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

APPENDICES

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Appendices

Appendices to Chapter 1

1A. RFP Statement of Work

RFP No. 6264

Statement of Work

PG&E REQUEST FOR PROPOSAL (RFP) No. 6264

For Workforce Education and Training (WE&T) Statewide Strategic Planning

March 2013

STATEMENT OF WORK

BACKGROUND

Program Context

Ensuring California's aggressive demand-side management goals are achieved requires a comprehensive and collaborative workforce infrastructure that both retools existing workers as well as trains new workers for the existing and future opportunities ahead. The Statewide Investor Owned Utility (IOU) Workforce Education and Training (WE&T) Program includes a portfolio of education, training and workforce planning efforts, increasingly aligned to these goals and the parallel directives in *California's Long-Term Energy Efficiency Strategic Plan* (Strategic Plan) and the WE&T Needs Assessment which acknowledge the IOUs' WE&T portfolio of activities as a critical crosscutting activity towards meeting California's greenhouse gas reduction goals.

Specifically, the Strategic Plan's vision is to train and engage the human capital necessary to achieve California's economic demand-side management potential. The WE&T sub-goals include establishing energy efficiency education and training at all levels of California's educational systems, and ensuring that minority, low-income and disadvantaged communities fully participate in these education and training programs.

To achieve the Strategic Plan's goals, the Statewide IOU WE&T Program is currently being structured to enable the following, among other strategic initiatives:

- Initiating and driving long-term WE&T development and strategic planning, including identification and leveraging of funding streams and market sector needs.
- Supporting community college and adult education efforts to develop education based on visible career paths in energy efficiency (EE) and demand-side management (DSM).
- Incorporating DSM into traditional contractor, apprenticeship and technician training.

- Supporting the creation or expansion of energy management and efficiency-focused curriculum by college and university programs and fostering this knowledge in clear view of students and faculty.
- Supporting the development of K-12 curriculum, programs and teacher training to include a basic understanding of energy and DSM fundamentals as well as energy-related career education.
- Achieving the fullest participation by minority, low-income and disadvantaged communities in training and education.
- Continued support and training opportunities for other key members of the energy workforce, including engineers, facility managers, designers and marketing professionals.

The larger policy context in which these WE&T goals sit is becoming increasingly rich. For example, California's EE goals now mandate Zero Net Energy in 50% of all commercial buildings by 2030. Called "too aggressive" by the AB 758 Scoping Plan, meeting this target would require much higher levels of market adoption than are currently being realized today, across a myriad of systems and technologies and in widely-varying building types. Additionally, significant investments authorized by the California legislature, supported by private ventures, are being designed to stimulate the market to achieve AB 32 (e.g., these include, but are not limited to, Prop 39, Energy Program Investment Charge (EPIC), Cap and Trade (CARB) and others). Synchronizing WE&T investments with market stimulation investments is critical to achieving the state's EE mandates.

PROGRAM DEFINED

The IOUs' WE&T Program includes the three below sub-programs:

(1) **Centergies:** The WE&T Centergies sub-program is executed primarily through eight IOU Energy Centers throughout California. Most Centergies activities revolve around targeted courses, technical consultations, outreach events, and building performance tool loans, through various tool lending libraries. The Energy Centers target specific market sectors in collaboration with internal and external partners.

(2) **Connections:** The WE&T Connections sub-program is organized around downstream and upstream relationships between the IOUs and the education sector. In order to advance statewide DSM initiatives, Connections emphasizes activities that inspire interest in energy careers, new and emerging technologies, and future skills development. Through this sub-program, the IOUs work with educational institutions, labor, communities and other stakeholders in order to nurture interest in energy careers and assist with workforce development.

Connections programs are designed to (a) promote green careers through energy and environmental curriculum, (b) educate students on energy, water, renewable energy, demand response, and distributed generation, in order to influence their day-to-day decisions, and (c) educate school/facility personnel on the benefits of participating in DSM programs and the importance of leading by example.

(3) **Planning:** The WE&T Planning sub-program involves the management and execution of several strategic statewide planning tasks and resulting project implementation actions initiated by the Strategic Plan and the Needs Assessment.

WE&T EXPERT: REGULATORY GUIDANCE AND QUALIFICATIONS

As required in *Decision 12-11-015*, *Decision Approving 2013-2014 Energy Efficiency Programs and Budgets* (Decision), the IOUs are hiring an expert entity (Expert) to help offer guidance and design a comprehensive approach to WE&T, for the IOUs to consider implementing in 2015. This approach should consider the full spectrum of DSM, including EE, distributed generation and demand response, and should align with the Strategic Plan. Although the Decision specifies implementation in 2015, the Expert should offer strategic guidance in 2013-14, as long this work relates to the 2015 strategic guidance plan (Guidance Plan).

The Expert must meet the minimum requirements listed below:

- Commitment to complete the project within a budget of $500,000.
- Assemble a team that possesses relevant knowledge and experience in the following areas:
    - IOUs' EE and DSM portfolios, both resource and non-resource programs.
    - WE&T and workforce development issues, with an ability to integrate WE&T across the portfolio.
    - A working knowledge of DSM technologies and their applications.
    - Expertise in market development.
    - The California regulatory landscape and process in energy and workforce training and development.
    - Working on behalf of disadvantaged, minority and low-income communities.
    - Familiarity with the WE&T Sector Strategy model.
    - Ability to work with a wide and diverse set of stakeholders, including trade organizations, apprenticeship programs and professional organizations.
    - Targeted hiring policies.
    - A high level knowledge of existing research pertinent to workforce training in the clean energy sector and pertinent EE Action Plans

In developing this RFP, recent regulatory guidance was referenced as providing the foundation for the following scope of work. Additionally, the IOUs comprehensively incorporated substantive stakeholder feedback received through a preceding public comment period.

WORK SCOPE

Throughout the term of the contract, the Expert's work will entail gathering data, performing research and developing a Guidance Plan for the IOUs to consider applying in 2015.

The Guidance Plan should be focused on the following strategic goals and should provide the IOUs with a practical implementation roadmap on how to modify existing, and create new, education and training programs, and how to optimally position the IOUs' Energy Training Centers and partnerships in the context of achieving Strategic Plan goals, accelerating market growth and increasing job placement rates of training program participants. The Guidance Plan must be specific, concrete and actionable and must provide the necessary level of detail to ensure the IOU's practical application of the Expert's recommendations, following the contract term.

Strategic Goal 1: Forecasting Market Needs to Create Career Pathways and Improve Candidate Placement and Advancement

Workforce planning that supports both the EE and workforce development goals of the Strategic Plan is required. As such, this work should address the entire EE workforce spectrum while leveraging, and supplementing, key research already performed in this area.

The Guidance Plan should provide the IOUs with a methodology for tracking "critical" DSM occupations and outlining the Knowledge, Skills and Abilities needed for each occupation. "Critical" is defined as occupations needed to ensure the IOUs' and California's clean energy, energy efficiency, and energy conservation goals are met, including those needed to drive both market adoption and job creation at a statewide level.

Using this information around market needs, the Guidance Plan should:

- Recommend how the IOUs can modify their existing, or create new, education and training programs and strategies, and identify how these training efforts provide an onramp to industry-recognized certifications and jobs for entry-level and incumbent workers.
- Describe the process for determining the role of the IOUs' Energy Training Centers and their relationship to offerings by public and private training providers. The Plan should use examples of successful programs, best practices and 'lessons learned' to add credibility to the proposed methods.
- Include a gap analysis of any key existing certifications and areas where certifications are needed including related training needs.
- Include an evaluation of existing efforts among IOUs in coordinating or collaborating with state licensing and certifying bodies and recommend strategies for improving coordination
- Describe the process to identify existing skills and competency standards and to evaluate current and needed skills and competency standards related to critical occupations.
- Identify and evaluate existing efforts and collaborations necessary for creating career pathways for the critical occupations, including aligning IOU training programs with state-certified apprenticeship programs, community colleges, four-year institutions, public-funded career technical education programs, WIA funded programs, ETP funded programs, CEC funded programs and other reputable third-party education and training providers.

The pathways identified through this work should be synchronized with market investments across the public and private sector, creating a balanced approach to education and training development.

Strategic Goal 2: Accountability to Local Communities with Disadvantaged Populations and High Levels of Unemployment and Underemployment

The Guidance Plan should ensure the Expert's 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.

For example, the Guidance Plan should:

- Develop a method or tool to track data from the IOUs' EE programs that determines to what extent high-road jobs are being created for low-income, diverse and disadvantaged populations. This process should be modeled after the surveying taking place through the Energy Savings Assistance (ESA) program.
- Identify how the IOU resource and WE&T programs should address and track the issue of inclusion of low-income, diverse and disadvantaged populations.
- Identify how to improve job placement rates upon completion of training and to create career ladders for disadvantaged populations.
- Identify and evaluate effective strategies, including pre-apprenticeship and multi-craft core curriculum (MC3), for connecting low-income, unemployed, underemployed, and other disadvantaged populations to state-approved apprenticeship programs.

Strategic Goal 3: Integrating Workforce Efforts with Resource Programs

There are significant opportunities to align the IOUs' WE&T efforts with the IOUs' resource programs. For example, WE&T can be leveraged as a catalyst to raise skills standards, competency levels and work quality within a particular field, growing the market over time, optimizing kWh reduction goals and improving candidate placement. There is also a substantial need to integrate WE&T with Emerging Technologies, Codes and Standards, and other aspects of the IOUs' portfolio.

For example, the Guidance Plan should:

- Recommend a process to effectively synchronize workforce development with initiatives and incentives throughout the IOUs' program portfolios.
- Outline alternatives for industry stakeholder engagement in reaching agreement on new skills and competency standards, as needed.
- Outline alternatives that will be researched for IOU and industry resource allocation and/or incentives that will reinforce the employment of contractors and workers who have achieved certification in standards recognized by the EE industry.
- Identify which IOU programs can be leveraged to create job opportunities for WE&T program participants.
- Evaluate existing IOU efforts in collaborating with WE&T program partners to align and update skills standards and certifications with new and emerging technologies and propose a plan for resource program integration for the IOUs' consideration.

Strategic Goal 4: Supporting Sector Strategies

WE&T sector strategies have been identified as a valuable approach for aligning workforce programs with industry needs. The IOUs have already spent time and resources setting the foundation for several of these strategies, including but not limited to the Energy Workforce Sector Strategy.

For example, the Guidance Plan should:

- Address how the IOUs' existing sector strategies can be improved, modified and scaled across the state to increase overall effectiveness.
- Outline the core considerations for developing and implementing a sector strategy that provides consistent outcomes across the state.

Strategic Goal 5: Stakeholder Involvement and Ongoing Governance

During and following the contract term and following, an active and participatory stakeholder group will be critical to ensure WE&T resources and programs are aligned to the goals outlined here, consistent with the Strategic Plan. A wide net of stakeholders from education, industry, labor, policy, community groups and government should be consulted on a regular basis.

For example, the Guidance Plan should:

- Offer an approach for this consultation, either through the existing sector strategies, or independently developed.
- Offer a plan for more effectively leveraging the previously established WE&T Task Force.

Strategic Goal 6: Evaluation of Workforce Education and Training Programs

The IOUs could benefit from guidance around WE&T program success evaluation. As such, the Guidance Plan should address what performance metrics are appropriate for the IOUs' WE&T programs and how should these be measured.

For example, the Guidance Plan should:

- Outline a comprehensive EM&V approach, including specific metrics that support the achievement of the strategic goals included here.
- Propose a list of performance metrics to measure effectiveness of the IOUs' WE&T programs and describe how these metrics should be used in continuous improvement of workforce skills and competencies and in advancing progress towards the IOU's and the state's energy goals.
- Address how and what key data the IOUs should track to gauge success of their programs as pathways into new or better jobs.
- Ensure the proposed metrics align to existing performance metrics for other WE&T training programs.

Strategic Goal 7: Recommendation for Development of a WE&T Web Portal as Described in the Strategic Plan.

The Strategic Plan directed the IOUs to develop a statewide web portal to serve as a central repository of WE&T resources. Portal development is in the initial planning stage, being led by the California Center for Sustainable Energy. During the contract term, the WE&T Expert should factor the web portal in the development of the Guidance Plan.

For example, the Guidance Plan should:

- Outline a comprehensive approach towards the online implementation of the IOUs' WE&T programs.
- Develop specific performance metrics for this program delivery method.

1B. List of Interviewees

We interviewed the following people (either individually or in a group) in the development of this Guidance Plan. Specific interview content is confidential except where otherwise noted in the text.

Interviewees by Organization

Name	Organization
Linda Derivi	American Institute of Architects CA Council
Paul Welschmeyer	American Institute of Architects CA Council
Steve Castallanos	American Institute of Architects CA Council
Don Langston	Aire Rite Air Conditioning & Refrigeration
Robert Fried	Atkinson, Andelson, Loya, Ruud & Romo
Jessica Pitt	Bay Area Community College Consortium
Jim Caldwell	CA Community Colleges Chancellor's Office, Workforce Incubator
Barbara Baran	California Budget Project
Jerry Winthrop	CA Department of Education
Wendy Miller	City College of San Francisco
Marco Cesar Lizzaraga	Cooperativa Campesina de California
Carmen Besst	CPUC Energy Division
Jaclyn Marks	CPUC Energy Division
Rory Cox	CPUC Energy Division
Lisa Paulo	CPUC Energy Division
Simon Baker	CPUC Energy Division
Jonathan Watts	Cunningham Architects
Amelia Feichtner	Cunningham Architects
Matt Golden	Efficiency.org
Matt Golden	Efficiency.org
Ortensia Lopez	El Concilio de San Mateo
Peter Cooper	CA Employment Training Panel
Gregg Ander	Energy Foundation
Catherine Ayers	Foothill-DeAnza College
Joanne Martens/Laurie Mack	Green 360/West Ed
Dan McNulty	International Union of Operating Engineers Local 39 Training Department
Jim Maple	International Union of Operating Engineers Local 39 Training Department
Bernie Kotlier	International Brotherhood of Electrical Workers / National Electrical Contractors Association Statewide Labor-Management Cooperation Committee Green Building Solutions
Susie Evans	Institute of Heating and Air Conditioning Industries, Inc.
Erik Emblem	International Association of Sheet Metal, Air, Rail, & Transportation Workers
Peter Crabtree	Laney College
Leticia Barajas & Bill Ellerton	Los Angeles Trade Technical College
Denny Mann	Marina Mechanical

Name	Organization
Jim Hussey	Marina Mechanical and Sheet Metal Workers Local 104 Joint Apprenticeship Training Committee
Anton Walker	PowerSave
Allan Rago	Quality Certification Services, Inc.
Cristal Bedortha	Residential Weatherization Inc.
David Ortiz	Richard Heath and Associates
Elena Foshay	Rising Sun Energy Center
Aaron Wilcher	Skyline College
Richard Villasenor	The East Los Angeles Community Union
Jennifer Wolch	UC Berkeley College of Environmental Design
Michael Siminovitch	UC Davis - California Lighting Technology Center
Jorge Partida	US Green Building Council - Los Angeles
Shamman Walton	Young Community Developers

Interviewees by IOU

Name	IOU
Aaron Berndt	PG&E
Bill Burke	PG&E
Bob Meyer	PG&E
Chris Corcoran	PG&E
Dave Canny	PG&E
Frances Thompson	PG&E
Gary Girardi	PG&E
Ila Homsher	PG&E
Jill Marver	PG&E
Larry Goldstein	PG&E
Leif Christiansen	PG&E
Lisa Shell	PG&E
Mangesh Basakar	PG&E
Marlene Vogelsang	PG&E
Mary Juvik	PG&E
Meghan Dewey	PG&E
Pam Murray	PG&E
Pat Eilert	PG&E
Paula Benassi	PG&E
Robert Marcial	PG&E
Robert Meyer	PG&E
Ryan Stroupe	PG&E

Name	IOU
Sam Augustine	PG&E
Siva Sethuramen	PG&E
Ann Edminster	PG&E, consultant
Charlene Spoor	PG&E, Fischer-Nickel
David Zobrowski	PG&E, Fischer-Nickel
Janel Rupp	PG&E, Fischer-Nickel
Judy Nickel	PG&E, Fischer-Nickel
Richard Young	PG&E, Fischer-Nickel
Diane MacLean	SCE
Hernan Garcia	SCE
Jack Parkhill	SCE
Jake Huttner	SCE
Jessica Mack	SCE
John Fasana	SCE
Kim Rodrigues	SCE
Lionel Moreno	SCE
Marjorie Hamilton	SCE
Marrs Gist	SCE
Mike Tomlin	SCE
Nina Perez	SCE
Randall Higa	SCE
Richard Jett	SCE
Robert Brunn	SCE
Robert Juskalian	SCE
Roberto Delreal	SCE
Rodger Bradfield	SCE
Roland Mollen	SCE
Steve Galanter	SCE
Tom Conlon	SCE, Geopraxis
Alma Williamson	SCG
Emma Ponco	SCG
Gary Johnson	SCG
Hackett Barney	SCG
Mark Aguirre	SCG
Melisa Marks	SCG
Rodney Davis	SCG
Sheila	SCG
Tom Hammani	SCG
Bob Nacke	SDG&E

Name	IOU
Bonnie Moreno	SDG&E
Brandon Pate	SDG&E
Chris Piccard Brown	SDG&E
Edmond Binuya	SDG&E
Ellery Stahler	SDG&E
George Katsufrakis	SDG&E
Jeff Liu	SDG&E
Jennifer Taylor	SDG&E
Kate Zeng	SDG&E
Linh-Chi Hua	SDG&E
Mayda Bandy	SDG&E
Michael Nguyen	SDG&E
Nate Taylor	SDG&E
Neil Sybert	SDG&E
Sandra Williams	SDG&E
Toan Trinh	SDG&E

1C. Stakeholder Advisory Group and Leadership Briefing Group

During the contract period, we engaged the feedback of a **Stakeholder Advisory Group** comprised of members chosen in consultation with the IOUs from existing working groups, listed below. 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 Delatorre, 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, 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 Katsufrakis, 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

1D. Stakeholder Comments on Draft Recommendations and WE&T Guidance Plan

See **Attachment 1** for detailed comments from the following stakeholders:

COMMENTS ON DRAFT SUMMARY RECOMMENDATIONS

Comments from IOUs and CPUC

- Energy Division, California Public Utilities Commission
    - Tory Francisco
    - Lisa Paulo
- Pacific Gas & Electric Company
- San Diego Gas & Electric Company
- Southern California Edison
- Southern California Gas Company

Comments from other stakeholders

- Brightline Defense Project
- California Community Colleges Chancellors' Office (Jim Caldwell)
- California Division of Apprenticeship Standards, Department of Industrial Relations, Labor and Workforce Development Agency (Diane Ravnik)
- California Workforce Investment Board (Amy Wallace)
- Emerald Cities Collaborative (Denise Fairchild)
- Hangtown Electric, Inc. (Johnnie R Smith)
- International Brotherhood of Electrical Workers Local 11
- Laborers' International Union of North America Local 261 (David De La Torre)
- Marina Mechanical (Jim Hussey)
- Natural Resources Defense Council (Lara Ettenson)
- Smith and Sons Electric (David Smith)
- The Greenlining Institute

COMMENTS ON DRAFT 1 OF GUIDANCE PLAN

Comments from IOUs and CPUC

- Energy Division, California Public Utilities Commission
- Pacific Gas & Electric Company
- San Diego Gas & Electric Company
- Southern California Edison
- Southern California Gas Company

Comments from other stakeholders

- Brightline Defense Project
- California Construction Industry Labor Management Cooperation Trust
- Laborers' International Union of North America (David De La Torre)
- Natural Resources Defense Council

COMMENTS ON DRAFT 2 OF GUIDANCE PLAN AND/OR APPENDICES

Comments from IOUs and CPUC

- Energy Division, California Public Utilities Commission
- Pacific Gas & Electric Company
    - Guidance Plan comments
    - Appendices comments
- Southern California Edison
    - General comments
    - Specific comments

Comments from other stakeholders

- California Community Colleges Chancellors' Office (Jim Caldwell)
- California Division of Apprenticeship Standards (Diane Ravnik) and California Workforce Investment Board (Tim Rainey)
- The Greenlining Institute (Ryan Young)

Appendices to Chapter 2

2A. Requirements for Resource Programs

This appendix includes the current requirements that the IOUs have for contractors and other professionals that participate in their programs. This covers most of the programs but is not exhaustive. The following programs (or category of contractor) are included:

1. Trade Professionals or Authorized Agents
2. Energy Savings Assistance Program
3. Energy Upgrade California (Home Upgrade)
4. Residential HVAC QM
5. Residential HVAC QI
6. Commercial HVAC QM
7. Core Programs: Customized or Deemed Measures
8. Third-Party Programs
9. Auto DR
10. Other

1. TRADE PROFESSIONALS OR AUTHORIZED AGENTS

Contractor Requirements:

SCE:[1] (1) Deliver quality services, including quality project consultation and installation, (2) Comply with all applicable local, state, and federal laws and licensing requirements when performing energy management project installations and related functions, (3) follow terms and conditions for individual programs

PG&E:[2] (1) Must comply with all applicable local, state, and federal laws when performing installation and related functions, (2) follow terms and conditions for individual programs, (3) for Energy Efficiency Business Rebates, the equipment must be installed and operating prior to an application being submitted

SDG&E:[3] (1) shall comply with all applicable local, state, and federal laws, rules, regulations and orders in its performance of services for any customer under this Agreement, (2) participate in Trade Professional training organized by SDG&E prior to soliciting ANY customer for SDG&E financing options. Trade Professional Training includes tutorials on customer eligibility restrictions; the use of program support software; Trade Professional roles and responsibilities and program requirements.

[1] SCE Customer's Authorized Agents Participation Requirements and Agreement Form (2012, September). Version 2.
[2] PG&E (2013). *Trade Professional Alliance Participation Guidelines*.
[3] SDG&E (2013). *2013-2014 Non-Residential Customer Programs Trade Professionals Participation Agreement*.

Quality Assurance/Quality Control:

SCE:[4] SCE reserves the right to limit participation for non-compliance

PG&E:[5] PG&E reserves the right to limit participation for non-compliance. For Energy Efficiency Business Rebates, (1) It is the sole responsibility of the Project Sponsor, whether the sponsor is the customer or the Trade Professional, to ensure that the equipment installed meets the terms and conditions of the product specifications, (2) PG&E reserves the right to inspect any installation before processing an application for payment, (3) PG&E reserves the right to utilize special inspection levels for specific Trade Professionals based on past performance, (4) A percentage of each Trade Professional's installations will be subject to inspection by PG&E personnel for the purpose of verifying that the equipment is installed and operating. Trade Professionals demonstrating high failure rates (based on a statistically significant sample) will have 100% of subsequent jobs inspected, and a $200 per application inspection fee will be imposed.

SDG&E:[6] SDG&E maintains a log of customer complaints, issues, and other examples of non-compliance by Trade Professionals. SDG&E, in its sole discretion, may suspend or cancel Trade Professional's participation in any SDG&E program for violation of the program guidelines or program requirements.

2. ENERGY SAVINGS ASSISTANCE PROGRAM

Contractor Requirements:

All utilities shall consider cost-of-service and quality-of-service criteria, contractor's program and service experience, knowledge of targeted communities, ability to reach targeted communities, ability to utilize and employ local individuals, performance quality, financial stability, and ability to provide local job training. All contractors must hold a valid license.

SCE: Contractors must have a strong marketing and outreach strategy and must have good historical and current performance. SCE also considers workload capacity and location. Vendors must have demonstrated performance in effectively delivering services to low-income communities.

PG&E: Contractors must have a competitive price, must be experienced, must be able to perform services required, must accept terms and conditions, must have a complete proposal, must have cost reduction ideas or alternatives for service, WMDVBE status must be included in subcontracting plan, must have a good safety record, must be financially stable, and must consider environmental impact. Each new vendor must meet the requirements of the current successful vendors.

SDG&E: N/A.
SCG: N/A.

3. ENERGY UPGRADE CALIFORNIA (HOME UPGRADE)

[4] SCE Customer's Authorized Agents Participation Requirements and Agreement Form (2012, September). Version 2.
[5] PG&E (2013). *Trade Professional Alliance Participation Guidelines*.
[6] SDG&E (2013). *2013-2014 Non-Residential Customer Programs Trade Professionals Participation Agreement*.

Contractor Requirements:

PG&E:[7]

The PG&E requirements are territory-wide and do not vary by region; however, there may be additional requirements for BayREN for Home Upgrade in the Bay Area. Contractors who do Advanced Home Upgrade in the Bay Area do not have to meet BayREN's requirements.

- Home Upgrade Contractor
    - Requires (in addition to all contractor licensing, bonding, insurance, etc) that the contractor take the Home Upgrade 3-day training (classroom and hands-on) and that the combustion safety testing for each job is performed by a BPI Certified Professional (Building Analyst, Envelope, Heat Pump, AC, etc)
- Advanced Home Upgrade Contractor
    - (In addition to the general requirements) must have a BPI Certified Professional on staff (can be certification other than BA).
    - Need a Whole-House Home Energy Rating System Certification, either through the Independent Rater path or the Building Performance Contractor (BPC) Rater path.
    - Building Performance Institute (BPI) Accreditation, or at a minimum hold, or employ staff that hold a BPI Building Analyst (BA) certification. In addition, they must attend a two-hour orientation on the program itself.
- Participating Raters
    - Must be HERS II and BPI certified by a qualified provider. Currently CalCERTS is the sole provider offering certification for Independent Whole House Raters.
- All BPI Certified Professionals must also take Advanced Training on combustion appliance safety.

Quality Assurance/Quality Control:

PG&E: Participating Contractors found in violation of any of the terms of the PG&E Energy Upgrade California Participant Handbook will be subject to removal from the Program or to restricted Program participation.

4. RESIDENTIAL HVAC QUALITY MAINTENANCE

PG&E:

- Possess a current C-20 license
- Have a minimum of 2 years Heating, Ventilation & Air Conditioning service experience
- Have a full-service shop within 25 miles of PG&E's service territory or within a county that's part of PG&E's service territory
- Employ HVAC technicians with adequate training and a minimum of 2 years experience
- Comply with PG&E background check requirements for each field employee
- Carry the minimum insurance requirements
- Sign the Contractor Participation Agreement

[7] See http://www.builditgreenutility.org

SDG&E:

- Comply with the terms and conditions of the Program, the Contractor Manual and this CPA. Submit all required documents, including customer applications and confirmations, contractor incentive applications, service agreement, QM Addendum, incentive calculators and work orders associated with each incentive application, and submit all required data for the Gold and Platinum tune-up services through the web application. Submit program-required Silver tune-up service data through a participating Verification Service Provider.
  (v) Bring all Qualified Units participating in the Gold or Platinum maintenance programs up to a Minimum Performance Level and within six (6) months (barring extenuating circumstances as set forth in the Contractor Manual) from the effective date of the Qualifying Customer Service Agreement for said Customer.
  (xi) Ensure that Contractor's Qualified HVAC Technicians attend all technical trainings.
  (xii) Ensure Contractor designated personnel performing HVAC Services attend the Contractor Sales Training and Contractor Operational Training.
  (xiii) Submit all marketing efforts on behalf of the Program completed by the Contractor for approval by the Implementer prior to Contractor's use. The unauthorized use of the SDG&E or Implementer logo without Program approval could result in termination from the Program.
- Contractor has, holds, and possesses all applicable licenses, permits and other governmental authorizations as required and necessary to conduct its business and to perform the HVAC Services.

Quality Assurance/Quality Control:

SCE:

- The policy is described as a "four 'strike' process" that requires documentation of a contractor's or technician's failure to comply with the program and the program's response. The program's response escalates from communication to warnings and mandatory retraining, to probation to expulsion. The policy covers the technical quality of the work, but not standards of professional behavior.
- PECI reserves the right to terminate this Agreement for cause in the event of any default by the Contractor, or if the Contractor fails to comply with any of the terms and conditions of this Agreement. Examples of cause include, but are not limited to: (a) failure to return Program equipment; (b) damage to Program equipment; (c) failure to properly complete incentive forms; (d) failure to properly process incentives; (e) loss of certifications necessary for participation in the Program, insolvency; or (f) failure to provide PECI reasonable assurances of future performance. In the event of termination for cause, the Contractor shall be liable to the Program for any and all damages sustained by reason of the default, which gave rise to termination.

SDG&E:

Contractor (business) Requirements:

- Active CSLB C20 License
- Currently provide repairs/maintenance to customers as part of regular business practices
- Minimum 3 Continuous Years in Business (Based on C20 License Used)
- Reside within 25 miles of SDG&E Territory (Based on C20 License Used)
- Minimum Level of Insurance (Based on Participation Agreement)

- Better Business Bureau rating of “B” or higher (Based on current website listing)
- Sign QM participation agreement
- No prior bankruptcy (Based on Dunn & Bradstreet report on business)

Technician Requirements (every employee participating in QM must complete these requirements):

- Pass five standardized HVAC quizzes
- Complete full day in-field training completing an actual QM project
- Complete 1-3 ride along trainings on actual QM projects
- Demonstrate that they carry all required QM tools for program
- Receive program certification (when approved)

SCG:

Reserves the right to suspend a Contractor from the Program and, during the suspension period and until reinstatement, hold all of the Contractor's pending applications and/or payment until further verification can be completed and qualified/ disqualified incoming applications for equipment rebates can be confirmed. Suspensions may arise if in the course of verification activities, CSG finds that the Contractor's applications are consistently inaccurate or incorrect, the reported installations fail inspection, or the Contractor is not adhering to the Participation Agreement or program policies and procedures regarding equipment or customer eligibility.

5. RESIDENTIAL ENERGY STAR QUALITY INSTALLATION

SDG&E:

Contractors:

- Active CSLB C20 License
- Currently provide installations to customers as part of regular business practices
- Minimum 3 Continuous Years in Business (Based on C20 License Used)
- Reside within 25 miles of SDG&E Territory (Based on C20 License Used)
- Minimum Level of Insurance (Based on Participation Agreement)
- Better Business Bureau rating of “B” or higher (Based on current website listing)
- Sign QI participation agreement
- No prior bankruptcy (Based on Dunn & Bradstreet report on business)

Technicians (at least one company employee):

- Attend 1-2 day QI software classroom training (Wrightsoft or Elite Software)
- Attend 3 day QI Manual J, D, and S classroom training (applied learning using software)
- Take computer QI test demonstrating competency after completing 4-5 day classroom training
- Attend 1 day in-field ENERGY STAR commissioning training on actual QI project
- Demonstrate that they carry all required QI tools for program
- Receive approval to move forward with program

6. COMMERCIAL HVAC QUALITY MAINTENANCE

PG&E:

Contractor Eligibility: To become an approved PG&E HVAC Quality Maintenance Service Contractor you must satisfy the following requirements

- Be in business for a minimum of five years
- Employ a minimum of three full-time certified HVAC technicians (trade school with a minimum of two years' service experience)
- Meet financial stability requirements which may include credit report
- Comply with PG&E background check requirements for each field employee
- Provide three local references from commercial customers with contracts of $10,000 or greater for a period of more than three years
- Carry the minimum insurance requirements
- Run scheduling software for maintenance visits
- Present proof of a minimum of a C-20 license

Technician Eligibility: In order for technicians to be eligible to participate, they must satisfy the below QM Program requirements:

- Completion a union or certified trade school HVAC Training Program
- Hold a Universal or Class II EPA Certificate
- Have a minimum of 2 years commercial HVAC service experience
- Avoided conviction of a felony or misdemeanor within the past seven years

SCE: **Southern California Edison HVAC Quality Maintenance Program - Rapid Feedback Process Evaluation**

Contractor requirements:

- "The Contractor shall demonstrate a minimum of five (5) years experience in the commercial mechanical temperature control business by submitting copies of state and local licenses and certificates. The Contractor shall have no unresolved claims with the Better Business Bureau."
- "The Contractor shall be fully licensed, as applicable, and with a minimum of a C-20 license. Contractors must be insured to do business at SCE customer's sites, in order to provide complete service."
- The Contractor must employ "at least one (1) full time professional who has an engineering degree or at least 10 years experience in the field of refrigeration, boilers, and pneumatic, electric, and electronic controls." The Contractor must also "employ a minimum of (3) full time HVAC service technicians," and up to five technicians per contractor firm can be enrolled in the program unless SCE pre-approves additional technicians.
- "Contractor applicants must take and pass an open-book, online exam about the content of ANSI/ASHRAE/ACCA Standard 180-2008 as a requirement for Program enrollment." The exam was created in collaboration with the HVAC Industry through Contractor Forums.
- Once qualified contractors have proceeded through all of the enrollment steps (provided in more detail in Figure 3.1), contractors are required to attend the Contractor Sales & Operations Training provided by PECI Account Managers and the Contractor Communications Manager.

Technician requirements:

- "A minimum of 2 years Heating, Ventilation & Air Conditioning service experience."
- "A Universal EPA license, refrigerant Transition and Recovery Certification, Class II or Universal, as required by 40 CFR Part 82, Subpart F, and a current certification issued under a Program approved by the U.S. Environmental Protection Agency."
- "Hold either appropriate certification from one of the following recognized industry certification bodies: UA STAR, NATE, HVAC Excellence, RSES, NCI, NEBB, TABB, or an equivalent that has been pre-approved by SCE (please contact the Program for pre- approval), OR have an HVAC Technician Certificate from an accredited HVAC vocational training program or school."
- "Maintain compliance with any and all required License or Code requirements as specified by the governing jurisdictions where work will be performed."
- "The service technicians assigned to maintain mechanical systems will be qualified to service the equipment type under contract as well as associated pneumatic, electric, and electronic controls."
- A two-day training is required for all technicians that are approved by the program.

SGG&E Commercial Quality Installation:

Minimum Contractor Requirement: ACCA Assured Contractor OR EPA ENERGY STAR® Service & Product Provider, completion of 4-part IHACI QI/QM training OR installing technicians hold ICE, NATE, AABC, NBI, NEBB, TABB or state recognized Journeyman Mechanic certification.

Contractor (business) Requirements:

- Active CSLB C20 License in good standing
- Minimum Level of Insurance (Based on Equipment Participation Agreement)
- Sign Equipment participation agreement
- Complete one-day classroom QI training and one-day rooftop QI training

Technician Requirements

- If contractor does not meet the Minimum Contractor Requirement above, installing technicians must hold ICE, NATE, AABC, NBI, NEBB, TABB or state recognized Journeyman Mechanic certification.

SGG&E Commercial QM and Tune-up requirements:

Contractor (business) Requirements:

- Active CSLB C20 License in good standing
- Currently provide installations to customers as part of regular business practices
- Minimum 3 Continuous Years in Business
- Minimum Level of Insurance (Based on Participation Agreement)
- Better Business Bureau rating of "B" or higher or five references with maintenance contracts of $10,000 or greater.
- Sign QM participation agreement
- In order to participate in QM incentives (paid over 3 years), financial stability must be demonstrated (three years financial and/or tax reports)
- Attend half-day contractor sales and operations training

Technician Requirements:

- The Contractor shall employ minimum of (1) full time, HVAC service technicians. The service technicians must meet the following requirements:
- A minimum of 2 years Heating, Ventilation & Air Conditioning service experience.
- An HVAC Technician Certificate from an accredited HVAC vocational training program or school, and/or appropriate certification from a recognized industry certification body (e.g. UA STAR, NATE, HVAC Excellence, RSES, NCI, NEBB, TABB).
- Compliance with any and all applicable required License or Code requirements.
- Mechanical service technicians will hold a Universal EPA license, Refrigerant Transition and Recovery Certification, Class II or Universal, as required by 40 CFR Part 82, Subpart F, and a current certification issued under a program approved by the U.S. Environmental Protection Agency.
- Complete Program training offered by Implementer (1-2 days, classroom plus rooftop)
- The Qualified Technicians assigned to maintain mechanical systems will have all necessary certifications and qualifications to provide HVAC Services the Qualified Unit subject to the Qualified Customer Service Agreement.
- The Program will review the qualifications of Technicians who have more than 5 years HVAC service experience but lack an HVAC Technician Certificate from an accredited HVAC vocational training program or school or Appropriate certification from a recognized industry certification body (Item 2) or a Universal EPA license, et al (Item 4) on a case by case basis to determine eligibility. Alternatives for partial qualifiers to achieve qualification may include the Technician's participation in additional, industry-recognized training courses such as those made available by SDG&E and/or verification of the Technician's experience/skill level by the Implementer through on-site job shadowing. The necessary steps will be subject to the Implementer's discretion.
- The Qualified Technicians assigned to maintain mechanical systems will be qualified to service the equipment type under contract as well as all associated pneumatic, electric, and electronic controls.
- Complete initial site with QA side-by-side training and participate in additional training activities as required.
- Demonstrate proper use of required tools and diagnostic procedures.
- Receive approval to move forward with program

7. CORE PROGRAMS: CUSTOMIZED OR DEEMED MEASURES

Quality Control:

For SCE and SDG&E service territories, the Project Sponsor submits an Installation Report to the Utility Administrator once the project has been installed and is fully commissioned and fully operational. The Installation Report must be submitted for a post-installation inspection to be scheduled.

Upon receipt of the Installation Report (SCE and SDG&E) or installation notification (PG&E), the Utility Administrator will schedule a post-installation inspection at the customer project site as soon as possible.

8. THIRD-PARTY PROGRAMS

SCE: Inspection, Measuring Savings, Verification: The SCE-assigned reviewer evaluates the project documentation and conducts a pre-installation site inspection.

After receiving the Installation Report package, the reviewer will evaluate the submittal package and may conduct a post-installation inspection to verify project installation and ensure the scope of work has not been altered from the agreed-upon PFS. For projects with DR measures, a verification/demonstration of the load shed capability and functionality of the equipment will be performed during the post-inspection.

SCE calculates the incentive payment based on its review of the submitted paperwork or site inspection.

The SCE assigned reviewer will contact the consultant to schedule a pre-installation site inspection within five (5) days. At the sole discretion of SCE, alternative methods of determining pre-installation conditions, such as photos, SCE personnel verification, and/or specific documentation may be used. Deemed only projects that have a total Customer Incentive less than $7000 may not receive a pre-inspection, at the sole discretion of SCE.

The purpose of this inspection is to take measurements when necessary and verify that: The PFS accurately reflects the existing project baseline; All existing equipment listed in the PFS is still operational (if not, the associated measures may be deemed ineligible); and Installation has not yet occurred (if field preparations for installation have begun, the project may be deemed ineligible).

The reviewer will verify that the M&V process is sufficient to verify the energy savings for the project scope.

A Measurement and Verification (M&V) Plan will include pre- and post-monitoring procedures/requirements. This M&V plan shall lay out how the baseline and post installation operating conditions and performance will be captured to generate the savings potential and how the consultant will verify the savings post installation.

For Itemized measures, savings and Incentives/Rebates are calculated using a deemed per-unit amount times the number of units installed for each measure type. Measures for Deemed Incentives will follow the procedures and protocols consistent with those used by other SCE programs (Express Solutions, formerly known as the “Express Efficiency” model).

For Custom Measures, savings are calculated using established engineering calculations and input values particular to the facility. The custom Measure Incentives/Rebates are calculated using a fixed dollar amount per gross EE kWh and EE kW saved and DR kW reduced. The specific Incentive/Rebate rates are shown in Appendix E (Deliverable Schedule). Calculated Incentives Measures will follow the procedures and protocols consistent with those used by other SCE programs (formerly known as “Standard Performance Contracting” program, DR’s TA&TI program, etc.).

Contractor Requirements:

SCE: For Turnkey Program, Consultant must: 1. Execution of the Customer Authorization Form (CAF) 2. Execution of Authorization Form (AF) 3. Project Completion Report (PCR)

Quality Assurance/Quality Control:

SCE: A project may be declined if any of the following conditions apply:

- The installation is not consistent with the PFS;
- The project fails inspection;
- The Installation Report is missing information that the consultant or customer is unwilling or unable to provide;

- The installed equipment is not fully commissioned and fully operational before inspection;
- The project otherwise fails to meet program criteria.

Project Installation: The consultant submits a signed Installation Report after all project measures have been installed, are fully commissioned, and are fully operational.

SCE may terminate Third-Party Implemented contracts under certain conditions including, but not limited to, the following: SCE determines that significant information was purposely withheld or was falsely stated in any submitted documentation; The project fails to be installed, fully commissioned, or fully operational before the installation deadline; The consultant requests withdrawal from the program; The customer requests withdrawal from the program.

Upon receipt of the PCR, SCE may schedule a post-installation inspection at the customer project site.

9. AUTO DR (DEMAND RESPONSE) PROGRAM

Contractor Requirements:

PG&E: Contractor called "Project Sponsor." No requirements/qualifications for Project Sponsor. They must submit form to participate.

Quality Assurance/Quality Control:

PG&E: Installation Review. Upon notification, the Utility Administrator schedules a post-installation inspection to verify completion and to perform one or more load reduction verification tests. M&V Projects. If a project requires M&V, the equipment must be operated for one or two years (at discretion of Utility Administrator) with the Project Sponsor performing the agreed-upon M&V activities. At the end of one or two years, the Project Sponsor submits the Operating Report and receives the remaining balance of the incentive based on the measured potential demand reduction, when the Utility Administrator approves the Operating Report. Measures not requiring M&V: The incentive may be less than contract amount, if actual equipment installation or operation differs from that described in the approved application. For example, if the installed equipment or operating schedule is different from the approved application, the incentive amount must be adjusted. 3. Third milestone: Operating Report (Projects requiring the M&V process only) This form is filed with the Utility at the end of the project performance period to confirm that the project is still in operation as installed and is submitted with M&V results. The Operating Report is the basis for the final incentive payment for Measured Savings.

10. OTHER

Contractor Requirements:

PG&E (LED Streetlights):[8] Subcontracted labor and installation to qualified electric contractors; Utilization of a competitive bid process; Union and/or union-friendly contractors to assure prevailing wages; Completion of work in 90-120 days (completion times may vary due to conditions such as heavy traffic or limited work hours permitted by a city); Each city will be responsible for securing required permits.

Quality Assurance/Quality Control:

PG&E (LED Streetlights):[9] PG&E-trained subcontractors; PG&E inspector verification of all completed work; One-year guarantee of PG&E workmanship; Five-year manufacturers' warranty on LEDs; One-year coverage for failed lamp removal and replacement installation.

[8]PG&E (2014). *LED Street Light Turnkey Replacement Service*. Retrieved from: http://www.pge.com/en/mybusiness/save/rebates/lighting/led/turnkey/index.page.

[9] Ibid.

2B. Evidence of Work Quality Affecting Energy Savings

This Appendix provides more detailed documentation of studies on work quality, and formed the basis for our summary of the research literature in Chapter 2. It was authored by Rachel Gold, graduate research assistant to Carol Zabin, in the fall of 2013 with funding from the UC Berkeley Institute for Research on Labor and Employment.

Numerous studies have documented a critical "gap" between energy efficiency programs' expected savings and the savings actually realized when evaluated. This gap in savings has grown over the past few cycles of energy efficiency programs in California. In 2009, the most recent program cycle for which there is complete data on reported vs. evaluated savings, evaluated MW savings were between 51 percent and 63 percent of reported savings.[10]

At the measure level, a recent evaluation of four CA IOU program evaluations documented similar gaps in savings in 129 commercial, public buildings, and industrial projects conducted from 2006-2008. The program evaluator reported realization rates by measure type, finding average realization rates of 40 percent-105 percent depending on the measure, with 9 of 12 categories of measures below 90 percent.[11]

Evaluation studies seek to verify that energy efficient technologies were installed and are producing savings *and* that the savings are directly attributable to the program intervention. These and other "gap" studies do not generally disaggregate data in a way that can separate quality concerns from other reasons for a gap in savings, like improper baseline selection and erroneous assumptions in engineering models. Some studies do suggest that the quality of installation directly leads to gaps in savings.[12,13] In their 2006-2008 evaluation report, CPUC Energy Division attributed this growing gap to slow incorporation of evaluated savings estimates into next-cycle project estimates, and to possible diminishing returns in incremental benefits due to a rising baseline efficiency level amongst consumers.[14] These studies underscore the importance of investigating all the reasons, including work quality, for this gap in order to identify effective ways of closing the gap.

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 literature also describes the breakdown of the solar water heater technology diffusion efforts of the 1980s, which failed as a direct result of challenges with poor quality installation. Many believe poor quality installations stopped the adoption of this technology for a generation. Poor quality work can derail market transformation and technology diffusion efforts for decades.

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

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

[12] Ibid.

[13] Nadel, S. (ACEEE) & K. Keating (Bonneville Power Administration) (1991). *Engineering Estimates vs. Impact Evaluation Results: How Do They Compare and Why?*.

[14] California Public Utilities Commission (Last Modified 2010, November 23). *2006-2008 Energy Efficiency Evaluation Report*.

HVAC

The issue of poor quality installation is particularly dramatic in the small commercial and residential HVAC sector. A study for the California Energy Commission 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. The study also found that failing to ensure quality installations or maintenance of cooling systems resulted in a 20 to 30 percent increase in the peak electricity needed by such systems.[15] These in-field results are consistent with laboratory tests, which demonstrate that installation and maintenance faults in the HVAC sector can reduce expected energy efficiency performance by more than 76 percent.[16]

The industry has recognized the issue of quality installation as well. A draft report from the Workforce Education and Training Subcommittee of the HVAC Quality Installation/Quality Maintenance Committee of the Western HVAC Performance Alliance, an organization established in 2009 to provide input to the IOUs in support of energy efficiency goals, concluded that "poor installation techniques and improper design have profoundly negative effects on the equipment operation and cancel out the benefits of the Seasonal Energy Efficiency Ratio (SEER) ratings or efficiency."[17] Similarly, the 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.[18]

These quality control challenges led to lower-than-expected savings results in the 2006-2009 HVAC installation and maintenance programs in California.[19,20] As a result, the California Public Utilities Commission's Energy Division has recognized that poor installation quality is a primary barrier to the realization of energy efficiency savings in the HVAC sector. They have dedicated Evaluation Measurement & Verification resources to better understand the scope of these issues in the 2013-2014 program cycle, including contractor surveys and field observations.[21] Research from one these field studies found that technicians participating in a 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 types of issues.[22] Field observations found gaps in knowledge of how to diagnose faults and implement repairs to save energy, and found that technicians often do not test, diagnose, or repair all of the deficiencies in a system. Significantly, the

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

[16] Mowris, R., R. Eshom, & E. Jones (2011, June). *Laboratory Measurements of HVAC Installation and Maintenance Faults*. ASHRAE.

[17] WE&T Subcommittee of the HVAC QI/QM Committee of WHPA, WE&T Working Group Draft Reports (2012, April). p. 6.

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

[19] 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.

[20] 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.

[21] 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*.

[22] 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.

report states that the "programs assume there are no significant industry issues with respect to technicians achieving the performance baseline and improving energy efficiency, " indicating possible overestimation of savings achieved by programs where quality issues are a factor.

Installation quality affects the energy use of HVAC systems. In the commercial HVAC industry, up to 40 percent of energy costs can be saved by sizing equipment properly and selecting equipment with high efficiency ratings, compared to conventional installations.[23] Energy efficient installation practices such as proper duct installation and sealing can result in energy savings up to 11 percent.[24] A properly commissioned HVAC system can use up to 20 percent less energy by correcting installation and operation problems, and optimizing system controls.[25] Similarly, a CEC working group of HVAC industry professionals estimated that higher quality installation and maintenance of commonly installed air-conditioning equipment could save up to 1,100 Megawatts by 2020.[26]

It is also significant to note that the IOUs have invested more than 10 million dollars in HVAC technician training over the last several program cycles. In fact, the 2010 impact evaluation of the IOU WE&T programs estimates that 44 percent of HVAC market actors in the state of California (usually defined to include contractors, architects, design specialists) have participated in IOU energy center classes.[27] As stated earlier, training alone is not enough to insure work quality improvements.

LIGHTING AND LIGHTING CONTROLS

Research and expert interviews provide evidence that improper installation of advanced lighting control systems has undermined their widespread adoption in the market. According to one lighting subject matter expert, "the anecdotal data overwhelmingly shows that poor quality installation is a widespread problem in the lighting sector."[28] An evaluation of Title 24 acceptance testing effectiveness found that automatic day-lighting controls failed in 7 out of 7 tests, and occupancy sensors failed in 2 out of 3 tests. All of the failures were due to design, installation, or calibration issues.[29] A study of the commercial lighting sector demonstrates that when properly installed, lighting controls reduce commercial buildings' energy use for lighting by 24 to 38 percent, but that only 30 percent of the market uses these advanced controls. They attribute this to the relative shortage of general electricians with the skills and certifications needed to properly install advanced lighting controls in California.[30]

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[23] David Energy Group (2001, January 19). *CEE Guidelines for Energy-Efficient Commercial Unitary HVAC Systems (Final Report)*. p. 2; see citation 15b.

[24] *Ibid*, see citation 6b.

[25] *Ibid*, see citation 18.

[26] Messenger, M. (2008). *Strategic Plan to Reduce the Energy Impact of Air Conditioners*. California Energy Commission Staff Report (CEC-400-2008-010). p. 6. See Appendix A, p. 30-36, for detailed estimates of energy and peak savings from increased quality installation.

[27] 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).*

[28] Interview with Doug Avery (2013, February 20).

[29] Tyler, M., J. Farley, & E. Crowe (2011, September). *Evaluation of Title 24 Acceptance Testing Enforcement and Effectiveness*. PECI.

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

The California IOUs validated this finding in a recent response to CPUC Energy Division questions, where they 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."[31] Interviews with IOU staff for this project reiterated this finding.

WEATHERIZATION

Office of Inspector General audit reports of Weatherization Assistance Program, funded through the Department of Energy and implemented at the state and local level by community action agencies, identified issues with "the poor quality of weatherization services, inspections, and re-inspections." In Michigan, more than 1/3 of the 412 homes weatherized required "call backs" to address faulty workmanship even after final inspection. They note that "the importance of identifying under-performing contractors and commonly recurring problems cannot be overstated."[32] Similar challenges were documented in California (Orange County),[33] Illinois,[34] Ohio,[35] New York,[36] Tennessee,[37] Missouri,[38] and West Virginia.[39]

WHOLE HOUSE MEASURES

Recent evidence suggests work quality issues in the whole house sector as well, including safety and energy performance gaps. An interim evaluation of the Energy Upgrade California (EUC) program found frequent safety

[31] 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. See SCE p. 384-386.

[32] 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.

[33] 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.

[34] 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).

[35] 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.

[36] 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 .

[37] 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).

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).

[39] 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).

issues and recommended that future iterations of the program provide ongoing safety training to contractors.[40] They noted that correct installation of insulation, CAZ (combustion appliance zone) testing, carbon monoxide testing, and identification of possible asbestos in ducts were areas missed by contractors. 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.

SOLAR WATER HEATERS

An historical example, solar water heater (SWH) policies in California, illustrates the deleterious long-term effects of poor quality installation. A number of studies document the history of the "CPUC Demonstration Project" effort to push for wider adoption of this technology in the 1970s and 1980s, finding that the poor quality of SWH installations was largely responsible for the collapse of the industry for the next two decades, with sales dropping from $1 billion per year in 1982 to $30 million per year in the late 2000s.[41] The CPUC Demonstration Project corresponded with well-publicized "abusive sales and marketing techniques" by some installers, like excessively high bids and "lifetime warranty" gimmicks that guaranteed service for the lifetime of the company, not the system. Anecdotal claims suggest that about one-half of SWH systems were not functioning within five years, and market data demonstrates that the SWH industry in California has yet to recover.[42,43] The failure of this technology diffusion effort is well known within the industry and can guide new market transformation efforts on the importance of high-quality workmanship early in a new market launch.[44]

BUILDING CODE COMPLIANCE

Work quality issues are also found in new residential and commercial construction. There is a well-documented history of non-compliance with building codes in both sectors, which occurs when workers do not build in accordance with the code as adopted. Evidence from the past 30 years suggests that building code compliance rates vary widely, with a recent literature review suggesting that compliance rates range from "[Zero] percent for residential buildings in New York to a high of 100 percent for residential buildings in Oregon."[45] A key barrier to code compliance is the lack of knowledge from designers, builders, and construction workers regarding the most recent codes and how to implement them. Proper installation of equipment is 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

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[40] 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.

[41] 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.

[42] Taylor, M. (2008). Beyond technology-push and demand-pull: Lessons from California's solar policy. *Energy Economics,* 30(6): 2829-2854.

[43] 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.

[44] 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.

[45] 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.

acceptance tests could not be performed without a moderate or substantial level of coaching, and that the contractor's knowledge of the tests exceeded their actual ability to perform the tests.[46] Problems with code compliance pose a particular challenge for IOU resource programs, in which incentives for energy efficiency must only be given for technologies or practices that exceed currents codes and standards. This points to a need for higher workforce standards within the resource programs, both for installers and for inspectors, than are required by code.

[46] Tyler, M., J. Farley, & E. Crowe (2011, September). *Evaluation of Title 24 Acceptance Testing Enforcement and Effectiveness*. PECI.

2C. Examples of U.S. Energy Efficiency Programs Requiring Certification

Exhibit 2C.1 Examples of U.S. Energy Efficiency Programs Requiring Certification

Incentive Offering	Certification or Standard	Required by:
Residential Home Performance & Financing	BPI Firm Accreditation (Building Performance Institute) BPI Building Analyst and RESNET HERS	NYSERDA;[47] SMUD;[48] Energy Upgrade CA
Residential New Construction	Pre-Qualification and ENERGY STAR Partner participation	NYSERDA[49]
Residential HVAC	Certification by an EPA H-QUITO organization http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_hvac_contractors_become	NYSERDA[50]
Solar	Solar NABCEP Certification (North American Board of Certified Energy Practitioners)	NYSERDA
Solar Thermal	Pre-Qualification based on: Solar Thermal NABCEP certification or nationally accredited Solar Thermal training or Solar Thermal training provided as part of an accredited apprentice training program or its equivalent and demonstration of experience in installing systems. All participating Eligible Installers must become NABCEP certified within two years of becoming an Eligible Installer.	NYSERDA
Advanced Lighting Controls	Certified Lighting Controls Acceptance Test Technician (CLCATT) or CALCTP-AT	California Energy Commission Title 24 - Acceptance Testing for advanced lighting controls (Section 10-103-A)
Nonresidential HVAC	Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), and the Testing Adjusting and Balancing Bureau (TABB) Technician	California Energy Commission Title 24 - Mechanical Acceptance Test Certification
Residential (Low-rise)	Certified HERS Rater	California Energy Commission Title 24 - field verification and diagnostic testing (Section 10-103)

[47] NYSERDA (2013, October 1). *Home Performance with ENERGY STAR*.

[48] SMUD Home Performance Program (n.d.). *Contractor Participation Agreement*.

[49] NYSERDA (2013, June 17). *Become a Builder*.

[50] Ibid.

Appendices to Chapter 3

3A. Sector Strategies

The Scope of Work directed the consultant team to assist the IOUs to implement "sector strategies" in a way that best contributes to achieving their energy efficiency and related workforce goals and specific CPUC directives. Chapter 3 incorporates sector strategies into the recommended re-design of the WE&T Skills-Building Portfolio. This appendix provides a more detailed review of the IOUs' activities relating to sector strategies to date.

WHY SECTOR STRATEGIES?

Sector strategies are industry partnerships of employers, training and education institutions, labor and community stakeholders, and others who come together to plan and implement training programs.[51] Sector strategies are considered a best practice approach to workforce development and are designed to meet the needs of employers for skilled workers, while benefitting workers through placement in career-track jobs and career advancement opportunities.

Evidence from the workforce development evaluation literature confirms sector strategies as a successful approach to workforce development for both incumbent and entry-level workers.[52] Workers participating in sector strategies have gained employment, experienced increases in wages, and have had better career trajectories than control groups. Studies also show positive returns to employers' investment in training through increases in productivity. On-going employer investments in training indicate that they see value.[53] Returns are particularly high for both workers and employers in apprenticeship, which is an institutionalized form of sector strategies, usually regulated by the state with on-going commitments of industry funding.[54] The main factor leading to the success of sector strategies compared to other types of workforce development projects is the involvement of employers, not only in identifying skill gaps but also in committing to co-fund training of incumbent workers and/or to hire graduates of training programs.[55]

There is currently a significant opportunity for the IOUs to collaborate with other state workforce and education agencies, who have ramped up their efforts to align funding using a sector strategy approach. The sector

[51] Corporation for a Skilled Workforce, National Governors' Association Center for Best Practices, National Network of Sector Partners (2008). State Sector Strategies Toolkit: Introduction.

[52] 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.

[53] Conway, M., A. Kays Blair, S. L. Dawson and L. Dworak-Munoz (2007). *Sectoral Strategies for Low-Income Workers: Lessons from the Field.* Washington, DC: Aspen Institute.

[54] Muehlemann 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. 2010., and Lerman, R. (2010). "Expanding Apprenticeship in the U.S." Presentation to the Ray Marshall Center, University of Texas–Austin, October

[55] Conway, M. et al. (2009). *Job Training That Works: Findings from the Sectoral Employment Impact Study.* Public/Private Ventures.

strategy approach has been adopted in the California Workforce Investment Board (CWIB) Strategic Plan,[56] which sets strategic direction for all of the state's workforce development programs. The Community Colleges Chancellor's Office has developed the Sector Navigator Initiative,[57] to realign priorities and funding. The state-certified apprenticeship system and the Employment Training Panel, whose programs already embed deep employer commitment and a sector strategy approach, are also actively engaged with the CWIB and the Community Colleges in aligning their efforts to collectively support sector strategies.[58]

REGULATORY BACKGROUND AND PROGRESS TO DATE

The UCB-DVC Needs Assessment recommended that IOU WE&T programs adopt the sector strategy framework for their WE&T programs. The Needs Assessment argued for this approach for two main reasons: first, the sector strategy approach can effectively engage employers in the building and construction industries, who have the capacity to impact the use of energy in buildings, in industry, and in agriculture; and second, the approach can leverage other training funding sources to provide training for workers already employed or with high probability of employment after training.

In their October 2011 Advice Letter[59] responding to the UCB-DVC Needs Assessment, the IOUs agreed to develop and initiate Sector Strategies, and test and refine the sector strategy approach as needed for the IOU context.[60]

The CPUC's Guidance Decision[61] addressed sector strategies as well. It recognized the value of sector strategies not only to address the "supply-push" for training construction workers with EE skills (i.e. by supporting EE skills training), but also the "demand-pull," to create the demand for skilled workers by requiring firms who participate in resource programs to use workers with certain skill certifications or providing a larger incentive for firms who do so. The CPUC directed the IOUs specifically to 1) support the California Advanced Lighting Controls Training Program (CALCTP),[62] 2) develop a sector strategy for the non-residential HVAC industry based on the CALCTP model, and 3) to initiate sector strategies in other sectors, also using CALCTP as a model.

The IOUs have begun to develop sector strategies, but their efforts remain incipient. PG&E has led this effort by convening the statewide HVAC sector strategy and launching an umbrella effort entitled the Energy Workforce Sector Strategy (EWSS) for their territory. The other IOUs have followed PG&E's lead but their participation has been largely limited to supporting the state wide HVAC effort and continuing to offer CALCTP classes at their Energy Centers.

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[56] See 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.

[57] WEDD RFAs (2013). *California Community Colleges Chancellor's Office*.

[58] Interviews with state workforce officials.

[59] 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).

[60] Ibid. p. 4.

[61] 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. Section 13.

[62] California Advanced Lighting Controls Training Program (n.d.).

In general, interviews with the other IOUs revealed confusion about the definition and purpose of sector strategies. For example, when asked by the CPUC to report on a specific funding allocation for sector strategies in their 2013-2014 the IOUs responded that they "do not see Sector Strategy efforts as mutually exclusive of current WE&T Centergies implementation strategy. IOUs will support sector strategies as a way of restructuring portions of their programs to focus on specific audiences."[63] The IOUs have now produced the Joint IOU WE&T Sector Strategies Document (Appendix 3B) that includes a definition of "sector strategies" that more closely corresponds to the widespread use of the term in the workforce world, which will help them distinguish these activities from their current class offerings.[64]

PG&E's has made an important investment in its EWSS, working through a consultant who also works with the community college Sector Navigator program. However, the statewide HVAC sector strategy has faced significant gridlock, although SCE expects to re-launch it in 2014. The IOUs' support for CALCTP is limited to offering classes at the Energy Centers.

Our recommendations are designed to strengthen current IOU efforts, while providing a plan that allows other groups with current capacity and greater expertise to play a more significant role in sector strategy implementation.

RECOMMENDATIONS

As described in Chapter 3, we recommend that the IOUs develop a competitive solicitation process for two types of sector strategies, as described in Chapter 3: one for upgrading the EE skills of incumbent workers, and one to promote inclusion of disadvantaged workers into living-wage, career-track jobs. We have presented the rationale for our recommendations for using a competitive solicitation process (RFP) for sector strategies in Chapter 3.

We also have specific recommendations about the sector strategies to date. These include:

CALCTP: The IOUs should launch a state-wide incentive program that requires CALCTP certification for participating contractors.

HVAC sector strategy: The IOUs should not lead this sector strategy, but rather encourage the HVAC industry to apply for funding from RFP # 1.

EBCx: The EBCx training effort should be reconceived and should be built on a partnership with the two Stationary Engineers apprenticeship programs in California, for apprenticeship and journey upgrade training.

Architecture Sector Strategy: The IOUs should foster deeper employer commitments to the Architecture Sector Strategy for integrated project design and delivery processes, similar to the current structure of the EBCx training.

EWSS: We recommend that the EWSS be folded in to the skills-building RFP in the following way: The EWSS has initiated a process of identification of key stakeholders, research, priority-setting, and scanning for opportunities

[63] 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. See PG&E p. 118, Attachment 1.

[64] See Appendix 3B.

that can easily be folded into the RFP process that we recommend. Specific partnerships that have been started will be eligible to apply for funding through the RFP. The identification of key stakeholders, subject matter experts and educational partners will inform both the state-wide priority setting process and jumpstart good sector strategy projects that can apply for funding through the RFP.

WHY IS CALIFORNIA ADVANCED LIGHTING CONTROLS TRAINING PROGRAM THE MODEL SECTOR STRATEGY?

The CALCTP program provides an example of a successful sector strategy leading to the development of incumbent worker training and third-party certification, and has been recognized by the IOUs, the CPUC, the community colleges and others as a model sector strategy for EE. This section provides a description of the program and the phases in its execution, and an analysis of what has made it so effective.

CALCTP involves strong industry buy-in, leveraging of industry and public workforce training dollars, and strong prerequisites for worker participation in training to enhance the skills of the incumbent electrical workforce. This project was initiated by SCE's Design and Engineering Services Group whose primary objective is to promote emerging technologies. CALCTP was initiated as a specific response to installation quality issues in the Advanced Lighting Controls sector. SCE along with the UC Davis California Lighting Technology Center (CLTC) and other subject matter experts had identified workforce issues and skills shortages as a major barrier to market adoption of this set of technologies and controls.

The initiative began with a stakeholder meeting with manufacturers, subject-matter experts (SMEs), and contractors (including both union and non-union contractors) to discuss the reasons for low take-up of advanced lighting controls and possible solutions. Stakeholder feedback validated SCE and CLTC's hypothesis that upgrading the skills of incumbent workers was necessary for successful installations, which in turn would improve market uptake. The initiative was launched, with SCE taking the lead on funding the curriculum,[65] which was developed by an industry expert with on-going input from a technical advisory group of SMEs from the IOUs, the national labs and the UC Davis CLTC.

SCE reached out to the lighting and electrical industry (both union and non-union) and asked for industry participation from contractors who would make commitment to use the training. The labor management cooperation committee (LMCC) of the International Brotherhood of Electrical Workers and National Electrical Contractors Association (IBEW–NECA) stepped up as a full partner, offering its joint apprenticeship program infrastructure as well as contractors and journey electricians who were interested in the training. IBEW-NECA invested heavily in the effort, including donating its training centers for curriculum testing, paying its instructors for the alpha and beta testing of the curricula, supplying grant writers who were able to secure a $5 million dollar federal Department of Labor grant and several other outside grants, and paying journey electricians to take the training.

The training is currently offered at the NECA-IBEW's 21 joint apprenticeship and training centers (JATCs), 7 community colleges with Advanced Transportation Technology and Energy programs, and 3 IOU Energy Training Centers, making it widely available to all state-certified General Electricians. Curriculum is updated on an annual basis.

[65] SCE continues to own its intellectual property rights, which it licenses to others.

As of February, 2014, CALCTP has trained 2,538 electricians, including 2,222 who have attained a CALCTP third-party certification. Ninety contractors have attained CALCTP firm certification which requires business and systems course work for management in addition to certification of the electrician employees, and 250 more contractors are in the process of getting certified.

CALCTP has become a nationally recognized model for improving work quality in a key energy efficiency sector and provides a guide for workforce planning for other emerging technologies and measures such as retro-commissioning, new energy storage technologies, and other integrated demand-side management initiatives. This program also illustrates the benefits of collaboration between the IOUs, the University of California, and networks of licensed contractors who have a proven commitment to investing in comprehensive skills training. It has drawn on the existing strengths of each of the partners, taking advantage of the technical expertise of CLTC and the existing training infrastructure at IBEW-NECA, as well as the Design and Engineering Services Group at SCE.

CRITICAL COMPONENTS OF EE SECTOR STRATEGIES

The following key components are necessary for the development of successful sector strategies for incumbent workers in the EE context, and were present in the development of CALCTP. We describe how CALCTP incorporated them.

1. **Identification of workforce skills issues as a key factor that can propel market adoption of advanced lighting controls.**

Subject matter experts identified installation problems as a key issue in their research on market adoption, evidenced by the fact that advanced lighting control systems were often overridden by building occupants when they didn't work. The link to workforce skills gaps was underscored when even contractors chosen by the manufacturers installed the systems incorrectly. The first sector strategy stakeholder convening, where manufacturers, contractors, SMEs, facilities managers and others were present, validated the hypothesis that upgrading skills could help expand market adoption.

2. **Specific employer commitment and co-funding.**

At the first sector strategy stakeholder convening SCE and CLTC invited the electrical contractor community and asked for support for the project. NECA stepped forward and became the industry co-lead, and invested several hundred thousand dollars in the project, including the costs of curricula testing, instructor training, grant writing for public training funds, and other investments. The fact that NECA represents contractors who already make a substantial investment in training through their participation in the electrical state-certified apprenticeship program meant that they could build on their very robust training infrastructure. It also meant that members were already in the segment of the market that values high skills, and they already had the mechanisms in place to create, test and then deploy new curricula. Furthermore, NECA contractors were already self-organized as a multi-employer association who could make investment decisions on behalf of their members. As part of the state apprenticeship system, NECA was also well-positioned to both be aware of and successfully apply for public training funds. This is a big advantage for the IOUs and the CPUC, as it leveraged substantial private industry funding for training. NECA-IBEW's investment was essential for launching the initiative; without industry validation and initial support SCE could not justify the investment and the curricula could never have been made available to the community colleges and the IOU training centers.

3. Adequate market demand—still a challenge.

Sector strategies are predicated on the voluntary participation by employers who are unlikely to commit resources or use the training unless they see a value proposition, i.e. higher productivity or growth in sales. Since training alone cannot drive market expansion, verifying market demand is critical.

In the case of CALCTP, industry's willingness to invest was predicated on SCE's signal that they were considering a new incentive program that would either require CALCTP certification or provide a higher rebate to customers who hire a CALCTP certified electrician. Shifting incentives towards certified workers creates a value proposition for investing in quality installations with verified energy savings, and thus in training so that the work can be effectively carried out. As it was conceived, the CALCTP partnership enabled planning for workforce training and new utility programming to occur simultaneously and in a complementary fashion, rather than addressing workforce issues after the fact.

We note that this incentive program is still under consideration five years later. NECA made a risky investment in the hopes that they could participate in a growing market, and the lack of follow-through by the IOUs has put the value of this investment in doubt.

4. Rigorous KSA identification and curricula development based on SME direction, including identification of base-line skills and training prerequisites.

The involvement of key SMEs with expertise in EE technologies and systems is essential for successful sector strategies that can contribute to the state's EE goal. This is more critical in the EE sectors where ratepayer funds are meant to drive changes that the industry has not yet embraced, than in other sectors, where employers may already have enough knowledge about needed learning outcomes. While industry validation is also critical, SMEs must be in a leadership role for the curriculum development process if sector strategies are to serve the policy goal of market transformation.

In addition, ratepayer investment in training can get the most bang for its buck when it focuses on curriculum development on upgrading the skills of trades workers who have already achieved a high level of skills and experience. Establishing clear pre-requisites for participation so that learning can occur from a similar starting point can create a readily deployable skilled workforce. Due to the advanced level of the skills taught, CALCTP not only requires an electrical licensure as a prerequisite for its program, but also mandates online prerequisites provided by lighting controls manufacturers.

5. Certification based on third-party competency testing.

Certifications that are industry-recognized, test for competency, and are verified by an independent third party, can help create clarity in the market, generating benefits for employers, workers, trainers, government regulators, and customers. A recognized system of portable, stackable credentials can lower employer hiring costs, help guarantee a standard quality of work, signal content to training providers, and reward workers' training investments with upward mobility.[66]

[66] White, S., L. Dresser, J. Rogers (2010). *Greener Skills: How Credentials Create Value in the Clean Energy Economy*. Center on Wisconsin Strategy, p. 4.

CALCTP incorporates a new certification that builds on an electrician's license and other advanced training. Trainees earn the certification upon completion of the training and must demonstrate competency through testing,[67] If an advanced lighting incentive program is launched that includes a link to CALCTP, it will reinforce the importance of this certification and create demand in the market.

Many are recognizing the importance of developing a robust certification system, in particular in energy-efficiency-related sectors. The Department of Energy (DOE) and the National Institute of Building Science, along with stakeholders, are currently in the process of developing voluntary national guidelines for commercial building workforce training and certification program as part of the Better Buildings Workforce Guidelines initiative.[68] DOE led a similar effort in the residential sector in 2012.[69] The Department of Labor has also been supporting strong third-party certifications.

IOU SECTOR STRATEGIES PROGRESS TO DATE

This section provides a more detailed description of the progress the IOUs have made in initiating sector strategies since the CPUC's May 2012 Guidance Decision direction to support their development. We present more detailed information about IOU sector strategies that also helps explain the rationale for our recommended approach. We identify points of commonality and difference between CALCTP and the more recent IOU efforts, and identify the core elements that allowed CALCTP to overcome challenges.

HVAC Sector Strategy

The May 2012 Guidance Decision ordered the IOUs to include in their 2013-2014 applications to "test the sector strategy approach for the non-residential HVAC sector."[70] In 2011, the California Division of Apprenticeship Standards (DAS) proposed that the IOUs develop a sector strategy in partnership with the state's apprenticeship programs. In their 2013-2014 PIPs, the IOUs included a commitment to work collaborated with apprenticeship system. As stated in the PIPs, "the IOUs have collaborated on a statewide memorandum of understanding with the California Division of Apprenticeship Standards, which will provide a framework for partnership with labor, trade and professional organizations that resembles the existing CALCTP program."[71]

Although the DAS and IOUs both spent considerable time developing an implementation plan, and DAS gained agreement from key apprenticeship programs to participate in the collaboration, the MOU was never signed. The IOUs wanted the collaboration with the DAS to involve all industry players and institutions, including those that do not participate in apprenticeship. The DAS proposed a customized plan for the apprenticeship programs and their participating labor-management partners, beginning with a voluntary commitment among them to

[67] California Advanced Lighting Controls Training Program (2010). *Become a CALCTP Certified Electrician.* Retrieved from: https://www.calctp.org/become-certified.

[68] Goldstein, B., & D. Smith (2013, November 7). *DOE/NIBS Better Building Workforce Guidelines*. Better Buildings U.S. Department of Energy.

[69] U.S. Department of Energy, Energy Efficiency & Renewable Energy, Weatherization & Intergovernmental Programs (n.d.). *Guidelines for Home Energy Professionals.*

[70] 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). Ordering Paragraph 107, p. 422.

[71] 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. See PG&E, p. 32.

review and enhance their training, which adheres to a common set of core competencies for each trade. The DAS and their apprenticeship partners believed that a tailored approach would result in a more useful outcome for their programs, compared to a broader collaboration with employers outside the system. They felt the latter would be less effective for their purposes, due to the vast difference in baseline competency levels among the workers within and outside of apprenticeship programs, and the unique funding mechanisms, oversight, and other specific features of apprenticeship. Although DAS and apprenticeship program participants were not opposed to the IOUs developing other partnerships with other HVAC industry groups, they did not believe an all-inclusive program was feasible or worth their investment. The IOUs were unwilling to commit to any plan that was tailored specifically to apprenticeship, and so the MOU was never signed.

At the same time that the IOUs and DAS were exploring a partnership, the PG&E WE&T team took the lead for the statewide commercial HVAC sector strategy that was specifically called for in the CPUC Guidance Decision. This effort brought together a large variety of stakeholders in the HVAC industry, including the Western HVAC Performance Alliance, a broad industry grouping financed by the IOUs. Stakeholder participants included union and non-union contractors, representatives of trade organizations such as IHACI and ACCA; educational institutions, CBO training organizations, sheet metal and plumbers/pipefitters' unions and apprenticeship programs; and CPUC and IOU staff. When the DAS collaboration stalled, a number of the participating unions and contractors continued to participate in the broader PG&E HVAC sector strategy effort.

While all participants identified work quality as a central concern, the IOUs' stakeholder process did not lead to consensus about an approach to training, identification of appropriate certifications, or a process to determine skills and competency requirements for the IOU commercial HVAC incentive programs. Two competing approaches were discussed: the non-union participants and the IOUs favored a specific focus on a skills and quality issues associated with single technology, economizers; the union contractors and apprenticeship trainers, DAS and some other stakeholders favored an approach emphasizing a broader skill set, and holistic approach to the full range of quality issues in HVAC installation and maintenance. The IOUs called for an online survey response to determine the approach, and the economizer proposal won the most votes from survey participants. However, the IOUs later withdrew their support for the focus on economizers because of on-going technical issues, and the sector strategy process was put on hold.

In early 2014 SCE took over statewide leadership of the HVAC Sector Strategy, and the IOUs are now re-assessing the initial approach. DAS and the IOUs have also continued conversations, and are looking to re-boot their partnership in coordination with the recommendations of this Guidance Plan. The discussion on work quality and resource program training requirements is also being continued in the context of the HVAC commercial QM programs, with the CPUC engaging in an in-depth EM&V process focused on quality issues in the HVAC sector. Recent reports show persistent quality problems in the QM program, including in the use of economizers, rooted in program design and technicians' skills.[72]

The HVAC sector's complexity is widely acknowledged, and there are multiple reasons that an HVAC sector strategy would face challenges. While we cannot provide either a full analysis of the dynamics of this sector strategy nor a comprehensive solution, we make two observations that distinguish the CALCTP approach from

[72] See DNV and RMA Energy (2013, November 7). *CPUC Work Order 32 Impact Evaluation Research Study*. Contracted for the California Public Utilities Commission.

the HVAC approach. First, the CALCTP project had a very strong and committed industry partner from the beginning. The IBEW-NECA was able to bring together multiple contractors, was willing to make specific investments in training their incumbent workers, and had a training delivery infrastructure in place. Second, the KSA identification and curricula development process was carried out by subject matters experts. While there was industry input, control remained in the hands of technical experts rather than those with economic interests in the outcomes. The fact that a specific set of employers came to the table, bringing workers who shared a common baseline skills level, provided the curricula developers with a clear and high-level starting point from which they could develop a program to enhance skills. In the case of the HVAC, the IOUs did not want to choose one industry partner (or even a specific set of partners), and they did not ask for the kind of commitment that occurred in CALCTP. The lack of these two necessary components contributed to the inability of the HVAC sector strategy to move forward during its initial launch.

An RFP process may provide a more successful approach. A strategic procurement process can clearly outline activities and outcomes, and allows for a transparent assessment of the level of commitment by employers, and involvement of subject matter experts, among other things.

PG&E's EWSS

In 2012 PG&E launched their umbrella "Energy Workforce Sector Strategy" (eesectorstrategy.com), hiring a non-profit organization called Workforce Incubator to carry out this work on their behalf. The EWSS was launched in 2012 with investment in background research and a series of convenings that has cultivated a stakeholder community of over 100 industry and educational partners. The EWSS takes a broad and comprehensive approach to sector strategies. Through the stakeholder advisory council, the EWSS has built a network of community colleges and universities, and is supporting a process to identify critical EE skills via a skills panel. It also has created a web portal with training resources for students and a list of training programs from which employers may seek to hire graduates.

This is a new effort and is building the knowledge-base of participants, creating and expanding networks, and opening doors to new strategic opportunities specific to energy efficiency. It helped support a new CSU East Bay certificate program in Integrated Energy Solutions that has not yet been launched. It has engaged in regional stakeholder convenings in Sacramento and Modesto to identify priorities and scan for opportunities.

It has also led to several concrete accomplishments:

- An 8 hour business development course for professionals and contractors to help them sell end-users on energy efficiency investments in the commercial building sector
- A partnership with SF City College (now on hold due to internal issues at the college) for commercial energy auditor program
- A "train-the trainer" program on Title 24 to engage faculty in consistent integration of content across community colleges in the PG&E territory, to be launched in 2014.

These efforts represent an important investment in sector strategies, although it is too early to assess their outcomes. One missing piece is the clear commitment by a group of employers for a specific project; we believe the RFP we recommend can facilitate this component.

The process of identifying key stakeholders, conducting research on jobs and occupations, setting priorities, and scanning for opportunities all can thrive within the RFP process that we recommend. Specific partnerships that have already begun will be eligible to apply for funding through the RFP. EWSS's identification of key stakeholders, subject matter experts and educational partners will inform both the formation of our recommended technical skills panels and help jumpstart new sector strategy projects that can apply for funding.

RETROCOMMISSIONING AND BOC

The IOUs have also identified already existing programs that may fit the definition of sector strategy even though they weren't conceived under this framework. Although not all programs identified by the IOUs as pre-existing sector strategies qualify as such, two PG&E programs in particular include some of the critical best-practice features of a sector strategy: the Existing Building Commissioning (EBCx) workshop series and the Building Operator Certification (BOC) program. The main feature of these two programs that mark them as best practices is the commitment by employers to co-fund the training for their employees, and to support the trained workers in making changes in the way they carry out their work. Both of these programs require the involvement of the end-users who put forth their buildings as hands-on learning sites and test cases for the building operators in their employ.

The Building Operator Certification is a national program that offers a very basic level of skills training and accreditation for facility operators/managers. It includes competency-based training and certification, and employer commitment to send their workers to the series of training sessions. BOC includes two levels of certification, which operators earn by attending training and completing examinations and project assignments and in their facilities.[73] This certificate is a basic level—much less comprehensive than a state-certified apprenticeship in stationary engineering. It should not be used as a substitute.

PG&E Pacific Energy Center's Existing Building Commissioning (EBCx) workshop series involves a more advanced level of training on building operation, using monthly workshops over the course of a year, that "expose participants to the planning, decision-making and diagnostic aspects of commissioning by actively working on a real facility."[74] Students apply what they learn directly to the buildings that they work on, completing all planning, analysis, and decision-making under the supervision of commissioning experts. [75]

Both of these programs include several of the critical components of successful sector strategies. Employers have a significant investment because of the worker time and building resources that they commit over the course of the training. Both programs also involve rigorous, SME-informed curricula; pre-requisites for participation; long-term series of hands-on training sessions; and competency testing. BOC also involves an industry-recognized certification. Each has demonstrated significant impacts on energy savings as well.[76]

[73] 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. See PG&E, p. 44.

[74] 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. p. 10-319 and 10-320.

[75] Ibid, p. 10-320.

[76] Interviews with IOU staff.

One element that could improve BOC and EBCx is to develop partnership with industry associations and apprenticeship programs for building operators, in particular the stationary engineers. The two stationary engineers' local unions in California represent about 27,000 incumbent building operators and are thus a prime candidate for partnerships for training because of the scale of their reach.[77] Although the BOC trains at a much lower level than the stationary engineers' apprenticeship program, the EBCx curricula may provide some areas of potential skills enhancements. No programmatic partnership has been developed, but PG&E indicated that this is something they would be interested in doing.

ARCHITECTURE SECTOR STRATEGY

Starting in 2012, the IOUs have been partnering with the American Institute of Architects–California Chapter to develop a "sector strategy" to offer upgrade training to incumbent architects in the area of integrated project design and delivery processes. The strategy focuses on project management and communication skills for architects, aiming to foster more collaborative business relationships with engineers and contractors, to better manage the work-flow processes involved in designing and constructing ZNE buildings.

This effort, led by PG&E with SCE's Energy Design Resources team, addresses a clearly identified incumbent worker skills-upgrading need recognized by subject matter experts on energy efficiency in architecture. Many of those we interviewed expressed support for both the content of the skills-upgrade training and the collaborative, multi-stakeholder process that the IOUs have used to develop and execute this effort. Program managers and staff expressed a desire to eventually connect the training to Savings-by-Design incentives as well.

The only drawback we identified with this effort is the lack of significant employer investment in the training, which is a defining element of a successful sector strategy approach. The IOUs should foster deeper employer commitments to the Architecture Sector Strategy, similar to the current format of the EBCx training.

NO SECTOR STRATEGIES FOR INCLUSION

Currently the IOUs have not launched any sector strategies in this area. We describe this recommendation, and our proposed "Phase One" bridge program to pre-apprenticeship, in detail in Chapter 3.

[77] Interviews.

3B. IOU Sector Strategies Document

Joint IOU WE&T Sector Strategies Document

Background, Definition and Application (v.20)

INTRODUCTION

This document outlines the Investor-owned Utility (IOU) perspective on sector strategies. It is intended to offer clarity and specificity to key stakeholders active in the implementation of sector strategies that are led by an IOU or a key stakeholder with IOU funds and support.

Resources referenced in the development of this document include:

- The California Workforce Education and Training (WE&T) Needs Assessment (NA)
- "Sector Strategy.org" website
- *State Sector Strategies Coming of Age: Implications for State Workforce Policymakers*, developed by the Woolsey Group and the National Governors Association

CONTEXT

The NA recommends that state-level WE&T planning should "emphasize sector strategies built on partnerships between business, labor and training and educational institutions." The NA also recommends that the IOUs "initiate, help fund and partner with other organizations to develop robust sector strategies in key energy efficiency [and demand response (DR) and distributed generation (DG)] sectors…"

WE&T sector strategies are among the few workforce interventions that improve employment opportunities for workers, thus impacting local economies and beyond. Sector strategies help to reduce inefficiencies and streamline state efforts by coordinating various programs and braiding disparate funding streams intended for the same purpose.

The California Long-term Energy Efficiency Strategic Plan defines four economic sectors: Commercial, Industrial, Agricultural and Residential. Further, each of these sectors are made up of multiple components (often referred to as sub-sectors) such as building systems (e.g., lighting, and HVAC), technologies (e.g., lighting controls and manufacturing equipment) and occupations (e.g., electricians and architects), just to name a few.

DEFINITION

A sector strategy is a workforce development partnership program designed to address specific industry needs (i.e. skills gaps or employment development opportunities). In the context of the IOU Energy Efficiency programs, a rate-payer-supported sector strategy also must be aligned with California's energy goals.

A sector strategy may include training, certifications, market incentives, information resources, and job recruitment and placement strategies. The program **must have** employer support--employers commit to hiring/promoting trainees or assuring that trainees apply the skills they acquire as part of their jobs. Employers should also co-fund training (i.e. pay for training fees, provide financial support to the training development, etc.) and/or provide other in-kind contributions (i.e., facility space, staff time, etc).

A sector strategy is designed and implemented by a group of stakeholders which may include, but not be limited to, employers, manufacturers, academic institutions, trade organizations, community-based organizations, labor, state agencies, professional organizations and utilities. There should be a lead organization which can be an industry group, an educational or training institution, a union or community based organization, utilities or a specialized "sector intermediary" that has experience developing sector strategies. Sector strategies are often funded through a competitive solicitation which can serve as a carrot that can facilitate the formation of voluntary collaborations among employers, who are otherwise competitors in the market. Competitive solicitations have been used by many workforce development agencies and institutions, including the U.S. Department of Labor, the California Workforce Investment Board, the California Community College District.

Registered apprenticeships are a notable sector strategy best practice - state or federally accredited programs, they offer learn-and-earn training programs in a particular trade. Key criteria include standardized curriculum approved by industry partners in labor and management, fair and impartial selection processes and work site supervision by journey-level workers of the same trade. Apprenticeships provide opportunities for regular advancement with increases in pay according to completion of classroom hours, testing and accumulated site training hours. Upon graduation, participants are awarded journey-level status by certifying government agency and in many cases, industry-recognized third-party certification.

PRODUCTS OR DELIVERABLES

*Deliverables in this context are defined as products or outcomes which solve a specific workforce problem identified by industry and yield a **tangible benefit for the customer/student/job seeker**. The below is not an exhaustive or exact list as specific deliverables can vary across sector strategies. The deliverables should not be assumed to be the IOUs' responsibilities solely as these are potential deliverables for the collaborative sector strategy **team**.*

Deliverable	Description of Deliverable	Resulting Outcome ***Intended to achieve the below outcome(s) over time
Classes/Curriculum/Training	New classes or curriculum, refining existing classes or curriculum or developing new resources for both the student and the trainer.	A, D, E, G
Industry-recognized Certifications/Credentials	Developing, modifying, and promoting the use of skills certifications	A, B, D, E, F, G
Implementation of training programs leading to certifications	Supporting training of incumbent workers or entry-level workers, with training leading to certification where relevant certifications are available.	A, B, D, E
Utility Program Integration	Linking competencies and skills sets to utility incentives perhaps as a requirement for program participation.	B, C, F
Internships	Facilitating service-learning opportunities and critical relationships between job seekers and employers	A, D, E, G
Job Recruitment and Placement	Developing partnerships with the workforce investment system to facilitate job placement	D, G

OUTCOMES

Short-Term Outcomes

- **A:** Improvement of an individual's EE, DR and/or DG knowledge, skills and abilities (KSAs)
- **B:** Improvements in work quality of contractors whose workers receive training
- **C:** Increase in IOU program participation
- **D:** Individual's career placement or advancement
- **E:** Individual's attainment of Continuing Education Units (CEUs) or certifications, aka stackable credentials

Long-Term Outcomes

- **F:** Increase in energy savings and progress towards the state's long-term EE, DR and/or DG goals
- **G:** Increase in skilled workers needed to achieve the state's long-term EE, DR and/or DG goals

PROCESS/PHASES

*The below steps outline the **general** process for developing a sector strategy.*

1. **Initiation and Planning**
   - Define the WE&T sector and primary area of focus.
   - Define the performance gap or problem to be solved.
   - Establish a lead organization and core leadership group. *Once a sector strategy is deemed necessary, a "champion" and group of leaders is critical to development and execution of the strategy.*
   - Define the workforce spectrum. *Identifying the occupations that can contribute to the goals within a sector is necessary to apply strategic workforce investments toward those goals.*
   - Create a common vision. *The leadership group provides a vision of the outcomes required to bridge the performance gap or solve the problem and develops a strategic approach to investing in workforce development.*
   - Define the goals or deliverables.
   - Identify and acquire funding.
   - Specify employer support and expectations. *Confirm that a set of employers will (1) send their employees to training programs and/or hire from these programs and (2) support workers to use newly acquired skills on the job. They should also commit to co-fund training or otherwise provide in-kind contributions.*
   - *Confirm that a set of employers will participate in the process, that find value in the end goals/products, that will send their employees to training programs and/or hire from these programs, that will support workers to use newly acquired skills on the job, and that will commit to co-funding training or otherwise provide in-kind contributions.*

2. **Engagement and Leadership Development**
   - Engage stakeholders. *The leadership group cultivates a network of stakeholders, including employers, who share a common vision and commitment to developing the sector strategy. This is often done on a regional basis.*
   - Refine the common vision. *The leadership group shares the vision and develops a value proposition throughout the stakeholder network.*

3. **Pre-Implementation**
   - Develop and agree upon an implementation plan which includes scope, timeline and milestones.
   - Develop, agree upon, and define metrics and measurement capabilities.
   - Define and obtain agreement on employer commitment.

4. **Implementation**
   - Execute the plan (course development, course delivery, internship begins, job fairs, job placement via WIBs, etc.)
   - Engage in ongoing stakeholder communications.

5. **Measurement and Ongoing Implementation**
   - Analyze and publish metrics.
   - Refine the strategy, as needed.
   - Scale the strategy, as needed.
   - Incorporate best practices into a model.

CRITERIA

The following best practices are required for any sector strategy.

Best Practice	Practice to Avoid	Description of Best Practice
Multi-employer Focus	Single employer focus	The sector strategy is focused on the needs of multiple employers.
WE&T directly contributes to energy mandate	Insufficient evidence of potential contribution to energy mandate	The sector strategy helps to achieve energy mandates set by the CPUC and CEC.
Data-driven and industry-validated investment in WE&T	Insufficient data to support investment	The sector strategy is guided by data-driven investment decisions, validated by industry partners, that produce the workforce outcomes needed to achieve energy mandates.
Multi-stakeholder partnerships that support the sector strategy with resources and expertise	Passive engagement by stakeholders	The sector strategy builds strong partnerships with employers, employer organizations, educators, workforce developers, labor and other stakeholders that address the skills needs of critical industries.
Applies appropriate geographic focus	Applies a top-down statewide strategy	The sector strategy is regional in nature, as supported by the data and stakeholder partnerships. It can be statewide, if supported by the data and stakeholder partnerships.

Best practices (continued)

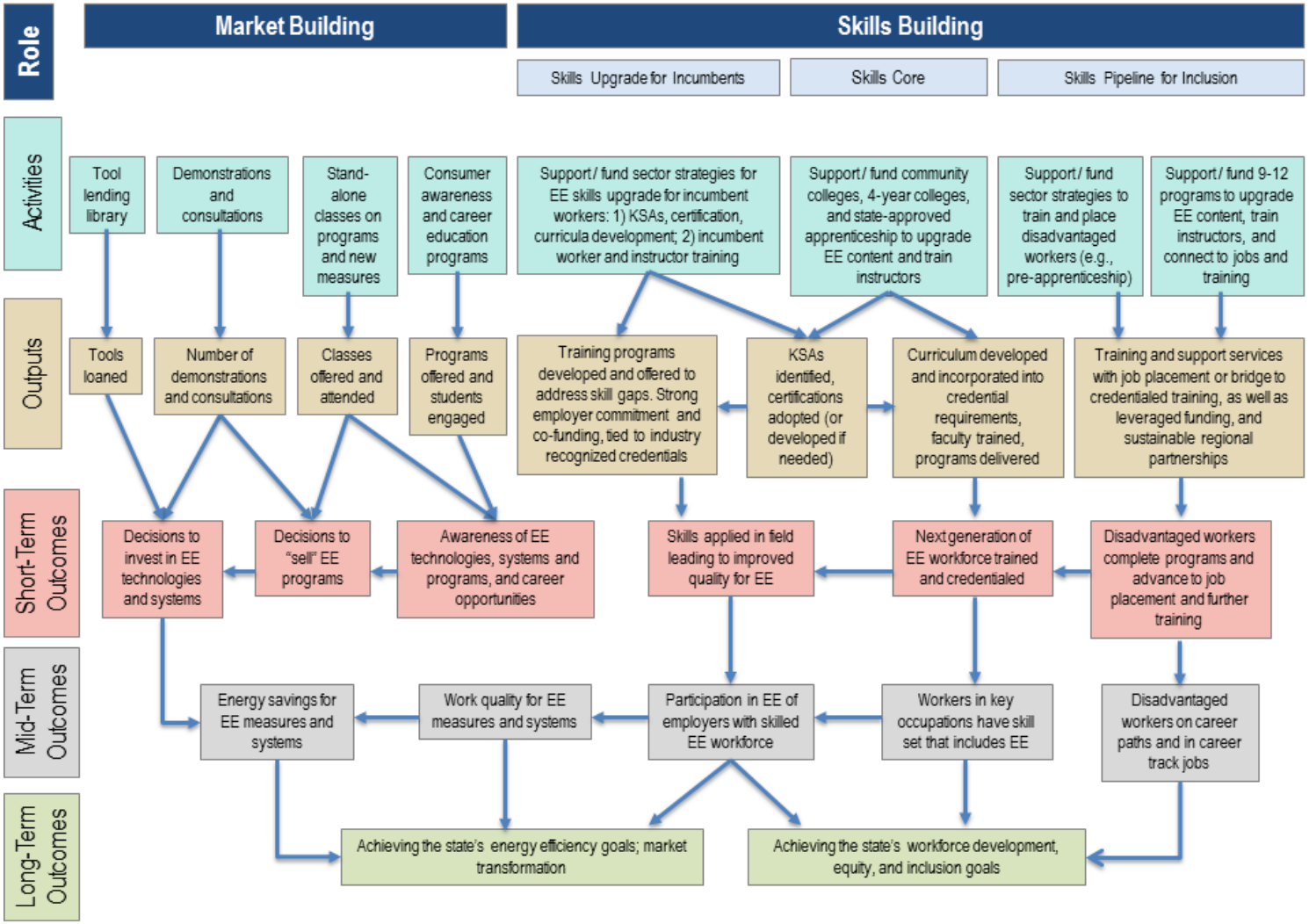
Best Practice	Practice to Avoid	Description of Best Practice
Multi-level leadership team, that includes industry, i.e., led by a Project Champion and supported by a project facilitator and strategic partners	Missing one or more elements of a multi-level leadership team	The sector strategy is led by a Champion, and includes a project facilitator and strategic partners to coordinate stakeholders and dialogue, support strategic development, identify and combine funding sources and support the development of customized workforce development solutions.
Builds sustainable and responsive career pathways	Builds isolated training classes outside of a career pathway approach.	The sector strategy builds training programs within a 'stackable credential' model that create sustainable career pathways.
Develops and includes a specific agreement from employers on their roles and responsibilities	Employer commitment is not specified	The sector strategy has a clear commitment from participating employers to co-fund training, otherwise contribute in-kind resources and to send their employees to trainings. For incumbent workers, employers should commit to using workers newly acquired skills on the job.
Promotes employment and career advancement through committed and engaged industry participation	Employers fail to participate in training programs, demonstrate lackluster interest and support, and/or do not hire or promote workers who have successfully completed training programs.	The sector strategy facilitates career onramps through employers who support and endorse the workforce strategy. For entry-level workers, the employers should commit to hiring qualified training program graduates or giving their applications preferential review.
Includes measureable outcomes	Includes outcomes which can't be measured or are vague.	The sector strategy can be shown to support the achievement of energy mandates.

The following include additional best practices that may be included, depending on the sector strategy focus and goals.

Best Practice	Description of Best Practice
Creates a replicable process	The sector strategy is based on a framework that can be scaled and used as a model to support other sector strategies.
Addresses low-income/minority populations	Includes low-income, minority, disadvantaged, rural or hard-to-reach communities. *(Note, the audience for each strategy will be different; these populations may not necessarily be relevant for every sector strategy or workforce intervention.)*
Integrates a strong communications or outreach platform	The sector strategy develops a strong communications plan or platform to link the varied group of stakeholders and ensure their ongoing engagement. Communications can take the form of a website, recurring meetings, communities of practice, other.
Establishes a clear linkage between WE&T and IOU resource programs	The sector strategy is based on a clear linkage between WE&T and resource programs (e.g., incentives, emerging technologies, codes and standards, other).

3C. Logic Model with Skills-Building for the Statewide WE&T Centergies and Connections Sub-Programs

Exhibit 3C.1 Logic Model with Skills-Building for the Statewide WE&T Centergies and Connections Sub-Programs



3D. Funding Sources and Partners for IOU Skills-Building Projects

The IOUs possess extensive expertise in energy efficiency, but are not equipped to provide comprehensive training leading to stackable credentials. Additionally, the funding is limited and the existing deployment of instruction and partnership only serves a fraction of the demand-side energy efficiency workforce. Instruction is provided to individuals and entities that sign up in open-access classes; who may or may not have requisite competencies and pre-requisites to get full value from the courses. Partnerships are generally done in an ad hoc basis and often have positive results, but do not achieve outcomes at scale. There is potential to further the IOU investment by strategic partnerships.

The value of aligning with core institutions is three-fold:

- Injecting targeted funds into core institutions will help move entire professions towards energy efficiency;
- Leveraging non-IOU investments to promote energy savings will extend the reach and influence of rate payer funds; and
- Engaging accredited core workforce institutions ensures energy efficiency best practices are taught in adherence to education best practices: sequenced, standards-based curriculum with clear learning outcomes aligned with industry needs.

CALIFORNIA-BASED OPPORTUNITIES TO LEVERAGE FUNDING FOR WE&T

Key workforce stakeholders such as the Division of Apprenticeship Standards (DAS), California Community Colleges (CCC), University of California (UC), the Employment Training Panel (ETP), and the California Workforce Investment Board (CWIB), are interested in partnering with the IOUs, and have verbally committed to aligning resources to promote improved energy efficiency education.

These partners will engage with the WE&T goals in the following ways:

- Representatives from each organization will participate in the PAG and will provide their time and expertise to the group. Representatives may also commit their institution's resources to targeted projects and RFPs.
- Partner organizations may be enlisted as critical partners in RFP development and deployment, including the potential braiding of funds in the RFP offering.
- Institutions and organizations responding to RFPs at the local and regional level will be required to submit leveraged resources from funding outside of the IOUs.

The following is a list of statewide investments that intersect with the work of the IOU WE&T programs. These investments, in the form of grants, organizations and initiatives, are a sampling of what could be leveraged with WE&T investments in energy efficiency training.

Ongoing Opportunities

Employment Training Panel (ETP): ETP is a state agency within the California Labor and Workforce Development Agency that funds the costs of workplace-based worker training. ETP is governed by an eight-member panel.[78] ETP is funded by a tax on employers, collected alongside the state's unemployment Insurance tax. The focus of ETP funding is on incumbent workers skills upgrade, services for unemployed workers, and some support for pre-apprenticeship programs to increase retention. In Fiscal Year (FY) 2007-08, the most recent year for which comprehensive budget and participant data is available, ETP received $57 million in state funding to serve over 82,000 workers and 5,000 businesses that faced out-of-state competition.[79]

Training agencies eligible for ETP funding include:

- Apprenticeships
- Community Colleges or Community College Districts;
- University or University foundations;
- Adult Schools;
- Regional Occupational Programs; and
- Private training agencies with at least a two-year history of providing training and placement services to the public and appropriate certification.

Potential Connection to WE&T Proposal: ETP funds could be accessed to fund training for unemployed/dislocated workers and to upgrade skills (EE-related) for workers in specific companies or industries.

State and Local Workforce Investment Boards (WIBs): The California Workforce Investment Board (CWIB) establishes and guides statewide workforce development policy. The CWIB's State Strategic Workforce Development Plan outlines a five-year strategy for the investment of federal workforce training and employment services dollars and directs its work in providing guidance to the statewide workforce investment system.[80] This plan is developed in collaboration with the California Community Colleges, the California Department of Education, other state agencies, and local WIBs, which are required to submit a comprehensive five-year local plan that reflects the vision, strategy, and goals of the State Strategic Plan. The WIBs received $389 million in federal Workforce Investment Act funding to serve dislocated workers, adults, and youth in FY 2007-08, the last available comprehensive data.[81]

Potential Connection to WE&T Proposal: WIB funds could be accessed to fund training (EE-related) and wrap-around support services for unemployed and disadvantaged workers.

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[78] See http://www.etp.ca.gov/panel_members.cfm

[79] California Budget Project. (May 2009). *Mapping California's Workforce Development System: A Guide to Workforce Development Programs in California*.

[80] California Workforce Investment Board (2013). *Shared Strategy for a Shared Prosperity: California's Strategic Workforce Development Plan 2013-2017*.

[81] California Budget Project. (May 2009). *Mapping California's Workforce Development System: A Guide to Workforce Development Programs in California*. We estimate total funding for the WIBs ($389 million) by aggregating funding for the WIA Dislocated Worker Program ($154 million), WIA Adult Program ($115 million), and WIA Youth Program ($120 million) for FY 2007-08.

State-Certified Apprenticeship Programs: State-certified apprenticeship is an "earn-while-you-learn" model that provides employment with on-the-job training and technical classroom instruction provided by an apprenticeship training center, technical school, community college, or other educational partner. Programs are primarily funded through industry contributions from employers and employees. Employers sit on curricula committees to ensure training is directly linked to industry needs. In California, the state Division of Apprenticeship Standards (DAS) promotes apprenticeship training, consults with program sponsors, and monitors programs to ensure high standards for on-the-job training and supplemental classroom instruction.

Educational funds for the classroom component of California apprenticeship programs (Related and Supplemental Instruction or "RSI", sometimes known as "Montoya Funds") are appropriated annually in the State Budget Act from Proposition 98 funds. The appropriations are made to the California Community College Chancellor's Office (CCCCO), the agency responsible for distributing the funds. RSI funds are then disbursed to Local Educational Agencies (LEAs), namely school districts (usually Adult Schools), County Offices of Education, Regional Occupational Centers and Programs (ROCP), and community college districts that contract with apprenticeship program sponsors. In FY 2007-08, the Community Colleges received nearly $15 million to support an estimated 22,500 registered apprentices while over $19 million went to CDE-affiliated LEAs to serve over 35,000 registered apprentices. [82] For FY 2007-08, we estimate that the $35 million in state funding was matched with an additional $140 million from industry contributions, for a total investment of $175 million. [83]

State appropriations for RSI have dropped in recent fiscal years. For example, in FY 2013-14, the appropriation to CDE LEAs was approximately $15.5 million, with just over $7 million received by the Community Colleges.[84] Industry funding therefore may account for an even greater proportion of apprenticeship funding in recent years.

Potential Connection to WE&T Proposal: State and industry funding could be accessed to provide apprenticeship training (EE-related) for workers.

California Community Colleges: In addition to apprenticeship, the California Community Colleges administer a number of ongoing initiatives to support workforce development, including:

Economic and Workforce Development: Received $47 million in state funding and served nearly 30,000 students, 45,000 businesses and 50,000 workers (FY 2007-08);

- Adult Education: Received $277 million in state funding and $10 million in federal funding and served over 850,000 adults (FY 2007-08);
- CalWORKS Education: Received $44 million in state funding and $8 million in federal funding and served 30,000 participants and individuals transitioning off CalWORKS cash assistance (FY 2007-08); and

[82] California Budget Project. (May 2009). *Mapping California's Workforce Development System: A Guide to Workforce Development Programs in California*.

[83] This estimate is based on the assumption that $35 million in state funding accounts for roughly 20 percent of total apprenticeship investment statewide. The additional 80 percent of funding (estimated at $140 million for FY 2007-08) would be provided by the industry.

[84] State of California Budget Act of 2013 (AB 110), available here: http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB110

- Career Technical Education; Received $57 million in federal funding (state funding and participant data not available for FY 2007-08).[85]
- The Doing What Matters for Jobs and the Economy which has developed "sector navigators" for key sectors, including energy and utilities.

Potential Connection to WE&T Proposal: Community College funds could be accessed to fund training (EE-related) for workers. Of particular relevance in the energy and utilities sector navigator program that is part of the Chancellor's office "Doing What Matters for Jobs and the Economy. See http://doingwhatmatters.cccco.edu/Contact.aspx

California Department of Education (CDE): CDE administers a number of ongoing initiatives to support workforce development, including:

- Adult Education: Received $727million in state funding and $80 million in federal funding to serve over 1.2 million participants (FY 2007-08);
- Career Technical Education: Received $77 million in state funding and $140 million in federal funding to serve nearly 535,000 high school students and adults (FY 2007-08);
- CalWORKS Adult Education: Received $10 million in state funding and served 38,000 adult CalWORKS recipients (FY 2007-08); and
- Regional Occupational Centers and Programs: Received $446 million in state funding to serve 460,000 high school students and adults (FY 2007-08).[86]

Potential Connection to WE&T Proposal: CDE funds could be accessed to fund training (EE-related) for workers.

Current Initiatives

California Clean Energy Jobs Act (Proposition 39): $ 2.75 billion for 2013-2018, with between $15-20 million dollars for training administered by the California Workforce Investment Board, the California Community Colleges Chancellors Office, and the California Conservation Corps. The California Clean Energy Jobs Act allocates revenue to local education agencies to support energy efficiency and alternative energy projects, along with related improvements and repairs that contribute to reduced operating costs and improved health and safety conditions in public schools.

The California Energy Commission is working with a number of key stakeholders to implement the California Clean Energy Jobs Act (Proposition 39):

- California Department of Education
- California Community Colleges Chancellor's Office
- California Department of Finance
- California Public Utilities Commission

[85] California Budget Project. (May 2009). *Mapping California's Workforce Development System: A Guide to Workforce Development Programs in California*.

[86] California Budget Project. (May 2009). *Mapping California's Workforce Development System: A Guide to Workforce Development Programs in California*.

- California Workforce Investment Board
- California Conservation Corps

Potential Connection to WE&T Proposal: Proposition 39 initiatives are naturally aligned with the WE&T Guidance Plan recommendations to focus on energy efficiency career pathways and the MUSH sector. Training funds can be aligned with IOU WE&T funds. We recommend that the Phase 1 inclusion sector strategy RFP be modeled on the CWIB's Proposition 39 solicitation (see http://www.cwib.ca.gov/sc_gcjc_funding_opportunities.htm).

AB 86 California Department of Education (CDE) Career Pathways Trust: $250 million for 2014-2016. AB 86 establishes regional consortia of K-12 and community college districts for "the purpose of developing regional plans to better serve the educational needs of adults." The areas of focus include short-term career technical programs with high employment potential and programs for apprentices.

Potential Connection to WE&T Proposal: If K-12 and/or college districts specify EE, Green Jobs, or even utilities or construction as possible pathways to be developed, there will be considerable opportunity to partner with the IOUs' WE&T program. Also, since there is language about supporting "programs for apprentices," the alignment of these two areas could lead to funding of pre-apprentice programs—both at the high school and community college level.

Career Advancement Academies (CAA): SB1070 / CA Community College Chancellor's Office (CCCCO). The CAAs are designed to establish pipelines to college and high-wage careers for young adults facing multiple barriers to post-secondary education. Since 2007, CAAs have served 27 college sites, and have received $31 million in funding by CCCCO. The California Community College Career Advancement Academy (CAA) Phase III grant cycle will award up to $6 million in SB 1070 Career Technical Education Pathways Program funding over three years, including $4 million in the 2013-14 budget, with potential renewal of up to $2 million for 2014-15. These renewal grants will aim to both scale-up and institutionalize CAAs and their key elements under four previously-funded regional consortia.

Potential Connection to WE&T Proposal: 2014-2017 funding focuses on supporting existing CAA sites to expand the range of their impact by engaging additional local college districts and expanding pathways; therefore, funding could be available for development of bridge/pathway programs in WE&T-related areas—including pre-apprentice programs.

California Community College Linked Learning Initiative (CCCLLI) and AB 790: CCCLLI is funded by Irvine Foundation, in a re-granting of $1.65 million by Career Ladders Project. Its focus is on extending the benefits of high school-based linked learning academies to post-secondary education, and strengthening the high school and community college connections to improve student success in college and career training. AB 790 expands the number of CA Linked Learning sites by 20, but provides no additional funding.

Potential Connection to WE&T Proposal: There is a potential to support Community College pathways in Green Construction, EE, Utilities, perhaps pre-apprenticeship. This could be in the form of additional support or collaboration with IOUs' Connections Program.

FEDERAL WORKFORCE DEVELOPMENT FUNDS

Perkins Funds: The intent of Perkins dollars is to support the development of new programs or to strengthen existing CTE programs. Programs targeting the transition from high school to community college are eligible. This is a potential funding source, but some work would need to be done to connect robustly with EE-related pathways.

U.S. Department of Labor (DOL): There are several local and regional consortia in California that have received Trade Adjustment Act grants and Workforce Innovation Fund grants. These funds can be leveraged for energy efficiency education, regional collaboration and career pathways, determined on a project-by-project basis.

Veterans: There are various funding streams (DOL + Veterans Administration) to serve training needs of returning veterans that can be connected with IOU training investments.

3E. Skills-Building RFP Criteria

Exhibits 3E.1 and 3E.2 below describe the criteria that the IOUs and PRG should use to rank proposals and select winning bids for the two skills-building RFPs described in Chapter 3.

Exhibit 3E.1 Criteria for WE&T Skills-Building RFPs – Energy Savings

RFP	Energy Savings RFP Part A	Energy Savings RFP Part B
RFP Component	Sector strategies for incumbent workers	Partnerships with core post-secondary institutions
Goals	Improve contractor performance through upgrading skills of incumbent workers in key occupations that have an impact on EE	Incorporate EE skills and knowledge in credentialed post-secondary education and training institutions in occupations that have an impact on EE
Allowable Activities	• Identification of KSAs • Curricula development • Certification development • Train the trainer for instructors • Training	• Identification of KSAs • Curriculum development • Train the trainer for instructors • Certificate development
Criteria for overall portfolio balance	• Balance based on priority occupations from job projections • SME prioritization and identification of KSA gaps due to emerging technology, code compliance or other quality problems SMEs • Regional balance for distribution of training funds	• Balance of grants based on priority occupations • SME prioritization and identification of KSA gaps due to emerging technology, code compliance or other quality problems SMEs • Balance of Distribution to credentialed partner institutions: 4 year and CCC for professional, apprenticeship and CCC for commercial, CCC for residential • Prioritization and identification by SMEs of KSA gaps due to emerging technology, code compliance or other quality problems SMEs • Regional balance for program reach
Requirements for successful proposals	• Evidence of need for training or curricula development • Evidence of adequate demand for services that skills will contribute to • Identification of relationship to existing credentials and curricula • Specific co-funding, in-kind support and other commitments from set of participating employers • Clear learning outcomes, based on skills enhancement from baseline, competency testing • Leveraging of other workforce dollars • Partnership with accredited training institution • Performance metrics data tracking	• Evidence of need for training or curricula development • Identification of relationship to existing credentials and curricula • Specific co-funding and other commitments from participating institutions • Clear learning outcomes, based on skills enhancement from baseline, competency testing • Leveraging of other public dollars • Performance metrics data tracking

Ranking criteria	• Amount of leveraged funds from employers and other sources • Use or development of industry-recognized credentials • Skills enhancement of already skilled workers • Commitment and performance of participating employers • Regional partnerships with key stakeholders, including employers, end users (to ensure adequate demand)	• Evidence of incorporation into required course work for credential • Evidence of strong placement rates for students attaining credential
Examples of Outcome Metrics	• Number of workers trained • Number of workers with industry recognized credential • Improvements in EE work quality • Increase in EE investments with documented improvements in work quality	• Additions of EE content to core curricula • First year reach: Number of students in credentialed programs receiving expanded EE curricula • Five year projected reach: Number of students over five years receiving expanded EE curricula
Who reviews and selects RFPs?	PRG and IOUs, with Technical Skills Panel input	PRG and IOUs, with Technical Skills Panel input
Geographic locus	• Preference for statewide focus or reach for KSA, curricula and certification development • Regional distribution of training funds	• Preference for state wide reach for curriculum development, identification or validation of credentials • Regional distribution for training

Exhibit 3E.2 Criteria for WE&T Skills-Building RFPs – Inclusion

RFP	Inclusion RFP
RFP Component	Training, support services and job placement services for workers from disadvantaged communities
Goals	Placement of disadvantaged workers into employment or post-secondary education that ladders to family-sustaining wages
Allowable Activities	• Training and Curriculum Development • Recruitment • Coordination/Collaboration
Criteria for overall portfolio balance	• Regional balance for distribution of training funds • Grants awarded to proposals to maximize the number of placements of disadvantaged workers in career-track jobs.
Requirements for successful proposals	• Evidence of need in target populations • Evidence of sustained regional partnerships that provide multiple services • Evidence of commitment of participating employers to consider hiring graduates • Evidence of living wage floors and pathways up • Clear learning outcomes, based on skills enhancement and competency development • Incorporation of work-based learning • Leveraging of other workforce dollars, including wrap around support services
Ranking criteria	• Amount of leveraged funds • Strength of commitment of participating employers to consider hiring graduates of training programs • Evidence of partners who can supply all elements needed for program success including assessment, wrap around services, job placement services, post placement mentoring,
Examples of Outcome Metrics	• Number of participants trained • Number of participants completing program with industry-recognized credential • Number of positive outcomes (job placement, enrollment in post-secondary education)
Who reviews and selects RFPs?	PRG and IOUs
Geographic locus	Regional distribution of funds

3F. Job Projections from the 2011 WE&T Needs Assessment

Exhibit 3F.1 Occupational Groups Affected by Energy Efficiency Related Investment and Estimated Percentage of Workforce[87]

Occupational Group	SOC	Occupation Title
Mechanical Systems (Construction Trades): *21 percent of Total Direct New Workers by 2020*	47-2073	Operating Engineers and Other Construction Equipment Operators
	47-2111	Electricians
	47-2152	Plumbers, Pipefitters, and Steamfitters
	47-2211	Sheet Metal Workers
	47-3013	Helpers—Electricians
	47-3015	Helpers—Pipelayers, Plumbers, Pipefitters, and Steamfitters
	47-4021	Elevator Installers and Repairers
	49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers
	49-2098	Security and Fire Alarm Systems Installers
	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
	49-9042	Maintenance and Repair Workers, General
	49-9052	Telecommunications Line Installers and Repairers
	49-9098	Helpers—Installation, Maintenance, and Repair Workers
		Solar Photovoltaic Panel Installers and Technicians
Building Envelope (Construction Trades): *50 percent of Total Direct New Workers by 2020*	47-1011	First-Line Sup/Mgrs of Construction Trades and Extraction Workers
	47-2031	Carpenters
	47-2051	Cement Masons and Concrete Finishers
	47-2061	Construction Laborers
	47-2081	Drywall and Ceiling Tile Installers
	47-3012	Helpers—Carpenters
Building Envelope (Performance Trades): *2 percent of Total Direct New Workers by 2020*	47-4011	Construction and Building Inspectors
		Energy Auditors
		Building Performance or Retrofitting Specialists
Architecture and Engineering: *6 percent of Total Direct New Workers by 2020*	17-1011	Architects, Except Landscape and Naval
	17-1022	Surveyors
	17-2051	Civil Engineers
	17-2061	Computer Hardware Engineers
	17-2071	Electrical Engineers
	17-2072	Electronics Engineers, Except Computer
	17-2112	Industrial Engineers
	17-2141	Mechanical Engineers
	17-2199	Engineers, All Other

[87] Zabin et al. (2011), p. 73-75. Excludes "Administration (General)" occupational category and estimated percentage of workforce.

	17-3011	Architectural and Civil Drafters
	17-3013	Mechanical Drafters
	17-3022	Civil Engineering Technicians
	17-3023	Electrical and Electronic Engineering Technicians
Administration (Sales-Related): *7 percent of Total Direct New Workers by 2020*	13-1051	Cost Estimators
	19-3021	Market Research Analysts
	27-3031	Public Relations Specialists
	41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers
	41-3099	Sales Representatives, Services, All Other
	41-4011	Sales Reps, Wholesale & Manf., Technical & Scientific Products
	41-4012	Sales Reps, Wholesale & Manf., Exc. Technical & Scientific Products
	41-9011	Demonstrators and Product Promoters
	41-9031	Sales Engineers
	43-4051	Customer Service Representatives
Management (Blue-Collar): *11 percent of Total Direct New Workers by 2020*	11-3051	Industrial Production Managers
	11-9021	Construction Managers
	11-4901	Engineering Managers
	11-9141	Property, Real Estate, and Community Association Managers
	11-1021	General and Operations Managers
Management (White-Collar): *2 percent of Total Direct New Workers by 2020*	11-2021	Marketing Managers
	11-2022	Sales Managers
	11-3021	Computer and Information Systems Managers
	11-3031	Financial Managers
	11-3061	Purchasing Managers
	11-9199	Managers, All Other
	11-1011	Chief Executives
		Sustainability Program Coordinators/Managers
	11-3061	Purchasing Managers
	11-9199	Managers, All Other
	11-1011	Chief Executives
Manufacturing: *Less than 1 percent of Total Direct New Workers by 2020*	51-1011	First-Line Supervisors/Managers of Production and Operating Workers
	51-8031	Water and Liquid Waste Treatment Plant and System Operators
	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
	51-9141	Semiconductor Processors

Exhibit 3F.2 Energy Efficiency Job Projections by Occupational Group with Training Needs[88]

Occupational Group	Distribution of EE Workers by Occupation
Building Envelope (Construction Trades)	50 percent
Mechanical and Electrical Trades	21 percent
Building Envelope (Performance Trades)	2 percent
Architecture and Engineering	6 percent
Administration (Sales-Related)	7 percent
Management (Blue-Collar)	11 percent
Management (White-Collar)	2 percent
Total	**100 percent**

Note: Both tables report estimates for direct jobs created that impact energy savings. We do not include general administrative jobs in these tables, as they do not require specific EE skills or knowledge.

[88] Ibid. Excludes "Administration (General)" occupational category and estimated percentage of workforce.

3G. Phase One WE&T Skills-Building Programs

In this appendix we offer detail for our three proposed "Phase One" WE&T skills-building programs.

1. ENHANCING EE CONTENT IN CORE CURRICULA FOR ARCHITECTS AND ENGINEERS

We recommend that the IOUs issue an RFP for the state's accredited architecture and engineering schools to review and enhance the EE content in their core curricula, and to offer faculty development on these topics. The RFPs should be developed and administered by the IOU subject matter experts (SMEs) for architecture, with input from outside SMEs as needed.

Architects and engineers are the primary professional occupations that affect energy use in buildings. There is a significant need to upgrade EE content in the architects' core curriculum. This need was recognized in the Strategic Plan and confirmed in our interviews with IOU program staff, architectural firms, the American Institute of Architects, and university architecture departments. According to the experts we interviewed, current education and training for architects is lacking sufficient information on building science and energy efficient design to help meet California's ambitious EE goals.

Improving the alignment of core training for architects with core training for the engineers that work on building systems is a key strategy for improving the EE knowledge of both sets of professionals. It can also enhance their ability to communicate and collaborate across discipline to address energy-related issues in building design and specification.

The RFP outlined here is a straightforward way to begin addressing this need in 2014. The IOUs are well-positioned to convene stakeholders and develop an RFP for architecture and engineering EE curriculum upgrades and faculty development. The IOUs have significant programming for architects and engineers but have not yet partnered with any of the state's core training programs. However they do have the internal capacity to do so, including internal subject matter experts, relationships with relevant industry groups, and current classes for incumbent workers, including continuing education classes.

We suggest an RFP process to tap the creative energy of entrepreneurial faculty in accredited architecture and engineering schools who can innovate from within to promote an institutional shift. RFPs are a common way for university faculty to incorporate innovation, and can work better than direct outreach from the IOUs to the universities. The RFP should require significant matching funds and commitment to integrate curricula into course work required for degree completion. The level of funding for these activities should depend on the quality and scale of impact of the proposals submitted.

Components:

1. The IOU will consult with the SMEs and leadership from the state's architecture and engineering schools to assess needs for EE content upgrade, and discuss options for structuring the RFP and criteria, using the proposed RFP template in Appendix 3E as a starting point.
2. The IOUs will develop the criteria and administer an RFP for public, accredited architecture and engineering schools in California to upgrade core curricula and train instructors to incorporate enhanced EE.

3. Architecture and engineering departments will respond to the RFP describing:
    a. Deficiencies in the current EE curriculum;
    b. Proposed curriculum development and training strategy to overcome these gaps (e.g. summer intensive, studio course, physical tools or learning laboratory, co-teaching with engineering departments, partnerships with firms or other outside experts, or some combination of the above);
    c. Faculty development plan;
    d. Partners, in particular faculty from architecture/engineering departments, and/or local architecture and engineering firms;

4. In addition a detailed description of the above program elements, the RFPs should include:

    a. A detailed description of the programs' expected impact, including an estimate of the scale of impact in terms of the reach of the program and its impact on energy savings.
    b. Budget and timeline with clear deliverables and objectives that can be accomplished by the end of 2015 and a detailed explanation of matching funds; and
    c. Other sources of funding that could be used to sustain and expand the programs after 2015.

2. EE BEST PRACTICES REVIEW AND UPGRADE FOR APPRENTICESHIPS IN THE KEY TRADES

We recommend that the IOUs facilitate a partnership between the Community College Chancellor's (CCC) Office of Apprenticeship, the California Division of Apprenticeship Standards (DAS), to enhance and verify EE skills in the core curricula for key energy-related trades in the state-certified apprenticeship system. IOU SMEs may be appropriate to consult in reviewing curricula. The agencies should then issue RFPs for local apprenticeships and their education/CC affiliates to deploy curriculum upgrade, journey upgrade for incumbent workers, and train-the-trainer.

The building trades make up around two-thirds of the workforce that is called upon to execute EE work. The key trades that impact energy savings include Electricians, Sheet Metal Workers, Plumbers/Pipefitters, Stationary Engineers, Carpenters and Laborers. As we note elsewhere in this document, apprenticeship is the state's most valuable asset for training the bulk of the EE workforce, and the IOUs have severely neglected this core resource in their WE&T programs to date, representing a huge missed opportunity to impact energy savings through training.

The CCC Office of Apprenticeship and DAS are ready to partner with the IOUs. The CCC Office of Apprenticeship Standards is responsible for the required "related and supplemental" classroom learning for all state-certified apprenticeship programs and DAS regulates the programs including each trade's Minimum Industry Training Criteria (MITC). As central coordinating bodies they can engage key industry representatives and individual apprenticeship programs, and work through the existing curricula and training standards review process at a state-wide level with the participating trades. They will work with subject matter experts convened by the IOUs (including internal IOU staff), to identify opportunities for enhancing current curricula to incorporate EE. They can also work with the IOUs to administer an RFP that individual apprenticeship programs can apply to once KSA enhancement are identified, to pay for faculty development and training at the local level.

This proposal builds off some of the initial work done to develop the MOU between the DAS and the IOUs for apprenticeship skills-upgrading in 2012, which stalled in early 2013. This effort is described in Appendix 3A.

Components:

1. IOUs will identify critical installer/technician EE KSAs for the priority trades occupations. Apprenticeship coordinators will review key trade curricula for the presence of these KSAs, in consultation with SMEs. If enhancements for EE best practices are identified, DAS and the CCC will develop a strategy for developing and deploying new material.
   a. DAS and the CCC will identify any certifications that correspond to the new KSAs, if any, and/or develop a trade-specific EE upgrade certificate that builds from the state's basic journey upgrade certificate.
   b. DAS will update Minimum Industry Training Criteria (MITC/Green MITC) if necessary, via the typical processes.[89]

2. DAS/CCC will issue RFPs for regional partnerships of JATCs and their CC affiliates to:
   a. Draft and integrate the new content into apprenticeship curricula at local JATCs.
   b. Develop the content into a journey upgrade-specific course.
   c. Carry out training for apprenticeship and journey upgrade instructors via the local Community College partner.
   d. Fund journey upgrade instructors' time.

3. In addition a detailed description of the above program elements, the RFPs should include:
   a. A detailed description of the programs' expected impact, including an estimate of the scale energy savings related to proposed interventions;
   b. Budget and timeline with clear deliverables and objectives that can be accomplished by the end of 2015 and a detailed explanation of matching funds; and
   c. Other sources of funding that could be used to sustain and expand the programs after 2015.

3. INCLUSION SECTOR STRATEGY: PRE-APPRENTICE BRIDGE PROGRAM

We recommend the IOUs issue an RFP for an inclusion sector strategy. The RFP should target funding for pre-apprenticeship bridge programs that prepare entry-level EE workers or job seekers for opportunities to advance into higher skilled and higher wage employment in MUSH sector EE work, other building trades jobs, and/or further training. The purpose of this pre-apprenticeship bridge program is to prepare and place disadvantaged jobseekers into good jobs with significant potential for advancement in long-term pathways in EE-related careers, in particular the construction trades. This recommendation is directly linked to our proposed interventions to create job opportunities for disadvantaged workers through demand-side mechanisms, discussed in Chapter 4.

The limited WE&T program funds allocated to training-side inclusion strategies and career pathway development should connect with and leverage existing statewide investments and initiatives. Partnerships in the form of a sector strategy can help broker and facilitate relationship-building to connect entry-level workers with advanced skills development and higher wage employment opportunities, and serve as a valuable

[89] The California Apprenticeship Council approves Minimum Industry Training Criteria for each trade as well, and in 2011 they approved the incorporation of green MITC. However, the MITC are fairly general categories of skill sets, rather than detailed curricula.

recruitment tool for employers in the field. Braiding funding will expand the reach of the system-wide workforce infrastructure, will support the sustainability of activities, and has the potential to accelerate positive outcomes for disadvantaged workers. We suggest WE&T funds leverage existing state investments from the Employment Training Panel, Division of Apprenticeship Standards, California Workforce Investment Board, and specific funding such as the California Community Colleges Chancellor's Office Career Advancement Academies, SB1070 funds, Proposition 39 and the California Career Pathways Trust. The RFP would encourage partnerships between the Community Colleges, Adult Schools, local Workforce Investment Board, community-based organizations, Building and Construction Trades and relevant employers.

There is precedence to invest in system-wide efforts, with a number of California programs successfully creating career ladders to higher wage jobs for disadvantaged communities. These programs span sectors, emphasize stackable credentials, and serve as effective models for EE inclusions strategies.

Components:

The IOUs should develop and administer the RFP in partnership with and experts on the state's workforce system, in particular resources and best practices for serving disadvantaged workers. This may also involve agencies and organizations contributing braided funding to the effort. We recommend modeling this RFP on the CWIB's Proposition 39 solicitation.[90]

Program components should incorporate elements of successful programs such as the Career Advancement Academies, Pre-Apprenticeship, and Multi-Craft Core Curriculum. These include:

1. Regional Collaboration
An RFP will support existing regional collaborations or incentivize new collaborations of employers, unions, educational organizations, community organizations and workforce organizations to work together in a regional capacity. The RFP will require organizations to:

- Align regionally and locally to create social infrastructure and agreements that facilitate connections for disadvantaged workers and seamless ascension of career ladder for participant
- Articulate training and certifications between organizations
- Articulate employer commitments to consider hiring workers who successfully complete the bridge program
- Choose partners based on a standard set of criteria that maximizes opportunities for advancement along the career ladder:
    - Educational institutions with strong career technical programs connected to industry-recognized credentials
    - Apprenticeship programs with projected openings and commitment to place disadvantaged workers
    - Strong industry support and placement of graduates
    - Strong understanding of community needs and established pipelines for recruitment of target populations

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

- A willingness to articulate curriculum across organizations and institutions, create viable career pathways and opportunities to achieve stackable credentials
- The leverage of cash and in-kind funding

2. Assessment and Recruitment

Recruitment of bridge program cohorts should adhere to the following guidelines:

- Open recruitment targeted to specific candidate pool:
  - Low-Income Energy Efficiency workers
  - WIB One Stop in-school and out of school youth
  - Community based organizations graduates
  - Community college students
  - Priority given for residents that meet definition of disadvantaged worker
- Pre-screening of candidates would include:
  - Math and English basic skills
  - An interview to determine a measure of core competencies such as motivation, professionalism, and a willingness to learn
  - Assessment of the need for wrap-around services (and should not be a consideration for acceptance into the program, but rather a determination of need)
- Employers and apprenticeship coordinators can and should assist with developing pre-screening criteria and implementation of a cohort recruitment

3. Academics

This portion could be leveraged with existing funding opportunities. Basic components of the curriculum should include:

- Contextualized basic skills (math and English)
- Academic counseling
- Contextualized career counseling
- Technical skills as designed by apprenticeship programs, industry advisors and employers
- Work based learning
- Result in a industry-based credential relevant to the pathway

The program should demonstrate the following best practices:

- Understanding competencies and skills driven by employer needs
- Understands competencies and needs of disadvantaged workers
- Design of career pathways with multiple entry and exit points, with earned credentials at each exit point
- Strategies to accelerate student learning of skills and competencies such as:
  - the cohort model (usually approximately 25 students/cohort)
  - contextualized teaching and learning
  - experiential learning
  - an emphasis on career skills
  - counseling and wrap around services
  - a practitioner community of practice

- Courses scheduled and timed to accommodate working students such as afternoon/evening program
- If ESA employers are involved, incorporate the desired skills and competencies desired for ESA workers to advance within their organization
- Ensure employer involvement in curriculum design without the breach of intellectual property concerns

4. Wrap-Around Support Services

Wrap-around services are critical to removing barriers for disadvantaged populations, providing unencumbered opportunities to progress beyond entry-level employment. *This portion could be leveraged with existing funding from the Workforce Investment Act.* Example services to students include:

- Transportation
- Child Care
- Career Counseling
- Access to housing and food
- Financial coaching
- Expungement services and alignment with criminal justice system

5. Advancement Pathways

The primary advancement pathway involves entry-level, low-skilled residential energy efficiency and construction workers to enter family-sustaining employment in the non-residential energy efficiency and construction sector.

Employers would be incentivized to participate in targeted hire via the project labor agreement process. Bridge program graduates would:

a) Get priority interviews for the next Apprenticeship class, or
b) Be directly hired by a MUSH contractor, who would co-fund the apprenticeship.

Programs should be designed to maximize alternative advancement pathways, providing options to all successful completers of programs. Pathways include:

- Placement in a state-certified apprenticeship program in the construction trades or in a utility job.
- Continuing education to earn career technical education (CTE) certificate or degree (Electrical, HVAC, etc) at an accredited institution, with ultimate job placement with a contractor.
- Continuing education to earn general education units towards an AS-T degree.

6. RFP Process

It may be beneficial to implement an RFP in a two phase process: (1) A planning grant or process for regional collaborations to demonstrate intention and interest and (2) An implementation grant and collaboration possibly co-designed with the funding agencies.

Given there is not enough funding to meet the needs of all low-income energy efficiency workers in all regions of California, these RFP projects are considered pilots that should be designed to consider the following:

- How can this be scaled?
- How can this be sustained without external funding?

- How can contractors view Colleges as viable feeders to Apprenticeship and employment?
- How can Colleges design programs/stackable credentials to accelerate student success for this industry?
- What are the best ways to simultaneously build the market for demand-side energy services and viable family-supporting career pathways?

3H. Additional Detail on Stakeholder Groups

STATEWIDE EE WORKFORCE STEERING COMMITTEE

The committee should include high-level representatives from the following groups:

- CA Workforce Investment Board
- CA Division of Apprenticeship Standards
- Employment Training Panel
- CA Community Colleges Chancellor's Office
- University of CA / CA State University
- CA Department of Education
- CA Energy Commission
- CA Public Utilities Commission (Commission will approve final portfolio)
- National Laboratories
- UC/CSU Energy Centers
- U.S. Department of Energy

The Steering Committee should be responsible for:

- Appointing Technical Skills Panels;
- Providing Guidance on the appropriate skills standards and certifications for EE work;
- Overseeing tracking and evaluation of the costs and benefits of skills standards;
- Establishing priorities for EE training investments; and
- Identifying areas to improve alignment and leveraging of training resources.

TECHNICAL SKILLS PANELS

Technical Skills Panels, appointed by the steering committee should include representatives from the following, grouped by expertise in various building systems:

- Technical experts from the IOUs emerging technology and new resource program groups,
- the national labs,
- CEC code compliance groups,
- the UC/CSU Energy Centers, and
- others, if appropriate.

The committees will be responsible for making recommendations about priority knowledge, skills and abilities (KSAs) needed for emerging technologies and underperforming technologies.

PEER REVIEW GROUP

This group involves leading advocates for environmental, labor, and low-income groups throughout the state, in addition to state agencies like the CWIB, DAS, and CCCCO. 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 in the Plan.

We suggest that the members of the Stakeholder Advisory Group involved in the development of this Guidance Plan are an appropriate list of invitees to join the PRG for the WE&T Skills-Building Portfolio. This includes representatives from the following organizations:

- Brightline Defense
- CA Community Colleges
- CA Construction Industry Labor-Management Trust
- CA Workforce Investment Board
- CA Division of Apprenticeship Standards
- Emerald Cities
- Greenlining
- International Brotherhood of Electrical Workers
- Laborer's International Union of North America
- Natural Resources Defense Council
- Piping Industry Progress and Education Trust Fund
- Sheet Metal, Air, Rail, and Transportation workers
- American Institute of Architects–CA Council
- Engineering professional associations

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.

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.

Appendices to Chapter 4

4A. Best Practices for Workforce Inclusion

This appendix provides additional detail on each of the best practice examples of workforce inclusion strategies discussed in chapter 4.

1. CURRENT IOU PRACTICES ADDRESSING JOBS CO-BENEFITS: INCLUSION AND JOB QUALITY STANDARDS

General Order 156

Adopted/Implemented: 1988

Applicability: The rules are applicable to all gas, electric, and telephone utilities under the jurisdiction of the California Public Utilities Commission (CPUC) with gross annual revenues exceeding $25 million, and their Commission-regulated subsidiaries and affiliates.

Targeted Population:

- Women-owned businesses
- Minority-owned businesses
- Service-disabled veteran-owned businesses

Partners:

- The Administering Agency is the California State Department of General Services, Office of Small and Minority Business
- The clearinghouse is the Supplier Clearinghouse
    - CPUC-supervised entity whose primary purpose is to audit and verify the status of the businesses, and to establish and maintain a database of the businesses that is accessible to the CPUC and to participating utilities

Description of Program: Under General Order 156, the CPUC required all investor-owned electric, gas, water and telecommunication utility companies with gross annual revenues in excess of $25 million and their regulated subsidiaries and affiliates, to develop and implement programs to increase the utilization of woman, minority, and service-disabled veteran owned businesses.

Key Elements/Best Practices:

- Procurement goals are as follows:
    - 5 percent for women
    - 15 percent for minorities
    - 1.5 percent for service-disabled veterans

- Each utility is required to maintain staff to provide overall WMDVBE program direction and guidance, implement WMDVBE program requirements, and ensure that its employees with procurement responsibilities receive training in the implementation of its WMDVBE program.
- Required outreach and subcontracting program to inform and recruit WMDVBEs to apply for procurement contracts.
- Suppliers' good faith efforts to subcontract with WMDVBEs are a factor considered in the bid evaluation process.
- Each utility shall monitor and include in its annual report to the CPUC a summary of prime contractor progress in increasing the participation of WMDVBE subcontractors.
- Each utility shall include in its annual plan a description of future plans for encouraging both prime contractors and grantees to engage WMDVBE subcontractors in all procurement categories which provide subcontracting opportunities.
- Each utility shall make special efforts to increase utilization and encourage entry into the marketplace of WMDVBEs in product or service categories where there has been low utilization of WMDVBEs, such as legal and financial services, fuel procurement, and areas that are considered technical in nature.

Monitoring/Reporting/Outcomes:

- The CPUC provides an annual report to the Legislature on the progress of activities under-taken by each utility.
- The Greenlining Institute releases an annual report that grades the state's utilities, telecoms, and cable companies based on their voluntarily reported supplier diversity statistics. The report includes rankings and a breakdown of spending by ethnic categories as well as across industrial categories for each company. The report concludes with recommendations for both the overall GO 156 program as well as each individual company.
- Contracting with minority based enterprises grew by $1 billion from 2010 to 2011.
- For the first time ever, six companies are spending at least 20 percent of their procurement dollars with minority based enterprises.
- Contracting with some types of businesses, such as professional and legal services, remain low.
- Companies that have been leaders in contracting with diverse businesses have seen their figures level off in terms of overall percentage.
- Companies that have traditionally ranked towards the bottom of the pack have increased their MBE contracting, bringing them much closer to the industry leaders.

SoCalGas & SDG&E Source and Job Creation Reporting Requirements

Adopted/Implemented: January/February 2013

Applicability: Third-party energy-efficiency contractors

Targeted Population: Individuals referred by San Diego's one-stop system

Description of Program: San Diego Gas and Electric and the Southern California Gas Company have begun inserting "Source" and "Job Creation" reporting requirements in their contracts with energy efficiency contractors.

Key Elements/Best Practices:

- The "Source" requirement includes advanced notice of job or internship opportunities with energy efficiency providers under contract to the two utilities. See language, below:

  SOURCE: 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 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 may be shared with organizations that provide EE workforce training.

- The "Job Creation" requirement directs contractors to track jobs data as specified below:

  JOB CREATION: The COMPANY is interested in understanding the job creation benefits that result from its energy efficiency programs. To that end, the Contractor shall track the number of new employees and job promotions that occur as a result of this SOW. Contractor shall provide this information to Company upon request and in its final report.

Monitoring/Reporting:

- Contractors self-report on both job creation and job opportunities.
- There is not yet a track record on job opportunities or job creation numbers.

Sierra Nevada Energy Watch (SNEW)

Adopted/Implemented: 2010

Targeted Population: Small and medium businesses (<200kW) through Direct Install; public facilities (No residential)

Partners:

- Pacific Gas & Electric Company
- Sierra Business Council

Description of Program: Sierra Nevada Energy Watch is a partnership between PG&E and the Sierra Business Council dedicated to providing innovative energy efficiency solutions in 14 Sierra Nevada and northern Central Valley counties within PG&E territory. In nine counties it serves through its in-house Direct Install program, SNEW hired local staff and contractors to implement the program for small and medium businesses, local

governments, special districts and non-profits (under 200kW). The SNEW program specifically focuses on geographic areas that were previously under-served by existing energy efficiency implementation programs. This program focuses on local job development, training, and quality control, hiring from the communities it serves, which have unemployment rates ranging from 7-14 percent.

Key Elements/Best Practices:

- Network of 12 local contractors
  - Builds relationships between customers and contractors.
  - Creates trusted spokespeople for clean energy.
  - Helps with understanding the local culture, but they also know and are known by local business owners.
  - Local point of contact for maintenance and service requests.
  - Since SNEW serves mostly small businesses, with an average project size of 29,000 kWh, bringing in contractors from the Bay Area or Central Valley would decrease the climate benefits of energy efficiency projects by 3-5 percent. Local contractors also allow the program to cost effectively serve much smaller businesses. The program has completed projects with annual savings as small as 600 kWh.
- Hiring from local communities.
- Requiring that contractors pay their electricians wages based on prevailing wage tables for the counties in which the work is being performed.
- Requiring that any apprentices (or anyone paid less than prevailing wages for electricians) be enrolled in a state-registered apprenticeship program.
  - Maximizes the financial resources returning to and re-circulating in these counties.
  - Requires the program to look for cost savings elsewhere to stay affordable for customers and maintain overall cost effectiveness.
  - Because SNEW pays higher labor rates, customers have higher co-pays which results in greater investment in, and commitment to, energy efficiency, and leads to market transformation. All customers pay at least 10 percent of their project cost. Since program inception, the average co-pay has been 28 percent of project cost. Co-pays are higher in the 2013-2014 cycle, averaging 46 percent, than they were in the previous program cycle (averaging 25 percent).
- Provides contractor training and capacity building by bringing in equipment manufacturers to demonstrate proper installation and maintenance. An electrical contractor on staff has provided training and mentoring for participating contractors.
  - Contractor training and mentorship allows for more comprehensive and complicated measures to be installed.
  - SNEW has achieved 20 percent of savings from refrigeration measures, 65 percent from lighting retrofits, 5 percent from other measures, and only 10 percent from screw-in lighting. In the 2006-2008 program cycle, nine of the 16 Energy Watch programs achieved 95 percent or more of their savings from lighting, and six of those achieved over half their savings from screw-in CFLs alone.
- SBC staff conducts all the marketing, outreach, and follow-up to ensure consistency in program offerings and effectiveness. SBC matches contractors with customers based on customer location and needs. SBC staff assist with scheduling installations, check in during installations, and follow up with

post-installation inspections to confirm that all the prescribed work was completed. This has given the program control over quality, reputation, and branding.

Monitoring/Reporting/Outcomes:
As of September 2013:

- Local businesses are saving $1.6 million annually.
- Over $2.4 million has been invested in the local economy.
- Cost-effectiveness is higher than for most other Energy Watch (Local Government Direct Install) programs. SBC's TRC was fifth out of 18 other energy watch programs.
- Support for climate and energy policy has increased.
- 23 municipal and community carbon inventories have been completed (out of 39 local governments that the program serves), and there are six climate or energy action plans under development.

Southern California Regional Energy Network (SoCal-REN), LA County Workforce Pilot

Adopted/Implemented: January 2013 - December 2014, Energy Efficiency Transition Period

Partners:

- Los Angeles County
- Governance committee of representatives from the cities and counties served by the SoCalREN
- Emerald Cities Collaborative
- Building and Construction Trades Unions
- Citi Community Development (Citibank)

Description of Program: The County of Los Angeles will execute a $30 million energy efficiency retrofit pilot project—to upgrade lighting and mechanical systems, and solar rooftop installations on its buildings—as part of the California Public Utility Commission's Southern California Regional Energy Network (SoCalREN). SoCalREN is a local government regional energy network pilot program serving SCE and SCG service areas. The program will achieve greater energy savings by driving the development and implementation of local energy sustainability programs and providing local governments with technical assistance, financing and expertise to execute shelf-ready energy efficiency retrofit projects.

Three pilot sub-programs ($63.7 million total): Energy Upgrade California ($30.8 million) Financing for Energy Projects ($15.2 million), and Southern California Regional Energy Center ($17.7 million). Upon implementing a successful pilot program, the County will seek to execute countywide energy efficiency projects valued at almost $1 billion.

The County and the CA Construction Industry Labor-Management Cooperation Trust proposed to develop a pilot workforce training program within the SoCalREN as well, to accomplish the following:

- Identify the need/demand for labor in non-residential building sectors, primarily the Municipal, University, School, Hospital (MUSH) sector.

- Create a program that connects and coordinates labor resources from local job training groups that assist minorities, low-income and disadvantaged workers.
- Identify and connect training resources with potential labor pools.
- Develop and encourage apprenticeship programs in energy efficiency non-residential sectors.
- Develop and deploy standard contract language for contractor selection that includes local hiring, support for state-certified apprenticeship programs, and job quality standards.

The County workforce pilot project will award contracts using a procurement strategy that promotes local, small contractor participation and an integrated workforce development strategy that stimulates the creation of local, highly-skilled careers. To carry out these objectives, the County established a partnership with Emerald Cities Collaborative to implement the E-Contractor Academy sponsored by Citi Community Development (Citibank) and a workforce development strategy rooted in a direct pipeline to union apprenticeship.

Key Elements/Best Practices:

- E-Contractor Academy prepares small contractors to compete and perform energy efficiency retrofit projects for and within the County of Los Angeles and throughout California. The seven, three-hour workshops cover the following topics:
    - Introduction to SoCalREN and Green Building Basics
    - How to Bid on Energy Efficiency Projects
    - Access to Capital and Bonding
    - Safety Program for Energy Efficiency Projects
    - Estimating & Bidding Principles
    - Labor Compliance (*e.g. certified payroll*), Project Labor Agreements (PLA), Community Workforce Agreements (CWAs) including local hire agreements, and how to benefit from becoming a Building Trades Signatory Contractor
    - LCP Tracker and B2GNow user training
    - Access to Electrical & Mechanical certifications
- Project is planned to include a master agreement for pre-qualified contractors, and is considering a community workforce agreement and a project labor agreement to create a mechanism and requirement for inclusive hiring and good wages.

2. CONTRACTUAL INCLUSION REQUIREMENTS

Los Angeles "Community Careers" Policies

First Adopted: 2008

Applicability:

- Redevelopment projects with public investment of $1 million or more
- Redevelopment Agency public improvement projects of $500,000 or more
- City public works projects on a "Five-Year Public Infrastructure" list

- Port of LA projects on a "Five-Year Capital Improvement Program" list
- Metro projects with a life-of-project value of $2.5 million or more

Targeted Populations:

- City or Impact Area residents in high-unemployment or high-poverty zip codes (e.g. zip codes with census tracts in which unemployment is in excess of 200 percent of the County rate, and/or 40 percent of the households live below the Federal poverty threshold).
- Metro: Economically disadvantaged areas nationally (zip codes with census tracts with less than $40,000 in median annual household income).
- "Disadvantaged Workers" Criteria: Household income below 50 percent of AMI, being homeless, receiving public assistance, lacking a GED or high school diploma, having a history of involvement with the justice system; being a single parent, suffering from chronic unemployment.

Partners:

- City of Los Angeles
- Former Community Redevelopment Agency of the City of Los Angeles
- Port of Los Angeles
- Metro
- WIA-funded one-stop centers
- Community Colleges
- Building and Construction Trades Council
- Community Organizations

Description of Program: This program was first adopted by the LA City Community Redevelopment Agency and then adapted for the LA City Department of Public Works, Metro, and the Port of Los Angeles. The program requires developers and contractors who build projects with public funding to meet certain targeted hiring goals in construction jobs. It also requires developers and contractors to sign on to a pre-negotiated project labor agreement with the Building and Construction Trades Council.

Key Elements/Best Practices:

- Requires 30 percent of project work hours to be performed by targeted population (40 percent in the case of Metro), of which 10 percent must be disadvantaged workers.
- Requires full use of apprentices (20 percent), as permitted by the State Apprenticeship Council.
- Requires up to half of apprentice hours to be performed by targeted populations.
- Defines specific activities that contractors must follow to be in compliance if they do not meet targeted hiring percentages, including creating an employment hiring plan to meet goals.
- Requires hiring of intermediary ("Jobs Coordinator") to facilitate relationships with employers, unions where applicable, and workforce development organizations.
- Effective and timely tracking of outcomes.
- Metro is the first transit agency in the nation to adopt such an agreement with national targeted hiring goals for federally-funded projects with FTA approval.

Monitoring/Reporting:
Monitoring is done through certified payroll submissions, which are required for prevailing wage projects. Where certified payroll is submitted electronically, as in Los Angeles and San Francisco,[91] reports can easily be run showing any combination of data that is collected, allowing immediate feedback to contractors who are not making good numbers while there is still time to adjust course. It is much more cumbersome and time-consuming to compile the data from paper payroll submissions. In addition, the data is a powerful tool for evaluation of the overall success of the project, and for predicting outcomes on future projects.

Capturing information on ethnicity, gender, and workers' barriers to employment is usually done more personally, via an intermediary such as a jobs coordinator or community-based organization, in order to protect individuals' privacy.

California High Speed Rail Authority Community Benefits Agreement

Adopted/Implemented: 2012

Applicability: All construction contracted by the California High Speed Rail Authority.

Targeted Population ("National Targeted Workers"):

- Individuals living within an Economically Disadvantaged Area in the United States (a zip code that includes a census tract or portion thereof in which the median annual household income is less than $40,000).
- Individuals living within an Extremely Economically Disadvantaged Area in the United States (a zip code that includes a census tract or portion thereof in which the median annual household income is less than $32,000).
- Disadvantaged workers living within an Economically Disadvantaged or Extremely Economically Disadvantaged Area in the United States and facing at least one of the following barriers:
    - Homeless;
    - Custodial single parent;
    - Receiving public assistance;
    - Lacking a GED or high school diploma;
    - Having a criminal record or other involvement with the criminal justice system;
    - Suffering from chronic unemployment;
    - Emancipated from the foster care system;
    - Veteran; or
    - Apprentice in a joint labor/management apprenticeship program with less than 15 percent of the hours required to graduate to journey level.

[91] The Los Angeles Public Works Department developed its own electronic system. San Francisco purchased a database developed by Elation Systems.

Parties to Agreement:

- The California High-Speed Rail Authority;
- Construction contractors, subcontractors, and employers;
- State Building and Construction Council of California; and
- Individual local labor unions.

Description of Program: The program requires contractors for the high speed rail construction to meet certain targeted hiring goals in construction jobs. It also requires contractors to sign on to a pre-negotiated project labor agreement with the Building and Construction Trades Council. Because it is partially funded with Federal Transit Authority money, it is prohibited from requiring a geographically-targeted program that gives preference to residents of a particular state or states.

Key Elements/Best Practices:

- Requires a minimum of 30 percent of all hours of Project Work to be performed by National Targeted Workers.
- Requires a minimum of 10 percent of all National Targeted Worker hours to be performed by Disadvantaged Workers.
- Includes a Project Labor Agreement that pre-negotiates dispute resolution procedures, prohibits strikes and lock-outs.
- Prioritizes referral of qualified National Targeted Workers for available construction jobs.
- Requires prime contractor to designate a qualified Jobs Coordinator to facilitate and implement the Targeted Hiring Requirements.
- Permits a certain amount of "core employees" in addition to union-referred employees.
- Contractors must document efforts to hire National Targeted Workers.

Monitoring/Reporting: No process stated in Community Benefits Agreement

First Source Hiring and Local Hire Ordinances, City of San Francisco

Adopted: 1998 (First Source); 2011 (Local Hire)

Applicability:
First Source:

- Any activity that requires discretionary action by the City's Planning Commission related to a commercial activity over 25,000 square feet including conditional use and project authorization under San Francisco Planning Code Section 309 and office development under Planning Code Section 320, et sec.
- Any building permit application for a residential project over 10 units.
- City-issued public construction contracts in excess of $350,000.
- City contracts for goods and services in excess of $50,000.
- Leases of City property.
- Grants and loans issued by City departments in excess of $50,000.

Local Hire: Contracts for public work or improvement projects over $400,000.

Targeted Population:

- Economically disadvantaged San Francisco residents seeking employment through San Francisco's Workforce Development System. (First Source)
- San Francisco residents domiciled in the city for at least seven days prior to working on the project. (Local Hire)
- Disadvantaged worker: (i) resides in a census tract within the City with a rate of unemployment in excess of 150 percent of the City unemployment rate; or (ii) at the time of commencing work has a household income of less than 80 percent of the AMI, or (iii) faces or has overcome at least one of the following barriers to employment; being homeless; being a custodial single parent; receiving public assistance; lacking a GED or high school diploma; participation in a vocational English as a second language program; or having a criminal record or other involvement with the criminal justice system. (Local Hire)

Description of Program: The intent of both programs is to connect disadvantaged San Francisco residents with entry-level jobs that are generated by the City's investment in contracts or public works; or by business activity that requires approval by the City's Planning Department or permits by the Department of Building Inspection.

The First Source ordinance requires employers to give first consideration to and make a good faith effort to hire job candidates referred by the City's workforce development system. The Local Hire ordinance requires public works contractors to meet targeted hiring minimums.

Key Elements/Best Practices:
Local Hire:

- For the initial year, the mandatory participation level is 20 percent of all project hours within each trade performed by local residents, with no less than 10 percent of all project work hours within each trade performed by disadvantaged workers.
- The mandatory participation level will increase annually over seven years up to a mandatory participation level of 50 percent of project work hours within each trade performed by local residents, with no less than 25 percent of all project hours within each trade performed by disadvantaged workers.
- At least 50 percent of the project work hours performed by apprentices within each trade shall be performed by local residents, with no less than 25 percent of project work hours performed by apprentices within each trade to be performed by disadvantaged workers.
- If contractors cannot reach local hiring requirements on their own, they are required to request referrals through CityBuild (see below).
- Program contemplates financial and non-financial incentives for contractors and subcontractors who exceed local hiring requirements, including financial incentives that comply with applicable law and do not exceed one percent of the estimated cost of the contract
- Program contemplates various consequences of noncompliance with the policy, including delay of building permits and/or progress payments and the authority to assess penalties against contractors that do not meet the local hiring requirements, with financial penalties to be used to support enforcement of the policy and workforce development initiatives.
- Offsite Hiring Credits

First Source:

- 50 percent of new hires—any worker who is not a member of Contractor's "core" or "existing" workforce—must be referred by CityBuild (see below).
- Businesses or non-profits that qualify as First Source employers according to the definitions above are required to project the number of entry-level job openings they expect during the contract period and provide that information to the First Source Hiring Administration or their designee.
- First Source employers are required to post their entry-level openings with First Source and proactively work with First Source to accept and consider qualified candidates that are referred to these positions.
- While First Source does not require an employer to hire a specific candidate, it does require that employers make a *good faith effort* to hire referrals from San Francisco's Workforce Development System.

CityBuild: The City centralizes public construction workforce training and placement under its CityBuild program, which aims to prepare local and disadvantaged resident jobseekers to meet the demands of the construction industry, and its own First Source and Local Hire ordinances, by providing comprehensive pre-apprenticeship and construction administration training to San Francisco residents and by coordinating city-wide construction training and employment placement programs. CityBuild is a partnership between the City's Office of Economic and Workforce Development, the building and construction trades, City College of San Francisco, and community-based organizations.

Monitoring/Reporting/Outcomes:

- The City of San Francisco uses Elation Systems to allow contractors to input certified payroll and employee information online, which then allows the city's compliance staff to run real-time reports on local hiring achievements or deficits.
- Since 2006, CityBuild has facilitated over 1,300 job placements in over 250 projects throughout the City of San Francisco.

Section 3 of the Housing & Urban Development Act of 1968

Adopted: 1968
Applicability:

- All housing construction, rehabilitation, or other public construction funded by Public and Indian Housing programs.
- All housing construction, rehabilitation, or other public construction funded by Housing and/or Community Development Assistance exceeding $200,000 combined from all sources in any one year.

Targeted Populations:

- Public housing residents.
- Low- or very low-income individuals (typically established at 80 percent and 50 percent of the median income for each locality by household size) residing in the metropolitan area or non-metropolitan county where the Section 3 covered assistance is expended.

- Businesses owned by, employing, or subcontracting to public housing residents and low- or very-low income individuals.

Description of Program: The purpose of Section 3 is to ensure that employment and other economic opportunities generated by certain HUD financial assistance for housing construction, rehabilitation, or other public construction shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly those who are recipients of government assistance for housing, and to business concerns which provide economic opportunities to low- and very low-income persons. This may mean going a step beyond normal notification procedures for employment and contracting procedures by developing strategies that will specifically target Section 3 residents and businesses for these types of economic opportunities.

Key Elements/Best Practices:

- 30 percent of the aggregate number of annual new hires shall be targeted individuals.
- The recipient agency must act as a facilitator, connecting targeted individuals to training and employment opportunities.
- 10 percent of the total dollar amount of all Section 3 covered contracts for building trades work for maintenance, repair, modernization or development of public or Indian housing or building trades work arising in connection with housing rehabilitation, housing construction and other public construction, shall be awarded to targeted businesses.
- Three percent of the total dollar amount of all non-construction Section 3 covered contracts shall be awarded to targeted businesses.

Monitoring/Reporting:

- Recipient agencies must document all actions taken to comply with the requirements of Section 3.
- Recipient agencies must submit an online Annual Summary Report for all covered funding to the Office of Fair Housing and Equal Opportunity.
- If an agency fails to fully meet the Section 3 numerical goals, they must adequately document the efforts taken to meet the numerical goals.

3. CONTRACTOR PREQUALIFICATION

Clean Energy Works Portland/Oregon

Implemented: 2009

Targeted Population:

- Portland residents
- Trainees from designated training programs
- Disadvantaged or underrepresented people, including people of color, women and low-income residents

- Business owned by disadvantaged or underrepresented people, such as women-owned businesses or minority-owned businesses

Description of Program: Clean Energy Works Portland (CEWP) was a pilot program to retrofit 470 Portland homes for energy efficiency. After the pilot phase, the City of Portland and the Energy Trust of Oregon scaled up the program as Clean Energy Works Oregon (CEWO).

Recognizing that a major barrier to retrofitting existing buildings is the up-front cost of the improvements, CEWP was designed to provide a simple financing solution to energy efficiency improvements while creating new jobs and making sure that economic opportunity would flow toward historically underserved populations: low-income people, women and people of color. In order to meet these goals, CEWP established a pool of "participating contractors" who were required to meet minimum criteria in the areas of skills, certification and also workforce hiring, as described in a "Community Workforce Agreement" (renamed "High Road Agreement").

Using funds from the Energy Efficiency and Conservation Block Grant program and other city resources, the city capitalized a revolving loan fund to offer pilot participants low-interest, long-term financing for home energy efficiency remodels. The pilot successfully attracted additional public and private investment, bringing the total loan portfolio to nearly $7 million.

CEWO provides a one-stop shop for whole-home energy upgrades in regions throughout the state. Participating contractors use marketing materials and messaging developed by CEWO to generate 35-40 percent of CEWO's new leads for energy efficiency upgrades.

Key Elements/Best Practices:

- Support for approved and emerging contractors (e.g., training and continuing education resources, business classes, business coaching, peer mentoring, access to working capital, engagement and outreach efforts targeting underrepresented and economically disadvantaged contractors).
- Portland General Electric, NW Natural and Pacific Power process CEWP loan payments as part of their routine customer billing process and transfer the funds to ShoreBank.
- Participating Contractors are required to be Energy Trust of Oregon trade allies, Home Performance with ENERGY STAR® qualified, and certified through the Building Performance Institute (BPI). All energy advisors are BPI certified.
- Participating Contractors are required or incentivized to comply with the following:
    - Local Hire: At least 80 percent of employees used in the CEWP pilot program must be Portland residents.
    - Family-Supporting Jobs: Workers participating in this pilot project will earn not less than 180 percent than state minimum wage.
    - Health Insurance: Employees hired under the CEWP pilot program will have access to affordable and adequate health insurance. The plan makes an effort to mitigate the burden on small contractors associated with providing health insurance to their employees.
    - Designated Training Programs: Employers must hire from approved training programs only, until they fill 50 percent of their positions. A pool of qualified training programs shall be identified to create pipelines to permanent jobs. Qualified training programs must provide weatherization

training, have relationships with pre-apprenticeship programs, offer mentoring and demonstrate a track record of placing trainees into construction jobs.
    - First Source: Contractors will hire 100 percent of new workers/installer weatherization employees from designated training programs, until 50 percent of contractor's total non-supervisory worker/installer weatherization employee work hours are performed by graduates of designated training programs.
    - Diversity: Disadvantaged or underrepresented people, including people of color, women and low-income residents will perform not less than 30 percent of the total trades and technical project hours in the pilot. Contractors should work with qualified training programs to meet this goal.
    - Businesses owned by disadvantaged or underrepresented people, such as women-owned businesses or minority-owned businesses, make up not less than 20 percent of all dollars in the pilot project.
- Contractor scoring: The program awards points to Participating Contractors based on the benefits they provide to their workers; the diversity of their workforce; hiring practices, including hiring of union workers; and subcontractor practices. The program allocates applicant referrals to qualified contractors based on contractor scoring under the terms of the CWA—the more points scored, the more audit assignments a contractor will receive.
- Resources for continuing education and certification are available to workers coming into the home performance industry and to those ready for opportunities for promotion and upward mobility through career pathways and entrepreneurship training.

Monitoring/Reporting/Outcomes:

- The program established a Stakeholder Evaluation and Implementation Committee composed of representatives from business, community-based organizations, organized labor, faith-based institutions and government oversaw CEWP's implementation of the CWA.
- Contractors are required to submit quarterly reports on their workforce diversity, subcontracting, health care and other issues pertaining to the CWA.
- The CWA creates an Evaluation and Implementation Committee which is responsible for setting accountability strategies for non-compliance, evaluating progress toward standards, and further developing lists of qualified training providers.
- The CEWP pilot program accomplished the following:
    - Investment of more than $6 million (payments to contractors);
    - 584 low-interest loans for whole-home energy remodels;
    - 20 percent or greater reduction in energy consumption in most homes;
    - 1,400 metric tons of annual carbon emissions reductions;
    - Employment for more than 400 workers, including 48 new hires in the construction trades;
    - Average wages of $20.34/hour;
    - Provision of health insurance by nearly 80 percent of the participating contracting firms;
    - 48 percent of the trade/technical hours worked by people of color (22 percent of Portland's residents are people of color; the Community Workforce Agreement (CWA) goal was 30 percent);
    - A doubling of state and national rates of participation by women in construction;
    - 23 percent of pilot dollars benefitted minority-owned or women-owned small businesses (CWA goal was 20 percent);

- Positive customer experiences (94 percent of participants surveyed said they would recommend the program to friends or family);and
- As of May 2012, CEWO reported nearly 60 percent of the more than 93,000 project work hours have been performed by women and minorities, and nearly half of all new hires have been woman and minorities. In addition, nearly 90 percent of the program's prime contractors offer subsidized health insurance to their employees.

Community Power Works, Seattle, Washington

Adopted/Implemented: 2011

Targeted Population:

- Low-income individuals
- Veterans and current members of the National Guard and Reservists
- Individuals with barriers to employment, including:
  - Homelessness;
  - Being a custodial single parent;
  - Receiving public assistance;
  - Lacking a GED or high school diploma;
  - Having a criminal record or other involvement with the criminal justice system; or
  - Being historically disenfranchised or disadvantaged by previous policies and practices and as a result being disproportionately represented in dropout rates, unemployment, lack of business ownership and criminal justice systems.

Description of Program: The City of Seattle's Community Power Works is a $100 million pilot program testing new models for energy efficiency for single-family and multi-family residences, small businesses, hospitals, and large commercial and municipal buildings.

In addition to meeting upgrade and investment goals, Community Power Works also intended to test new marketing, service delivery and financing mechanisms and increase homeowner demand for—and contractor capacity to deliver—high-quality comprehensive energy-efficiency upgrades.

The program aims to benefit the local economy by partnering with local contractors and small businesses. All home contractors are businesses with fewer than 50 employees and over one-third are women, minority, veteran, or employee-owned; 92 percent of participating contractors are from the Puget Sound region, which keeps most of the dollars spent in the local economy.

The program also includes a Community High-Road Agreement—a collaborative and flexible partnership involving the city, contractors, workforce training organizations, labor and community groups to assure quality services, build a skilled workforce, provide family-wage jobs and benefits, and offer career pathways for new hires and returning workers. By including high-road standards in its innovative home energy upgrade program, the program shows how smart green investments can grow local businesses, provide on-ramps to opportunity

for low-income and historically underserved communities, and connect low-income or otherwise disadvantaged workers to good careers.

Key Elements/Best Practices:

- All contractors that participate in Community Power Works have at least one employee on staff that is certified by the Building Performance Institute (BPI).
- Tiered wage system as compromise between prevailing wage and no wage standard:
  - A base rate of $21.50 per hour plus $2.50 in additional wages or benefits.
  - A lower rate of $15.50 per hour plus $2.50 in additional wages or benefits for new trainees, plus 80 hours of training, with the lower rate limited to one year.
  - Higher rates for specialized work.
- Community High-Road Agreement stakeholder-defined program goals:
  - Maintain sustainability and consistency of job and sector growth and investment.
  - Keep the program simple and predictable, especially for contractors.
  - Maintain balance between creating jobs for entry-level targeted workers* and for the existing skilled workforce, so that at least 33 percent of technical work hours are performed by targeted workers.
  - Achieve business participation rates of 80-100 percent small business participation; at least 30 percent minority-owned business participation; at least 10 percent women-owned business participation; close to 10 percent local business participation; and increase opportunities for employee-owned and veteran-owned businesses.
  - Ensure that contractors provide high-quality work.
  - Ensure that program jobs lead to career pathways.
  - Ensure that program jobs pay a family-supporting wage.

Monitoring/Reporting/Outcomes:

- The program integrated wage and work reporting with the Energysavvy IT platform for electronic data capture including hiring outcomes.
- As of September 30, 2012, Community Power Works has completed 1,077 energy upgrades. An additional 352 projects have signed bids. The total investment in completed and signed projects is $29 million.
- As of September 30, 2012, more than 202 workers worked a total of 25,030 technical hours on Community Power Works for Home projects.
- Targeted workers provided 42 percent of technical hours. Diversity is greater in lower-paying classifications such as weatherization worker.
- A detailed compliance review for all projects completed through August 2012 found close to 100 percent compliance for reporting, wage payments, and meeting training and certification requirements. The few cases that were found to be non-compliant were traced back to data errors or miscommunications over appropriate worker classifications or wage rates that, when corrected, returned cases to compliance. CPW conducts random site visits to match reported data to contractor records.

Retrofits for Energy Efficiency Works (RENEW) Cleveland/Cuyahoga, Ohio

Adopted/Implemented: 2013

Targeted Population: Residents of Cuyahoga County

Description of Program: RENEW provides financing and technical assistance for energy efficiency in municipal buildings. A joint effort of Emerald Cities Cleveland, Cuyahoga County Government, the Cleveland-Cuyahoga County Port Authority, and Public Finance & Energy Advisors LLC, RENEW finances 100 percent of energy conservation measures through Lease-Purchase agreements between the municipalities and the Port Authority. The Port Authority will issue Lease Revenue Bonds secured by the pool of municipal leases. Energy savings are guaranteed through an insurer. The municipalities procure their own contractors to implement the energy efficiency measures and must agree to include RENEW High-Road Contractor Standards in RFPs.

Key Elements/Best Practices:

- Municipalities procure their own contractors but must agree to require RENEW's high-road standards in the contracts, except for contracts requiring less than $10,000 worth of labor costs.
- Contractor must maintain its primary office and the majority of its operations in Cuyahoga County.
- High-road standards include licensing and experience qualifications and job and training quality qualifications. Job and training quality qualifications include:
    - No excessive violations of workplace laws in the past three years.
    - The company provides at least 50 percent of the costs of health insurance coverage to workers performing construction work. (Mini-med and catastrophic-only plans do not qualify.)
    - The company provides a pension plan or retirement benefits to construction workers.
    - The company has an agreement with a State- or Federally-registered apprenticeship program and regularly employs apprentices. Small and MBE/WBE/VBE contractors are waived from some of the requirements.
    - High-road standards apply to contractors of any tier unless otherwise waived.
    - Prime contractor must obtain a guarantee on the energy and water costs savings.
    - Each contractor must pay prevailing wages.
    - 50 percent of work hours under the RENEW contract must be performed by Targeted Workers.
    - All employees performing RENEW Pilot Program Work must be either a graduate of or enrolled in a State- or Federally-registered apprenticeship program or a Designated Training Program; or must have at least three years of experience in that trade.

Monitoring/Reporting/Outcomes: Program recently launched so data was not yet available.

4. PATHWAYS TO ADVANCEMENT

Department of Water and Power Utility Pre-Craft Trainee (UPCT) Program, Los Angeles, CA

Adopted/Implemented: 2012

Targeted Population: Recruits for the UPCT program are dispatched from IBEW Local 18's book of applicants and include workers from low-income and minority communities that historically lack access to high-quality careers and face barriers to qualifying for civil service examinations.

Partners:

- Los Angeles Department of Water and Power (LADWP)
- International Brotherhood of Electrical Workers (IBEW) Local 18
- City of Los Angeles, Office of the Mayor
- Southeast Los Angeles Crenshaw (SELAC) WorkSource Center
- UCLA Labor Occupational Safety and Health Program
- Los Angeles Trade Technical College (LATTC)
- RePower LA Coalition

Description of Program: The Utility Pre-Craft Trainee program is a pre-apprenticeship training program that offers participants the chance to work full-time as weatherization installers while receiving substantial career-oriented training and preparing for civil service examinations that would qualify them for permanent employment and further training with LADWP.

Key Elements/Best Practices:

- Serves the short-term and long-term needs of the utility, the trainees, and the union, while also furthering environmental and economic policy goals.
- Trainees are guaranteed a paycheck, provided with valuable skills training and mentorship, and have access to long-term career paths.
- The utility cultivates a pool of pre-screened, trained, and motivated entry-level workers that can feed into critical job classifications.
- The union builds capacity to take on more energy efficiency work that might otherwise be contracted out to non-union providers.
- LADWP and IBEW Local 18 developed the program and have taken the lead on coordinating and delivering training for UPCTs, but they also worked with the Mayor's office to develop and leverage a number of important partnerships in implementation of the program. The Southeast Los Angeles Crenshaw (SELAC) WorkSource Center, one of the state's one-stop career centers, has provided initial intake and work readiness screening for prospective trainees along with the UCLA Labor Occupational Safety and Health Program. Los Angeles Trade Technical College (LATTC), a local community college with a large and well-established construction department, provided the initial weatherization training. The UPCT program has also received strong support from RePower LA, a broad coalition of environmentalists, low-income advocates, and labor, which sees this program as a central element of its ongoing campaign to both reduce the city's carbon footprint and create good jobs for local workers. In addition, RePower LA assists with outreach and coordination.
- LATTC is the main technical training partner for the UPCT program. At the beginning of the program, LATTC provides 40 hours of training in technical skills, such as the use of hand tools, basic construction, and safety, as well as the specific weatherization training demanded by the federal Weatherization Assistance Program. Once they complete this training, UPCTs are eligible to become

certified in weatherization through the California Department of Community Services and Development (CSD). Trainees can also earn college credit for the training they receive through LATTC.

Monitoring/Reporting/Outcomes:

- The Department's recently adopted guiding principles include a commitment to leverage increasing energy efficiency investments to create high-quality jobs for the local workforce.
- Going forward, the utility has committed to sustaining the program through its general training and energy efficiency budgets. Advocates of the program estimate that if the program continues to be funded and expanded over the next five years, it could create about 750 UPCT positions as well as a number of new permanent jobs for journey persons and supervisors.

For more information about best practices and inclusion strategies in the construction industry, please see The Construction Careers Handbook, Partnership for Working Families, 2013.

5. TARGETED HIRE THRESHOLD COMPARISON

Exhibit 4A.1 Thresholds for Targeted Hire Requirements

Program	Type of projects covered	Threshold to trigger targeted hire
Federal Housing and Urban Development Act, Section 3	Housing construction, rehabilitation, or other public construction	Projects funded by Public and Indian Housing programs or by >$200K of Housing and/or Community Development Assistance
California High Speed Rail	High speed rail construction	All construction contracted by the Authority (includes PLA[92])
San Francisco Local Hire Ordinance	Public works or improvement projects	Projects > $400K
Richmond Local Employment Program[93]	Public works or service contracts or city subsidy	Public works/service contracts/city subsidies of $100K+
Los Angeles Community Redevelopment Agency	Public improvements and private development projects	Contracts for public improvement of $500K+ (includes PLA); private development projects with at least $500K in CRA investment.
Los Angeles Public Works Department	Public works projects on a 5-year public infrastructure list or as designated by the Board	All projects (includes PLA)
Los Angeles Unified School District	New construction, rehabilitation, capital improvement	Prime multi-trade contracts > $175,000; prime specialty contracts > $20,000 (includes PSA)
Los Angeles County Metropolitan Transportation Authority	Transportation projects	Projects with a life-of-project value of $2.5M (includes PLA)
San Diego Unified School District Project Stabilization Agreement[94]	Projects funded by Propositions S and Z	Projects of $1M+ (includes PSA)
RENEW Cleveland/Cuyahoga[95]	Municipal building EE retrofits	RENEW contracts with over $10,000 estimated labor costs
GO 156 (diverse contractor procurement goals)	All procurement	To be implemented by all IOUs with gross annual revenues > $25M

[92] Requiring a PLA (Project Labor Agreement) or PSA (Project Stabilization Agreement) usually triggers a higher threshold of application than targeted hire alone.

[93] *See* Richmond City Council (2006, July 26). *Updating the Local Employment Ordinance—Richmond Municipal Code Chapter 2.56 Ordinance No. 52-06 N.S.*

[94] *See* San Diego Unified School District (2009, July 28). *Project Stabilization Agreement*.

[95] *See* Retrofits for Energy Efficiency Works (RENEW) (n.d.). *High-Road Contractor Standards*.

4B. Impact of Wage Floor on Program Costs

We recommend that the CPUC establish a wage floor, using state prevailing wages, on the ESA and Direct Install programs, and third-party programs where the contractors are pre-selected. The IOUs and others have expressed concerns about the effect of wage standards on overall program costs and cost effectiveness. Wage mandates have been shown to increase final costs by a significantly smaller factor than the wage increase itself. In this appendix we provide a rough "back-of-the-envelope" calculation based on transparent assumptions about current ESA worker wages, labor intensity in ESA work, and reduced employee turnover.

We present estimates based on three different wage floor scenarios. Hourly rates for the wage floor scenarios are based on the 2010 California Residential Weatherization Wage Determinations from the U.S. Department of Labor.[96] Wage rates vary by region, and the Department of Industrial Relations would need to make a wage determination by region once the policy is adopted. Since we don't have exact prevailing wage levels at this time, we provide estimates for wage floors of $15-$17 per hour to illustrate reasonable scenarios.

This calculation estimates that ESA costs will increase two percent if the wage floor is increased to $15 per hour, by less than three percent for a $16 per hour wage floor, and by less than four percent for a $17 per hour wage floor. It is important to note that this is a rough estimate due to the limited availability of data about current wage levels and other variables. Further data is needed in order to develop more accurate estimates.

The assumptions for these estimates are as follows:

- Labor costs account for roughly 20 to 30 percent of total construction costs, with the proportion somewhat lower for residential construction.[97] For the purposes of our calculation, we use a mid-range estimate of 25 percent of total construction costs spent on labor.
- Our research found that most ESA wages range between $10-20 per hour. For the purposes of our calculation, we assume an even distribution of employers across this range, e.g. 50 percent of employers pay $15 per hour or less.
- Research on the impact of wage standards indicates that wage increases are absorbed in part through employer savings on turnover costs, increases in productivity, and accepting a lower profit margin. Based on a review of the literature, we estimate that 16 percent of the cost of raising wages would be offset by savings for employers through reduced turnover and other factors.[98,99, 100]

We use the following formula to estimate the overall cost of raising the ESA wage floor:

[96] U.S. Department of Labor, Wage and Hour Division (2009, December 11). *California Residential Weatherization Wage Determination (S2009-CA-001)*.

[97] U.S. Census Bureau (2005, October). *2002 Economic Census: Construction*.

[98] For example, see Reich, M., P. Hall, & K. Jacobs (2003, March). *Living Wages and Economic Performance: The San Francisco Airport Model*. Berkeley, Calif.: Institute of Industrial Relations.

[99] 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.

[100] 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.

% overall cost increase = % construction costs spent on labor *times* % wage increase *times* % of employers below wage floor *times* (1 minus % cost increase offset by savings from reduced turnover)

Exhibit 4B.1 Estimated Cost Impact of Raising ESA Wage Floor

Variable	Scenario A: $15/hr wage floor	Scenario B: $16/hr wage floor	Scenario C: $17/hr wage floor
% construction costs spent on labor	25%	25%	25%
Average hourly wage for employer below floor	$12.50	$13.00	$13.50
% wage increase	(15-12.50) *divided by* 12.50 = 20%	(16-13) *divided by* 13 = 23%	(17-13.50) *divided by* 13.50 = 26%
% of employers below wage floor	50%	60%	70%
% cost increase offset by savings from reduced turnover	16%	16%	16%
% overall cost increase	0.25*0.2*0.5*(1 - 0.16) = **2.1%**	0.25*0.23*0.6*(1-0.16) = **2.9%**	0.25*0.26*0.7*(1-0.16) = **3.8%**

Exhibit 4B.1 summarizes the impact of three scenarios: raising the ESA wage floor to (A) $15 per hour; (B) $16 per hour; or (C) $17 per hour.

- **Scenario A**: Assuming a wage floor of $15 per hour and an average wage of $12.50 per hour for employers below the floor, the proposed wage increase in Scenario A would increase costs by 20 percent for the 50 percent of employers that we assume fall below the wage floor. Taking into account the assumption that 16 percent of the cost of raising wages would be offset by savings for employers through reduced employee turnover, we find that overall ESA costs would increase by two percent (2.1%).
- **Scenario B**: Assuming a wage floor of $16 per hour and an average wage of $13 per hour for employers below the floor, the proposed wage increase in Scenario B would increase costs by 23 percent for the 60 percent of employers estimated to fall below the floor. This would result in less than a three percent (2.9%) ESA cost increase overall, taking into account savings from reduced employee turnover.
- **Scenario C**: Assuming a wage floor of $17 per hour and an average wage of $13.50 per hour for the 70 percent of employers below the floor, the wage increase proposed in Scenario C would increase overall costs by less than four percent (3.8%), taking into account savings from reduced employee turnover.

Appendices to Chapter 5

5A. EM&V "Best Practice" References

Examples of "best practice" documents EM&V studies focused on energy include:

- 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.

- EM&V for Program Evaluations for California's IOU WE&T (and predecessor) Programs.

- KEMA, Inc. (2007, November). 2*004-2005 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. P*repared for Southern California Edison, Southern California Gas, San Diego Gas & Electric, and Pacific Gas & Electric. 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.

- Opinion Dynamics Corporation (2013, February). *Education and Training Program—Evaluation Plan for Energy Savings Impact Study for 2013-2014*, prepared for California Public Utilities Commission.

- Opinion Dynamics Corporation and McLain ID Consulting (2012, December). *2010-2012 WE&T Process Evaluation, Volume I: Centergies, Volume II: Connections*, prepared for Pacific Gas & Electric, Southern California Edison, San Diego Gas & Electric, and Southern California Gas.

- Opinion Dynamics Corporation, Wirtshafter Associates, Inc., Jai Mitchell Analytics, Summit Blue Consulting (2010, March*), Indirect Impact Evaluation of the Statewide Energy Efficiency Education and Training Program, Final Report*, prepared for the California Public Utilities Commission Energy Divis.

- 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-ciee.org/downloads/proc_eval_whtppr.pdf.

- Peters, J. (2007). *White Paper: Lessons Learned After 30 Years of Process Evaluation*, Research Into Action.

- 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.

- SBW Consulting, Inc. and Ridge & Associates (2011, December). *Evaluation Protocols for NEEA Commercial Sector Advice Initiatives*, prepared for Northwest Energy Efficiency Alliance.

- 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).

5B. Recommended Changes to IOU WE&T Data Collection Practices

This memo provides more detailed information about our recommendations to the IOUs on workforce and job data collection. We recommend that the IOUs establish a more comprehensive approach to workforce education and training (WE&T) data collection in order to produce better information on jobs and workforce outcomes of IOU investments. The IOUs' current approach will not produce the data needed for rigorous analysis of the impact of workforce issues on energy savings and program performance that is valuable for program planning. Moreover, the current approach will not provide useful workforce metrics to inform the CPUC's interest in exploring how best to address the jobs co-benefits of energy efficiency investments, which are of great interest to a number of stakeholders.

RECOMMENDED CHANGES TO WE&T DATA COLLECTION PRACTICES

1. Require Contractors to Use an Electronic Certified Payroll Reporting System for Reporting WE&T Data

The IOUs should require all contractors and subcontractors employed on EE projects to use an electronic certified payroll reporting system to report specified jobs and workforce data. Such systems are widely-used in the public works sector for tracking jobs and workforce data and monitoring compliance with labor laws. Our initial research identified improved survey design as a short-term option to produce better WE&T data but based on further research, we strongly recommend an electronic reporting system as the preferred method for collecting data. Electronic reporting systems present a lower burden for contractors due to an automated reporting process, provide for secure and confidential transfer of data, produce better quality and more comprehensive data based on certified payroll records, and are typically cheaper, compared to a survey.

The IOUs should fund the annual cost of the electronic reporting system, and solicit qualifications and bids to compare costs and services. In order to streamline reporting and minimize costs, the IOUs should pool their funding to secure one reporting system that will be utilized by all of the IOUs across multiple 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.[101] The IOUs should also collectively fund a program administrator (to be housed within one of the IOUs) to manage the set-up and oversight of the electronic certified payroll reporting system and process.

The IOUs should collectively develop standard language for contract documents to instruct contractors and subcontractors to report jobs and workforce data according to standard requirements across all the IOUs. At minimum, the IOUs should require contractors and subcontractors employed on EE projects to submit electronic certified payroll records that contain the following information for each worker employed on a project:

- 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;

[101] Additional measures to streamline reporting and reduce costs include negotiating contracts with a payroll company for all contractors, as is done for some other bulk purchasing of materials.

- Race, ethnicity, and gender; and
- Certifications held.

The IOUs should produce quarterly reports with summary level data provided by the electronic certified payroll reporting system. The reports should be publicly available on each IOU website and/or a centrally located page on the CPUC website. Data collection should also include a mechanism for annual review and public reporting. This could be similar to the requirements related to CPUC General Order 156, which provided guidelines for a supplier diversity program subject to annual reporting and review.[102]

Submitting payroll data to an electronic certified payroll reporting system is a straightforward and automated process. For contractors that use a payroll company, an electronic certified payroll system can easily set up a web interface with the payroll company to facilitate the secure transfer of data. For contractors that use payroll software, most software programs can generate a certified payroll record report that can be imported into an electronic certified payroll system in Excel, PDF or another compatible format. The relatively small number of contractors that use software programs without this capability would have to manually enter data.

There are a variety of electronic systems that track and report jobs and workforce data. Systems available off-the-shelf include Elation Systems,[103] used by the City of San Francisco and other jurisdictions, and LCP Tracker,[104] used by a number of UC campuses and K-12 school districts, among others. Some agencies, such as the City of Los Angeles Bureau of Contract Administration,[105] have developed custom tracking and reporting systems. This approach generally requires more time and resources than using an off-the-shelf system but also provides opportunities for customization and in-house data management and storage. The state Department of Industrial Relations (DIR) within the Labor and Workforce Development Agency uses a custom system to collect certified payroll data for a portion of public works projects however, DIR will consider using an off-the-shelf system for implementing Proposition 39 jobs and workforce reporting requirements if upgrades to its current system are not complete by the time Proposition 39 projects get underway.[106]

Additional information is needed to estimate costs for utilizing specific reporting systems to track WE&T data for particular EE programs. Our initial research suggests that costs are relatively low compared to the overall budget of the program. For example, the cost to use LCP Tracker for $300-400 million dollars of active projects for the ESA program would be roughly $50,000 for the first year and $37,500 each subsequent year. The first year cost is higher due to one-time, upfront costs to set up the system and create customized report templates.

[102] For more information, see California Public Utilities Commission (2014). *Utility Supplier Diversity Program*. Retrieved from: http://www.cpuc.ca.gov/puc/supplierdiversity/.

[103] For more information, see Elation Systems (2012). Retrieved from: http://www.elationsys.com/elationsys/.

[104] For more information, see LCP tracker - Labor Compliance Software. (n.d.). Retrieved from: http://www.lcptracker.com/.

[105] For more information, see Bureau of Contract Administration, City of Los Angeles, California. (n.d.). Retrieved from: http://bca.lacity.org/index.cfm.

[106] A portion of California public works projects are subject to Compliance Monitoring Unit (CMU) regulations which require that contractors submit certified payroll records (CPRs) via DIR's Electronic Certified Payroll Record (eCPR) system within 30 days after the work has been performed. CMU regulations only apply to projects that contain state construction bond funding or when awarding bodies utilize certain design-bid statutes. DIR is working to upgrade its eCPR system to move from a PDF upload application to a more data-driven system allowing for comparison and analysis of data submitted.

On average, a contractor will spend two hours learning how to use LCP Tracker and setting up reports. This includes one hour of training provided by LCP Tracker (unlimited training is included in the system cost) followed by one hour to set up employee profiles, which takes roughly three to four minutes per employee. Once profiles are set up, contractors will spend about one minute per employee per week to submit reports.

The IOUs should also explore collaboration with the Division of Labor Standards Enforcement (DLSE) and the Employment Development Department (EDD) within the California Labor and Workforce Development Agency to monitor wage and earnings data through these agencies ongoing data collection and analysis practices. For example, the DLSE may be able to verify compliance of contractors participating in IOU programs with employment laws and regulations. The construction industry has been identified as one of the industries with the greatest rate of wage and hour violations, and DLSE is currently developing specific indicators and screens to identify violators. Employers are also required to report employee earnings data to the EDD, and it is worth exploring whether or not this data could be accessed in a way that would be useful for IOU and CPUC goals.

Inter-agency efforts currently underway to identify labor violations may offer lessons for collaboration and an avenue for partnership. The Labor Enforcement Task Force (LETF), for example, is a joint effort between state agencies to ensure that workers receive proper payment of wages and are provided a safe work environment; ensure that the state receives all employment taxes, fees, and penalties due from employers; and eliminate unfair business competition by leveling the playing field. The LETF inter-agency collaboration includes the Department of Industrial Relations, the Employment Development Department, the Contractor's State Licensing Board, the California Department of Insurance, the Board of Equalization, the Bureau of Automotive Repair, and the State Attorney General.

2. Provide Staffing for Electronic Reporting System Set-Up and Oversight

The IOUs should collectively fund a program administrator (to be housed within one of the IOUs) to manage the set-up and oversight of the electronic certified payroll reporting system and process. We estimate that the upfront work necessary to oversee system set up, establish procedures and coordinate with the IOUs, contractors, subcontractors and system procured for reporting will require approximately 80 hours of work over the first month. The IOUs should identify an experienced professional with a specific skill set needed for this work, including technical knowledge and experience with the construction industry (including construction terminology, principles and project delivery methods); technical knowledge and experience with labor compliance systems; knowledge of California Labor Code rules and regulations; and experience using electronic certified payroll systems for a high volume of projects. While more work will be needed on the front end, ongoing oversight is also necessary to monitor contractors and subcontractors to ensure a successful system that provides good quality, comprehensive data. At minimum, we estimate this will require ten hours of ongoing work per month. The specific staffing levels to ensure successful reporting will vary depending on the volume of programs and projects utilizing the electronic reporting system.

Among other responsibilities, the program administrator will:

- Interface and coordinate with IOUs, contractors and subcontractors (e.g. add new users to the system by generating IDs and passwords);
- Establish procedures for contractors and subcontractors to report specified jobs and workforce data and monitor compliance;

- Establish procedures for IOUs to check and validate data reported by contractors and subcontractors;
- Interface and coordinate with the provider of the electronic certified payroll system (e.g. coordinate training and technical assistance for contractors and subcontractors to be delivered by electronic certified payroll system; work with developers to design customized reports that will produce good quality data); and
- Interface and coordinate with IOU staff and/or consultants responsible for data analysis, evaluation and preparation of reports (e.g. generate and compile electronic certified payroll system reports for periodic review and in-depth analysis and evaluation).

3. Evaluate WE&T Data Annually and Develop a Scorecard

The IOUs should produce an annual report of WE&T data that includes an analysis of data provided by the electronic certified payroll system and a comparison of WE&T outcomes within and across EE programs for all IOUs.

The IOUs should develop a common scorecard or similar evaluation tool to compare detailed outcomes including 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. Annual evaluation reports and materials, such as scorecards and supplemental narrative reports, should be publicly available on each IOU website and/or a centrally located page on the CPUC website.

If the IOUs do not act collectively to develop and implement a common scorecard, the CPUC could develop statewide WE&T goals and direct the IOUs to develop a common scorecard to measure, report and compare ongoing progress toward these goals. The CPUC could require that the IOUs submit the scorecard on an annual basis to report and measure progress toward specified WE&T goals. The scorecard could be available for public review, which may provide further incentive for the IOUs to target data collection efforts to effectively measure and demonstrate progress.

CPUC GUIDANCE ON WE&T DATA COLLECTION PRACTICES

Decisions issued by the CPUC instructed the IOUs to collect current data on jobs, workforce and other labor market characteristics for various energy efficiency programs. Decision 12-08-044 stated that the "IOUs should proactively collect, review, and act on" information related to workforce issues.[107] This decision directed California's four IOUs (Pacific Gas and Electric Company, Southern California Edison Company, Southern California Gas Company, and San Diego Gas and Electric Company) to collect and report workforce education and training (WE&T) data in seven areas[108] for the ESA program by February 1, 2013. Decision 12-11-015

[107] 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).

[108] Decision 12-08-044 directed the IOUs to immediately begin collecting data in seven WE&T areas: (1) Contractor and subcontractor contract terms (competitive bid, direct award, etc.); (2) Contractor and subcontractor compensation schemes (hourly, piecemeal, salaried, etc.); (3) Number of inspection failures and the types of failures (including the number of enrolled customers later deemed ineligible, number of incorrectly assessed households and instances of measure

directed the IOUs to follow ESA program WE&T data collection protocols for all other energy efficiency programs during the 2013-14 program cycle until a more comprehensive approach is designed by an expert entity.[109]

The discussion and orders in both the ESA program and the general EE proceedings emphasize that the purpose of data collection on workforce issues is to provide information that can improve program effectiveness. For both the ESA program[110] and the general EE programs, baseline data on jobs and workforce is necessary to answer a set of analytical and research questions about the impact of different workforce management approaches—including, but not limited to, training—on the cost and performance of energy efficiency improvements. As an example of the kinds of questions that could be answered with better data, the UCB-DVC Needs Assessment[111] presented anecdotal and qualitative evidence that low wages and high turnover negatively affect the quality of installations and the energy saved, but this cannot be systematically verified or quantified without basic data on both job and workforce characteristics and quality performance.

An additional purpose of collecting workforce data is to document the job and workforce outcomes of ratepayer energy efficiency investments. These outcomes can be used as metrics for the jobs and workforce "co-benefits" of energy efficiency investments. They can also systematically document labor conditions to verify and ensure compliance with existing employment and labor laws. The CPUC has recognized the concerns of stakeholders that IOU investments should create good jobs with living wages, offer access to good jobs for disadvantaged workers, and build career ladders that include adequate starting wages and a career path that leads to higher skilled, higher paid work.[112] The CPUC has not yet specified quantitative goals related to these co-benefits nor has it specified how these goals should be weighed against other priorities. However, it has recognized the value of baseline workforce data as a first step that can identify opportunities as well as areas of concern.

Data collection mechanisms must be designed with these overall purposes in mind. For addressing the goal of energy savings, workforce and jobs data will be inputs into an analysis of program effectiveness. For the second goal related to co-benefits, workforce and jobs data will be helpful to the CPUC in understanding the current situation and measuring progress over time. Baseline data and periodic monitoring has been an effective tool in

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installation inspection failures); (4) Level and type of IOU training (including lead safety training) and screening (including background check) these specific contractors have completed; (5) Customer feedback for these contractors, positive and negative; (6) Demographic data of the current ESA workforce, including minority, local, low income, disabled, displaced, and other disadvantaged communities; and (7) the IOU's assessment of any other needs of the existing workforce to meet the current and future ESA Program demands.

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

[110] 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. 179-180.

[111] 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.

[112] For example, see 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*.; Daniel, K., & J. Arce (2012, February 16). *Reply Brief of Green For All and Brightline Defense Project*; Daniel, K. (2012, May 24). *Green For All Written Opening Comments to the Proposed Decision*. p. 2-5; Gallardo E., & R. Young (2012, May 24). *The Greenlining Institute's Opening Comments on the Proposed Decision*. p. 11-15; Gallardo E., & V. Truong (2012. May 30). *The Greenlining Institute's Reply Comments on the Proposed Decision*. p. 4-5; Daniel, K., & J. Arce (2012, May 30). Brightline Defense Project and Green For All's Reply to Opening Comments on the Proposed Decision.

CPUC General Order 156, which promotes diversity in procurement, another potential co-benefit of ratepayer investments.

REVIEW AND ASSESSMENT OF CURRENT WE&T DATA COLLECTION PRACTICES

The IOUs complied with the CPUC's guidance on workforce data collection, and participated in a CPUC-established low-income WE&T working group to assess the data collection effort and offer suggestions for improvement. Their efforts to date involved conducting two separate surveys requesting self-reported information: one for ESA subcontractors and another for participating contractors in one of the many EE programs, the EUC program. The ESA survey instrument was a spreadsheet template sent via email to ESA subcontractors. The survey asked contractors questions regarding their entire workforce and did not ask for disaggregated data by job category or individual worker. The EUC program developed an online survey for participating contractors based on revised questions from the ESA survey. The main revision in the EUC survey was that the IOUs asked EUC contractors for information broken down by employee job category.[113]

Participation rates differed greatly between the two surveys due to differences in program structure. The ESA program is fully subsidized and ESA contractors have a subcontracting relationship with the IOUs (or as in the case of PG&E, their direct subcontractor, Richard Heath and Associates). For the ESA program, the IOUs required each ESA subcontractor to complete a survey, so the response rate was effectively 100 percent. One company was suspended from the program for a short time until they submitted a response.[114] In contrast, the EUC program, like many other (but not all) programs under the general EE proceedings, is a rebate program in which the end-user chooses and hires the contractor, and there is no direct subcontracting relationship between the IOU and the contractor. The IOUs asked EUC contractors to fill out the survey on a voluntary basis. The survey yielded a very low response rate of 16 percent.[115] These experiences demonstrate that collecting WE&T data through a survey is feasible, but only if the IOUs have a direct contracting relationship with program contractors. However, as previously discussed, we recommend the IOUs use an electronic certified payroll reporting system because it presents a lower burden for contractors due to an automated reporting process, provides for secure and confidential transfer of data, produces better quality and more comprehensive data based on certified payroll records, and is typically cheaper, compared to a survey. Notably, there were no questions related to compensation included in either survey, such as hourly wage rates by job category, rates paid per unit and number of units per day, hours worked per week, and whether workers received benefits such as employer-provided health care. Both surveys included a question about household income that asked for the number of employees eligible for California Alternate Rates for Energy (CARE), a program that provides a monthly discount on energy bills for income-qualified households.[116] This provides baseline data about whether ESA workers belong to a low-income household but does not supply any information about ESA wage and compensation levels because CARE eligibility is based on total combined gross annual household income and the number of

[113] Employee Job Type categories from the EUC survey were Management/Supervision, Office Work, Marketing, Installer, and Other.

[114] Email from Charles Segerstrom (2013, June 6). *P&GE*.

[115] A total of 57 responses were received out of 367 contractors surveyed. See 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*. p. 3.

[116] For more information, see The CARE Program (n.d.). *PG&E*. Retrieved from: http://www.pge.com/care/.

people in each household. Although CPUC direction did not specifically ask for data on wage and compensation levels, this type of information should be considered essential for the WE&T data collection effort.

While the IOUs have complied with the specific direction from the CPUC so far, we believe that the current efforts have fallen far short of what constitutes a meaningful effort to collect workforce data. Critical data was missing from the surveys, or was not collected in an adequate way. We identified at least three major deficits with the IOUs' current WE&T data collection efforts that undermine the usefulness of this effort for informing WE&T policy. These include: (1) no data collected related to wage levels and a number of other WE&T issues areas; (2) rigorous survey design methodologies were not followed, resulting in a variety of problems including, for example, the inability to disaggregate data by job category in the ESA survey; and (3) there are potential problems with self-reported data for some of the critical data needs such as employee compensation. The IOUs remain open to suggestions about collecting additional data and improving data collection strategies, although the CPUC has not issued further direction on this topic.

We encourage the IOUs to demonstrate leadership in this area. We suggest that they expand upon the CPUC's directive to collect ESA data in seven specific WE&T areas by incorporating these areas into a broader and more rigorous framework for WE&T data collection. Exhibit 5B.1 suggests a new framework consisting of six WE&T issue areas and provides an overview of the data needed in these areas compared to the data collected to date. This is our preliminary assessment and needs refinement if the IOUs adopt a more comprehensive approach.

Exhibit 5B.1 Suggested Framework for WE&T Issue Areas, Data Needed to Measure Progress, and Data Collected to Date

WE&T Issue Area	Data Needed to Measure Progress	Data Collected to Date
Job Quality	• Detailed data on wage and benefit rates, along with hours worked. This should include hourly earnings for workers paid by the unit.	• Both surveys collected data on compensation type (hourly, salary or per unit)[117] • Both surveys collected data on the number of CARE eligible employees[118] • EUC survey asked average hours worked per week by employee job type but did not include results in summary report to CPUC[119]
Workforce Diversity and Job Access for Disadvantaged Workers	• Detailed demographics and data on workforce by job category to see how targeted groups are represented throughout the full spectrum of jobs	• Both surveys collected demographics and other data on workforce (only EUC survey collected data by job category)[120]
Career Ladders	• Career trajectories over time	*none collected*
Training Investments	• Training completions • Hiring rates from various training programs • Turnover rates • Retention rates • Worker certifications / licenses	• ESA survey asked whether contractors were required to complete specified IOU trainings[121] • EUC survey asked for number of employees who attended specified IOU training classes[122] • EUC survey asked average years of employment in current position but did not include results in summary report to CPUC[123] • Both surveys collected data on worker certifications / licenses[124]

[117] 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*. p. 9; and Southern California Edison (2012, December 21). *Template for Collecting Energy Savings Assistance (ESA) Program Workforce Education and Training Data per D.12-08-044.* p. 2. This corresponds to the following WE&T area for ESAP data collection as instructed by the CPUC in D.12-08-044: (2) Contractor and subcontractor compensation schemes (hourly, piecemeal, salaried, etc.).

[118] Patrick, S. (2013, May 1) p. 10; and Southern California Edison (2012, December 21) p. 4. This corresponds to the following WE&T area for ESAP data collection as instructed by the CPUC in D.12-08-044: (6) Demographic data of the current ESA workforce, including minority, local, low income, disabled, displaced, and other disadvantaged communities.

[119] Patrick, S. (2013, May 1) p. 4 and 12.

[120] Patrick, S. (2013, May 1) p. 4, 10-11, 13; and Southern California Edison (2012, December 21) p. 3-5. This corresponds to the following WE&T area for ESAP data collection as instructed by the CPUC in D.12-08-044: (6) Demographic data of the current ESA workforce, including minority, local, low income, disabled, displaced, and other disadvantaged communities.

[121] Southern California Edison (2012, December 21) p. 6. This corresponds to the following WE&T area for ESAP data collection as instructed by the CPUC in D.12-08-044: (4) Level and type of IOU training (including lead safety training) and screening (including background check) these specific contractors have completed.

[122] Patrick, S. (2013, May 1) p 15. This corresponds to the following WE&T area for ESAP data collection as instructed by the CPUC in D.12-08-044: (4) Level and type of IOU training (including lead safety training) and screening (including background check) these specific contractors have completed.

[123] See Patrick, S. (2013, May 1) p. 4 and 12.

[124] The ESA survey asked each subcontractor for the total number of current active employees holding the following certification/licenses: Home Improvement Salesperson Registration, Lead Safe Practices, Other. The EUC survey asked each participating contractor for the number of employees in 2012 by employee job type that held the following certifications or licenses: BPI Certified (non-BA), HERS II Rater, BPI Building Analyst, Other. See Patrick, S. (2013, May 1) p. 14; and Southern California Edison (2012, December 21) p. 5.

WE&T Issue Area	Data Needed to Measure Progress	Data Collected to Date
Quality of Work	• Inspection success/failure rates • Call backs • Other measures of quality	• Inspection failure rates for ESA
Qualifications of Participating Contractors	• Contract terms (subcontractor, competitive bid, direct award) • Inspection success/failure rates • Contractor certifications / licenses • Contractor investments in employee training	• ESA survey collected data on contract terms, number and type of inspection failures, and customer comments.[125]

We also recommend that WE&T survey design follow survey research design protocols in order to increase its effectiveness. Many challenges arise from inadequate attention to survey design, for instance, revisions had to be made to the EUC survey after the fact, when the working group pointed out that there was insufficient detail about different job categories in the ESA survey.

Finally, collecting data through self-reporting comes with a number of inherent risks. For example, respondents may estimate information rather than identifying a precise answer due to time constraints or lack of knowledge, among other factors, or different respondents may interpret questions differently. Some of these risks can be mitigated through careful testing of survey questions. However, there is also the possibility of misreporting if respondents perceive a risk in answering accurately. Labor economists specializing in low-wage labor markets are especially cognizant of misreporting on data related to compliance, including critical areas addressed here such as wages. Data collection systems that rely on self-reporting, therefore, must include checks on self-reported data to ensure accuracy. One way to do this is to request that employers submit a sample of certified payroll records for workers employed by program subcontractors and participating contractors. Another potential avenue for checking self-reported data is through spot interviews of employees. Worker interviews, similar to employer surveys, require expertise and resources to design and develop a survey methodology and questions based on recognized protocols.

[125] Southern California Edison (2012, December 21) p. 1. This corresponds to the following WE&T areas for ESAP data collection as instructed by the CPUC in D.12-08-044: (1) Contractor and subcontractor contract terms (competitive bid, direct award, etc.); (3) Number of inspection failures and the types of failures (including the number of enrolled customers later deemed ineligible, number of incorrectly assessed households and instances of measure installation inspection failures); (5) Customer feedback for these contractors, positive and negative.

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