California Green Innovations Challenge
2012 SolarTech Leadership Summit Workforce Session

Recommendations for a National Clean Energy Workforce Development Roadmap
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Energy Workforce Development Roadmap

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Preface

The California Labor & Workforce Development Agency (LWDA) is the state agency responsible for coordinating labor and employment programs for workers and businesses. Within the LWDA, the California Employment Development Department (EDD) offers a wide variety of services to Californians under the Employment Service, Unemployment Insurance, State Disability Insurance, Workforce Investment, and Labor Market Information programs.

The EDD provides labor market information to employers, job seekers, and others, including policy makers, economic developers, economists, and planners. Its programs provide job search workshops, referral to education and training, and supportive services to help keep employers, employees, and job seekers competitive.

Within the LWDA and the EDD, the Green Innovation Challenge grants encourage industry leaders to collaborate with workforce development organizations and find innovative methods to determine the workforce needs of businesses (characterize the labor market), identify actions to address priority industry needs in commercialization and application process, and integrate/align actions into an overall collaborative strategy. The objectives are to fill immediate employment needs as well as develop a partnership and infrastructure flexible enough to support employment growth for up to 10 years.

The grants encourage business-led partnerships in a number of counties to develop the most creative methods to accelerate talent development to serve increasing employment specialties within the green economy. The programs offered will support development of a highly-trained workforce with the critical skills required for jobs in the following clean tech sectors:

- Renewable energy generation
- Energy efficient buildings
- Alternative and renewable fuels
- Efficient vehicles
- Energy storage

Key Acronyms

GIC, Green Innovations Challenge, a California state 2010 grant initiative
LWDA, California Labor and Workforce Development Agency
FHDA, Foothill-De Anza Community College District (FHDA), Los Altos Hills, Calif.
NOVA, North Valley Job Training Consortium, Sunnyvale, Calif.
SWIC, SolarTech Workforce Innovations Collaborative, which includes SolarTech, NOVA and FHDA
Acknowledgements

From SolarTech and the SolarTech Workforce Innovations Collaborative (SWIC)

The original state grant proposal and SWIC/Solar Workforce Acceleration Method definition came about through the collaborative efforts of:

- Shonda Ranson, Workforce Analyst with NOVA, and now with the City of Sunnyvale, CA
- Catherine Ayers, Project Manager, Professional & Workforce Development, Foothill-De Anza Community College District
- David McFeely, Director of Grants and Industry Solutions with SolarTech

Upon successfully securing the SWIC grant, countless individuals played key advisory, leadership, and program execution roles. The list is extensive and the following represent just the beginning of a very important cast of participants representing the three structural legs of the collaboration:

- Justin Bradley, Principle of Bradley Consulting
- Rick Kuhn, Director of Economic & Resource Development at Foothill-De Anza Community College District
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- Doug Payne, Executive Director, SolarTech
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- Doug McKenzie, Recruiter & Consultant, SolarTech
- Dr. Meghna Virick, Professor, San Jose State University
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- Andrea Luecke, Executive Director, The Solar Foundation
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1.0 Executive Summary

It is the best of times and worst of times for the solar and clean energy sectors.

Volatility is the rule, even more than it is in the rest of the U.S. economy. While global investing in renewable energy increased by 17% to an all-time high of $257 billion in 2011, share prices were down primarily because of overcapacity. Solar industry market growth in particular has been phenomenal. But casting a shadow over that growth has been the lagging job market, which is significantly behind projections. The Solar Foundation projected 26% job growth in the U.S. for 2011, but the actual growth rate came in at 6%, which was nowhere close to keeping up with revenue and installation volume growth. Under great market pressure, the sector is becoming more efficient.

That amazing revenue growth occurred in spite of a steep national downturn from late 2008 through 2010, and a weak recovery in 2011 and 2012. During that time, the solar industry still managed to grow at an average rate of more than 40% year on year. Fueled by unprecedented levels of government support throughout the industrialized world, including a wide array of direct and indirect incentives and subsidies, the nascent market now seems ready to sustain itself without these economic “training wheels.”

On the other hand, not all is well in the manufacturing sector. The Solar Energy Industries Association (SEIA) reported a 50% decline in c-Si module prices in 2011. The general trend continues in 2012. Lower prices are great for customers, but tough on manufacturers and manufacturing jobs. Production overcapacity and questionable pricing tactics from Chinese manufacturers is leading to market consolidation and the loss of many high-value jobs in the short- to medium-term.

Given the enormous public investment in preparing workers for the clean energy sector, we have an obligation to leverage the lessons learned by identifying and deploying the best practices developed through these subsidies. These top ideas and programs can be featured in a national roadmap applicable to regions throughout the U.S.

In addition, this current and sustained period of general economic malaise makes more urgent the need for a sustainable and efficient workforce development system. It is now a critical time for clean energy companies to take the lead and fund the workforce development needed to support the next great phase of growth.

Also, job seekers need an efficient, real-time way to identify key trends in skills requirements so that they can get the proper training and develop the most effective tactics for finding work. Hiring managers need pipelines of properly-trained talent that they can fit quickly into their operations.

With such significant challenges and opportunities facing the sector, SolarTech believes an accelerated industry-driven and industry-funded national workforce development roadmap can best prepare us to take advantage of the next steep growth curve. We submit this report as a basis upon which to build that strategic plan.
Such a plan requires an organizational foundation of several regional industry-driven and industry-funded private/public workforce partnerships in a handful of the top U.S. markets. Each regional group would be comprised of one or more core industry associations, leading workforce development entities, and education and training organizations, along with supporting government agencies such as the Department of Energy.

We believe that the Solar Workforce Acceleration Method (SWAM) described here is a compelling model for such regional partnerships and should be considered alongside other candidates, such as PG&E’s Power Pathway. What distinguishes SWAM from other workforce development frameworks is that it is a demand-side strategy and a process focused on the needs of the employers, where typical workforce training strategies are supply-side driven.

This report provides details of SWIC’s partnership research and market experiences, as well as the results of strategic conversations among sector leaders at SolarTech’s Solar Leadership Summit, which took place on March 7 and 8 in San Jose, California. It includes a thorough labor market analysis, from a 6-month roll-up of week-to-week job data in Bay Area solar and energy efficiency markets to regional employer surveys highlighting trends such as leading occupations and employers.

It also contains a description of the SWAM process we have developed, which will be detailed in a publicly-available “how-to” manual that could be applied to any sector in any part of the country.

Finally, it presents strategic recommendations for a multi-regional partnership roadmap of the solar and clean energy industries to initiate economically sustainable workforce development services and funding. Such a roadmap would require considerable additional input and research, but we are confident that, with the leadership of such partners as the DOE, IREC, Solar Foundation, PG&E and others making breakthroughs in this arena, we can complete that plan and begin taking action within the coming year.
2.0 Introduction

2.1 Overview: SolarTech Workforce Innovations Collaborative (SWIC) and Solar Workforce Acceleration Method (SWAM)

SolarTech Workforce Innovations Collaborative (SWIC) -- a partnership of SolarTech, the North Valley Job Training Consortium (NOVA) and the Foothill-De Anza Community College District (FHDA) was awarded a $4 million grant in July 2010 as part of the Green Innovations Challenge. This workforce development group was created through the leadership of SolarTech’s Workforce Committee to prepare the Bay Area to meet the labor needs of the burgeoning and fast-changing clean-tech industry over the next two years.

The Green Innovations Challenge is part of a highly competitive effort to focus on green jobs that was begun in May 2010 by the California Labor and Workforce Development Agency (LWDA). SWIC’s grant was among five statewide awards issued by the LWDA totaling $19 million.

SWIC’s mission is to identify the immediate and mid-term unmet workforce needs of the solar industry. Through its unique model, SWIC is connecting job seekers, educators, and employers to better align labor supply and demand.

The ultimate goal: To leverage real-time market intelligence and create educational programs providing the right type of training at the right time so that 245 regional workers are trained and placed in renewable energy jobs. SWIC was unique in defining two programmatic proposals:

1. A tight programmatic and management relationship between the three lead partners:
   - NOVA Workforce Board handling the coaching and placement of the target client population;
   - Foothill-De Anza Community College District handling training, curriculum development, and the relationship with other local colleges;
   - SolarTech industry association handling the industry relationship and labor market research activities.

2. Proposal and development of real-time labor market investigation methods based on well-known product management techniques used by technology companies to guide their business offerings.
This combination of management structure, roles and responsibilities, and leveraging traditional product management and marketing techniques comprises what we call the Solar Workforce Acceleration Method (SWAM), which was piloted and proven within the SWIC grant program.

![SWAM Process Piloted Through SWIC Grant](image)

2.2 Pulling it all Together

SWIC published more than 40 reports over two years, including multiple in-depth labor market analyses, occupational profiles, summaries of events, industry interviews, and numerous job board studies.

This white paper provides an overview of the solar and energy efficiency labor markets and a summary of the conversation that took place at the SolarTech Solar Leadership Summit. The Workforce Session delved into workforce development drivers and trends while fostering a rich dialogue about industry needs, gaps, and opportunities.

Participants explored best practices for workforce development and training, establishing the framework for a national roadmap. This white paper is intended to provide:

1. A high-level analysis of the solar and energy efficiency industries
2. A detailed review of current labor market data across these sectors
3. A summary of the Workforce Session at the SolarTech Leadership Summit, including employer requirements and national workforce development trends
4. An understanding of the industry-led Solar Workforce Acceleration Method (SWAM)
5. A set of recommendations for a national workforce development roadmap
6. An assessment of various funding mechanisms to leverage both public and private investments
3.0 Market Overview

3.1 Industry Analysis: Shining Light on the Solar Industry

Market Size & Growth

Despite tumultuous falls of solar manufacturers both here and in Europe, solar advocates have cause to celebrate. The global market for solar photovoltaics (including modules, system components, and installation) increased from $71.2 billion in 2010 to a record $91.6 billion in 2011. Analysts project the market will continue to expand to $130.5 billion by 2021.

While total market revenues were up 29%, installations climbed more than 69% from 15.6 gigawatts (GW) in 2010 to more than 26 GW worldwide in 2011.

Last year saw historic growth in the U.S. solar energy industry, with the installation of 1.85 GW of capacity, a 109% jump over the previous year.

This growth occurred across residential, commercial, and utility segments in most of the top solar states. Perhaps even more significant is the growing number of traditional energy companies choosing to invest in the largest solar projects.

While system developers have been growing, U.S. and European manufacturers have suffered a 50% price drop in panel prices. This is due to a combination of factors including, a slowdown in global demand, doubling of global manufacturing capacity and questionable pricing practices by Chinese manufacturers. As a result, eroding profit margins shut down some U.S. manufacturing plants, including the notorious failures of Solyndra and Evergreen. Despite these closures, U.S. module manufacturing capacity expanded 28% while production remained flat for the year.

Up until Q1 of this year, California held a regional leadership position in the domestic market, although the state’s share of U.S. domestic installed capacity fell from 90% in 2004 to 30% in 2011. Much of the market has shifted away from California to a small set of secondary states and in Q1 of this year New Jersey edged out California for the lead in solar installations.

Figure 4: Solar Growth in the U.S. by State

Figure 3: Solar Industry Growth Worldwide
3.2 Situation Analysis: Clean Energy Sets the Stage for a Regional Comeback

Silicon Valley has been leading the way nationally both in the deployment of solar energy and energy efficiency programs. As one of the first regions to feel the pain of the national recession, Silicon Valley now is one of the first making strides toward economic recovery. According to the 2012 Index of Silicon Valley from Joint Venture Silicon Valley, a few key sectors are leading regional growth and helped fuel creation of more than 42,000 jobs in the past year alone.9

Overall unemployment in Silicon Valley fell 1.4% in a year to 8.3% in December 2011, putting it on par with the rest of the country but significantly lower than the 10.9% rate for the rest of the state. Several indicators point to solar power and energy efficiency as bright spots in this story.

“Smart grid-related” jobs in the region rose from 12,560 in 2009 to nearly 17,800 by the end of 2010, according to a report from the Silicon Valley Leadership Group. During that same period, California total employment fell nearly 8%.10 More than half the jobs counted in the report, “Smart Grid Deployment and the Impact on Silicon Valley,” are in the category of distributed generation, which is mainly attributed to solar companies.

According to the report, about 3,100 jobs, or 17%, were in energy storage, which includes electric vehicle batteries and grid applications. Nearly as many jobs -- 2,800, or 16% of the total -- fell into the “power management and energy efficiency products” category, including applications such as smart appliances and power electronics. The remaining 1,600 jobs, or 9% of the total, were in transmission and distribution.

Silicon Valley’s core high-tech jobs engine provided the backdrop for this green sector growth. Overall, software accounted for nearly 120,000 jobs in 2010, semiconductor and equipment manufacturing employed approximately 49,000, and 38,500 people worked in computer hardware.11 Of those, clean energy and smart-grid sector jobs account for about 15% of software workers, 36% of semiconductor employment and 46% of computer hardware jobs in the region.

Venture capital forms a critical linchpin in Silicon Valley job creation. Overall venture capital funding grew from approximately $6 billion in 2010 to a bit more than $7 billion a year later, while clean-tech venture funding nearly doubled from about $1.5 to $3 billion over the same period. Clean energy generation, energy efficiency, and energy storage dominated regional venture capital investments in the sector.12

This is good news for solar and energy efficiency companies that have been struggling over the past few years to secure funding. But does venture capital ultimately translate into sustainable economic growth and reliable local jobs?
3.3 Defining the Solar and Energy Efficiency Labor Markets

The U.S. Solar Labor Market: Small Industry – Large Growth

Growth of an industry does not necessarily translate into commensurate job growth. For instance, while solar installations grew nearly 100% between 2010 and 2011, the industry generated only about 6.8% more jobs. And while that certainly is far better than the national job growth rate of 0.7% for the same period, it would seem that solar companies should be hiring more people.

Two factors have played against that happening: Integration and consolidation among solar companies keep employment levels stable, while increasing productivity per worker keeps headcounts stable.

According to The Solar Foundation’s “Solar Job Census Report,” the industry employed 100,237 workers in 2011, up from 93,000 the previous year. The growth outlook for 2012 is projected to be 24%, or approximately 124,000 workers.

Installation firms expect to add the most new jobs, followed by distribution and manufacturing.

In 2011, California’s solar industry employment alone represented nearly one quarter of all solar employment in the U.S.

Forward looking, employment in the industry is expected to hit nearly 300,000 jobs, according to data from The Solar Foundation, Greentech Media and the SunShot initiative.
Energy Efficiency – Plucking the Low-Hanging Fruit

California consistently has been a leader in promoting energy efficiency within buildings. According to the 2010 Clean Tech Jobs Trends report, the state is home to four of the top 15 metro areas for energy efficiency employment, including the two largest – the Bay Area and Los Angeles.  

California regulators have been promoting energy efficiency measures vigorously, providing a variety of incentives. Chief among these are the state Public Utilities Commission’s $1.2 billion Energy Upgrade California to drive demand-side adoption and California’s Energy Efficiency Strategic Plan, which mandates all new residential construction must be zero net energy by 2020, while new commercial construction must achieve that goal by 2030. 

A University of California, Berkeley report, *California Workforce Education & Training Needs Assessment*, attempted to project trends into 2020. By then, the study said, about 50,000 full-time equivalent positions will be created. Of these, however, only about 5,000 jobs will require that workers have specific skills in energy efficiency. (Note: The other 45,000 full-time equivalent positions represent directly-generated jobs that include both energy efficiency and other work; these positions can also be distributed to more than one worker.)

3.4 Regional Hiring Trends: Top Jobs & Employers

**Where are the Jobs? SWIC and SJSU Collaborate on Labor Market Research**

The key to SWAM’s success has been the ability to leverage relevant and timely information about regional hiring trends to source and train displaced workers. Key questions in gathering that information have been:

- What jobs will be in highest demand?
- What criteria define success in these positions?
- Which companies will drive this growth?

SWIC’s research team partnered with San Jose State University’s College of Business to track the pulse of the industry during the grant’s two-year run. Two concurrent research initiatives helped ensure close market monitoring: 1) Regional employer surveys and 2) Job Board Studies based on local employer postings.

According to SJSU’s survey, conducted at the SolarTech Leadership Summit in March 2012, 40 local solar companies will hire over 445 new workers in the San Francisco Bay Area during 2012. More than 73% of respondents plan to grow in 2012, with nearly one quarter of them indicating that they would hire aggressively.

Survey respondents came from across the value chain, including System Design, installation and monitoring firms (46%), manufacturers (19%) and consulting and support services (25%).
Sales representatives were the most common occupation across the sector, followed by solar engineers and project managers. Figure 8: SJSU Solar Employer Survey - Occupational Demand, 2012 shows the total demand for each occupation. Sales Representatives are in the highest demand with 129 openings across 19 companies, followed by Project Managers (9 companies / 79 openings) and Solar Designers / Engineers (14 companies / 57 openings).  

A survey earlier this year that was conducted by SJSU of 100 energy efficiency contractors participating in the Energy Upgrade California program showed interesting trends. Thirty-nine percent of companies added workers in 2011; almost half (48%) kept employment levels the same; and 12% said they down-sized. Projections for 2012 are positive: Over half of the
companies surveyed (55%) plan to hire more employees and 42% plan to keep the same size workforce. Only 2% of companies plan to down-size this year.

Figure 9: SJSU Energy Efficiency Employer Survey – Staffing Projections, 2012

The 100 companies surveyed expect to hire 237 full-time workers and 43 part-time workers over the course of 2012. As shown in Figure 10, most of the new full-time hires, or 95 jobs, are expected to be field workers, followed by sales, with 70 expected jobs. Companies in the survey expect to hire more staff in other occupations in 2012 than they did in 2011, including general labor, sales, and energy modeling jobs. By comparison, demand is expected to be lower for energy auditors, HVAC technicians, office managers, and insulation workers.

Figure 10: SJSU Energy Efficiency Employer Survey - Occupational Demand, 2012

SWIC Job Board Study
SWIC’s research team observed similar results in its Jobs Board Studies. Program analysts have been collecting and analyzing data from employment postings for the solar and energy efficiency sectors in the region. Sources include employer websites and job boards such as LinkedIn, Craigslist, and SimplyHired.com.

The data below represents an excerpt from SWIC’s Summary Jobs Board Study. The charts in Figure 8 show total number of unique postings from November 2011 through May 2012 in our region.

Within solar, PV system sales jobs lead at 21% followed by finance at 10%. Employment opportunities with system integrators and design firms are much more prevalent than jobs with manufacturing companies: System-level job types represent 43% of the positions, while manufacturing and R&D positions represent 18%.1

The energy efficiency picture is more fragmented, but SWIC’s research shows a dominance in IT jobs, particularly because of the growing importance of intelligent grid solutions.

![Figure 11: Top Jobs as a Percent of All Postings (November 2011 – May 2012)](image)

Seasonal patterns are more apparent within solar over the last six months as companies gear up for the spring and summer months. But without a full year of data, little can be determined about the seasonality of energy efficiency jobs.
Consolidation: A Few Employers Make All the Difference

Looking at specific employers, it comes as no surprise that behemoth SolarCity leads employment in the sector with over 384 openings, averaging 54 postings over the last six months, followed by SunEdison with 202 postings, and SunPower with 160 postings. Silver Springs Networks on the energy efficiency side consistently offered more jobs than any other employer, with the remaining leading employers averaging 21 to 29 new listings per month.

The SWIC Summary Job Board Study takes a deep dive into the leading positions and top employers. See http://www.solartech.org/research/job-board-studies
4.0 Solar Leadership Pulls Out the Workforce Stops

4.1 Background

Participants in the Solar Leadership Summit’s Workforce Panel brought together views from both the public and private sectors to address labor market needs and training gaps within solar and energy efficiency. Three questions were key:

1. What are the primary national issues, trends and opportunities within the solar industry workforce development space?
2. How do trends across various segments of the industry impact the labor market and what can be done to address those needs?
3. What are the best practices in training and curriculum development? How can these best practices be scaled nationally?

The 90-minute panel discussion, moderated by SolarTech’s Workforce Committee Co-Chairmen Justin Bradley, SWIC Project Manager, and Rick Kuhn, Director of Economic and Resource Development, FHDA, included more than 45 leaders from industry, training and education, workforce development, research and the public sector, notably:

- Ezra Auerbach, Executive Director, NABCEP
- Catherine Ayers, Project Manager, Professional & Workforce Development, FHDA
- Laurie Bringuel, HR Director, SMA America
- Laura Caccia, Program Manager, NOVA Workforce
- Jim Caldwell, Director, Workforce Incubator
- Andrea Luecke, Executive Director, The Solar Foundation
- Joe Sarubbi, Program Manager, DOE, Solar Instructor, Training Networks
- Dr. Meghna Virick, Professor, San Jose State University
- Jane Weissman, Executive Director, IREC

Table 1 reflects the level of representation by type of organization:

<table>
<thead>
<tr>
<th>Organization Type</th>
<th># Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>15</td>
</tr>
<tr>
<td>Training Providers and Colleges</td>
<td>11</td>
</tr>
<tr>
<td>Workforce Investment Board</td>
<td>9</td>
</tr>
<tr>
<td>SolarTech (Industry consortium)</td>
<td>5</td>
</tr>
<tr>
<td>Researchers</td>
<td>3</td>
</tr>
<tr>
<td>Government</td>
<td>2</td>
</tr>
<tr>
<td>Total Attendees</td>
<td>45</td>
</tr>
</tbody>
</table>
4.2 Workforce Development: “It All Comes Down to Jobs”

Jane Weissman, executive director of the Interstate Renewable Energy Council, shared her views on national and strategic trends in solar workforce development and training.

Training has improved over the past five to ten years, she said, becoming more standardized and professional, but there remains confusion about what is expected from workforce training.

Volatility in the solar industry hasn’t helped matters, Weissman said, making it difficult to anticipate market needs and rapidly deliver relevant training. The resulting imbalances leave job seekers unprepared for openings that do come up.

On top of that, she noted, job seekers have skewed expectations about what training can do for them. While continuing education programs are an important part of professional development, short courses (30-40 hours) often cannot provide sufficient training to make installers or field technicians proficient. Such training may help entry-level workers get a foot in the door, but there is a misconception among job seekers that such courses make them ready for more than just entry-level work. Employers typically prefer far more hands-on experience. For their part, employers misunderstand the differences between the words “certificate” and “certification programs.”

Curriculum development also needs to be more rigorous, Weissman urged, and more formal standardized processes are required to outline the duties, tasks, knowledge, skills and, in some cases, the tools required for a specific occupation. One valuable guide for educators can be an industry-validated job task analysis (JTA) such as that found at http://www.dacum.org/.

Part of the confusion stems from competency models and career paths that are no longer valid, Weissman said. These types of vertical ladders are less valuable than more nuanced lattices that look across diverse industry jobs to chart career growth and identify the training necessary for success.

Figure 14 features an interactive online career lattice that maps three dozen solar occupations in four sectors: component production, system design, sales & marketing, and installation/operations. This Solar Career Map is a visual roadmap that includes occupational information, skills and competencies, education, and training pathways.

Recommendations for a National Clean Energy Workforce Development Roadmap
If training or certifications command a higher value from the marketplace Weissman asked, how does industry define that value and do training programs actually lead to jobs?

The criteria that make up a good program, she said, are: Direct linkages with industry; training based on a JTA standard; and learning objectives connected to a current and relevant JTA. Weissman’s recommendations included:

- Integrate the influx of training programs into the existing programs and infrastructure.
- Correct the false expectation that short courses lead to proficient skills and, where possible, integrate such training into the trades.
- Perform JTA for all curriculum development.
- Confirm market linkage through industry collaboration so certificates produced have market connection and value.
- Align consumer expectations by assuring training is sufficiently comprehensive to match employment goals, and that trainers have the applicable skill-set; conduct labor market analyses to make sure training is relevant to the needs of the market; and create a competency model and a solar career lattice rather than a linear “ladder.”
4.3 Industry Trends

Convergence is King - Solar Leaders are Stepping into Energy Efficiency

As discussed at the SolarTech Leadership Summit, solar industry leaders have long been predicting convergence with energy efficiency, but has the market followed suit? Companies such as SolarCity are putting money on their convergence bet with services such as energy auditing, home improvements, and financing. Other solar integrators, however, are not convinced the margins warrant a dedicated energy efficiency offering.

SWAM analysts are focused on this trend. Our recent survey, led by SJSU, shows that 21% of solar companies already have expanded into energy efficiency while 24% more plan to do so in the near future.

More than a quarter of survey respondents said it is at least a high priority for them to hire new employees who are skilled in both solar and energy efficiency. But job postings over the past six months only mention “energy efficiency” 7% of the time, and most of these jobs were posted by SolarCity.22

Figure 15: Solar Companies Plan for Energy Efficiency

Jo Fleming, principal with Green Careers Partnership, noted during the Summit that SWIC’s program has successfully bridged the two sectors of solar and energy efficiency on behalf of educators and job seekers. SWIC has been striving to help trainees see the linkage between energy efficiency and renewables, she said, an effort that employers should be thinking about as well.

Convergence is occurring with demand-side energy management providers as well. Beutler Corp., an electric and HVAC contractor based in the San Joaquin Valley, has added solar PV to their portfolio to offset losses from the housing industry. Through this tactic, they are able to retain some of their best employees, and they are projecting growth into the future.
Financing Models Industry “Game-Changer”

Many Summit Workforce Session participants commented on the impact leasing models are having on the residential segment. Power Purchase Agreements (PPAs) for commercial projects were introduced in 2005 and residential leasing programs were pioneered in 2007.

A solar lease requires a consumer to pay a fixed amount monthly regardless of how much power the leased system produces, and the solar company retains ownership of the equipment. In a PPA, the customer is billed only for the amount of power the system generates.

These financing options have spurred growth in the installation market and have led to the California solar lease/PPA market burgeoning in recent years, increasing 174% in the first two months of 2012 over the same period in 2011. Companies such as Sunrun, Sungevity, SolarCity, SunPower, and Clean Finance are teaming with financiers such as Morgan Stanley, US Bancorp, and Citigroup and with investors such as Google to offer low-cost financing. The new financing models have simplified the process of selling and closing, altered how integrators do business, and shifted the skills required for sales and operations.

4.4 Hiring Across the Solar Value Chain

Each participant in the solar value chain faces unique issues in continuing to grow their business and hire new workers. What follows is a brief overview of the different perspectives presented at the Summit.

Manufacturers

Shrinking margins have been punishing domestic solar panel manufacturers, but they are optimistic that the new U.S. Department of Commerce tariff on imported Chinese panels will help reverse this trend. Despite these pressures, some U.S. manufacturers are still thriving. Dave Hochschild, vice president for external relations at Bay Area manufacturer Solaria, says his company now is growing steadily at about a 25% rate.

Laurie Bringuel, human resources director at SMA America, noted that her company has seen substantial growth, particularly in sales-related functions. She expressed surprise that so many newly-graduated engineers prefer a sales career over the more technical -- and traditional -- R&D and manufacturing options. This may reflect an abiding pessimism in U.S. solar manufacturing prospects over the long term.

Installers

Residential solar installers appear to have experienced the highest growth, giving them the greatest near-term potential. Randy Zechman, president of Bay Area installer Clean Solar, anticipates expanding his workforce by 50% this year, in large part because of the emerging leasing models. Other industry leaders are not as bullish, expecting that increasing costs will slow sales and job growth for installers. They point to the potential unintended consequences of new tariffs on Chinese-made modules, which have thus far been the bulk of low-cost panels...
installed in the United States. Workforce growth is expected to cool as the installation business shifts labor crew makeup to use less experienced apprentice workers alongside a single experienced leader.

Although common wisdom is that the North American Board of Certified Energy Practitioners (NABCEP) certification carries weight during hiring decisions, only 3% of the 1,300 postings collected in SWIC’s Job Board Study mention the NABCEP certification as a hiring criterion.

**Cities**

Local governments are less optimistic that they will see any growth in municipal-funded PV or energy efficiency installations this year, or for the foreseeable future. Larry Owens, division manager for customer services at Silicon Valley Power, explained that the recession has caused sharp declines in tax revenues, which freezes hiring, cuts funding for employees to obtain training, and hampers the execution of professional and timely solar inspection and permitting work.

**Utilities**

Owens also spoke from a small municipal utility perspective, stressing that the costs associated with increasing renewable portfolio standards to 33% will drive electric rates up. In response, municipalities such as Santa Clara are trying to control rising rates by eliminating overhead – which in practice means reducing headcount. This trend drives grid automation investment as well, which creates growth and opportunities in other types of skills and jobs.

**Dichotomy in Difficulty Hiring**

Both the Solar Foundation Job Census and SWAM’s employer surveys found a disconnect between the difficulty that companies say they have in hiring new talent and their perception of how hiring difficulties may impact their growth.

According to The Solar Foundation study, employers within each industry segment report difficulty hiring workers with the right skills and experience. In the installation segment, for example, 53% of respondents said they had enough job applicants but too few met their requirements. Forty-three percent of manufacturers and 45.6% of distributors expressed the same concern.\(^\text{24}\)

But when asked about any potential barriers to growth, only 4.5% of the respondents believe an insufficient pool of workers poses an obstacle. So, while solar employers may be overwhelmed with irrelevant candidates, they don’t think hiring troubles will slow them down. The main issue, it would seem, is that employers need assistance filtering for the right candidates at the right time. Because this is primarily a placement challenge, a useful solution would be to create a clearinghouse of properly trained and experienced workers.
4.5  Trends in Workforce Development & Training

Overall, Summit participants agree that photovoltaic curricula have improved substantially over the last five years. What began as primarily teaching from a textbook and offering little practical experience has now morphed into a more comprehensive approach with significant practical hands-on training that often is delivered by experienced solar practitioners during evening courses.

Subject Matter Expertise vs. Solar Industry Experience

SWIC’s most recent employer survey also looked at whether employers value subject matter/technical expertise over industry experience. Results show that across all job types, the overall sentiment favored technical expertise, but industry experience remained critical, with 58% of respondents ranking experience in solar as either a “high priority” or a “very high priority.” Enthusiasm about energy also scored high with 69% of respondents reporting that “passion” was either a high or a very high priority in choosing which candidate to hire.25

What Training Do Employers Offer?

Most companies provide some kind of on-the-job training (OJT). In fact, more than two-thirds of respondents report providing either a large or a very large amount of OJT to staff. See Figure 16: Employer OJT and Internships. Forty percent of the companies that offer OJT do not outsource that training at all, while another 40% use external training agencies less than half the time. A small proportion of employers provide more than half of their OJT through external organizations.26

Because having professional experience is such a critical factor in penetrating the solar industry, internships increasingly have become a key focus for the workforce development community. A high proportion of respondents – nearly 30% -- said they provide substantial internship opportunities and almost half said they provide at least some internships.

Session participant Blair Mandell, principal at consulting firm Green Careers Partnership, noted that industry experience still forms a major barrier for new entrants to the solar industry.

Figure 16: Employer OJT and Internships
Carol Zabin, a research director at UC Berkeley, highlighted state and federal certified union-based apprenticeship programs which offer value to new entrants with limited experience. Both employers and employees pay for the training with an expectation that wages will rise commensurately. Employers sit on curriculum committees to ensure that certifications add real value. Zabin acknowledged fundamental issues with the apprenticeship model, but believes it would be more efficient to base any new workforce development and OJT system on this model, rather than starting a new experiential program from scratch.

Industry’s disinterest in the unions’ lengthy and rigorous apprenticeship model comes primarily from the perception that it is too costly and too slow to respond to rapidly shifting market needs. Inflexible hourly pay structures for installation jobs also are impractical in an industry with razor-thin profit margins. The program also faces limitations because it targets trade occupations, and so cannot be applied to the industry’s demand for white-collar professionals.

Training Needs According to Industry Segment

Manufacturing

Tom Chatagnier, a professor at Diablo Valley College, said that manufacturers educate their customers about how to use their products through such things as in-person training sessions and webinars. But manufacturer training usually does not cover training in such areas as sales, design, or finance. Public sector educators must overcome this hurdle to leverage some of the best in-house industry training methods and materials.

Installation

According to Andrea Luecke, executive director of The Solar Foundation, the installation segment faces several training gaps. With a growing number of roofing companies entering the solar installation business, there must be better communication, cross-training, and job consolidation between the two sectors. Much of that onus will fall on installers who must engage the workforce training community to help create and enforce viable standards.

Other trends noted at the breakout session: Increasingly, installation companies are deploying on-the-job training instead of participating in external training programs. Simultaneously, public educators are moving toward developing more systematic curricula as well as stackable credentials and prerequisites.

Financing

Catherine Ayers of FHDA noted that underwriters and mortgage brokers who are new to the clean energy sector also need training to understand the industry’s technical aspects and to help them better quantify risk to speed financing decisions and to develop more standardized contracts for solar project financing. This lack of knowledge, she said, is limiting the industry’s growth. Familiarity with the sector is essential before standard financial vehicles can be pioneered in commercial and industrial projects.
Local Government

Municipal inspectors also need training, says Jim Caldwell, director of the Workforce Incubator. Because inspectors should receive the same training as installers, they could be encouraged to complete that training alongside the professionals they are regulating. Common code needs to be discussed in training, he said, including specific variations according to jurisdiction.

In an attempt to create some standardization and best practices, SolarTech asked David Clemens, CEO of the International Association of Electrical Inspectors, to create a training program for electrical contractors and inspectors. The goal would be to create a means for inspectors and contractors to receive both onsite and online training.

Following up on this idea, Ezra Auerbach, executive director of NABCEP, proposes that industry and permitting authorities work together to design training standards. He asserted that cross training is important to address issues related to codes and safety. Providing proper training for electrical inspectors is key, he said, because jurisdictions no longer hire single-discipline experts and instead require inspectors to work in a variety of sectors.

Energy Efficiency

Margaret Bruce, vice president of the Climate Program at Ecology Action, emphasized that the fragmented energy efficiency sector lacks a deep, robust, and strategic educational framework. There is no uniform standard of competency or experience to describe a project for an entire home or commercial building, yet these are systems that require a uniquely broad skill-set. Ecology Action would support specific hands-on OJT requirements to complement sector-specific training curriculum development, stackable, or inter-linkable opportunities.

Table 2 summarizes key points for industry training and workforce development:

<table>
<thead>
<tr>
<th>Participant Key Takeaways</th>
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<tr>
<td>Focus on core skills that are transferrable into clean energy jobs</td>
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<tr>
<td>Emphasize quality of the work performed over quantity of trained workers</td>
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<tr>
<td>Increase credentialing through training programs to ensure quality</td>
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<tr>
<td>Integrate solar and clean energy into core educational programs</td>
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<tr>
<td>Establish career lattices for entry-level workers to move toward higher wage opportunities</td>
</tr>
<tr>
<td>Introduce clean energy training for higher level professionals in engineering, finance, and sales</td>
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<tr>
<td>Drive programs that facilitate work experience to increase success of new entrants</td>
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<tr>
<td>Increase industry stakeholder participation for successful training program development</td>
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<tr>
<td>Be realistic about the demand for NEW specialized occupations</td>
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Table 2: Summit Workforce Session Training Summary
5.0 Employer-Led Partnership Method – How it works

Over the past three decades, industry involvement has been an important factor in workforce development programs. Colleges and workforce development programs have become sophisticated at reaching out to industry to mine market needs and gaps that let them become organically responsive to opportunities. In addition, these organizations occasionally have entered short-term contracts to meet specific seasonal workforce needs. What has been missing is long-term, systematic industry leadership and commitment. The SWAM process has been designed to address this deficit and to demonstrate a model for standardizing it beginning with the clean energy industry.

What distinguishes SWAM from other workforce development frameworks is that it is a demand-side strategy and a process focused on the needs of the employers, where typical workforce training strategies are supply-side driven.

The following section provides an overview of the SWAM process. Readers wishing to learn more may read SWIC’s more comprehensive white paper and “how to” guide on the subject.

The SWAM process addresses the following strategic objectives:

1. Identifying under-served labor market needs by doing tactical market research in northern California
2. Shortening the time between industry demand and trained labor supply with the right training at the right time for on-going industry demand; and
3. Providing training to displaced workers and assisting with placement in renewable energy jobs, specifically in the solar industry, which has so far resulted in 53% placement rates.

5.1 Approach

While there are many factors that are essential to an effective workforce development partnership, there is one that stands above the rest: Employer leadership.

A catalytic factor for SWAM’s success is collecting and disseminating near real-time labor market information. While many workforce organizations regularly collect and distribute labor market information, we are unaware of any that perform this service tactically – in other words, through week-to-week collection, assessment, and dissemination of labor market data to hiring managers as well as those seeking work in the sector.

Information about market need was used to inform training choices, develop curriculum, design assessment criteria, and establish relationships with companies interested in hiring trainees.
Both quantitative and qualitative data were gathered to pinpoint market demand. Multiple data sources were used to tap into industry information including surveys, existing industry reports, job board postings, employer forums and webinars.

Figure 17: Workforce Acceleration Method- Continuous Feedback Loop

Through a constant cycle of investigation and outreach, industry remains engaged while information is analyzed and updated continuously to inform both the education community and the talent community — career advisors and job seekers — about what is needed in real-time.

Data also informed training deployment and talent screening to layer new knowledge and skills on existing skill sets. Going full circle, industry was re-engaged by connecting job opportunities with skilled individuals to meet hiring demands.


6.0 Mapping Out a National Clean Energy Workforce Development Roadmap

In 1942, Economist Joseph Schumpeter coined the term “creative destruction.” What he viewed as a fundamental dysfunction of free markets is now understood as the natural result of healthy market innovation and a drive toward efficiency. Those companies that adjust course fastest can take best advantage of new product or service opportunities. Short-term job loss creates healthy dynamics, leading to fresher, higher-value job opportunities down the road.

The U.S. labor market increasingly is experiencing creative destruction as the pace of global technological change accelerates. In just the past 25 years, the U.S. has experienced three deep recessions and two extended job booms. Nearly 8.8 million jobs have been lost since 2008. New product cycles in the telecom industry used to be years long. Now breakthrough mobile products can be expected in months. This innovation acceleration requires that workforce development systems keep pace.

How is that possible when much of the infrastructure is based on decades-old models? Dislocated workers expected to remake themselves are whiplashed between the creation and destruction of companies and, sometimes, entire industry sectors within a handful of years.

Students enrolled at four-year schools as freshmen today may find that their training and skills are obsolete by the time they graduate. Community colleges, which are in the best position to serve changing market needs, are contending with ever-shrinking budgets. Workforce investment boards are struggling with commensurate cuts in funding. Government fiscal efficiency, once viewed as an attractive but elusive philosophy, now is considered essential to avoid public sector bankruptcies. How can workforce development systems possibly thrive with such rapidly evolving needs?

6.1 Tapping into the Power of Industry Leadership

Industry-led sector partnerships are a big part of addressing such workforce volatility, SolarTech believes. Through regional partnerships, programs can be custom fit and continuously retooled to build more nimble, efficient, and integrated workforce data gathering, dissemination, development and placement systems that can leverage electronic infrastructures across the board.

The 1997 Workforce Investment Act (WIA) vision had it right. Employers must be the hub of any workforce development system. But placing better-engaged employers on workforce development boards is just a start. University and community college advisory committees are helpful, but insufficient. Pay-to-train relationships with talent-hungry industries are welcome, but ephemeral.

Regional industry associations should take the lead to create permanent industry sector-driven partnerships funded through membership’s pooled resources. Such partnerships should include all training sectors and all workforce development efforts.
Because SolarTech and its partners NOVA and FHDA already have prototyped and demonstrated such a partnership, we recommend its propagation in several major solar and energy efficiency markets over the next three to five years at the DOE’s Solar 3.0 target sites.

The decision about where to deploy this style of industry-led workforce partnership next should be determined by the identification of willing leaders in key industry groups.

Figure 18: DOE Solar 3.0 Target Sites

6.2 Next: Establish a Market Clearinghouse

An effective clearinghouse of training providers, proven curriculum, and talent will be critical to the success of future regional industry-led partnerships. Such a clearinghouse would be similar to the highly successful Database of State Incentives for Renewables and Efficiency (DSIRE) web site, established in 1995 through a DOE grant to the North Carolina Solar Center in partnership with the Interstate Renewable Energy Council (IREC).

Several things make the DSIRE site a unique go-to clearinghouse of essential market information: The elegant simplicity of its map-based approach; dynamic information updating to keep it reliable and relevant; and amazing comprehensiveness. These elements are key to a workforce clearinghouse that captures information and opportunities at the local, regional, state, and national levels.

We recommend seeking long-term funding to affect this goal and consulting with the Center for Energy Workforce Development (CEWD) and IREC to develop a plan to adapt this best practice. See www.dsireusa.org for more information on DSIRE.

6.3 Other Actions for Near-Term Implementation

The “here today, gone tomorrow” clean energy training courses that have emerged during the clean energy boom are an artifact of the lack of dynamically available market data verifying the scope of actual need. Such courses must be designed with “mix and match” flexibility to let
individual trainees fit education modules into the gaps in their current skill sets. Industry-led regional partnerships can help create the shared framework needed for long-term success, while minimizing superfluous offerings.

We recommend adopting the essence of PG&E’s Pathway Energy Competency Model of Industry Supported Competencies and Stackable Credentials to establish the shared model and syntax of skills and training needed for talent development; whether a worker is new or richly experienced, it is essential to have a way to identify strengths and gaps. PG&E’s model incorporates the so-called “stackable” skill sets that build a foundation on personal effectiveness and academic requirements before adding technical and workplace skills. This and other means for skill and credential “stackability” should be part of any ongoing best practices research.

The goal is not primarily to help younger workers develop a strategic education and career development plan, but more to help experienced, dislocated workers who need to transition into new careers. For these workers, rapid deployment must be first priority. We must systematically match the skills they already have with those needed in their new sector, help them develop broad-based sector knowledge and terminology so that they may converse fluently within that sector, and provide training in key niche skills (such as computer-assisted design competency for photovoltaic design positions).

Figure 19: Energy Industry Competency Model
6.4 Where to Focus Next Generation Industry-Led Partnerships

During SolarTech’s March 2012 Leadership Summit, several workforce market gaps and opportunities emerged from employer conversations. Many of these issues warrant further research to determine the nature and level of need, and to what extent each regional market is already responding. While we are recommending all of these areas for further study, we are doing so without commentary because they require further vetting and validation by a future coalition.

**Labor Market Research**
- Perform engagement models best practices survey in job data collection, analysis, and distribution

**Training**
- Training in finance and sales for energy professionals. Many programs are just emerging for this need. Research is needed to identify best practices
- Interdisciplinary training in “converging” clean energy sectors such as solar with energy efficiency and HVAC
- Training with practical full project experience in partnership with private sector companies
- Investigate business entrepreneurship training programs to identify best practices and openness to integrate small business essentials with technical training
- Investigate the scope of new training requirements needed for implementing solar permit process standardization
- Research private company product training to identify best practices

**Policy Making**
- Investigate and report on expected impact of recent California Public Utilities Commission workforce policymaking on systemic funding of workforce partnerships
- Leverage State and federal certified programs (DOL (U.S. Department of Labor) apprenticeship programs)
- Pilot legally workable industry contracts for practical internships in concert with training programs

**Industry**
- Quantify dollar value to employers of pre-training potential employees vs. industry-led partnership vs. status quo
- Perform an on-line survey of responsiveness to regional industry-led funding partnership
- Research and report on non-employer engagement models to identify best practices, such as California’s Community College Consortium’s Energy Faculty Forum
• Research and report on various approaches to stackable credentials and apprenticeship programs in both the trades and private sectors, recommending best practices
• Research and report on how colleges and training organizations are using existing infrastructure, departments and skills to expand training programs and teach new careers.
7.0 Traditional and Proposed New Funding Models

7.1 Public Grants

The resources needed to sustain this workforce acceleration method have come from state and federal grants. A significant portion of the money in SWIC’s case came as a direct result of one-time “stimulus” funds. The State of California through its community college system has workforce and economic development initiatives that directly supported this program.

A more diversified funding approach will help insulate future WAMs from economic and policy volatility, which often runs counter to need. Public grants that support workforce and economic development through training of displaced and/or under-employed workers make a good match with energy industry needs. An available workforce already being served by government-funded programs creates other public and private opportunities to support development of transferable skills in technical and sales positions.

7.2 Shifting from Public Funding to Private

The Workforce Investment Act (WIA) of 1998 was established to improve the Job Training Partnership Act of 1982 by attempting to get employers to take a more active role in the workforce development system. This was to be accomplished by forming workforce development boards (WIBs) chaired by private sector business leaders. As a prototype of industry-led partnership, it was the right idea. But it didn’t go far enough.

In addition, funding of these programs through federal and state grants seldom coincides with greatest need and opportunity in the markets. Such funding is by its nature abrupt in beginning and ending. SolarTech believes there is a way to bridge this difficult public funding model into one that is sustainable through a private sector-led partnership. Work on such a plan already has begun with leaders of SolarTech and The Solar Foundation.

How might the workforce development system break out of the hyper-volatile grant funding cycles experienced since 1998? We believe that growth in the solar industry and successful demonstration of the SWAM method both build a credible foundation for piloting a new approach for better matching private capital and human capital. Several steps are involved in accomplishing this.

1. **First, develop a workforce development market baseline**, reinforced with the latest data, that projects out through 2015 what happens under “business-as-usual” funding scenarios. Such funding currently consists largely of sun-setting DOE, DOL, or state funding for workforce development, with industry-funded programs a distant third on a relative aggregate dollar basis.

2. **Identify highest priority but under-capitalized areas in workforce development** (e.g. skills, jobs, and needed certifications). Apply a model program to address these
programs, systematically connecting private capital with an ever-increasing need for human capital.

3. **Institute a voluntary industry/private capital-funded, opt-in model** that sector employers could access on a pre-qualified basis (according to industry standards as established by leading organizations) to receive regular labor market reports, available curricula and training courses, as well as talent search and placement.

For a more thorough presentation of SolarTech’s approach to private capital funding, see the consortium’s white paper, *Financing the Next Generation of Solar Workers- An Exploration of Workforce Training Program Sustainability in the Context of Reduced Public Funding*, developed in collaboration with The Solar Foundation and NABCEP.

(www.solartech.org/research/labor-market-reports)
8.0 Summary & Next Steps

8.1 Summary

The solar and clean energy sectors are superb candidates for pioneering the next generation of industry-led workforce development partnerships because of their strong growth, new products and processes, high market volatility and, perhaps most importantly, the amount of taxpayer investment over the past three years to establish new best practices. R&D is typically an inefficient process, but requires a cold-hearted accounting upon implementation to determine whether a new approach is effective, or simply favored by originators and incumbents.

True sustainability is always “exothermic,” creating more energy than it requires to get the “reaction” started. If it doesn’t scratch the market itch in a high-value and timely manner, it may not be needed. More to the point: If industry is ultimately unwilling to find a way to pay for it, it fails the sustainability test. This must be the success metric applied to these recommendations for a national workforce roadmap through the DOE 3.0 process.

SolarTech’s experience demonstrates the great potential of industry sector-led workforce development, perhaps the only model with a sustainable chance of linking employer with worker on a significant scale in tough economic times.

8.2 Final Recommendations

Emphasize industry-led partnerships: Industry-led sector partnerships are a big part of addressing such workforce volatility. Through regional partnerships, programs can be custom fit and continuously retooled to build more nimble, efficient, and integrated workforce systems.

Establish a market clearinghouse: An effective clearinghouse of training providers, proven curriculum, and talent will be critical to the success of future regional industry-led partnerships.

Adopt industry supported competencies and stackable credentials: PG&E’s model incorporates the so-called “stackable” skill sets that build a foundation on personal effectiveness and academic requirements before adding technical and workplace skills.

Leverage training best practices: Cross-train in “converging” clean energy sectors such as solar with energy efficiency and HVAC; Investigate the scope of new training requirements needed for implementing solar permit process standardization; Research private company product training to identify best practices.

Design for industry: Quantify dollar value of training to employers; repeatedly survey needs; Research and report value of stackable credentials and apprenticeship programs.
8.2 Next Steps

SolarTech will convene with its local and national partners (SolarTech’s members and Board of Directors, DOE, The Solar Foundation, IREC, SEIA, Underwriters Lab and others) during the summer of 2012 to compile a joint action plan, with a central focus on securing industry funding for ramping up the Workforce Acceleration Method. SolarTech will present some of these ideas at IREC’s Clean Energy Workforce Conference, November 13-15, 2012, in Albany, New York.

8.3 Call to Action

SolarTech invites your comments and personal feedback as we take action on the objectives explained in this document. If you would like to engage directly with us in this effort please contact Mr. David McFeely, SWIC Program Director, at dmcfeely@solartech.org or at 408-529-0508.
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