Clean Energy/Clean Tech Workforce Needs Assessment and Strategy for the Los Angeles Region

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PREPARED BY

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INTRODUCTION

The mission of the California Center for Sustainable Energy (CCSE) is to accelerate the transition to a clean energy future with a strong, low-carbon economy that provides abundant jobs and business opportunities, a high quality of life and a clean, healthy environment. To further this goal, CCSE asked Estolano LeSar Perez Advisors (ELP Advisors) to perform an assessment of workforce needs in the clean energy and clean tech sectors in the Los Angeles Region, understanding that these emerging industries cannot advance in the region without a trained workforce.

In addition, CCSE and the Los Angeles Cleantech Incubator (LACI) asked ELP Advisors to use the needs assessment as a basis to develop recommendations on direction and strategy for programming LACI's Workforce Training Center at the future La Kretz Innovation Campus, projected to open in 2015.

New job opportunities in the clean tech and clean energy sectors have been hailed as the holy grail for workforce and education leaders looking to rebuild the stock of middle-class jobs in America. However, the excitement over the opportunity to rebuild the middle class with "green collar" jobs coupled with a large infusion of training money from the American Recovery and Reinvestment Act (ARRA) ended up flooding the market with training programs in weatherization, energy efficiency and solar panel installation. The glut of trained entry-level workers who could not find placements resulted in

some backlash and skepticism about the idea of creating new training programs in the clean tech and clean energy sectors.

A 2011 study released by the California Community Colleges' Centers of Excellence identified the solar industry as one of the drivers of California's clean tech economy. However, the report also concluded that community colleges statewide have responded adequately to solar employment demand, with at least 55 colleges statewide providing some type of training. "Anecdotally, we heard colleges had difficulty matching graduates with jobs, and from conversations with some of the companies, we knew they had a lot of applicants per position," said Evgeniya Lindstrom, one of the report's authors and the director of the Inland Empire & San Diego/Imperial Center of Excellence. "What colleges need to do now is diversify their offerings to address other skills needed in the solar workforce."[1]

Our approach to this study has followed this lead. In our research, we have not found a large number of occupations in any particular clean tech or clean energy sector going unfilled for lack of workforce training programs. With regard to known, large-scale needs such as clean transportation and advanced manufacturing, energy efficiency installers and utility workers, the community colleges and workforce investment boards are aggressively developing programs and credentials to create pathways into entry- and mid-level green economy jobs.

[1] Press release from Centers of Excellence, "Study Finds Solar Industry Could Add 18,000 Jobs by 2015," Feb. 9, 2012, accessed Oct. 28, 2013, http://www.coeccc.net/documents/pressrelease_solar_sw.pdf.

However, the combined clean tech and clean energy industry is still very much in development, with new technologies and new companies emerging at a rapid clip. We found that the biggest concerns facing many companies in the sectors was not finding skilled workers but rather building a market for their products and wrestling with regulatory requirements. However, a need exists for local workers to upgrade certain skills in order to fulfill the growing service needs of the clean tech and clean energy sectors. This includes occupations that measure, evaluate and maintain equipment or products.

The Workforce Training Center will be a relatively small facility embedded in an innovative and entrepreneurial venue. It is ideal for a "just-in-time" model of training, where new and specific training needs can be met quickly. It is also well suited for higher skill and incumbent worker training or to add a specialization in partnership with an existing large-scale training program.

REVIEW OF RESEARCH

A. Sector Studies

Researchers have taken a keen interest in the question of the clean tech market's strengths and general workforce needs in Los Angeles, from the point of view of meeting employer needs and of new opportunities for job seekers. We reviewed the following reports, dating from 2008 to 2013, to understand current perspectives.

- Los Angeles Cleantech Cluster Project (Los Angeles Economic Development Corporation, 2013)
- 2013 U.S. Cleantech Leadership Index (Clean Edge, 2013)
- The Path Forward: Economic and Workforce Intelligence for Northeast Los Angeles (Los Angeles Economic Development Corporation, 2013)
- Industry and Labor Market Intelligence for the City of Los Angeles (Los Angeles Economic Development Corporation, 2013)
- 2013 California Green Innovation Index (Next10, 2013)
- Seven Growth Sectors Driving California's Clean and Efficient Economy (Environmental Defense Fund/Collaborative Economics, 2012)
- Presentation: Los Angeles and California: Leading in Clean Technology (Bill Allen, Los Angeles Economic Development Corporation, 2012)
- Many Shades of Green (Next 10, 2012)
- Electric Vehicles: The Market and Its Future Workforce Needs (Los Angeles Economic Development Corporation, 2012)

- Roadmap to Green Manufacturing in Los Angeles (UCLA Luskin School of Public Affairs, 2012)
- Los Angeles County: The New Leader in Bioenergy (Los Angeles Economic Development Corporation, 2012)
- Innovating the Green Economy in California Regions (Center for Community Innovation, UC Berkeley, 2011)
- Green Jobs and the Los Angeles Region (Phillip J. Romero, California State University, 2011)
- Workforce Trends and Needs in Green Sectors (California Community College Centers of Excellence, 2011)
- Clean Technology: Company Case Studies in the LA Region (Diaz, Cesar and Colleen Callahan, UCLA Luskin School of Public Affairs, 2011)
- California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response (Don Vial Center for Employment in the Green Economy, UC Berkeley 2011)
- Empowering LA's Solar Workforce (Los Angeles Business Council Institute, 2011)
- Data: Cleantech Businesses in California (Environmental Defense Fund, 2011)
- Presentation: Maximizing Investments (California's Green Collar Jobs Council, California Workforce Investment Board, 2010)
- California's Green Economy: Summary of Survey Results (California Employment Development Department, 2010)
- Clean Technology in Los Angeles: Improving the City's Competitiveness (Bedrossian, Kristina et al., UCLA Luskin School of Public Affairs, 2010)

- Clean Tech Corridor Study (Urban Land Institute/Community Redevelopment Agency of the City of Los Angeles, 2010)
- Water & Wastewater Occupations in the Bay Region (California Community Colleges Centers of Excellence, 2009)
- Green Industries & Jobs in California, Research Preview (California Community Colleges Centers of Excellence, 2009)
- Clean Technology Workforce Challenges and Opportunities (BW Research Partnership/LA Trade Tech, 2008)
- Water Operators, LA County (California Community Colleges Centers of Excellence, 2008)
- Environmental Scan: Heating Ventilation & Air Conditioning Occupations, Los Angeles County (California Community Colleges Centers of Excellence, 2008)

While there is no one definition for the term "clean tech," it is generally agreed to include clean energy generation, storage and distribution; advanced transportation and manufacturing; water technology and distribution; and building and site resource efficiency.

An annotated bibliography is attached, but a summary of the research finds that the state's clean tech growth sectors include renewable energy generation, energy efficiency, clean transportation, energy storage, finance and investment, advanced materials and energy infrastructure.[2] There were approximately five million people employed in what are loosely labeled "green

[2] "Seven Growth Sectors" and "Innovating the Green Economy."

occupations" in Los Angeles County in 2012. More than one million were in occupations related to architecture and engineering; computers and mathematics; life, physical and social sciences; building and grounds cleaning and maintenance; construction and extraction; installation, maintenance and repair; production; and transportation and materials moving[3] — fields that support clean tech. Energy generation represents a significant amount of the core green employment, and jobs in energy efficiency, energy storage, water and waste water[4] and recycling[5] are also significant.

In terms of the clean tech market, the State of California ranks fourth in the nation in installed solar PV capacity.[6] Los Angeles is home to the most ENERGY STAR-certified buildings in the nation, more than 30 biomass facilities (including landfills), 28 hydrogen fueling stations[7] and more than 230 publicly accessible charging stations countywide.[8] Plug-in electric vehicle sales in LA County are expected to account for 11.7% of all car sales by 2020.[9]

A growth in the market for a product indicates increased service-related jobs, but does not necessarily forecast a growth in local manufacturing jobs. As has been seen in other industries, local jobs growth in the field of energy

[3] Los Angeles County Green Occupations
[4] "Many Shades of Green" and "Seven Growth Sectors"
[5] "Clean Tech Corridor Study"
[6] "2013 U.S. Cleantech Leadership Index"
[7] Los Angeles Cleantech Cluster project
[8] Presentation: Los Angeles and California: Leading in Clean Technology
[9] Id.

efficiency is moving away from manufacturing products and towards the service sector[10] — in this case, sales, installation, repair and maintenance.

The Community Colleges' Centers of Excellence perform scans of industries and sectors to determine workforce and training needs as a basis for development of community college curricula. Theirs and other sector-specific research referenced below led us to look more closely at workforce needs in the areas that showed most strength and potential in the LA region: water plant operation, clean energy generation and distribution, clean transportation and building performance. We interviewed stakeholders in these fields to determine if they were aware of any workforce gaps. The next section will discuss these findings.

B. Funding Opportunities

After the large infusion of ARRA training dollars was allocated with mixed results, there has not been another large-scale federal opportunity for similar training. Federal funding has largely been focused on research and development and programs to revitalize manufacturing. However, there are potential opportunities within the large federal grant programs, if they are renewed, as well as at the state and local level. Descriptions of funding programs are in the attachment section on page 32.

[10] "California Workforce Education and Training Needs Assessment For Energy Efficiency, Distributed Generation, and Demand Response"

ANALYSIS OF WORKFORCE NEED

A. Industries or Occupations with Current Need

i. Building Performance[11]

Building performance is one of the most significant and accessible areas of potential energy savings in the county. There are both opportunities and obstacles presented by the availability of more efficient mechanical and lighting systems and construction materials.

a) Education for architects, contractors, designers on approval processes for new materials and technologies

Our research turned up many anecdotal accounts of building and safety or fire department inspectors who refused to permit a new technology or material due to lack of knowledge of the product. We hypothesized that there could be a need for continuing training on new products and technologies for local agency building inspectors to support their adoption.

In interviewing managers in both building and safety and fire inspection agencies, we learned that the constantly changing number of construction and mechanical innovations is so large that inspectors find it nearly impossible to stay current with the majority of very new products. Given the

[11] Based on interview with Frank Weckerle, Pasadena Fire Department, and Osama Younan, LA City Building and Safety.

pace of innovation, the field has generally placed the onus on architects, contractors, manufacturers or designers to ensure that innovative or reused products are verified to meet national codes and standards safety and performance requirements. The endorsement of large rating companies such as Underwriting Laboratories (UL) and Factory Mutual (FM) for the particular use of products is well accepted but also time consuming and expensive to obtain. Some larger inspection agencies may have their own testing labs where they can simulate a limited amount of safety and performance tests for unrated items or items used in a way not tested.

Products from other countries may be rated differently based on their countries of origin and that rating has to be interpreted by inspectors accordingly. Inspectors frequently find that architects, contractors or designers are unfamiliar with the national codes and standards requirements and have installed items that are difficult, if not impossible, to approve for that particular use. The resulting waste of time and resources is very challenging for a construction project. Inspectors agreed that it would be helpful for architects, contractors and designers to understand the ratings systems and approval process in advance of the inspection process so that they can make informed decisions about installing products and technologies in the design stage.

b) Additional and specialized building commissioners

Osama Younan at LA Building and Safety stated that several companies that "commission" or "retro-commission" buildings for LEED and Title 24 (CALGreen) certification that were having difficulty finding employees to do the commissioning work had contacted him. Jason Lorcher of Green Dinosaur, a company that commissions buildings, confirmed this. According to Lorcher, the skill set they were seeking included a good technical understanding of building systems (background in architecture, plumbing or mechanical engineering), strong communication skills and the ability to organize a complex process. Because new buildings over 10,000 square feet require CALGreen commissioning, and the market is driving increased voluntary commissioning, periodic recommissioning and retro-commissioning of existing buildings, there is a growing and sustainable need for people in this field. Lorcher found that not enough people with the right experience were seeking out these jobs, although full-time, year-round, annual salaries start in the mid-$50,000 range and can go up to $100,000.

Younan is chairing a committee to develop with the International Accreditation Service commissioning standards and specialized commissioning certifications in areas such as lighting and HVAC. Once these requirements, which include training and experience, are in place, there will be a need for existing building commissioners to upgrade their skills and accreditation. This is a growth area that CCSE and LACI may be able to fill.

ii. Carbon Footprint Analysis

AB 32 set a goal for California to reduce greenhouse gas emissions to 1990 levels by 2020 and to maintain and continue reductions beyond 2020. The law tasked the California Air Resources Board with quantifying this goal and implemented a mandatory emissions reporting system. In order to monitor emissions, they need to be tracked on a consistent basis by what are called "third-party verifiers," who are trained to identify, collect and assess relevant data on a baseline and continuing basis.

The Climate Registry is a nonprofit collaboration among North American states, provinces, territories and Native sovereign nations that sets consistent and transparent standards to calculate, verify and publicly report greenhouse gas emissions into a single registry.[12] "The concept of verification is similar to the concept of a regular financial audit: an annual external assessment of reported financial information (or GHG emissions) provides useful and credible information to an organization's stakeholders."[13]

The Climate Registry has identified a need for more trained third-party verifiers, both for their voluntary reporting program and to support AB32 compliance.[14] The model it has identified combines training and internships and leads to placement at the Registry or with Registry member consulting companies that offer the service. In initial conversations, the Climate Registry was interested in a potential training partnership between themselves, CCSE

[12] http://www.theclimateregistry.org/resources/verification/
[13] Id.
[14] Based on interview with Amy Holm, The Climate Registry.

and LACI. The training and internship program is estimated to be nine-month long, in concurrence with a school year. Although the work is very technical, trainees do not need to have an engineering background. Likely candidates are college or master's students in the fields of sustainability, environment, science or energy. The Registry is also interested in possibly developing a credential in this field, which could be administered via the training program.

iii. Employer Convening and Job Connection for Trainees

The most critical (and often overlooked) element in designing a career training program is connection with employers who will eventually hire the trainees. This also is often the most challenging element, as employers are busy and can be difficult to connect with successfully.

CCSE's San Diego GETUP program is a successful model matching training to employment through relationships with employers.[15] Through its management of the Energy Upgrade California initiative, CCSE was able to convene employers with a common workforce agenda. As energy efficiency companies entered the program and generated additional business, they needed to grow their capacity and engaged with CCSE in designing the training course to meet their needs. After a three-week instructional session, trainees, many of whom are displaced workers, are placed with participating local home performance contractors in a 40-hour paid internship. Approximately 80% of

[15] Based on interview with Jesse Fulton and Lindsey Taggart, California Center for Sustainable Energy.

the trainees graduate from the program and complete their internships, and 60% of those find paid full- or part-time work following the internship.

Another example is the Chicago Manufacturing Renaissance Council (CMRC), a coalition of business, labor, government and community leaders working to make Chicago the global leader in advanced manufacturing.[16] Beginning in 2005, CMRC convened local manufacturers to determine barriers to local production and sector growth. One of the key findings was a need to develop the next generation manufacturing workforce. As a result, CMRC founded a charter high school focusing on business and manufacturing skills. Employer partners provide funding, internships and jobs for the school and students. The Council continues to work together to identify ongoing sector needs and propose solutions.

Ideally, models like these could be replicated in a number of other clean tech sectors, both to better understand employers' actual and forecasted workforce needs and to foster connections between employers and job seekers via education, customized training, internships and direct placements.

Convening employers by cluster of activity or affiliation is the most practical way to begin. In the recommendations section, we have suggested a number of specific cohorts to approach. In particular, it would be valuable to stay in regular contact with companies affiliated with the LA Cleantech Incubator, to keep abreast of their company-specific workforce needs, to educate them

[16] http://www.chicagomanufacturing.org/

about workforce development resources and to gain early information about the new industries that they represent.

iv. Access to and Training on Advanced Manufacturing Equipment[17]

The U.S. Department of Commerce's National Institute of Standards and Technology funds Hollings Manufacturing Extension Programs (MEP) nationwide to assist small and mid-sized manufacturers with a variety of services, from innovation strategies and process improvements to green manufacturing. California Manufacturing Technology Consulting (CMTC) operates the MEP for Southern California. Based in Torrance, CMTC has been a very eager partner in grant proposals and initiatives that propose to connect existing local manufacturers to emerging clean tech manufacturing opportunities.

James Watson, CMTC's president and CEO, has had previous discussions with the LACI director about partnership opportunities to leverage the resources of the future Incubator's training and prototype manufacturing space. Although the community colleges are providing training in advanced manufacturing, there is more demand than availability, and LACI's location would be a benefit to manufacturers in the Central Industrial district.

Watson suggests two possible pathways for collaboration in support of small manufacturers. The first would be to add a short, 12- to 15-hour educational

[17] Based on interview with James Watson, California Manufacturing Technology Consulting.

and demonstration unit on advanced equipment to CMTC's Growth and Innovation consulting services track for small manufacturers. Manufacturers would be able to observe the capabilities of new technology such as 3-D printers to determine the usefulness to their own businesses. The second pathway would be training on and/or ongoing use of LACI's advanced manufacturing machines for small runs or prototyping, structured as, for example, a per-hour access fee or membership.

In both cases, CMTC could help design the curricula and market the programs to its network of manufacturers. Watson vetted LACI's proposed equipment list with colleagues who recommended that LACI consider adding a Computer Numerical Control (CNC) machine (cost ranges from $3,000 to $100,000), which would complement the additive manufacturing capacity of the 3-D printer with automated machine tools that remove material from a product.

B. Industries or Occupations with Potential Future Need

i. Clean Energy Generation and Distribution

There are certainly many new technologies and venues for evolving clean energy generation and distribution infrastructure. New technologies and venues mean that new and upgraded skill sets will be required of energy workers, both at the utility level and at the level of distributed generation. However, these workforce training needs and opportunities are among the

most highly visible of the clean economy, and thus there is already a great deal of activity and positioning by training programs in this field.

California's public and investor-owned utilities have many stakeholders involved in workforce program development. In addition to the community colleges, the relevant unions, most of which run their own training programs, are very engaged in training job seekers for well-paying utility jobs. The Los Angeles Department of Water and Power and its union IBEW Local 18 run a precraft utility worker training program in which entry-level candidates are trained by participating in direct-install residential efficiency projects.[18] Subsequently, they have the opportunity to move into the ranks of regular utility employees.

The electrical union IBEW Local 11 has a very sophisticated training center that aims to stay at the forefront of electrical technology, including solar power and advanced controls. Their goal is to keep their contractors and workers ahead of the latest trends to maximize their market share.

The investor-owned utilities (IOUs) fund a significant amount of workforce education and training. In September 2008, the California Public Utilities Commission adopted the California Long Term Energy Efficiency Strategic Plan to guide the scaling up of programs to meet California's clean energy goals.[19] The plan includes the goal of having a diverse, trained and engaged workforce adequate to support this effort by 2020. The IOUs commissioned

[18] "Training for the Future: Workforce Development for a 21st Century Utility," UC Berkeley Labor Center (2013), http://laborcenter.berkeley.edu/greenjobs/training_future13.pdf (Oct. 30, 2013).
[19] California Public Utilities Commission (CPUC) (2008). D.08-09-040. *Decision Adopting the California Long Term Energy Efficiency Strategic Plan.*

first a workforce education and training needs assessment and then an implementation strategy to improve efficiency and worker outcomes in energy efficiency, demand response and distributed generation. The implementation strategy is currently in progress and includes ELP Advisors as part of the strategy team.

The needs assessment forecast that public and private investment in energy efficiency would exceed $11 billion in California by 2020, leading to the creation of approximately 78,000 direct jobs statewide.[20] However, incumbents would fill most of these positions and only about 6,500 new FTEs would be created.

Distributed generation in Los Angeles has primarily taken the form of solar PV installation. With LADWP's new feed-in tariff program, solar installation will only increase. However, this occupation in particular has been the subject of a great deal of investment in worker recruitment and training, and experts feel this market for job seekers is saturated.[21]

[20] "California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation and Demand Response."
[21] Press release from Centers of Excellence, "Study Finds Solar Industry Could Add 18,000 Jobs by 2015."

ii. Waste to Energy[22]

The conversion of waste to energy can be done in a variety of ways, but the County and City of Los Angeles are most interested in pursuing noncombustion methods, such as anaerobic digestion. Eventually, as businesses develop the capacity and find the real estate to take on this work, they will need technicians and organic waste sorters. Because most of the technology and companies are nonlocal, local businesses may need assistance to develop in this field.

iii. Clean Transportation[23]

Los Angeles and San Francisco are home to the most plug-in electric vehicles in the country, accounting for a quarter of all electric car sales nationwide.[24] However, electric car manufacturers such as Coda and Fisker, with local area plants, have not been able to sustain production due to financial difficulties.[25, 26]

On the other hand, local transportation agencies such as Los Angeles METRO are procuring increasing numbers of electric buses and trains. In addition,

[22] Based on interview with Coby Skye, LA County and John Guevarra, Los Angeles Alliance for a New Economy.
[23] Based on interview with Linda Nguyen, LAANE.
[24] Gorzelany, Jim. "Cities with the Greenest Cars," *Forbes*, January 4, 2013, accessed Oct. 27, 2013, http://www.forbes.com/sites/jimgorzelany/2013/01/04/cities-with-the-greenest-cars/?goback=%2Emid_I778547589*415_*1_*1_*1#%21.
[25] "Fisker Automotive," Wikipedia, accessed Oct. 27, 2013, http://en.wikipedia.org/wiki/Fisker_Automotive.
[26] "Coda (Electric Car)" Wikipedia, accessed Oct. 27, 2013, http://en.wikipedia.org/wiki/Coda_(electric_car).

local community and workforce organizations have been advocating for a local manufacturing component to products purchased with public money, to some effect. Kinkisharyo, a Japanese railcar manufacturer, agreed as part of the terms of its successful railcar proposal to METRO to perform a certain amount of final assembly in the Los Angeles region. It has moved its U.S. headquarters from Massachusetts to El Segundo and is building its assembly plant in Palmdale, where it plans to hire more than 150 manufacturing engineers, production supervisors, quality control inspectors and technicians and master schedulers.[27]

Build Your Dreams (BYD), a Chinese electric car and bus manufacturer, established its U.S. headquarters in downtown Los Angeles and is locating its first U.S. assembly plant in Lancaster to build plug-in buses, energy storage modules and electric batteries for METRO and the City of Long Beach.[28] The plant will start with 50 employees and has plans to scale up over time.

Boulder Electric Vehicle, a manufacturer from Colorado, has begun building vehicle-to-grid bidirectional charging electric delivery trucks and utility vehicles at a plant in Chatsworth, starting with 30 workers.[29, 30] Several electric

[27] "Kinisharyo Plans to Move U.S. Headquarters to El Segundo," *LA Business Journal*, Sep. 6, 2013, accessed Oct. 29, 2013, http://www.labusinessjournal.com/news/2013/sep/06/kinkisharyo-plans-move-us-headquarters-el-segundo/.
[28] Li, Shan, "Chinese carmaker to open first U.S. plant in Lancaster in October," *LA Times*, May 1, 2013, accessed Oct. 29, 2013. http://articles.latimes.com/2013/may/01/business/la-fi-mo-china-bus-green-lancaster-20130501.
[29] Vincent, Roger, "Boulder Electric Vehicle to open Chatsworth assembly plant," *LA Times,* May 13, 2012, accessed Oct. 29, 2013, http://articles.latimes.com/2012/may/13/business/la-fi-mo-electric-vehicle-plant-20120513.
[30] "Electric Truck Manufacturer Boulder Electric Vehicle Successfully Demonstrates Vehicle-to-Grid Charging Across the Nation," *PR Newswire*, Sept. 11, 2013, accessed Oct. 29, 2013,

truck manufacturers are collaborating with the Port of Los Angeles to produce, sometimes locally, electric drivetrain vehicles for port drayage functions.[31] While all of these companies will need trained employees, the type of training required is more suited to the design and scale of a community college program. Moreover, LACI's location downtown is not a good fit for providing tailored training programs for these San Fernando Valley and North Los Angeles County transportation manufacturing plants.

With increased consumption of electric vehicles comes a need for electric vehicle and charging station service and maintenance. Numerous training programs in these fields already exist in LA County at community colleges, technical schools and universities, as well as directly through employers.[32] This niche appears to be already filled.

The Los Angeles Economic Development Corporation (LAEDC) in partnership with the Pacific Gateway Workforce Investment Network received a Regional Industry Clusters of Opportunity grant to develop a strategy for cluster development in alternative fuels and advanced transportation in Orange and Los Angeles counties.[33] Prior to this project, LAEDC had created an "E-Mobility Task Force" including employers and other stakeholders in the field to address issues promoting or hindering the adoption of electric vehicle technology

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http://www.prnewswire.com/news-releases/electric-truck-manufacturer-boulder-electric-vehicle-successfully-demonstrates-vehicle-to-grid-v2g-charging-across-the-nation-223286091.html.

[31] See, for example, www.balqon.com.

[32] Los Angeles County Economic Development Corporation: Economic & Policy Analysis Group. Electric Vehicles: The Market and Its Future Workforce Needs. 2012. http://laedc.org/reports/EV_PGWIN_FINAL.pdf.

[33] Based on interview with JoAnne Golden-Stewart, LAEDC.

such as charging station infrastructure. As this group progresses in its research into workforce need, there may be a niche for CCSE and LACI to fill. For example, research to date indicates opportunities for continued investment in managerial and entrepreneurial training for start-up firms. Another potential area may be in training local government employees who issue permits for electric vehicle chargers and other support equipment so that they are familiar with the new technologies.

C. Industries or Occupations Where No Training Need was Identified

i. Water Plant Operators[34]

While research performed by the Community College Centers of Excellence shows that there is a continuing need for trained and certified water operators due to projected retirements,[35] practitioners in the field see the issue not as a lack of training programs, but rather a result of the complicated certification requirements. In fact, as water technology has improved, fewer workers are needed. However, they need to be more highly trained. The community colleges and the American Water Works Association are providing necessary training modules, but a bottleneck is created by the requirement that workers obtain a certain number of hours of on-the-job experience before moving up a step on the certification ladder.

[34] Based on interview with Leticia Barajas, LA Trade Technical College; Richard Atwater, Southern California Water Committee; and Kevin Wattier, Long Beach Water Department.
[35] "Centers of Excellence. Water Operators: Los Angeles"

Employees are generally categorized as water treatment workers or water distribution workers. Water distribution tends to be mechanical and construction work; its credentialing requires a lower bar, and as the jobs are well paid, they are usually easy to fill. Water treatment credentialing, however, is a more difficult process. Water facilities are rated from 1 to 5, depending on the size and complexity of the system (with 5 being the largest and most complex). A grade 5 system, such as that of the Long Beach Water Department, requires a grade 5 operator on call at all times and a minimum grade 4 operator on site. To move up the ladder, an operator must not only pass the required certification tests; he or she must also have actual experience performing the higher-grade activities while at the lower-grade level under the supervision of an adequately certified operator. This requires a redundancy of hiring by water facilities in order to promote employees and maintain the minimum number of required certifications, which is difficult for the smaller agencies to support.

Solving this bottleneck will require coordination and potentially cost-sharing training arrangements among agencies. As such, this is not a problem that can be solved simply by providing space or programs at the Workforce Training Center.

ATTACHMENTS

- Annotated Bibliography of Research
- List of Training Funds
- List of Interviews

List of Interviews

JoAnne Golden-Stewart, Director of Public Policy, Los Angeles Economic Development Corporation (7/17/2013)

Board of Directors of Cleantech Los Angeles and the Los Angeles Cleantech Incubator (including David Abel, David Nahai, Kelli Bernard, Romel Pascual, Brad Cox, Evan Birenbaum, JoAnne Golden-Stewart (7/26/2013)

Evan Birenbaum, Program Manager for Environmental Strategy and Corporate Responsibility & Sustainability, Southern California Edison (7/31/2013)

Kevin Norton, Organizing Coordinator/Assistant Business Manager, IBEW Local 11 (8/12/2013)

Richard Atwater, Executive Director, Southern California Water Committee (8/16/2013)

Coby Skye, Associate Civil Engineer, Environmental Programs Division of the L.A. County Department of Public Works (8/28/2013)

Kevin Wattier, General Manager, Long Beach Water Department (8/30/2013)

Larry Frank, President, and Leticia Barajas, Vice President for Academic Affairs and Workforce Development, Los Angeles Trade Technical College (9/3/2013)

Javier Romero, Manager, California State Workforce Investment Board (9/3/2013)

Michael Swords, Executive Director of Strategic Research Initiatives, Office of the Vice Chancellor for Research, UCLA (9/4/2013)

Linda Nguyen-Perez, Senior Research and Policy Analyst, Los Angeles Alliance for a New Economy (9/4/2013)

David Nahai, David Nahai Companies (9/5/2013)

James Weckerle, Hazardous Materials Specialist, Pasadena Fire Department (9/6/2013)

Frank Lopez, Senior Public Policy Manager, Los Angeles Chamber of Commerce (9/10/2013)

Karly Katona, Assistant Senior Deputy for Environmental Sustainability, Office of LA County Supervisor Mark Ridley-Thomas (9/10/2013)

Steve Glenn, Co-Founder and Chair, Sustainable Business Council and Founder and CEO of Living Homes LLC (9/12/2013)

Gregg Irish, Executive Director, Los Angeles City Workforce Investment Board (9/17/2013)

Osama Younan, Chief of Green Building Division and Mechanical Engineering Section, LA City Department of Building and Safety (9/20/2013)

Amy Holm, Director of the Energy Efficiency Program, The Climate Registry (9/24/2013)

John Guevarra, Research and Policy Analyst, Los Angeles Alliance for a New Economy (10/3/2013)

Ben Stapleton, Director of Commercial Property, Los Angeles Better Buildings Challenge (10/7/2013)

James Watson, President and CEO, California Manufacturing Technology Consulting (10/8/2013)

Gillian Wright, Director of Customer Programs and Assistance, Southern California Gas Company (10/11/2013)

Jason Lorcher, Principal/Mechanical Engineer, Green Dinosaur (10/15/2013)

LAEDC E-Mobility Task Force (10/16/2013) (including JoAnne Golden Steward, Jeff Joyner, Michael Boehm, SCAG, SBA

Jesse Fulton, Building Science Manager, and Lindsey Taggart, Senior Manager, Building Performance , California Center for Sustainable Energy (10/16/2013)

Funding Programs

Workforce Investment Act Funding

The federal Workforce Investment Act (WIA) funds local training in various ways. SB 734 requires that at least 25% (30% by 2016) of annual, locally allocated federal adult and dislocated worker funds be spent on client training.[36] This can take the form of on-the-job training, customized training designed with employer partners, occupational training, skill upgrading and retraining, entrepreneurial training and workplace training in combination with classroom training. This funding is usually available through application to the local Workforce Investment Board or one-stops and is often allocated early in the program year.

The state also issues periodic RFPs for its discretionary allocation of WIA funding. Since clean energy and clean tech is an important sector to the state, it is likely that some discretionary funding could be available for a training program in that field in the coming year or two. Tim Rainey, the Executive Director of the State Workforce Investment Board, would be a good source of information about upcoming opportunities.

[36] SB734, accessed on 10/31/2013 at http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0701-0750/sb_734_bill_20111006_chaptered.html

Other Federal

The following programs fund training as at least a portion of the proposal. These programs are closed for the current application year but may be continued in future years.

Department of Labor: The Make it in America Challenge - MIIA2013

The Make it in America Challenge will provide up to $40 million in competitive grant funding through the DOC's EDA and NIST Manufacturing Extension Partnership (NIST MEP), DOL's ETA and the DRA. This collaboration allows applicants to submit one application to leverage complementary federal funding sources to support the development and implementation of a regionally driven economic development strategy that accelerates job creation by encouraging reshoring of productive activity by U.S. firms, fostering increased foreign direct investment, encouraging U.S. companies to keep or expand their businesses — and jobs — in the United States and training local workers to meet the needs of those businesses.
Closing Date: May 31, 2013
Link: http://www.doleta.gov/grants/pdf/MAKE%20IT_IN_AMERICA.pdf

Environmental Protection Agency: FY13 Environmental Workforce Development and Job Training (EWDJT) Grant

Annual Environmental Workforce Development and Job Training grants allow nonprofit and other organizations to recruit, train and place predominantly

low-income and minority, unemployed and underemployed people living in areas affected by solid and hazardous waste. Residents learn the skills needed to secure full-time, sustainable employment in the environmental field, including assessment and cleanup. These green jobs reduce environmental contamination and build more sustainable futures for communities.
Closing Date: Unknown (already closed)
Link: http://www.epa.gov/brownfields/pilot_grants.htm

Environmental Protection Agency: Brownfields Training, Research, and Technical Assistance Grant

The Brownfields to Greenfields Program assists communities across the country in establishing equitable and sustainable brownfields job development and training programs. The project's objectives are to provide professional learning communities with support to train residents for jobs in brownfields economic development programs and conduct annual forums for community participants with established brownfields job development and environmental training programs. The project will provide community residents with education and information regarding sustainable, renewable and green practices.
Closing Date: Unknown (already closed)
Link: http://www.epa.gov/brownfields/trta_k6/k6_08_hmrti.pdf

State

California Energy Commission: Alternative and Renewable Fuel and Vehicle Technology Program

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the Energy Commission to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The Energy Commission has an annual program budget of approximately $100 million to support projects that

- Develop and improve alternative and renewable low-carbon fuels
- Optimize alternative and renewable fuels for existing and developing engine technologies
- Produce alternative and renewable low-carbon fuels in California
- Decrease, on a full fuel-cycle basis, the overall impact and carbon footprint of alternative and renewable fuels and increase sustainability
- Expand fuel infrastructure, fueling stations and equipment
- Improve light-, medium- and heavy-duty vehicle technologies
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets
- Expand infrastructure connected with existing fleets, public transit and transportation corridors
- *Establish workforce training programs, conduct public education and promotion and create technology centers*

The statute allows the Energy Commission to use grants, loans, loan guarantees, revolving loans and other appropriate measures. For fiscal year 2013-14, the
Energy Commission reserved $1.5 million for workforce training and developm ent and related support projects. Eligible recipients include public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters and academic institutions.
Link: http://www.energy.ca.gov/altfuels/

California Workforce Investment Board: Alternative and Renewable Fuel and Vehicle Technology Program Regional Industry Cluster of Opportunity II Grants SFP 2013/14

The Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program will award grants to applicants in support of Regional Workforce Development Networks that are developing industry sector partnerships that have the most compelling proposal to support regional industry clusters that are forming as a result of the growth of alternative fuel and vehicle industries. The proposal should seek to develop the necessary specialized workforce by developing career pathway opportunities for their regional residents.
Closing Date: June 3, 2013
Note: the LAEDC/Workforce partnership applied for this second round grant.
Link: https://cms.portal.ca.gov/cwib/SiteEdit.aspx?p=4887

Employment Training Panel

The State of California's Employment Training Panel (ETP) provides funds to offset partially the costs of necessary job skills training for jobs that are threatened by out-of-state or international competition. The funding comes from the Employment Training Tax paid by California employers and is awarded as a match to an employer's training investment. In order for the employer to be reimbursed, trainees must successfully complete training and be retained in jobs at or above a required wage base for at least 90 days. In October, the ETP approved 28 contracts worth more than $6.6M in job training funds for proposals in sectors including manufacturing, green technology and transportation/logistics.[37] Anecdotally, this funding stream can be difficult to use because of all the requirements, but when it is applicable, it is a very solid base of ongoing funding.

Link: http://www.etp.ca.gov/

[37] "Employment Training Panel Approves Over $6M to Train California Workers for New Jobs," State of California Employment Training Panel press release, accessed on 10/31/2013 at http://www.etp.ca.gov/docs/pressreleases/October%202013%20Press%20Release.pdf

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Bedrossian, Kristina, Sarah Locher, Frank Lopez and Matthew O'Keefe, UCLA Luskin School of Public Affairs. *Clean Technology in Los Angeles: Improving the City's Competitiveness.* 2010. http://luskin.ucla.edu/sites/default/files/Clean%20Technology%20in%20Los%20Angeles.pdf.

> *This report assesses Los Angeles's strengths and competitiveness by comparing it to competitor cities on the following seven business placement factors: workforce, land & facilities, business environment, financing and funding access, industry clustering, transportation systems and quality of life.*

BW Research Partnership. *Clean Technology Workforce Challenges and Opportunities.* 2008. http://www.lattc.edu/dept/lattc/acaaffairs/files/Clean_Technology_Report.pdf.

> *This report describes Los Angeles's clean technology cluster and assesses current and emerging workforce needs within Los Angeles and Orange County region.*

California Community Colleges Centers of Excellence. *Green Industries & Jobs in California, Research Preview.* 2009.

> *This report discusses a top occupations/jobs identified in the green economy. For each occupation a brief understanding of what influences the job outlook, earnings potential, skills, training opportunities and*

training gaps and well as recommendations for community colleges to consider.

California Community Colleges Centers of Excellence. *Environmental Scan: Heating Ventilation & Air Conditioning Occupations, Los Angeles County.* 2008.

This report provides an informative overview of the HVAC sector in California and as it relates to the county. Topics covered include occupations, career pathways and employers' needs and challenges within the industry. Finally, it offers a set of recommendations for colleges interested in workforce training for HVAC occupations.

California Community Colleges Centers of Excellence. *Water Operators: Los Angeles County.* 2008.

This report looks as the existing workforce and predicted job opportunities for water operators. There is an expectation of expanded opportunity over the next five years as many employees reach retirement. The report also looks at what training and certifications are necessary or beneficial for those looking to enter the field. Lastly, existing training programs in LA County are discussed, and recommendations are provided for how the programs may move forward given the research findings.

California Community Colleges Centers of Excellence. *Water & Wastewater Occupations in the Bay Region, Key Findings.* 2009.

This brief touches on the employers (water and wastewater utilities and agencies) in the Bay Area. A table outlines the industry's seven related occupations with information on employment, growth rate and estimates for new and replacement jobs, based on the expected number of retirement. One of the key challenges highlighted is the difficulty of hiring for certain occupations relative to others. Electrician/electrician technician and EMT/instrument technician were identified as the two most difficult occupations to hire for, but were also expected to have a higher retirement rate in the coming years.

California's Green Collar Jobs Council, California Workforce Investment Board. *Maximizing Investments [Presentation].* 2010. http://www.green-technology.org/gcsummit/images/Green_Jobs_1.pdf.

This presentation discusses the value that the Green Collar Jobs Council provides employers and the workforce by serving as a bridge and facilitator for resources and partnerships. Two main strategies are related to promoting data-driven work and better understanding the green workforce needs. Focuses of the council are energy efficiency, water, solar, automotive and wind. Costs, reach and goals the three pieces of the California Green Workforce initiative are outlined. The key findings of Many Shades of Green are also highlighted. A second presentation focuses on the economic competitive strategies to maximize investments. It provides an overview of the benefits and characteristics of the state sector strategies, followed by case studies of three counties with green funding — Alameda, Butte and Sacramento.

Clean Edge. *2013 U.S. Cleantech Leadership Index.* 2013. http://www.cleanedge.com/sites/default/files/CTLI-2013-Report.pdf.

> *The U.S. Clean Tech Leadership Index contained findings from the 2013 editions of the Clean Edge's State and Metro Indexes, which tracks clean tech activity in the U.S. based on a diverse set of indicators. Report looks at technology, policy and capital at the state level. The report looks at green buildings, advanced transportation, clean electricity and carbon management and clean tech investment innovation and workforce at the metro level. California ranks 1st in the state index. Los Angeles ranks 4th in the metro index.*

Diaz, Cesar and Colleen Callahan, UCLA Luskin School of Public Policy. *Clean Technology: Company Case Studies in the Los Angeles Region.* 2011. http://luskin.ucla.edu/sites/default/files/Clean%20Tech%20Company%20Case%20Studies.pdf.

> *Five clean technology companies in the Los Angeles region were interviewed to gain insights from firms of various sizes and in various sectors. The case studies highlight factors that contribute to the local clean tech industry including trends, public policies and business incentives. Regional challenges that clean tech firms may face are also explored.*

Don Vial Center for Employment in the Green Economy, UC Berkeley. *California Workforce Education and Training Needs Assessment.* 2011. http://www.irle.berkeley.edu/vial/publications/WET_Part1.pdf.

The Workforce Education & Training Needs Assessment is a by-product of the California Long Term Energy Efficiency Strategic Plan, which was adopted by the California Public Utilities Commission in 2008. The plan provides a roadmap for the dramatic scaling up of EE efforts to meet California's EE goals.

Environmental Defense Fund. *Cleantech Businesses in California.* 2011. [Data].

Environmental Defense Fund/Collaborative Economics. *Seven Growth Sectors Driving California's Clean and Efficient Economy.* 2012. http://www.edf.org/sites/default/files/EDFSevenSectors-5.24.2012pdf.pdf.

This report identifies seven growth sectors in California's clean and efficient economy. They include energy generation, energy efficiency, clean transportation, energy storage, finance & investment, advanced materials and energy infrastructure. The seven growth sectors are subsectors of the 15 identified in Next 10's Many Shades of Green. The report looks at employment numbers by sector in Los Angeles County.

Los Angeles Business Council. *Empowering LA's Solar Workforce: New Policies that Deliver Investment and Jobs.* 2011.http://dornsife.usc.edu/pere/publications/empowering.cfm.

This report is the fifth in a series on the solar industry. It focuses on understanding the regional infrastructure for workforce development in the solar industry, the potential for solar in different parts of the region and policies that could lead to greater equity outcomes. Case studies on existing training programs in the LA region also are included.

Los Angeles Economic Development Corporation: Economic & Policy Analysis Group. *Electric Vehicles: The Market and Its Future Workforce Needs.* 2012. http://laedc.org/reports/EV_PGWIN_FINAL.pdf.

This report analyzes the market for electric vehicles, the infrastructure in place to support them and the forms of investments and incentives that are needed. The second part of the report looks into workforce training programs in LA County. This is followed by a directory of all occupations related to the electric vehicle industry, with details on each.

Los Angeles Economic Development Corporation: Economic & Policy Analysis Group. *The Path Forward: Economic and Workforce Intelligence for Northeast Los Angeles.* 2013.

The Northeast Los Angeles River Corridor study gives a overview of the region's geography and demographics, followed by in-depth anlysis of the the labor market and occupational landscape.

Los Angeles Economic Development Corporation: Economic & Policy Analysis Group. *Indusry and Loabor Market Intelligence for the City of Los Angeles. 2013.*

This report gives an overview of the city's demographics before diving into analysis of the labor market and employment by industry and occupation. This is followed by an in-depth look at the job market within different industries in Los Angeles.

Los Angeles Economic Development Council. *Los Angeles and California: Leading in Clean Technology* [Presentation by Bill Allen]. 2012.

http://asiasociety.org/files/uploads/286files/LAEDC%20-%20LA%20%20California%20as%20Leaders%20in%20Cleantech%20Biz%2009-28-2012%20by%20Bill%20Allen%20%28FINAL%29%20%282%29.pdf.

This presentation first discusses the achievements in green tech and policy in which California has been the leader. Then, focusing more on LA County, recognizes its strength in skilled labor, trade and more recently, electric vehicles. The growth of the local electric vehicle market is presented as an example and opportunity for LA to further its investment in clean tech.

Los Angeles Economic Development Corporation. *Los Angeles Clean Tech Cluster Project.* 2013. http://laedc.org/cleantech/.

The LAEDC Cleantech Cluster Project is a first attempt at examining the current and future state of clean technology in Los Angeles County.

Los Angeles Economic Development Corporation. *Los Angeles County: The New Leader in Bionenergy.* 2012. http://laedc.org/wp-content/uploads/2013/03/2013-LAEDC-Industry-bioenergy-FINAL.pdf.

This brief document outlines the potentials for the bioenergy industry in Los Angeles. Much of the emphasis is on waste-to-energy projects, citing the different sources and volume of local waste. Connections are made to the consumer end of bioenergy and the role it plays in moving green transportation forward.

Next 10. *2013 California Green Innovation Index.* 2013. http://next10.org/sites/next10.huang.radicaldesigns.org/files/2013%20California%20Green%20In(Romero 2011)novation%20Index%20031913.pdf.

> *The Green Innovation Index tracks the state's progress in reducing GHG emissions, generating technological and business innovation and growing businesses and jobs that enable the transition to a more resource-efficient economy. Their indicators include the carbon economy, energy efficiency, renewable energy, clean technology innovation and transportation.*

Next 10. *Many Shades of Green.* 2012. http://next10.org/sites/next10.huang.radicaldesigns.org/files/MSOG_2012_M2.pdf

> *This report looks at California's green economy, identifies key sectors and occupations and looks at the breakdown of the "core green" sector by California region. Source: Green Establishment Database (Collaborative Economics)*

Romero, Phillip J., California State University, Los Angeles. *Green Jobs and the Los Angeles Region.* Californians for Clean Energy & Jobs Network. 2011

> *This report forecasts the jobs in the clean tech industry as it was beginning to grow. In addition to employment outlook, there is discussion on the promising earning power potential that can be related to the skills requirements of the industry occupations. The report also touches on the policy landscape and the implications for*

employment benefits, as well as the indirect effects of the growth of the clean tech industry.

State of California, Employment Development Department, Labor Market Information Division. *California's Green Economy: Summary of Survey Results.* 2010. http://www.energy.ca.gov/cleanenergyjobs/GrSurveyRpt_1115.pdf.

This report summarizes a survey conducted by the Labor Market Information Division that estimates the number of green jobs/practices in California's economy. Their working definition of green jobs/practices is as follows: "Jobs that produce goods or services that result in: generating and storing renewable energy; recycling existing materials; energy efficient product manufacturing, distribution, construction and maintenance; education, compliance and awareness; and natural and sustainable product manufacturing.

UC Berkeley Center for Community Innovation. *Innovating the Green Economy in California Regions.* 2011. http://communityinnovation.berkeley.edu/reports/cci-ucb_innovating-green-econ-ca-regions_2010.pdf.

Identifies four principal sectors of the clean energy economy: renewable energy and alternative fuels, green building and energy efficiency technology, energy-efficient infrastructure and transportation and recycling and waste to energy.

UCLA Luskin School of Public Affairs. *Roadmap to Green Manufacturing in Los Angeles: Policies, Planning and Partnership for Quality Jobs.* Spring 2012. http://dornsife.usc.edu/pere/documents/Comp_Project_Final_Report_web.pdf.

This report provides an in-depth analysis of Los Angeles's manufacturing industry. It specifically looks at the challenges faced by manufacturers, recommendations for the evolving global economy and suggestions for additional research that can further support a manufacturing initiative. A literature review on green manufacturing and case studies on other cities are also included. Other topics covered are roles for organizations, unions and training services.

Urban Land Institute/Community Redevelopment Agency of the City of Los Angeles. *Clean Tech Corridor Study.* 2010

This study analyzes opportunities and ways to position the Downtown Los Angeles industrial area as a hub for clean tech innovation and manufacturing.