that the burden on contractors is minimal. See Appendix 5B for a detailed analysis of the benefits and requirements of these systems. Such systems are widely used in the public works sector for tracking jobs and workforce data and monitoring compliance with labor laws. The IOUs should solicit qualifications and bids from different systems to compare costs and services. Based on these bids, the IOUs should propose to the CPUC a specific approach to be used by all

IOUs. The annual costs should be included in the budgets for the EE portfolio or shared between the budget for the EE portfolio and the ESA program.

The implementation of an electronic certified payroll reporting and labor compliance system could be phased in, beginning with the ESA program. The IOUs should collectively develop standard language for contract documents to instruct contractors and subcontractors on how to report jobs and workforce data according to standard requirements across all the IOUs. At a minimum, the IOUs should require their direct contractors and subcontractors employed on projects funded by EE and ESA to report data based on certified payroll records for each worker employed on a project, including:

- Job classification by trade or occupational category;
- Job classification by journey level or apprentice level;
- Rate of pay;
- Number of hours worked per week;
- Disadvantaged status, including zip code of residence;
- Race, ethnicity, and gender;³¹¹ and
- Certifications held.

There are a variety of electronic systems that track and report jobs and workforce data. Systems available off-the-shelf include Elation Systems,³¹² used by the City of San Francisco and other jurisdictions, and LCPtracker,³¹³ used by a number of UC campuses and K-12 school districts, among others. In order to streamline reporting and minimize total costs, the IOUs should pool their funding to procure one electronic certified payroll reporting system that should be used by all the IOUs for EE and ESA programs. This bundling approach will entail lower costs than if each IOU were to contract separately with such a system and may provide leverage to negotiate an even lower price due to the potentially large volume of projects. Submitting certified payroll data to an electronic certified payroll reporting system is a fairly straightforward and automated process. For contractors that use a payroll company, an electronic certified payroll system can easily set up a web interface with their payroll company to facilitate the secure transfer of data. The confidentiality of contractor and worker data has been addressed in these electronic reporting systems and should not pose a problem here.

2. Data Collection for EE Programs in Which Contractors are Hired by Customers

Data on job quality and work quality for contractors and workers who perform EE work are needed to better understand the extent to which work quality lowers energy savings, the relationship of job quality to work

³¹¹ While Proposition 209 makes it illegal to give preference to minority or female jobseekers in California, it is neither illegal nor unprecedented to request the information on a voluntary basis for statistical information.

³¹² For more information, see Elation Systems (2012). Retrieved from: <http://www.elationsys.com/elationsys/>.

³¹³ For more information, see LCPtracker - Labor Compliance Software. (n.d.). Retrieved from: <http://www.lcptracker.com/>.

quality, and the extent to which disadvantaged workers participate in EE work.³¹⁴ As addressed in detail in Chapter 2, the IOU EE programs, by providing rebates and other incentives to customers who hire contractors and workers, have a significant influence on this market. The type of information that we believe should be collected from contractors includes:

- Workers employed by contractor and subcontractor, including average number of full-time, part-time, and “casual” employees;
- Use of independent contractors;
- Qualifications and experience of workers hired;
- Training provided to workers once hired;
- Wages paid, including starting wages and average wages for key positions;
- Employee turnover and tenure rates; and
- Employee benefits including employer contribution to benefits.

As part of this project, we wrote sample survey questions that were included in the 2010-2012 CPUC Joint HVAC Contractor Survey.³¹⁵ Responses to these questions need to be reviewed and the questions subsequently should be revised, if necessary. The questions should be routinely included in contractor surveys for broad market assessments and for studies of contractors participating in IOU resource programs.

3. Report Key Program Metrics Using “Scorecard” Reports

Based on program-specific metrics and using data available from the electronic reporting system and other data collection systems, scorecard reports for job characteristics (e.g., wages, certifications, disadvantaged status, race, gender) should be developed annually. Annual reports and materials, with scorecards and supplemental narrative reports, should be publicly available on each IOU website, the proposed join IOU website and/or a centrally located page on the CPUC website. These reports are part of the overall process evaluations, an essential part of the EM&V plan, and are not substitutes for comprehensive impact evaluations to address the benefits and costs of ratepayer investments in the specific Guidance Plan recommendations. These scorecards are now commonly used by public agencies for tracking workforce outcomes.³¹⁶

The funding for this activity should be part of the EM&V budget for EE and ESA. In addition to the scorecard reports, this activity should include an annual evaluation for WE&T data. The annual evaluation should be administered by the IOUs as part of the process evaluations and should include a stakeholder engagement

³¹⁴ The CPUC’s Energy Division is now working with a consultant to develop a survey approach to address jobs and workforce data collection for the rest of the EE portfolio.

³¹⁵ Zabin, Carol (2013, August 20). E-mail from Carol Zabin to Lisa Paulo and Lisa Shell.

³¹⁶ For an example of targeted hire reporting using an electronic jobs reporting system see Soto, V. (2013, September 17). *Beyond LCP Compliance: The use of online certified payroll to measure results and document economic impact of energy efficiency investment through Local Worker Hiring*. Presentation to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

plan to involve parties interested in the evaluation process. Evaluation activities should include, but not be limited to, an analysis of data provided by the electronic certified payroll system and a comparison and interpretation of the WE&T data within and across EE programs for all IOUs.

The common scorecard should include comparisons of wages, job classifications, apprentice- and journey-level hours, total job hours, and demographic and other data as previously described. Additional research is necessary to evaluate options for and develop a common scorecard or similar tool. Report categories and indicators should be standardized for comparison across different programs and IOUs, and be determined in consultation with the CPUC.

4. Take Initial Steps for Implementing Data Collection

The IOUs should develop an implementation plan for the electronic reporting system. Alternative systems should be considered and one system for all of the IOUs should be adopted. Required changes to standard contractual language should be developed and included as contracts are up for renewal or in existing contracts with a change order. These efforts should be closely coordinated with the CPUC Energy Division with recognition that these issues are being addressed as part of the WE&T study being managed by the CPUC. The IOU EM&V team should be actively involved given their experience and knowledge with surveys and other data collection methodologies. The program teams who were responsible for the initial ESAP and EE contractor surveys should be consulted as well.

The consultant for the evaluations managed by the CPUC Energy Division should be encouraged to consult with state and national experts in the area of data collection, particularly related to wages, benefits, employee turnover, hiring practices, and other indicators of job quality and labor market characteristics. The timing of this task depends in part on the timing of other studies managed by the CPUC. However, the consultation with experts should be directed to take place within the coming six months.

B. EVALUATE COSTS AND BENEFITS OF WORKFORCE STANDARDS FOLLOWING ADOPTION IN IOU EE RESOURCE PROGRAMS

We fully support the evaluation of the costs and benefits of workforce standards and believe that the best way to do so is to introduce the standard, carefully monitor its introduction, and conduct a quasi-experimental study to evaluate the benefits and costs of having introduced the standard. We recommend introducing the standards suggested in this Guidance Plan. Data required for a quasi-experimental design should be determined (e.g., building attributes, information on experience and training of workers and contractors) and collected as projects are undertaken with workers meeting the certification requirements.

The IOUs should support the introduction of workforce standards as proposed in the Guidance Plan, particularly for measures and systems where work quality is a recognized problem. Comprehensive EM&V plans should be developed and implemented with the use of quasi-experimental methods.

With respect to timing, the inclusion of workforce standards along with the EM&V plan should be proposed as part of the next funding cycle. Lessons learned from recent efforts to better understand the CALCTP program should be considered in designing the program and EM&V plan.

C. REFORM PROGRAM PLANNING AND APPROVAL (EX ANTE) AND PROGRAM EVALUATION (EX POST) POLICIES AND PROCESSES TO EXPLICITLY ADDRESS WORK QUALITY

The Ex Ante planning and approval policies and processes need to include acknowledgement of the impact of work quality on energy savings. The best approach for addressing work quality in the review and approval process is not obvious. Moreover, changes to the Ex Ante review process should be comprehensive and not limited solely to inclusion of work quality. We recommended that the IOUs support the formation of a task force (or subgroup of a task force carrying out a broader review of the Ex Ante process) to address these issues.

The first task would be to explore and document the extent to which work quality issues are implicitly incorporated in the assumptions used in the Ex Ante review process. To the extent that assumptions incorporate information from previous Ex Post evaluations, work quality may well be one of the factors implicitly included, but ideally it should be isolated from other factors. The second task would be to identify approaches for integrating work quality, and assessing the pros and cons of the various approaches. These approaches could range from modification of specific energy use assumptions to "broad-brush" assumptions such as the Gross Realization Rate that is applied to all customized projects that are not reviewed by the CPUC Energy Division. The third task would be to propose modifications to the existing process (or options for modifying the existing process) to the CPUC.

We recommend that the IOUs work with stakeholders and the CPUC Energy Division to modify the Ex Ante program planning and approval policies and processes to address work quality issues among other issues. This effort should be initiated in coordination with the CPUC Energy Division staff responsible for the refinement of the Ex Ante review process. Similarly, the IOUs should support modifications of the Ex Post process to incorporate work quality into the Ex Post process that results in estimates of savings.

D. DEVELOP FULL PROGRAM THEORY, PROGRAM PERFORMANCE METRICS, AND COMPREHENSIVE EM&V PLANS AS SPECIFIC RECOMMENDATIONS ARE INCORPORATED INTO PROGRAM IMPLEMENTATION PLANS

As the program administrators, the IOUs, with the oversight of the CPUC, are responsible for the initial development of program metrics along with the program theory and logic models. We recommend that the IOUs address the specific recommendations in the Guidance Plan in their Program Implementation Plans submitted with their applications for funding. A final set of metrics for specific recommendations should follow the identification of the program theory and the development of a corresponding logic model. In addition to addressing the program theory and program metrics, comprehensive EM&V plans should be developed.

1. Demand-Side Recommendations

The IOUs should support and the CPUC should require contractors conducting ongoing program impact evaluations to explicitly consider work quality as an additional topic for those measures and programs where work quality may be an issue (e.g., complex systems such as advanced lighting systems and HVAC installations; programs where the emphasis has been on "widgets" and contractor payment has not depended on verification of the proper installation of equipment).

The IOUs and the CPUC should address the recommendations presented in the Guidance Plan in the summer 2014 update of the EM&V roadmap and should make every effort to work with existing contractors to modify the EM&V studies by the end of 2014. Additional funding for these studies should be requested as part of the budget requests for 2015.

2. Supply-Side Recommendations

For supply-side recommendations, the success metrics identified in Exhibit 5.1 will need to be refined and integrated into the competitive solicitations designed to support skills building and programs targeted for disadvantaged workers (see Chapter 3.IV). One of the potential benefits of the proposed RFP process is that applicants are required to provide data tracking proposals and performance metrics, which will allow further refinement and enhancement of the proposed program metrics.

As part of the proposed RFP process, the applicants will be asked to address how they propose to track data and make it accessible to evaluators. The data tracking plan will include the establishment of baselines for specific metrics and the development and implementation of a data tracking system for the specific program activities. The timing of this activity depends on the timing of the RFP process. The plans for data tracking will be reviewed by the IOUs and CPUC as appropriate.

3. Select Qualified and Independent Consultants for Evaluations of Workforce Initiatives

The IOUs and the CPUC Energy Division should expand their evaluation consultant pool to include labor market researchers with experience in evaluating the impact of various workforce standards, including certification requirements. The IOUs should support the CPUC also in contracting with one or more experts with special expertise in this area to advise them on alternative models for evaluating the impact of these activities.

VIII. STAKEHOLDER FEEDBACK

This Guidance Plan reflects the combined expertise and opinions of the IOUs, firms implementing IOU programs, policy and subject matter experts, CPUC Energy Division staff, labor and contractor advocates, environmental organizations, low-income advocates, and the consultant team.³¹⁷ Throughout this project's review process, many useful suggestions have been made by these stakeholders and incorporated by the consultant team.

This feedback was provided both verbally and in written form, in monthly meetings with the Stakeholder Advisory Group and the IOUs, several sessions with the Leadership Briefing Group, and during many other meetings with the IOUs.

As with all the recommendations in this Guidance Plan, the IOUs have stated that they are reviewing these recommendations and other internal and external program advice to inform future program planning, and have not committed to taking specific action.

³¹⁷ See Appendix 1B for a complete list of interviewees. See Appendix 1C for a complete list of participants in the Stakeholder Advisory Group and the Leadership Briefing Group. All written feedback, except for IOU comments inserted in Guidance Plan drafts, is contained in Appendix 1D—Attachment 1.

In addition to other stakeholders, this Chapter was reviewed by a member of the EM&V teams for PG&E and for SCE.

The feedback received from stakeholders focused on a number of issues, including:

1. Costs and contractor burden of the proposed recommendations for data collection and other EM&V studies;
2. Development of indicators of work quality; and
3. Protection of the confidentiality of contractor and worker data.

We fully agree that the costs of the proposed recommendations should be considered. However, we believe there is substantial evidence that work quality is a legitimate concern and that reductions in the number of improperly installed or maintained measures and systems could increase the cost-effectiveness of the EE portfolio. Similarly, there is little or no information available to address the extent to which EE programs are providing opportunities for disadvantaged workers. The proposed data collection is needed in order to begin understanding and addressing these issues.

We also agree that additional attention needs to be given to defining work quality. However, we believe that indicators of work quality both for installation and maintenance are available and need to be part of data tracking and quality assurance for programs, most particularly for programs where work quality has been identified as an issue.

Finally, we also agree that the confidentiality of contractor and worker data is critical, but do not think this is a problem because electronic jobs reporting systems have resolved this issue and report only aggregated data without identifiers. These systems are in use across the state by a variety of public agencies and confidentiality has not been breached.

IX. POLICY RECOMMENDATIONS FOR THE CPUC AND OTHERS

This section identifies CPUC direction that is required to support more focused attention on work quality and inclusion in EM&V. As noted above, the CPUC has provided specific directives regarding the objectives of EM&V studies. The CPUC has also split responsibility for EM&V studies between the CPUC and IOUs with the majority of the funding being assigned to the CPUC. For example, the CPUC is responsible for managing impact evaluations while the IOUs are responsible for process evaluations.

The IOUs have expressed concerns regarding a number of the recommendations, particularly those related to data collection. Without the collection of job quality and work quality data for IOU EE programs neither the need for nor costs and the benefits of various workforce initiatives can be evaluated. The CPUC also refrained from adopting workforce standards in 2012 due to a lack of information that can only be developed with the wide spread adoption of standards.

We recommend that the CPUC fully support the recommendations regarding EM&V. More specifically, this requires the CPUC to monitor and issue directives to the IOUs as needed to ensure that

1. Funding is adequate to support data collection and other EM&V activities required;
2. The introduction of workforce standards is not delayed based on arguments that data are not available since evaluation of the benefits and costs requires the introduction of workforce standards system-wide;
3. Policies and processes are modified to allow for the explicit consideration of work quality and job quality; and
4. Both on-going and proposed EM&V studies, whether the responsibility of the IOUs or CPUC, address work quality and its relationship to energy savings and consider the implications of IOU EE programs on job quality and inclusion.

X. IMPLEMENTATION TIMELINE

Exhibit 5.3 presents a recommended schedule for implementing the recommendations included in this chapter.

Exhibit 5.3 Implementation Timeline for EM&V Plan

Time	Actor	Action
Q2 2014	IOUs	Modify recommended budgets for 2015 to more fully address work quality and inclusion as part of EM&V studies.
Q3 2014	IOUs, with Stakeholder Advisory Group and CPUC input	Include proposed modifications to EM&V studies in summer update of EM&V plan.
Q3 2014	IOUs, with Stakeholder Advisory Group input	Begin consultations with experts and review of literature to identify indicators of job quality and of work quality.
Q3 2014	CPUC	Request that contractors selected to conduct impact evaluations for current program cycle explicitly address work quality and job quality issues in contractor surveys and other project tasks, as appropriate.
Q3 2014	IOUs	Add as a requirement “documentation of contactor and worker competencies” as part of reports for field demonstrations.
Q3 2014	IOUs, with Stakeholder Advisory Group (or PRG) input	Begin planning on adoption of electronic payroll reporting, including a review of alternative suppliers, selection of supplier for all four IOUs, and development of standard contractual language for third-party providers.
Q4 2014	IOUs	Develop and propose scorecard reports for key job quality and work quality metrics with objective of submitting first reports in conjunction with annual program performance metric reports (e.g., May 2015).

CHAPTER 6: Supporting Activities

I. OVERVIEW

In this chapter we offer recommendations on two types of activities that will support the implementation of this Guidance Plan. The first includes an on-going plan for soliciting input and feedback on program design and development from critical stakeholders, state workforce agencies, and subject matter experts. We also describe the stakeholder engagement process that we used throughout the creation of this Plan. The second set of recommendations address the creation of a joint IOU WE&T website to communicate and consolidate relevant information on programs, and provide a gateway for keeping stakeholders informed.

II. RECOMMENDATIONS FOR SUPPORTING ACTIVITIES

RECOMMENDATIONS: SUPPORTING ACTIVITIES

Chapter 6. Supporting Activities		
General Recommendations	Specific Recommendation	Goal
A. Post-contract stakeholder engagement plan	<ol style="list-style-type: none"> 1. The Stakeholder Advisory Group should oversee Guidance Plan implementation in the short term. 2. The IOUs should establish a Peer Review Group for the WE&T Skills-Building Portfolio (see Chapter 3 recommendation A.3). 3. The IOUs should reconvene the WE&T Task Force and report on implementation of the Guidance Plan. 	Energy and Inclusion
B. Development of a joint IOU WE&T website	The IOUs should develop a joint IOU WE&T website to communicate WE&T activities and plans, post requests for proposals, provide information on workforce requirements for the statewide EE programs, and report progress on WE&T goals. The website should link to other relevant sites, including ME&O, EDR, and ETCC.	Energy and Inclusion

III. STAKEHOLDER ENGAGEMENT

A. STAKEHOLDER ENGAGEMENT DURING THE CONTRACT

The solicitation for this project required the consultant to articulate and execute a participatory stakeholder process during and to create a plan for on-going stakeholder engagement. We developed a stakeholder engagement process for the entire project, as well as tailored approaches for each component of the Guidance Plan. Each chapter describes the specific activities involved in stakeholder engagement for that section of the Plan.

During the contract period, we engaged the feedback of a **Stakeholder Advisory Group** comprised of members chosen by the IOUs from the Peer Review Group that reviewed the RFP for this contract and others active in WE&T in the proceeding. This group met in-person monthly for a briefing on the progress on the WE&T Contract. The consultant team solicited written and verbal feedback on key issues of concern to the group. The members of this group were active participants, contributing valuable input and feedback that we incorporated into this Guidance Plan.

Stakeholder Advisory Group:

- David De La Torre, Laborer’s International Union of North America Local 261
- Denise Fairchild, Emerald Cities Collaborative
- Diane Ravnik and Glen Forman, CA Division of Apprenticeship Standards
- Eddie Ahn and Josh Arce, Brightline Defense Project
- Elizabeth Klebaner, Adams Broadwell Joseph & Cardozo, on behalf of the CA Construction Industry Labor-Management Cooperation Trust
- Erik Emblem, International Association of Sheet Metal, Air, Rail, & Transportation Workers
- Jim Caldwell, on behalf of the CA Community Colleges Chancellor’s Office
- Jim Hussey, Marina Mechanical and Sheet Metal Workers Local 104 JATC
- Kayla Race, Environmental Health Coalition
- Lara Ettenson, Natural Resources Defense Council
- Lisa Paulo and Tory Francisco, CPUC Energy Division
- Mike Massey, Piping Industry Progress & Education Trust Fund
- Ryan Young, The Greenlining Institute
- Tim Rainey and Amy Wallace, CA Workforce Investment Board
- Uyen Le, International Brotherhood of Electrical Workers Local 11

IOU staff also participated in the advisory group, in addition to the weekly calls with the consultant team:

- Lisa Shell and Robert Marcial, PG&E
- Rodney Davis and Alma Williamson, SCG
- Ellery Stahler, Lianna Rios and Bonnie Moreno, SDG&E
- Nina Perez , Jake Huttner, and John Fasana SCE

We also engaged a **Leadership Briefing Group** comprised of utility executives, CPUC Commissioners, CEC Commissioners, and representatives from the Governor’s Office, California Community Colleges, Labor Agency, and others. This group met several times throughout the course of the project. The Consultant team solicited feedback on the project to help ensure that the recommendations leverage and complement related state initiatives.

Leadership Briefing Group:

- Commissioner Andrew McAllister, CA Energy Commission
- Commissioner Catherine Sandoval, CPUC
- Carol Brown, on behalf of Commissioner Mike Peevey, CPUC
- Diane Ravnik, CA Division of Apprenticeship Standards
- George Katsufraakis, SDG&E
- Gillian Wright, SCG
- Janice Berman and Paola Benassi, PG&E
- Jeanne Clinton, CPUC and Advisor to the Governor on Energy Efficiency
- Jim Caldwell, John Dunn and Chris McCullough on behalf of Van Ton-Quinlivan, CA Community Colleges Chancellor's Office
- Lisa Paulo and Jaclyn Marks, CPUC
- Mark Wallenrod, SCE
- Patrick Henning, Office of the Governor
- Tim Rainey, CA Workforce Investment Board

B. POST-CONTRACT ENGAGEMENT PLAN

The consultant team was also tasked with developing a post-contract stakeholder engagement plan to effectively support the implementation of the recommendations in this Guidance Plan. This plan also ensures that these efforts avoid duplication of other activities currently under way in the state.

1. The Stakeholder Advisory Group Should Oversee Guidance Plan Implementation in the Short Term

In the near term, we recommend that the IOUs continue to convene the Stakeholder Advisory Group on a quarterly basis to monitor the IOUs' progress in implementing the recommendations in this document, and provide feedback on their approach. The Group should select representatives to report on progress on Guidance Plan goals to the WE&T Task Force and other working groups, including, but not limited to: the IOU sector strategy working groups, the Labor Agency, the CPUC, and other stakeholder groups, if appropriate. Members of this group may merge into one or more of the other forums for engagement once they are formed. These are described below.

As we have seen with the example of G.O. 156, a focused reporting scorecard can drive performance and increase accountability among parties. Similarly, the IOUs should create a scorecard to evaluate progress on the recommendations ask the Stakeholder Advisory Group for their input, and use it to report on progress to the CPUC, the WE&T Task Force, and the Statewide Steering Committee, if and when it is formed. The scorecard should track the following: each of the Guidance Plan's recommendations and objectives, metrics by which to evaluate each goal, and a point system showing progress (or lack thereof) on each of the goals. The chart should be made publicly available online and shared widely with stakeholders.

2. The CEC Should Convene a Statewide EE Workforce Steering Committee

There is a clear need to improve overall state policy and program alignment in the energy and workforce arenas, not only the IOUs' WE&T programs. The lack of clarity on workforce standards and skills certifications for EE work in the state will continue to undermine the effectiveness of investments in EE programs and training if this structural problem is not addressed.

Regulatory and other constraints make it difficult to adequately address this issue through an outside advisory body to the CPUC. To improve statewide coordination on workforce issues, we recommend that the CEC convene a Statewide EE Workforce Steering Committee that involves the state agencies and experts on labor, education, and energy. We describe this recommendation in full in Chapter 3. This entity would be responsible for determining appropriate certifications for EE work; setting priorities for EE training investments; and identifying areas to improve alignment and leveraging of training resources.³¹⁸

3. The IOUs Should Establish a Peer Review Group for the WE&T Skills-Building Portfolio

As we describe in Chapter 3, the IOUs should establish a Peer Review Group (PRG) to provide ongoing input into the statewide RFP process for the skills-building portfolio and help the IOUs' access expertise on workforce development best practices and how to leverage the state's existing training infrastructure.³¹⁹ The PRG will focus on the recommendations for the IOUs' training investments, whereas the other groups described here will consider implementation of the full spectrum of the Guidance Plan's recommendations.

The existing Stakeholder Advisory Group for this contract should nominate members to form the PRG (Advisory Group members may remain part of the group), and membership should be finalized in consultation with the IOUs. If the CEC and other state policymakers decide to form a Statewide EE Workforce Steering Committee, the state agency members of the PRG may decide to participate in that forum instead (or in addition).

4. The IOUs Should Reconvene the WE&T Task Force and Report on Implementation of the Guidance Plan

The CPUC and IOUs have built a large network of stakeholders interested in workforce education and training issues, known as the WE&T Task Force. While this is not an adequate vehicle for engaging with the state's workforce and education agencies or high-level agenda-setting for WE&T policy issues, the Task Force can serve as a forum for a broad array of workforce experts and stakeholders to provide feedback and develop strategies to leverage other efforts with Guidance Plan implementation.

We recommend bi-annual reporting to the WE&T Task Force, in which the IOUs and PRG provide updates on the implementation of the Guidance Plan recommendations and solicit feedback on WE&T-related issues.

³¹⁸ To the extent that policy recommendations from the Statewide EE Workforce Steering Committee fall under the CPUC's jurisdiction, recommendations would have to be approved by the CPUC through its normal regulatory process.

³¹⁹ The CPUC has proposed a longer "rolling" cycle for the energy efficiency portfolios, to replace the current three year cycle and regulatory proceeding format. It has not yet determined how stakeholder involvement will be organized. As the stakeholder process for the rolling cycle for the IOUs' energy efficiency programs develops, the PRG should be incorporated or modified as appropriate to align with this broader effort.

IV. DEVELOPMENT OF A JOINT IOU WE&T WEBSITE

A. PROBLEM STATEMENT

Although the Strategic Plan recommended the development of a comprehensive WE&T web portal³²⁰ that included EE training resources and career opportunities, the UCB-DVC's 2011 WE&T Needs Assessment recommended against an IOU role in a repository for labor exchange and training resources. The Needs Assessment pointed out that employment information services (often called job listings) are the responsibility of workforce agencies not energy regulators, and that they take enormous investment of resources with very mixed results. Private job listing websites are useful in niche markets, mostly for highly specialized professionals, but are ineffective for most of the broad range of occupations that are predominant in EE work. It suggested that One-Stops and other efforts by the Employment Development Department and educational institutions represent the best point of entry if the CPUC elects to get involved in job matching, because of its comprehensive services and strong partnerships, targeted support for unemployed and disadvantaged populations, and existing infrastructure targeted regionally throughout the state. Any work in this arena on the part of the IOUs should be in support of their efforts.

The UCB-DVC Needs Assessment also recommended against a web portal that seeks to provide a comprehensive resource for training opportunities:

“Building career pathways is an extremely complex process... and stepping into this arena can actually be a disservice to workers if the CPUC portal provides superficial information rather than the in-depth set of career development services that can support jobseekers to develop successful careers related to energy efficiency and other demand side activities.”³²¹

The IOUs and the stakeholder advisory group concurred that a comprehensive web portal for training and labor exchange was not a role for the IOUs.

Although an IOU- or CPUC-administered job matching and comprehensive training resource web portal cannot be recommended as a solution to any of the problems identified in this Guidance Plan, there are several small but helpful functions that a WE&T component within a comprehensive statewide website could achieve. These functions are outlined in the recommendations.

1. Regulatory History and Progress to Date

Since at least 2006, the CPUC has envisioned a comprehensive user-centered web portal that provides one point of access to a multitude of energy efficiency information.³²² The CPUC specified that the internet-based tool would include information regarding program elements, best practices and lessons learned as

³²⁰ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. p. 71.

³²¹ Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. p. 263

³²² California Public Utilities Commission (2007, October 19). *Interim Opinion on Issues Relating to Future Savings Goals and Program Planning for 2009-2011 Energy Efficiency and Beyond* (D.07-10-032).

well as “technological changes and applications to facilitate access to third-party programs, utility contracting procedures, innovative and pilot programs, and new outreach opportunities.”³²³

The 2008 Strategic Plan and the 2011 update proposed a WE&T web portal linked to the more comprehensive version. As described in the 2011 Strategic Plan, “The web portal will include links to various demand-side management (DSM) related training programs and will allow for a single point of communication. The portal will also serve as a repository for all demand-side management and energy efficiency training, educational conferences, and career opportunities.” The Strategic Plan also outlined other specific functions including Internet-Based Networking, allowing energy efficiency practitioners and consumers to exchange information and solutions on implementing energy efficiency programs and measures,³²⁴ a clearinghouse for energy efficiency programs to promote behavior change, and an online resource to assist disseminating RD&D solutions and demonstration outcomes.³²⁵

Engage 360 was launched to become the statewide brand and web portal for energy efficiency information, but in late 2011, it was determined “that the development and delivery of the Engage 360 brand was costly and likely not producing enough ratepayer benefits to justify its continuance.”³²⁶ The website was taken off line in early 2013. In 2012, the CPUC directed the statewide branding effort to expand Energy Upgrade California, which is the statewide marketing effort for the utilities’ whole house retrofit programs. In December 2013, the CPUC issued more guidance on structure, governance, goals, and funding allocation for coordinated statewide Marketing, Education, and Outreach, administered by California Center for Sustainable Energy (CCSE). While a functional website is central to the ME&O efforts, funding allocation for this particular element is relatively small (17 percent for education, of which a website is only one of three elements). The specific attributes of a web portal are not identified, nor is any direction provided on how to integrate the WE&T efforts.

Charged with assessing the various options for creating a WE&T web portal, the 2011 UCB-DVC Needs Assessment evaluated a range of employment information systems, in order to recommend a potential solution to the mismatch or “gaps” in labor demand and supply for the energy efficiency sectors. In reviewing both internet job boards and full service programs that incorporate on-site services, the Needs Assessment ultimately cautioned against investing this type of web portal because their benefits do not align well with WE&T objectives or IOU strengths.

2. Scope

The RFP requested that the Consultant provide guidance on how to approach online implementation of a statewide web portal for WE&T resources and performance metrics for evaluating this type of online program delivery.

³²³ Ibid.

³²⁴ California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. Marketing, Education, & Outreach section, p. 76.

³²⁵ Ibid. Lighting section, p. 111.

³²⁶ California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). p. 291.

B. RECOMMENDATIONS AND RATIONALE

1. Develop a Joint IOU WE&T Website, Linked to the ME&O and Other Relevant Websites, to Communicate WE&T Activities and Plans.

The IOUs should develop a joint website and work together to communicate their activities in a transparent and timely way, as they have generally done in the past. A joint website that considers the following recommendations would be more efficient and user-friendly than individual websites on WE&T.

a. Do Not Develop a WE&T Job Matching or Training Web Portal

Job matching services do not tend to be well-aligned with the goals of EE WE&T programs, and are not effective in bridging the gap between labor supply and demand. A web page of training resources also is extremely complex and would be effective only as part of a larger effort to support career counseling and other career support activities.

b. Link to the Energy Design Resources (EDR) Website to List all IOU WE&T Programs

The Energy Design Resources (EDR) website has recently begun to list all the WE&T classes along with its other learning resources for architects and other designers. EDR was initially used for technical support resources for architects, engineers, and others involved with the IOUs' EE design programs. In recent years it has expanded to offering software tools for analysis, then some online and live trainings as well. Currently the IOUs fund EDR out of their budgets for the Savings by Design program, rather than WE&T, but they are exploring new ways to leverage these programs. EDR is already starting to act as a portal for the IOUs' WE&T programs, and carries the potential to be a connecting hub for a greater scope of EE incentives and rebates with training and education resources.

c. Integrate the Emerging Technology Coordinating Council (ETCC) Website into the Statewide Web Portal

Information on demonstration projects, market and technology assessments, and other emerging technology projects can be helpful to those looking at the frontier of training needs. Additionally, as recommended in Chapter 2, documenting the skills and credentials of contractors and workers involved in demonstration projects can be helpful to program design, determining workforce standard requirements for programs, or documenting KSAs. This information might be more easily accessed and widely used if provided through a centralized website.

d. Post WE&T Requests for Proposals on the Statewide Website

Chapter 3 recommends two RFP processes—one for skills upgrades for incumbent workers and incorporating EE skills into key post-secondary education and training institutions, and another for improving opportunities for disadvantaged workers in EE careers. If integrated effectively into the statewide Energy Upgrade California website, these opportunities can be more widely distributed to new potential partners.

e. Integrate Solicitation and Proposal Review Website into Statewide Website

The current website for posting and managing solicitations for all of the CA IOUs is Proposal Evaluation and Proposal Management Application (PEPMA). There are other options for managing the solicitation process as recommended in this guidance document (see Chapter 2). Open solicitations could be more easily accessed by a wider range of firms if this information was provided or linked from a common website that houses all energy efficiency information.

f. Include Existing Contractor or Participation Requirements for Statewide Programs on Website

Currently contractors (or customers) seeking to participate in most IOU EE programs need to navigate the websites of the individual utilities, chasing multiple links, and sometimes downloading lengthy PDFs or program applications, scanning fine print, to determine their eligibility or responsibilities. Since program requirements, eligibility, and contractor or customer responsibilities are related to work quality and ultimately realized energy savings, making this information available and accessible in an easy-to-navigate central location is important.

g. Use Website to Report Progress on Inclusion and Other WE&T Goals

Reporting progress on the recommendations laid out in this guidance document is an important part of an ongoing stakeholder engagement strategy.

C. STAKEHOLDER FEEDBACK

There were no objections to our suggestions for the website.

D. IMPLEMENTATION

The first step for IOU WE&T staff is to develop a Scope of Work for the WE&T elements of the statewide Energy Upgrade California website currently under development. Coordination on how to integrate EDR, ETCC and PEPMA websites with the CCSE ME&O efforts will require leadership by WE&T staff. Additionally, ongoing effort will be required to ensure up-to-date information is provided on the statewide website.

BIBLIOGRAPHY

- ACCA (2014). *Inspection & Maintenance of Commercial HVAC Systems*. Retrieved from: <http://www.acca.org/other-standard/inspection-maintenance-of-commercial-hvac-systems/>.
- Akerlof, G. and J. Yellen. 1990. The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*. Vol. 105, No.2, pp. 255-83.
- Alcott, H., & Greenstone, M. (2012, July 20). *Is There an Energy Efficiency Gap?*. Energy Institute at Haas Working Paper Series, EI @ Haas WP 228R, Berkeley, California. Retrieved from: http://ei.haas.berkeley.edu/pdf/working_papers/WP228.pdf.
- Asper, C. (2012, August). *Efficiency First California and California Building Performance Contractors Association Comments on California Energy Commission Staff Report: Comprehensive Energy Efficiency Program for Existing Buildings Scoping Report* (CEC-400-2012-015-Docket No. 12-EBP-1).
- ASW Engineering and SBW Consulting, Inc. (2012, May 1). *Interim Findings and Recommendation from the Whole House Process Evaluation—SCE Contractor Training Assessment*. Whole House Process Evaluation Interim Report Workbook.
- Barger, N. (2012). *Ensuring Quality Work When the Work is Hard to See: The Importance of Quality Assurance/Quality Control Protocols in Energy Efficiency Programs*. Clean Energy Solutions, Inc. ACEEE Summer Study Proceedings.
- Beach, B., K. Mulligan-Hansel, & S. Owens-Wilson (2013). *The Construction Careers Handbook*. Partnership for Working Families. Retrieved from: http://www.forworkingfamilies.org/sites/pwf/files/publications/0413%20Constr%20Careers%20HBook_f_web.pdf.
- Belman, D., R. Ormiston, R. Kelso, W. Schriver, & K.A. Frank (2010, January). Project Labor Agreements' Effect on School Construction Costs in Massachusetts. *Industrial Relations*, Vol. 49, No. 1.
- Belman, D., and P. Voos. (1995). *Prevailing Wage Laws in Construction: The Costs of Repeal to Wisconsin*. Milwaukee: Institute for Wisconsin's Future. Retrieved from http://www.faircontracting.org/PDFs/prevailing_wages/PrevailingWage%20Laws%20in%20Construction_%20Cost%20of%20Repeal%20to%20Wisconsin.pdf.
- Bisbee, D. (2011, June 3). *Advanced Office Lighting Systems*. Energy Research & Development Sacramento Municipal Utility District. ETCC Report #: ET10SMUD1017. Retrieved from: http://www.etcc-ca.com/sites/default/files/OLD/images/et10smud1017_amerisourcebergen_led_office_lighting.pdf
- Blumstein, C., & M. Taylor (2013, May). *Rethinking the Energy-Efficiency Gap: Producers, Intermediaries, and Innovation*. Energy Institute at Haas Working Paper Series, EI @ Haas WP 243, Berkeley, California. Retrieved from: http://ei.haas.berkeley.edu/pdf/working_papers/WP243.pdf.
- California Advanced Lighting Controls Training Program (2010). *Become a CALCTP Certified Electrician*. Retrieved from: <https://www.calctp.org/become-certified>.
- California Alternative Energy and Advanced Transportation Financing Authority (2014). Retrieved from: <http://www.treasurer.ca.gov/caeatfa/>.

California Center for Sustainable Energy (2013). *Energy Upgrade California 2013-2014 Marketing Plan*. Retrieved from: http://energycenter.org/sites/default/files/docs/nav/programs/swmeo/EUC_Marketing_Plan_2013-2014_final%20070113.pdf.

California Construction Industry Labor Management Cooperation Trust (CCILMCT) (2012, November 5). *Reply to Comments on the Proposed Decision Approving 2013-2014 Energy Efficiency Programs and Budgets*.

California Energy Commission and California Public Utilities Commission (2005, October). *Energy Action Plan II: Implementation Roadmap for Energy Policies*. Retrieved from: http://docs.cpuc.ca.gov/word_pdf/REPORT/51604.pdf.

California Public Utilities Commission (2014). *Utility Supplier Diversity Program*. Retrieved from: <http://www.cpuc.ca.gov/puc/supplierdiversity/>.

California Public Utilities Commission (2014, March 6). *CPUC Supplier Diversity Program Hits Procurement Milestone*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M088/K899/88899091.PDF>.

California Public Utilities Commission (2014, February 5). *California Alternate Rates for Energy (CARE)*. Retrieved from: <http://www.cpuc.ca.gov/PUC/energy/Low+Income/care.htm>.

California Public Utilities Commission (2014, February). *Report to the Legislature in Compliance with Public Utilities Code Section 910*. Retrieved from: http://www.cpuc.ca.gov/NR/rdonlyres/428F0F2F-1275-4441-9FAE-EC690AAF57AC/0/Section910Report_2014_FINAL.pdf.

California Public Utilities Commission (2013, September 19). *Decision Implementing 2013-2014 Energy Efficiency Financing Pilot Programs (D.13-09-044)*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M077/K182/77182202.pdf>.

California Public Utilities Commission (2013, August 5). *2013-2014 Energy Division-Investor Owned Utility Energy Efficiency Evaluation, Measurement and Verification Plan Version 2: Long Term Research Roadmap for HVAC*. Retrieved from: http://www.cpuc.ca.gov/NR/rdonlyres/B6D32B87-249E-44BB-8083-7139EC4D3B3A/0/20132014_EnergyDivisionEMV_Workplan_v2.pdf.

California Public Utilities Commission (2013, July). *Energy Efficiency Policy Manual: Applicable to Post-2012 Energy Efficiency Programs, Version 5 (R.09-11-014)*. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/7E3A4773-6D35-4D21-A7A2-9895C1E04A01/0/EEPPolicyManualV5forPDF.pdf>.

California Public Utilities Commission (2013, March 26). *CPUC Energy Efficiency Policies and Investor-Owned Utility (IOU) Programs: Presentation for WHPA Executive Committee*. Retrieved from: http://www.performancealliance.org/Portals/4/Documents/Committees/Leadership/CPUC%20EE%20Primer_for%20WHPA_03-2013_by%20SimonBakerCPUC_v1.pdf.

California Public Utilities Commission (2012, November 29). *Decision on Test Year 2012 General Rate Case for Southern California Edison Company (D.12-11-051)*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M037/K668/37668274.pdf>.

California Public Utilities Commission (2012, November 8). *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets (D.12-11-015)*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M034/K299/34299795.PDF>.

- California Public Utilities Commission (2012, August 23). *Decision on Large Investor-Owned Utilities' 2012-2014 Energy Savings Assistance (ESA) (Formerly Referred to as Low Income Energy Efficiency or LIEE) and California Alternate Rates for Energy (CARE) Applications* (D.12-08-044). Retrieved from: <http://www.liob.org/docs/ACF265.pdf>.
- California Public Utilities Commission (2012, May 10). *Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios 2012 Marketing, Education, and Outreach* (D.12-05-015). Retrieved from: http://www.calmac.org/events/Decision_12-05-15.pdf.
- California Public Utilities Commission (2011, October 24 and approved on 28). *Additional Supplemental Joint Filing: 2010-2012 Statewide Workforce Education and Training (WE&T) Program Modifications based on Findings of WE&T Needs Assessment - SDG&E 2260-E-B/2041-G-B, SoCalGas 4249-B, SCE 2588-E, and PG&E3212-G-B/3852-E-B* (D.09-09-047).
- California Public Utilities Commission (2011, May 5). *General Order 156 - Rules Governing the Development of Programs to Increase Participation of Women, Minority and Disabled Veteran Business Enterprises in Procurement of Contracts from Utilities as Required by Public Utilities Code Sections 8281-8286* (R.09-07-027). Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/PUBLISHED/GRAPHICS/171157.PDF>.
- California Public Utilities Commission (2011, January). *2009 Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period*. Retrieved from: http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/2009_Energy_Efficiency_Evaluation_Report.htm.
- California Public Utilities Commission (2011, January). *Energy Efficiency Evaluation Report for the 2009 Bridge Funding Period*. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/D66CCF63-5786-49C7-B250-00675D91953C/0/EEEvaluationReportforthe2009BFPeriod.pdf>.
- California Public Utilities Commission (2010, December 2). *Resolution E-4385*. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/4B211C37-7977-4C19-9243-9B9D7FE58467/0/ResolutionE4385.pdf>.
- California Public Utilities Commission (Last Modified 2010, November 23). *2006-2008 Energy Efficiency Evaluation Report*. Retrieved from: <http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/2006-2008+Energy+Efficiency+Evaluation+Report.htm>.
- California Public Utilities Commission (2010, April 8). *Decision Determining Evaluation, Measurement and Verification Processes for 2010 through 2012 Energy Efficiency Portfolios* (D.10-04-029). Retrieved from: http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/116710.PDF.
- California Public Utilities Commission (2009, September 24). *Decision Approving 2010 to 2012 Energy Efficiency Portfolios and Budgets* (D.09-09-047). Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/A08D84B0-ECE4-463E-85F5-8C9E289340A7/0/D0909047.pdf>.
- California Public Utilities Commission (2008, updated 2011). *California Long Term Energy Efficiency Strategic Plan*. Retrieved from: http://www.energy.ca.gov/ab758/documents/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf.
- California Public Utilities Commission (2007, October 19). *Interim Opinion on Issues Relating to Future Savings Goals and Program Planning for 2009-2011 Energy Efficiency and Beyond* (D.07-10-032). Retrieved from: <http://www.liob.org/docs/ACF19B9.pdf>.

- California Public Utilities Commission (2006, April). *California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*. Prepared by The TecMarket Works Team.
- California Public Utilities Commission (2005, January 27). *Interim Opinion on The Administrative Structure for Energy Efficiency: Threshold Issues* (D.05-01-055). Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/CEE4F3B4-OCFB-46E7-A14B-AFE7E3FB953F/0/D0501055.pdf>
- California Senate Bill 535 (2012). *California Global Warming Solutions Act of 2006: Greenhouse Gas Reduction Fund*. Retrieved from: [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB535&search_keywords=.](http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB535&search_keywords=)
- California Workforce Investment Board (2014, February). *Proposition 39 Pre-Apprenticeship Support, Training and Placement, Request For Applications*. Retrieved from: <http://www.cwib.ca.gov/res/docs/PROP%2039/Prop%2039%20RFA.pdf>.
- California Workforce Investment Board (2014). *California's Strategic Workforce Development Plan: 2013-2017*. Retrieved from: http://www.cwib.ca.gov/plans_policies_state_plans.htm.
- California Workforce Investment Board (2010). *Initiatives*. Retrieved from: <http://cwib.ca.gov/Initiatives.htm>.
- Career Ladders Project (2013). *California Community College Linked Learning Initiative*. Retrieved from: <http://www.careerladdersproject.org/initiatives-programs/california-community-college-linked-learning-initiative-cccli-2/>.
- Career Ladders Project (2013). *High Impact Pathways* ©. Retrieved from: <http://www.careerladdersproject.org/initiatives-programs/hip/>.
- Career Ladders Project (n.d.). *Career Advancement Academies*. Retrieved from http://www.careerladdersproject.org/wp-content/uploads/2012/10/CAA_2-Pager-9.12f02.pdf.
- CareerOneStop (n.d.). *View an Industry Model*. Retrieved from: <http://www.careeronestop.org/CompetencyModel/pyramid.aspx?C>.
- Cascio, W. (2006, December). The High Cost of Low Wages. *Harvard Business Review*. Retrieved from: <http://hbr.org/2006/12/the-high-cost-of-low-wages/ar/1> ; Adapted from Cascio, W. (2006, August). *Decency Means More than "Always Low Prices": A Comparison of Costco to Wal-Mart's Sam's Club*. Academy of Management Perspectives.
- Center for Energy Workforce Development (n.d.). *Energy Industry Competency Model: Generation, Transmission and Distribution*. Retrieved from: <http://www.cewd.org/documents/energymodel.pdf>.
- Center on Education and Training for Employment at The Ohio State University (n.d.). "DACUM and SID Training Information." Retrieved from: <http://www.dacumohiostate.com/>.
- Chapman, J. and Thompson, J. (2006, February 15). *The Economic Impact of Local Living Wages*. Economic Policy Institute, Briefing Paper #170. Retrieved from: <http://www.epi.org/publication/bp170/>.
- City Build Overview. (n.d.). *San Francisco Office of Economic and Workforce Development*. Retrieved from: <http://www.oewd.org/citybuild.aspx>.

City of Los Angeles Workforce Investment Board (2005-2013). *Building a Stronger Los Angeles Workforce: Highlighting Eight Years of Collaboration*.

ConnectEd: The California Center for College and Career (2010). *Why Pathways? A better approach to transforming high school education in California*. Retrieved from: http://www.careerladdersproject.org/wp-content/uploads/2011/06/Why_Pathways.pdf.

Conway, M., A. Kays Blair, S. L. Dawson and L. Dworak-Munoz (2007). *Sectoral Strategies for Low-Income Workers: Lessons from the Field*. The Aspen Institute. Retrieved from: <http://www.aspenwsi.org/resource/sectoral-strategies/>.

Conway, M. and Blair, A. (2006). *Skills to Live By: Participant Reflections on the Value of their Sectoral Training Experience*. The Aspen Institute. Retrieved from: <http://www.aspenwsi.org/wordpress/wp-content/uploads/06-010.pdf>.

Corporation for a Skilled Workforce, National Governors' Association Center for Best Practices, National Network of Sector Partners (2008). *State Sector Strategies Toolkit: Introduction*. Retrieved from: <http://www.sectorstrategies.org/toolkit/introduction>.

Daniel, K., & J. Arce (2012, May 30). *Brightline Defense Project and Green For All's Reply to Opening Comments on the Proposed Decision*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFILE/CM/168127.PDF>.

Daniel, K. (2012, May 24). *Green For All Written Opening Comments to the Proposed Decision*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFILE/CM/168055.PDF>.

Daniel, K., & J. Arce (2012, February 16). *Reply Brief of Green For All and Brightline Defense Project*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFILE/BRIEF/160136.PDF>.

Daniel, K., & J. Arce (2012, January 13). *Response of Intervenors Green For All and Brightline Defense Project to ALJ Kim's First Set of Questions*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFILE/RESP/157920.PDF>.

David Energy Group (2001, January 19). *CEE Guidelines for Energy-Efficient Commercial Unitary HVAC Systems (Final Report)*. Retrieved from: <http://library.cee1.org/content/cee-guidelines-energy-efficient-commercial-unitary-hvac-systems-final-report>.

Dayton C., C.H. Hester, D. Stern (2011, October). *The California Partnership Academies 2009-2010*. California Department of Education. Retrieved from: <http://www.cde.ca.gov/ci/gs/hs/documents/cpareport2010.pdf>.

Department of Industrial Relations (2014). *Frequently Asked Questions - Prevailing Wage*. Retrieved from: http://www.dir.ca.gov/OPRL/FAQ_PrevailingWage.html.

Department of Industrial Relations (2012). *General prevailing wage determinations: 2012-2 journeyman determinations*. Retrieved from: <http://www.dir.ca.gov/oprl/2012-2/PWD/index.htm>.

Directive 2009/28/EC of the European Parliament and of the Council (2009, April 23). Retrieved from: <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028>

DNV and RMA Energy (2013, November 7). *CPUC Work Order 32 Impact Evaluation Research Study*. Contracted for the California Public Utilities Commission. Retrieved from: <http://performancealliance.org/Portals/4/Documents/WO32-EMV-Presentation-11-7-13-Part-5.pdf>.

- Emerald Cities Seattle and Washington Athletic Club Workforce Tracking (2012, July 2). *Community Workforce Agreement Compliance Report for Washington Athletic Club*. (accessed 2013, February 7).
- Emerging Technology Associates, Inc. (2010, December 15). *Advanced Lighting Control System Assessment Final Report*. Prepared for SDG&E. Retrieved from: http://www.etcc-ca.com/sites/default/files/OLD/images/advanced_lighting_controls_system_assessment.pdf
- Emerging Technology Associates, Inc. (2010, December 15). *Office of the Future 25% Solution Assessment: Stage One Final Report*. Prepared for SDG&E. Retrieved from: http://www.etcc-ca.com/sites/default/files/OLD/images/office_of_the_future_25_solution_assessment.pdf
- Energy Efficiency Standardization Coordination Collaborative of the American National Standards Institute (2014, January). *Standardization Roadmap: Energy Efficiency in the Built Environment*. Version 1.0, Draft for Public Comment. Retrieved from: http://www.ansi.org/standards_activities/standards_boards_panels/eesc/EESCC_RoadmapV1.0_PublicCommentDRAFT.pdf.
- Energy Efficiency Standardization Coordination Collaborative of the American National Standards Institute (2013). *EESCC Inventory Database: Conformance Programs and Rating & Labeling Systems*. Retrieved from: <http://toolwiki.ansi.org/tiki-index.php?page=Conformance>.
- Energy Market Innovations, Inc., Western Cooling Efficiency Center at UC Davis, Verified[®], Inc., and Better Buildings, Inc. (2012, September 14). *Contractor & Technician Behavior Study*. Retrieved from: http://www.calmac.org/publications/CA_HVAC_Behavior_Study_FinalReport_2012Sept14_FINAL.pdf.
- Fairris, D., D. Runsten, C. Briones, & J. Goodheart (2005). *Examining the Evidence: The Impact of the Los Angeles Living Wage Ordinance on Workers and Businesses*. Los Angeles, Calif.: Los Angeles Alliance for a New Economy. Retrieved from: http://www.irlu.ucla.edu/publications/documents/LivingWage_fullreport.pdf.
- Fitzgerald, J. (2006). *Moving Up in the New Economy: Career Ladders for U.S. Workers*. Ithaca: Cornell University Press.
- Freely, J., Clymer, C., Conway, M., & Schwartz, D. (2010). *Tuning in to local labor markets: Findings from the Sectoral Employment Impact Study*. Public/Private Ventures.
- Gallardo E., & V. Truong (2012, May 30). *The Greenlining Institute's Reply Comments on the Proposed Decision*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFIELD/CM/168053.PDF>.
- Gallardo E., & R. Young (2012, May 24). *The Greenlining Institute's Opening Comments on the Proposed Decision*. Retrieved from: <http://docs.cpuc.ca.gov/PublishedDocs/EFIELD/CM/167445.PDF>.
- Giloth, R. (2004). *Workforce Intermediaries for the 21st Century*. Philadelphia, Pa.: Temple University Press.
- Giraudet, L., & S. Houde (2013). *Double Moral Hazard and the Energy Efficiency Gap*. International Association for Energy Economics, First Quarter.
- Goldstein, B. (2014, March 14). *U.S. Department of Energy: Federal Recognition for Workforce Standards and Credentials in the Energy Efficiency Sector*. Presentation (by phone) to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California.

- Goldstein, B., & D. Smith (2013, November 7). *DOE/NIBS Better Building Workforce Guidelines*. Better Buildings U.S. Department of Energy. Retrieved from: http://c.ymcdn.com/sites/www.nibs.org/resource/resmgr/cwcc/bbwg_webinar_deck.pdf.
- Graham-Squire, D., & K. Jacobs (2010). *School Cafeteria Worker Wage Increases Would be Partially Offset by Savings for Employers and Taxpayers*. Berkeley, Calif.: U.C. Berkeley Center for Labor Research and Education.
- Green for All (2012). *High Road Agreements: A Best Practice Brief by Green for All*. Retrieved from: http://greenforall.org/wordpress/wp-content/uploads/2012/06/High_Road_Agreements.pdf.
- Greenwald, B. and J. Stiglitz. (1988). Pareto inefficiency of market economies: search and efficiency models. *American Economic Review*. Vol. 78, No. 2, pp. 351-55.
- Hack, S. (2006). *International Experiences with the Promotion of Solar Water Heaters (SWH) on Household-level*. Prepared for Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. Retrieved from: <http://www.conuee.gob.mx/work/sites/CONAE/resources/LocalContent/6942/1/IEPSWH.pdf>.
- Harris, B.W. (2013, August). *Career Technical Education Pathways Initiative*. California Community Colleges Chancellor's Office. Retrieved from: http://californiacommunitycolleges.cccco.edu/Portals/0/reportsTB/REPORT_CTEPathwaysInitiative_082613_FIN AL.pdf.
- Heschong Mahone Group, Inc. (2009, October 23). High Efficiency Office: Low Ambient/ Task Lighting Pilot Project: Large Office ("Ziggurat" Building) Site Report. Retrieved from: <http://www.etcc-ca.com/sites/default/files/OLD/images/pge0819.pdf>
- Heschong Mahone Group, Inc. (2009, September 30). High Efficiency Office: Low Ambient/ Task Lighting Pilot Project: Small Office ("Encon" Building) Site Report. Retrieved from: <http://www.etcc-ca.com/sites/default/files/OLD/images/pge0820.pdf>
- Hunt, M., K. Heinemeier, M. Hoeschele & E. Weitzel (2012). *HVAC Energy Efficiency Maintenance Study*. Davis Energy Group and Western Cooling Efficiency Center. CALMAC Study ID SCE0293.01. Retrieved from: http://www.calmac.org/publications/HVAC_EE_Maintenance_Final.pdf.
- International Certification Board & Testing, Adjusting and Balancing Bureau (n.d.). *TABB Quality Assurance Program*. Retrieved from: <http://www.tabbcertified.org/site/public/content/index/quality-assurance>.
- Irwin, J., S. Rhodes-Conway, S. White, J. Rogers (2011). *Making M.U.S.H. Energy Efficient: Energy Efficiency in the Governmental and Institutional Sector*. Center on Wisconsin Strategy. Retrieved from: http://www.cows.org/_data/documents/999.pdf.
- Jackson, C. (CALCTP), D. Avery (Southern California Edison), & M. Ouellete (ICF) (2012). *California's Advanced Lighting Controls Training Program: Building a Skilled Workforce in the Energy Efficiency Market*. ACEEE Summer Study Proceedings. Retrieved from: <http://cltc.ucdavis.edu/sites/default/files/files/publication/20120800-aceee-calctp-jackson-1.pdf>.
- Johnson, M. (Southern Edison California), R. Baker (ASHRAE & BBJ Environmental), & L. Flaming (PECI) (2012). Relationships Matter - Transforming HVAC Through Quality Maintenance. Association of Energy Service Professionals (AESP) 22nd national conference on February 7, 2012. Retrieved from: <http://www.peci.org/resources/library/relationships-matter-transforming-hvac-through-quality-maintenance-aesp>.

- Kang S., E. Delaney (2013, June). *2013 Supplier Diversity Report Card*. The Greenlining Institute. Retrieved from: <http://greenlining.org/wp-content/uploads/2013/06/2013-SD-Report-Card-to-post.pdf>.
- Kashiwagi, D. (2011). Case Study: Best Value Procurement/Performance Information Procurement System Development. *Journal for the Advancement of Performance Information and Value*, 3(1). Retrieved from: <http://pbsrg.com/app/wp-content/uploads/2011/07/Journal-for-the-Advancement-of-Performance-Information-and-Value-V3I1.pdf>.
- Kaufman N., K. Palmer (2010, April). *Energy-Efficiency Program Evaluations: Opportunities for Learning and Inputs to Incentive Mechanisms*. Resources for the Future. Washington, DC. Retrieved from: <http://www.rff.org/documents/rff-dp-10-16.pdf>
- KEMA, Cadmus, Summit Blue (2010, February 10). *EM&V of the California Public Utilities Commission HVAC High Impact Measures and Specialized Commercial Contract Group Programs*. 2006-08 Program Year, Volume 1 and 2. Retrieved from: http://www.calmac.org/publications/Vol_1_HVAC_Spec_Comm_Report_02-10-10.pdf.
- KEMA, Inc. (2007, November). *2004-2005 Statewide Education, Training and Services Program Evaluation*. Prepared for California Public Utilities Commission, Southern California Edison, Southern California Gas, San Diego Gas & Electric, and Pacific Gas & Electric.
- KEMA-Xenergy (2003, December). *Evaluation of the 2002 Statewide Education, Training and Services Program, Final Report*. Prepared for Southern California Edison, Southern California Gas, San Diego Gas & Electric, and Pacific Gas & Electric.
- Khawaja, M. Sami Ph.D. Allen Lee, Ph.D. Michelle Levy. *Statewide Codes and Standards Market Adoption and Noncompliance Rates*. Quantec, for Southern California Edison, 2007.
- Kim, J., C. Kuo-Liang, & P. Philips (2012, October). The Effect of Prevailing Wage Regulations on Contractor Bid Participation and Behavior: A Comparison of Palo Alto, California with Four Nearby Prevailing Wage Municipalities. *Industrial Relations*, 51(4). Retrieved from: <http://onlinelibrary.wiley.com/doi/10.1111/j.1468-232X.2012.00708.x/pdf>.
- Kotler, F.B. (2009, March). *Project Labor Agreements in New York State: In the Public Interest*. Cornell University School of Industrial and Labor Relations. Retrieved from: <http://digitalcommons.ilr.cornell.edu/cgi/viewcontent.cgi?article=1021&context=reports>.
- Lerman, R. (2010). "Expanding Apprenticeship in the U.S." Presentation to the Ray Marshall Center, University of Texas—Austin, October 2010. Retrieved from: <http://www.utexas.edu/research/cshr/pubs/pdf/Robert%20Lerman%20-%20Expanding%20Apprenticeship%20in%20the%20US.pdf>.
- Linked Learning Alliance. (n.d.). *Evidence of Effectiveness*. Retrieved from: <http://linkedlearning.org/about/evidence-of-effectiveness/>.
- Local Government Commission (n.d.). *Local Government Energy Efficiency Best Practices Case Studies*. Retrieved from: http://www.lgc.org/resources/energy/case_studies.html?f=freepub/energy/case_studies.html
- Los Angeles Trade-Technical College (2014) *Lineworker Training Program*. Retrieved from: <http://college.lattc.edu/wed/programs/lt/>.
- Low Income Oversight Board (1999). *AB 1393*. Retrieved from: <http://www.liob.org/docs/ACFCF.pdf>.

- Lutz, A. & V. Tirumalashett (2012). *Measure by Measure: the Real Reasons for Gaps in Claimed and Evaluated Savings*. Itron. ACEEE Summer Study Proceedings. Retrieved from: <http://www.aceee.org/files/proceedings/2012/data/papers/0193-000134.pdf>.
- Madland D., K. Walter, P. Sonn, & T. Gebreselassie (2010, March). *Contracting that Works: A Toolkit for State and Local Governments*. Retrieved from: <http://www.nelp.org/page/-/Justice/ContractingThatWorks2010.pdf?nocdn=1>.
- Maguire, S., J. Freely, C. Clymer, D. Schwartz, & M. Conway (2010). *Tuning in to Local Labor Markets: Findings from the Sectoral Employment Impact Study*. Philadelphia: Public/Private Ventures. Retrieved from: <https://www.nationalservicerresources.gov/files/m4018-tuning-in-to-local-labor-markets.pdf>.
- Mahalia, N. (2008). *Prevailing Wages and Government Contracting Costs: A review of the research*. EPI Briefing Paper #215. Retrieved from: <http://www.epi.org/publication/bp215/>.
- McGraw Hill Construction (n.d.). *Construction Industry Workforce Shortages: Role of Certification, Training and Green Jobs in Filling the Gaps*. Retrieved from: http://www.gbcsa.org.za/wp-content/uploads/2013/06/USGBC-Report-Smart-Market-Report_Construction-Industry-Workforce-Shortages-Role-of-Certification-Training-and-Green-Jobs-in-Filling-the-Gaps-2012-Copy.pdf.
- Messenger, M. (2008). *Strategic Plan to Reduce the Energy Impact of Air Conditioners*. California Energy Commission Staff Report (CEC-400-2008-010).
- Michel, M. (2006). *NATE Impact Study*. Service Roundtable. Prepared for NATE. Retrieved from: <https://www.serviceroundtable.com/freebies/viewfreebie.asp?PCID=1469>.
- Mowris, R., R. Eshom, & E. Jones (2013). *Lessons Learned from Field Observations of Commercial Sector HVAC Technician Behavior and Laboratory Testing*. Robert Mowris & Associates, Inc., IEPEC Conference Proceedings. Retrieved from: <http://www.performancealliance.org/Portals/4/Documents/Committees/Leadership/129.pdf>.
- Mowris, R., R. Eshom, & E. Jones (2011, June). *Laboratory Measurements of HVAC Installation and Maintenance Faults*. ASHRAE.
- Muehleemann, S., & S.C. Wolter (2013, October). *Return on Investment of Apprenticeship Systems for Enterprises: Evidence from Cost-Benefit Analyses*. European Expert Network on Economics of Education. Analytical Report No. 16.
- NYSERDA (2013, October 1). *Home Performance with ENERGY STAR*. Retrieved from: <http://www.nyscrda.ny.gov/BusinessAreas/Energy-Efficiency-and-Renewable-Programs/Residential/Builder-Contractor/Existing-Home-Renovations.aspx> (accessed 2013, December 6).
- NYSERDA (2013, June 17). *Become a Builder*. Retrieved from: <http://www.nyscrda.ny.gov/BusinessAreas/Energy-Efficiency-and-Renewable-Programs/Residential/Builder-Contractor/New-Construction/Certified-Homes/Become-a-Builder.aspx> (accessed 2014, January 16).
- Nadel, S. (ACEEE) & K. Keating (Bonneville Power Administration) (1991). *Engineering Estimates vs. Impact Evaluation Results: How Do They Compare and Why?*. Retrieved from: <http://www.aceee.org/research-report/u915>.

National Environmental Balancing Bureau. (2014). *Quality Assurance Program*. Retrieved from: http://www.nebb.org/certified/qa_program/.

National Renewable Energy Laboratory (2013, April). *The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures*. Lead authors Tina Jayaweera and Hossein Haeri of The Cadmus Group, Subcontract Report NREL/SR-7A30-53827.

Navigant Consulting Inc. (2013, November 26). *2013 California Energy Efficiency Potential and Goals Study*. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/29ADACC9-0F6D-43B3-B7AA-C25D0E1F8A3C/0/2013CaliforniaEnergyEfficiencyPotentialandGoalsStudyNovember262013.pdf>.

Navigant Consulting, Inc., and Heschong Mahone Group (2012, March 19). *Analysis to Update Energy Efficiency Potential, Goals, and Targets for 2013 and Beyond, Track 1 Statewide Investor Owned Utility Energy Efficiency Potential Study*. Prepared for California Public Utilities Commission. Retrieved from: <http://www.cpuc.ca.gov/NR/rdonlyres/5A1B455F-CC46-4B8D-A1AF-34FAAF93095A/0/2011IOUServiceTerritoryEEPotentialStudyFinalReport.pdf>.

Negoita M., & K. Dunham (2013, June 30). *Designing a Performance Measurement System for Career Pathways*. Developed on behalf of the U.S. Department of Labor by Social Policy Research Associates. Retrieved from: <https://learnwork.workforce3one.org/view/2001327053929884521>.

Nemet, G., A. Grubler, F. Aguayo, K.S. Gallagher, M. Hekkert, K. Jiang, L. Mytelka, L. Neij, & C. Wilson (2012). Solar Water Heater Innovation in the US. Historical Case Studies of Energy Technology Innovation in: Chapter 24, *The Global Energy Assessment*. Cambridge University Press: Cambridge, UK. Retrieved from: http://www.iiasa.ac.at/web/home/research/researchPrograms/TransitionstoNewTechnologies/03_Nemet_Solar_Water_Heaters_WEB.pdf.

Office of Environmental Health Hazard Assessment (2014). *California Communities Environmental Health Screening Tool (CalEnviroScreen 1.1)*. Retrieved from: <http://oehha.ca.gov/ej/ces11.html>.

Official California Legislative Information (n.d.). *California Labor Code Sec. 1720*. Retrieved from: <http://leginfo.public.ca.gov/cgi-bin/displaycode?section=lab&group=01001-02000&file=1720-1743>.

Opinion Dynamics Corporation (2013). *Impact Evaluation of the California Statewide Building Operator Certification Program*. Draft.

Opinion Dynamics Corporation (2013, December 17). *Investigation into WE&T Critical Data Needs*. Memorandum to CA IOU WE&T M&E Team.

Opinion Dynamics Corporation (2013, February). *California Workforce Education and Training Program—Evaluation Plan for Energy Savings Impact Study for 2013-14*.

Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume I: Centergies*. Report ID# PGE0317.01. Retrieved from: http://www.calmac.org/publications/2010-2012_WE%26T_Centergies_Process_Eval_Report_volume_I.pdf.

Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation Volume II: Connections*. Report ID# PGE0317.02. Retrieved from http://www.calmac.org/publications/2010-2012_WE%26T_Connections_Process_Eval_Report_FINAL-volume_II.pdf.

- Opinion Dynamics Corporation, Wirtshafter Associates, Inc. Jai J. Mitchell Analytics, and Summit Blue Consulting (2010, March). *Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program (2006-2008)*. Retrieved from: http://www.calmac.org/publications/06-08_Statewide_Education_and_Training_Impact_Eval_Vol_I_FINAL.pdf.
- Owens, C. (2013, February). *Multifamily Energy Auditor Job/Task Analysis and Report*. National Renewable Energy Laboratory. Retrieved from <http://www.nrel.gov/docs/fy14osti/60447.pdf>.
- PG&E (2014). *LED Street Light Turnkey Replacement Service*. Retrieved from: <http://www.pge.com/en/mybusiness/save/rebates/lighting/led/turnkey/index.page>.
- PG&E (March 2013). *Request for Proposal (RFP) No. 6264, For Workforce Education and Training (WE&T) Statewide Strategic Planning*.
- PG&E (2013). *Trade Professional Alliance Participation Guidelines*.
- PG&E (2012, August 26). *Non-Residential HVAC RTU Quality Maintenance*. PG&E Work Paper: PGECOHC138.
- PG&E, SCE, SCG, and SDG&E (Proposed July 2012; Approved January 2013). 2013-2014 Energy Efficiency Portfolio Statewide Program Implementation Plan, Workforce Education and Training. Each utility's PIP is available at <http://eega.cpuc.ca.gov/Documents.aspx>.
- Patrick, S. (2013, May 1). *Preliminary Findings and Summary of the Joint Utilities' Initial Data Collection Efforts Pertinent to Workforce Education and Training Initiatives as Directed in Ordering Paragraph 35 of Decision 12-11-015*. Retrieved from: https://www.pge.com/regulation/EnergyEfficiency2013-2014-Portfolio/Other-Docs/Joint-PSS/2013/EnergyEfficiency2013-2014-Portfolio_Other-Doc_Joint-PSS_20130501_273686.pdf.
- Peters J., & M. R. McRae (2009, February). *Process Evaluation Insights on Program Implementation*. California Institute for Energy and Environment. Prepared for CIEE Behavior and Energy Program, Edward Vine, Program Manager and the California Public Utilities Commission. Retrieved from: http://www.uc-ctiee.org/downloads/proc_eval_whtppr.pdf.
- Peters, J. S. (2007). *White Paper: Lessons Learned After 30 Years of Process Evaluation*. Research Into Action.
- Philips, P. (1998, February 20). *Kansas and Prevailing Wage Legislation*. Prepared for the Kansas Senate Labor Relations Committee. Retrieved from: http://www.faircontracting.org/PDFs/prevailing_wages/kansas_prevailing_wage.pdf.
- Philips, P. (1996, September 6). *Square Foot Construction Costs for Newly Constructed State and Local Schools, Offices, and Warehouses in Nine Southwestern and Intermountain States: 1992-1994*. Prepared for the Legislative Education Study Committee of the New Mexico State Legislature. Retrieved from: http://www.faircontracting.org/PDFs/prevailing_wages/sq_ft_report.pdf.
- Pleasure, R. (n.d.). *Building Trades Curriculum*. Building & Construction Trades Department, AFL-CIO. Emerald Cities Collaborative (2010-11).
- Portland Energy Conservation, Inc. (1999, September). *Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations*. Retrieved from: <http://www.energystar.gov/ia/business/assessment.pdf>.

- Reference for Business (n.d.). *Quality Gurus: Dr. W. Edwards Deming*. Encyclopedia of Business, 2nd Edition. Retrieved from: <http://www.referenceforbusiness.com/management/Pr-Sa/Quality-Gurus.html#ixzz2snoQ2XW7>.
- Reich, M., P. Hall, & K. Jacobs (2003, March). *Living Wages and Economic Performance: The San Francisco Airport Model*. Berkeley, Calif.: Institute of Industrial Relations. Retrieved from: http://laborcenter.berkeley.edu/livingwage/living_wage_performance.pdf.
- Research Into Action, Inc., and Educational Consulting Services (2009, August). *Process Evaluation of the 2006-2008 EARTH Education & Training Program*, funded with California Public Goods Charge Energy Efficiency Funds.
- Retrofits for Energy Efficiency Works (RENEW) (n.d.). *High-Road Contractor Standards*. Retrieved from: <http://renewretrofits.files.wordpress.com/2013/02/renew-high-road-standards-614131.pdf>.
- Richmond City Council (2006, July 26). *Updating the Local Employment Ordinance—Richmond Municipal Code Chapter 2.56 Ordinance No. 52-06 N.S.* Retrieved from: <http://www.ci.richmond.ca.us/DocumentCenter/Home/View/1374>.
- SBW Consulting, Inc., & Ridge & Associates (2011, December). *Evaluation Protocols for NEEA Commercial Sector Advice Initiatives*. Prepared for Northwest Energy Efficiency Alliance.
- SCE (2012, December 21). *Template for Collecting Energy Savings Assistance (ESA) Program Workforce Education and Training Data per D.12-08-044*.
- SCE Customer's Authorized Agents Participation Requirements and Agreement Form (2012, September). Version 2.
- SCE (2011). *Energy Management Success Story: Brookfield Office Properties*. Retrieved from: <http://energydesignresources.com/media/9413124/SCE-BrookfieldCaseStudy.pdf?tracked=true>
- SCE (2010, October 14). *Office of the Future Landmark Square Pilot Results*. Design & Engineering Services Customer Service Business Unit ET09SCE1220 Report. Retrieved from: http://www.etcc-ca.com/sites/default/files/reports/ET09SCE1220%20OTF_Landmark%20Square_Final.pdf
- SDG&E (2013). *2013-2014 Non-Residential Customer Programs Trade Professionals Participation Agreement*.
- SMUD Home Performance Program (n.d.). *Contractor Participation Agreement*. Retrieved from: <https://www.smud.org/en/do-business-with-smud/contracting-opportunities/documents/HPP-Application.pdf>.
- San Diego Unified School District (2009, July 28). *Project Stabilization Agreement*. Retrieved from: <http://www.sandi.net/page/1921>.
- Sosland, D., J. Loiter, M. Guerard, J. Schlegel (2012). *Collaboration that Counts: The Role of State Energy Efficiency Collaboration Stakeholder Councils*. Retrieved from: <http://www.optenergy.com/assets/files/289%20Collaboration%20that%20Counts%20-%20final.pdf>
- Soto, V. (2013, September 17). *Beyond LCP Compliance: The use of online certified payroll to measure results and document economic impact of energy efficiency investment through Local Worker Hiring*. Presentation to the California Workforce Investment Board Green Collar Jobs Council, Oakland, California. Retrieved from: http://cwib.ca.gov/res/docs/special_committees/gcjc/meeting_materials/2013/091713%20REV%20PPT%20LWHPCompliance%20CAWIB.pdf.

State and Local Energy Efficiency Action network (SEE Action) (2012, December). *The Energy Efficiency Program Impact Evaluation Guide* (update to the 2007 National Action Plan for Energy Efficiency, Model Energy Efficiency Program Impact Evaluation Guide).

Stroupe, R. (2012). *The Building as a Classroom: Training Commissioning Providers through Interactive Activities and Energy-Saving Projects*. 2012 ACEEE Summer Study on Energy Efficiency in Buildings. Retrieved from: <http://www.aceee.org/files/proceedings/2012/data/papers/0193-000335.pdf>.

Taylor, M. (2008). Beyond technology-push and demand-pull: Lessons from California's solar policy. *Energy Economics*, 30(6): 2829-2854.

Taylor, M., G. Nemet, M. Colvin, L. Begley, C. Wadia, & T. Dillavou (2007). *Government Actions and Innovation in Clean Energy Technologies: The Cases of Photovoltaic Cells, Solar Thermal Electric Power, and Solar Water Heating* (CEC-500-2007-012). Sacramento, California Energy Commission. Retrieved from: <http://www.energy.ca.gov/2007publications/CEC-500-2007-012/CEC-500-2007-012.PDF>.

The James Irvine Foundation (2013). *Evidence (for Linked Learning)*. Retrieved from: <http://www.irvine.org/linkedlearning2013/evidence/research>.

The National Skills Academy (n.d.). *National Skills Academy Register*. Retrieved from: <http://www.nsaet.org.uk/public-register/>.

The National Skills Academy (n.d.). *The Green Deal*. Retrieved from: http://www.nsaet.org.uk/green-deal_explained/.

Ton, Z. (2012, January-February). Why “Good Jobs” are Good for Retailers. *Harvard Business Review, The Magazine*. Retrieved from: <http://hbr.org/2012/01/why-good-jobs-are-good-for-retailers>.

Tyler, M., J. Farley, & E. Crowe (2011, September). *Evaluation of Title 24 Acceptance Testing Enforcement and Effectiveness*. PECL. Retrieved from: http://www.cacx.org/PIER/documents/T24_Acceptance_Testing_Final_Report.pdf.

U.S. Census Bureau (2005, October). *2002 Economic Census: Construction*. Retrieved from: <https://www.census.gov/prod/ec02/ec0223sg1.pdf>.

U.S. Department of Energy, Energy Efficiency & Renewable Energy, Weatherization & Intergovernmental Programs (n.d.). *Guidelines for Home Energy Professionals*. Retrieved from: <http://energy.gov/eere/wipo/guidelines-home-energy-professionals>.

U.S. Department of Energy, Energy Efficiency & Renewable Energy, Weatherization & Intergovernmental Programs (n.d.). *Guidelines for Home Energy Professionals - Project Benefits*. Retrieved from: <http://energy.gov/eere/wipo/project-benefits> (accessed 2013, March 28).

U.S. Department of Energy, Energy Efficiency & Renewable Energy (2011, September). *Job/Task Analysis for an Energy/ Sustainability Manager: Public Comment Draft*. Retrieved from http://www1.eere.energy.gov/buildings/commercial_initiative/pdfs/energy_manager_jta_comment.pdf

U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2013, June). *Audit Report: The Department of Energy's Weatherization Assistance Program Funded under the American Recovery and Reinvestment Act for the State of Michigan* (OAS-RA-13-25). Contracted to Lani Eko & Company. Retrieved from: <http://energy.gov/sites/prod/files/2013/06/f1/OAS-RA-13-25.pdf>.

- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2012, October 17). *Examination Report on Community Action Partnership of Orange County—Weatherization Assistance Program Funds Provided by the American Recovery and Reinvestment Act of 2009* (OAS-RA-13-03). Contracted to Lopez and Company, LLP. Retrieved from: <http://energy.gov/sites/prod/files/OAS-RA-13-03.pdf>.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2012, June 25). *Audit Report on The Department of Energy's Weatherization Assistance Program under the American Recovery and Reinvestment Act in the State of Ohio* (OAS-RA-12-13). Contracted to Lopez and Company, LLP. Retrieved from: <http://energy.gov/sites/prod/files/OAS-RA-12-13.pdf>.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2012, April 6). *Audit Report on The Department of Energy's Weatherization Assistance Program Funded under the American Recovery and Reinvestment Act for the State of New York* (OAS-RA-12-07). Contracted to Otis and Associates, PC . Retrieved from: http://energy.gov/sites/prod/files/OAS-RA-12-07_0.pdf.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2011, September 19). *Audit Report on The Department of Energy's Weatherization Assistance Program under the American Recovery and Reinvestment Act in the State of Tennessee* (OAS-RA-11-17). Retrieved from: <http://energy.gov/sites/prod/files/OAS-RA-11-17.pdf>.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2011, August 22). *Audit Report on The Department of Energy's Weatherization Assistance Program under the American Recovery and Reinvestment Act in the State of Missouri* (OAS-RA-11-12). Retrieved from: <http://energy.gov/sites/prod/files/OAS-RA-11-12.pdf>.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2011, June 13). *Audit Report on The Department of Energy's Weatherization Assistance Program under the American Recovery and Reinvestment Act in the State of West Virginia* (OAS-RA-11- 09). Retrieved from: <http://energy.gov/sites/prod/files/igprod/documents/OAS-RA-11-09.pdf>.
- U.S. Department of Energy, Office of Inspector General Office of Audits and Inspections (2010, October 14). *Audit Report on The State of Illinois Weatherization Assistance Program* (OAS-RA-11- 01). Retrieved from: <http://energy.gov/sites/prod/files/igprod/documents/OAS-RA-11-01.pdf>.
- U.S. Department of Labor, Wage and Hour Division (2009, December 11). *California Residential Weatherization Wage Determination (S2009-CA-001)*. Retrieved from: <http://www.dol.gov/whd/recovery/dbsurvey/weatherCA.htm>.
- U.S. Green Building Council (2014). *Maintain your LEED-AP credential*. Retrieved from: <http://www.usgbc.org/credentials/leed-ap/maintain>.
- U.S. House of Representatives (2010, May 7). *An Act to Provide for the Establishment of the Home Star Retrofit Rebate Program, and for Other Purposes* (HR 5019 RFS). Retrieved from: <http://www.gpo.gov/fdsys/pkg/BILLS-111hr5019rfs/pdf/BILLS-111hr5019rfs.pdf>.
- WE&T Subcommittee of the HVAC QI/QM Committee of WHPA, WE&T Working Group Draft Reports (2012, April).
- WEDD RFAs (2013). *California Community Colleges Chancellor's Office*. Retrieved from: <http://extranet.cccco.edu/Divisions/WorkforceandEconDev/WEDDRFAs.aspx>.

- Western HVAC Performance Alliance (2013, November 7). *Work Order 32: Standard 180 Maintenance Programs*. Retrieved from: <http://www.performancealliance.org/WorkOrder32/tabid/388/Default.aspx>
- Western HVAC Performance Alliance Goal 2.3-2.4 Certification Working Group Gaps Report (2013, March 27). Awaiting Executive Committee Approval.
- White, S., L. Dresser, J. Rogers (2010). *Greener Skills: How Credentials Create Value in the Clean Energy Economy*. Center on Wisconsin Strategy. Retrieved from: http://www.cows.org/_data/documents/1124.pdf.
- Williams, A., E. Vine, S. Price, A. Sturges, & G. Rosenquist (2013, April). *The Cost of Enforcing Building Energy Codes: Phase 1*. Lawrence Berkeley National Laboratory. Retrieved from: <http://eetd.lbl.gov/sites/all/files/lbnl-6181e.pdf>.
- Wilson, M. (2012, July 24). *The Role of Training in Protecting Worker Health and Safety in the Energy Efficiency and Retrofit Industry*. Labor Occupational Health Program. UC Berkeley.
- Winn, V.J. (2012, March 21). *Implementation of SB 454—Appliance Efficiency Enforcement Rulemaking: Comments of Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company and San Diego Gas and Electric*. Retrieved from: http://www.energy.ca.gov/appliances/enforcement/documents/public_comments/PGE_SCE_SoCalGas_and_SDGE_Joint_Comments_2012-03-21_TN-64243.pdf.
- Zabin, C. & E. Avis (2013). *Training for the Future*. UC Berkeley Labor Center. Retrieved from: http://laborcenter.berkeley.edu/greenjobs/training_future13.pdf.
- Zabin, C. et al. (2011). *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Donald Vial Center on Employment in the Green Economy and the Institute for Research on Labor and Employment. UC Berkeley. Retrieved from: http://irle.berkeley.edu/vial/publications/ca_workforce_needs_assessment.html.

GUIDANCE PLAN TEAM

THE UC BERKELEY DONALD VIAL CENTER ON EMPLOYMENT IN THE GREEN ECONOMY

The UC Berkeley Donald Vial Center on Employment in the Green Economy (UCB-DVC) carries out research on the emerging green economy and climate change policy in California, as these relate to labor markets, workforce development, and workforce policy.

Dr. Carol Zabin (Ph.D. Economics, UC Berkeley) chairs the UCB-DVC and led the 2011 *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation and Demand Response* conducted for the California Public Utilities Commission (“Needs Assessment”). Dr. Zabin and her team (Jessica Halpern-Finnerty, M.A. International Public Affairs, University of Wisconsin and Megan Emiko Scott, Masters of Public Policy, UCLA) led this project.

BETONY JONES, CONSULTANT

Betony Jones (Masters of Environmental Science, Yale University) is a consultant with experience designing and implementing IOU programs for local government and other programs. Ms. Jones has expertise in small business and contractor needs, WE&T, commercial and residential energy efficiency programs, utility regulation in California, program and product design, stakeholder engagement, and organizational behavior and change.

DR. ROBIN WALTHER, CONSULTANT

Dr. Robin Walther (Ph.D. Economics, UC Berkeley) is a consultant with over 30 years of experience in the energy industry and specializes in policy and technical analysis. She has been an economic consultant for the past 12 years and served as the study manager for the 2011 *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation and Demand Response*. Dr. Walther previously worked at Southern California Edison (SCE) for 20 years with project management experience in energy efficiency, system planning, and regulatory policy.

ESTOLANO LESAR PEREZ ADVISORS (ELP)

Estolano LeSar Perez Advisors (ELP) is a nationally recognized economic and workforce development consulting firm with experience doing research and developing and implementing policy in energy efficiency and infrastructure, environmental issues, and workforce development. ELP specializes in managing multi-stakeholder processes to address complex public policy issues and is a premier resource for cities and other entities on the design and implementation of targeted hiring policies.

ELP partner Cecilia Estolano (J.D., UC Berkeley; M.A. Urban Planning, UCLA) and principal Alex Paxton (J.D., Yale University) have provided consulting services for utilities on programs to improve workforce outcomes. Associate Cynthia Guzman (Masters of Urban & Regional Planning, UCLA) also contributed to this project.

CAREER LADDERS PROJECT (CLP)

The Career Ladders Project (CLP) is a nationally recognized non-profit fostering educational and career advancement for low-income students. CLP operates under the auspices of the Foundation for California Community Colleges, and is the official auxiliary to the California Community Colleges system. CLP carries out research, policy initiatives, and strategic assistance to community colleges and their workforce partners to build high-quality career pathways and meet the needs of regional economies in key economic sectors.

Linda Collins (M.A. Sociology, UC Berkeley) is the Executive Director of CLP. Anjana Richards (M.S. Environmental Management, Illinois Institute of Technology), Peter Simon (M.A. Adult Education, San Francisco State University), and Theresa Rowland (M.A. Counselor Education, San Diego State University) also contributed to this project.

DOUG AVERY, CONSULTANT

Doug Avery (B.A. Psychology, CSU Chico) is a Certified Energy Manager (CEM), with over 34 years of experience in the lighting industry. Currently, Mr. Avery serves as co-chair of the statewide management team for the California Advanced Lighting Controls Training Program (CALCTP), and was one of the leaders in developing the program. Mr. Avery has been a consultant for numerous utility companies, including Southern California Edison, where he was responsible for developing demand-side management programs related to the installation of efficient lighting systems and taught classes on lighting technology, retrofit options, and auditing procedures. Mr. Avery served as an expert technical adviser for the development of the Guidance Plan.



The Donald Vial Center carries out research on the emerging green economy and climate change policy in California, as these relate to the labor market, to workforce development, and to workforce policy.

UC BERKELEY
LABOR
CENTER

The Center for Labor Research and Education (Labor Center) is a public service project that links academic resources with working people.

Both the Labor Center and Donald Vial Center are projects of the UC Berkeley Institute for Research on Labor and Employment

This study was funded by the California utility ratepayers under the auspices of the California Public Utilities Commission.



INSTITUTE FOR RESEARCH ON LABOR AND EMPLOYMENT
2521 Channing Way #5555
Berkeley, CA 94720-5555
Phone: (510) 643-7068
Fax: (510) 643-1694
<http://www.irlle.berkeley.edu/vial/>

To download the full report, please visit
the Donald Vial Center website:
www.irlle.berkeley.edu/vial/

May 2014