

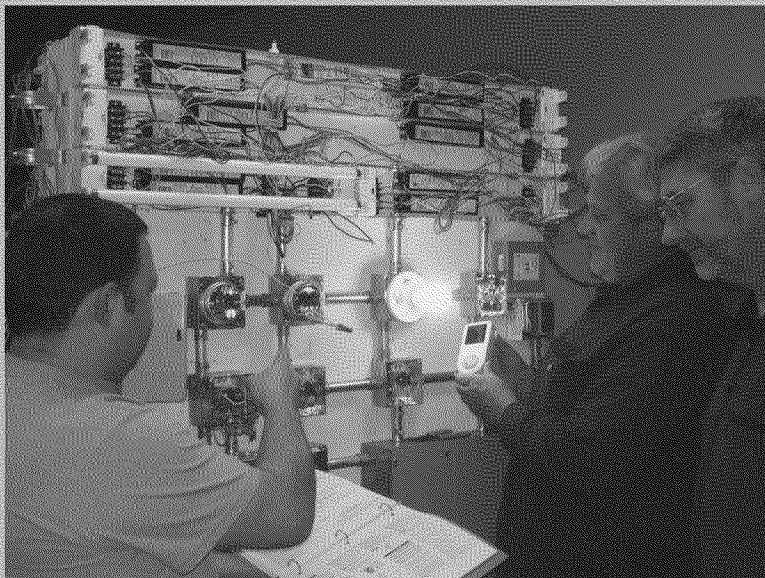
Workforce Issues and Energy Efficiency Programs

A Guidance Plan for California's Utilities

DONALD VIAL CENTER ON EMPLOYMENT IN THE GREEN ECONOMY
Institute for Research on Labor and Employment
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Executive Summary



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

EXECUTIVE SUMMARY

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

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

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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.

¹³California 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: <ul 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: <ul 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. 	<p>Energy and Inclusion</p>
		<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. 	<p>Energy and Inclusion</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>	<p>Energy</p>
		<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>	<p>Energy</p>
		<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>	<p>Inclusion</p>
<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>Energy</p>
		<p>b. Target classes to specific market-building audiences.</p>	<p>Energy</p>
		<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>	<p>Energy</p>

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.

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.

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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.



UC BERKELEY
**LABOR
CENTER**

The Donald Vial Center carries out research on the emerging green economy and climate change policy in California, as these relate to the labor market, to workforce development, and to workforce policy.

The Center for Labor Research and Education (Labor Center) is a public service project that links academic resources with working people.

Both the Labor Center and Donald Vial Center are projects of the UC Berkeley Institute for Research on Labor and Employment

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