Emerging Industry and Technology Sectors in Silicon Valley's Green Economy: Workforce Implications

Conducted for work2future and NOVA

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[bw] RESEARCH PARTNERSHIP

GREEN LMI

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work2future is the Local Workforce Investment Board administering the Federal Workforce Investment Act of 1998 for the cities of Campbell, Gilroy, Los Altos Hills, Los Gatos, Monte Sereno, Morgan Hill, San Jose and Saratoga. It also serves the unincorporated areas of Santa Clara County. work2future addresses the workforce and economic development needs of these communities in collaboration with small and large businesses, educational institutions and community-based organizations.

It is strategically positioned within the City of San José Office of Economic Development and provides One-Stop Centers in San Jose, Campbell, Morgan Hill and Gilroy. work2future One-Stop Centers offer services and resources that help job seekers obtain the skills and training they need to find employment, assist businesses in meeting their workforce and business development needs, and enable youth to jump-start their careers with skills training and job-search assistance.

The NOVA (North Valley) Workforce Investment Board is a nonprofit, federally-funded employment and training agency that provides customer-focused workforce development services for northern Santa Clara County, including the cities of: Cupertino, Mountain View, Los Altos, Milpitas, Santa Clara, Palo Alto, and Sunnyvale. We work closely with local businesses, educators, and job seekers to ensure that our programs provide opportunities that build the knowledge, skills, and attitudes necessary to address the workforce needs of Silicon Valley.

NOVA's purpose is to support workforce mobility by easing workers' transitions to new opportunities throughout their career cycles. To advance transitions with economic sustainability, NOVA provides: real-time labor market information about in-demand skills; skill-building and enhancements to match market demand; navigation tools for the ever-changing and entrepreneurial new labor market; advocacy for necessary infrastructure to support workers between opportunities, such as unemployment insurance for all and portable benefits; and interconnected support system for multiple career pathways for youth.

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EXECUTIVE SUMMARY

An innovation epicenter for more than 50 years, Silicon Valley is poised to be a major player in the green economy. work2future and NOVA commissioned this study to examine the workforce and economic development opportunities created by the region's green economy, in five key "emerging green" sectors.

THE EMERGING GREEN ECONOMY IN SILICON VALLEY

The researchers began by distinguishing "emerging green" companies from traditional or established green firms. Where established green firms use mature technologies and processes that have already been developed, emerging green firms are developing new technologies and producing the next generation of green products and services.

Researchers identified the five industry sectors where emerging green employers are most likely to be found: (1) energy, (2) materials & manufacturing, (3) specialized suppliers & supporting industries, (4) transportation, and (5) water. Research focused on the green employers within those sectors, defined as those firms that are involved in selling green products or services, working to develop green products or services, or directly supporting the development or production of green products or services.

SILICON VALLEY'S EMERGING GREEN EMPLOYERS

Total employment in the five key sectors accounts for 175,077 Silicon Valley jobs, or 14% of all employment in the region. Of these jobs, 14,401 are with firms identified as green in our five emerging green sectors. Approximately two-thirds of the jobs in emerging green firms are in the energy and specialized suppliers & support industries sectors.

Survey of employers

The research team surveyed 150 Silicon Valley firms identified as known or potential green employers in the five sectors with the goal of better understanding how employers identify with the green economy, their hiring needs and expectations, and the occupations and skills they will be looking for in the future.

The survey revealed that almost half (47%) of the surveyed employers expect to increase their total number of employees over the next 12 months, and "emerging green" employers have even higher expectations. An additional 47 percent of the employers expect their total staffing levels to stay the same, and only one percent expect to make cuts. That only five percent report being unsure of their staffing needs indicates a high level of confidence, as it is typically more difficult for firms to anticipate staffing needs in rapidly changing industries and during times of economic uncertainty.

These strong hiring expectations equate to a far-above-average job growth rate among green employers over the next 12 months: Green employers expect a 9.2 percent employment growth rate versus California's overall projected 2011 employment growth rate of 1.6 percent. Emerging green employers expect an even faster growth rate of 11.6 percent in the next 12 months.

Employers were also asked about the anticipated future composition of their workforce, and 62 percent report expecting a change in the skills, education, and abilities of their employees in the next 12 to 24 months.

Additional survey results offer further insight into the nature of the surveyed green employers: More than half the firms employ between 6 and 24 workers; of the emerging green employers, 79 percent identify as green support firms, 56 percent offer green services, and 46 percent manufacture green products (most firms identified with more than one category); forty-nine percent of the green firms derive at least half their revenue from green products or services and two out of three firms expect their green revenue to increase in the next 12 months; and nearly half of the green firms see smart grid and/or energy efficiency technologies and solar and/or photovoltaic technologies as very important to their businesses.

When asked about challenges they face in building their workforces, 46 percent of the green employers reported difficulty recruiting enough non-entry-level employees with adequate work experience. Ninety-one percent of green firms say they currently employ or expect to employ individuals with less than a Master's degree in the next 12-24 months, and four in ten employ or expect to hire sales personnel, operations and maintenance technicians, and customer service representatives.

Employer profiles

Ten of the emerging green employers were selected for more in-depth interviews designed to give better insight into their industries and their workforce needs. This sample of the emerging green employers includes firms from varying lifecycle stages, of various sizes, and from diverse locations within Silicon Valley. Most of the firms are involved in manufacturing and R&D or design. All are subjects of profiles contained in the report.

Researchers found the profiled companies have very strong hiring expectations, and younger companies and start-ups generally expect their workforces to at least double in size each year. When asked what they're looking for in employees, the firms report that industry experience and passion for the relevant technologies is often more important than advanced degrees or specific training. With experience so highly valued, it is perhaps not surprising that the firms also report very few entry-level jobs will be available.

AN OCCUPATIONAL ASSESSMENT OF EMERGING GREEN EMPLOYERS

The lack of entry-level jobs or jobs that do not require industry experience may, in the short term, be discouraging to Silicon Valley's unemployed. Long-term prospects, however, are more promising, as it is expected the emerging green economy will create a large number of high quality jobs. Virtually all of the jobs being created by emerging green firms are in high- or mid-skill occupations (99.6%), which provide workers superior earning and advancement potential. The large percentage (39%) of mid-skill jobs—the jobs that traditionally support the middle class—is particularly encouraging since mid-skill jobs have been disproportionately affected by the Great Recession.

The vast majority of new jobs in the emerging green economy will be in the energy, materials & manufacturing, and specialized suppliers & support industries sectors, and administrative, professional, sales, and skilled technical positions are the best

occupational categories for finding a job in any of these sectors. Fortunately, the excellent educational institutions of Silicon Valley include numerous regional employment training programs as well as university- and community college-based programs ready to prepare workers for these occupations.

CONCLUSIONS AND RECOMMENDATIONS

Based on these findings, the research team was able to reach five specific conclusions and make five recommendations.

Conclusions

1) Employers in Silicon Valley's five emerging green sectors expect to increase their ranks by approximately 10 percent in the next 12 months, meaning approximately 1,300 new jobs will be created every twelve months. This number does not include replacement jobs, which should also create significant employment opportunities.

2) Silicon Valley's emerging green occupational profile is almost entirely made up of high- and mid-skill occupations, with virtually no low skill/low wage jobs available.

3) Employment at emerging green firms is distributed broadly across technology areas and throughout the value chain, meaning that generic green training has little value and there are few pockets of large employment demand.

4) Silicon Valley emerging green employers are more likely to report difficulty finding workers with experience and an understanding of the industry than they are to report difficulty finding workers with the right education or training. And training programs able to prepare workers for entry- and mid-level jobs in the most desired occupations are available and largely uncongested.

5) Because the green economy is in flux, occupational forecasting is challenging and less reliable than forecasting in other more mature industries.

Recommendations

1) Workforce training should not focus on "green" skills and experience, but should focus on preparing workers for careers in one of the five emerging green sectors or in one of the broad occupational categories that were identified in the research.

2) Because Silicon Valley's emerging green sectors are still evolving, a system should be developed to continually gather information on the sectors' workforce needs. This system should involve developing relationships with key employers, developing metrics and indicators that reveal employment changes in these emerging green sectors and better tracking and assessment of the emerging green firms that have been identified in this study.

3) New training models should help job seekers gain industry experience and a deeper understanding of the industries and the technologies that make up Silicon Valley's emerging green economy.

4) Workforce investment boards should focus on meeting specific workforce needs by providing more varied and specialized training to smaller cohorts of trainees.

5) Because the region's specialized suppliers & support industries are a critically important but frequently overlooked part of Silicon Valley's emerging green economy—providing more than one-third of all employment in the five focus sectors—additional research should be performed to better understand the evolving workforce and training needs of this sector and its role in other emerging aspects of Silicon Valley's economy.

THE EMERGING GREEN ECONOMY IN SILICON VALLEY

INTRODUCTION

From semiconductors to the development of the Internet, Silicon Valley has been the epicenter of innovation, entrepreneurship, and technology for over 50 years. As a recognized leader in developing new technologies and companies, it is expected that Silicon Valley will play a significant role in the emerging green economy. More importantly, the emerging green economy offers the next phase for Silicon Valley in driving technological innovation, economic advancement, and regional employment growth.

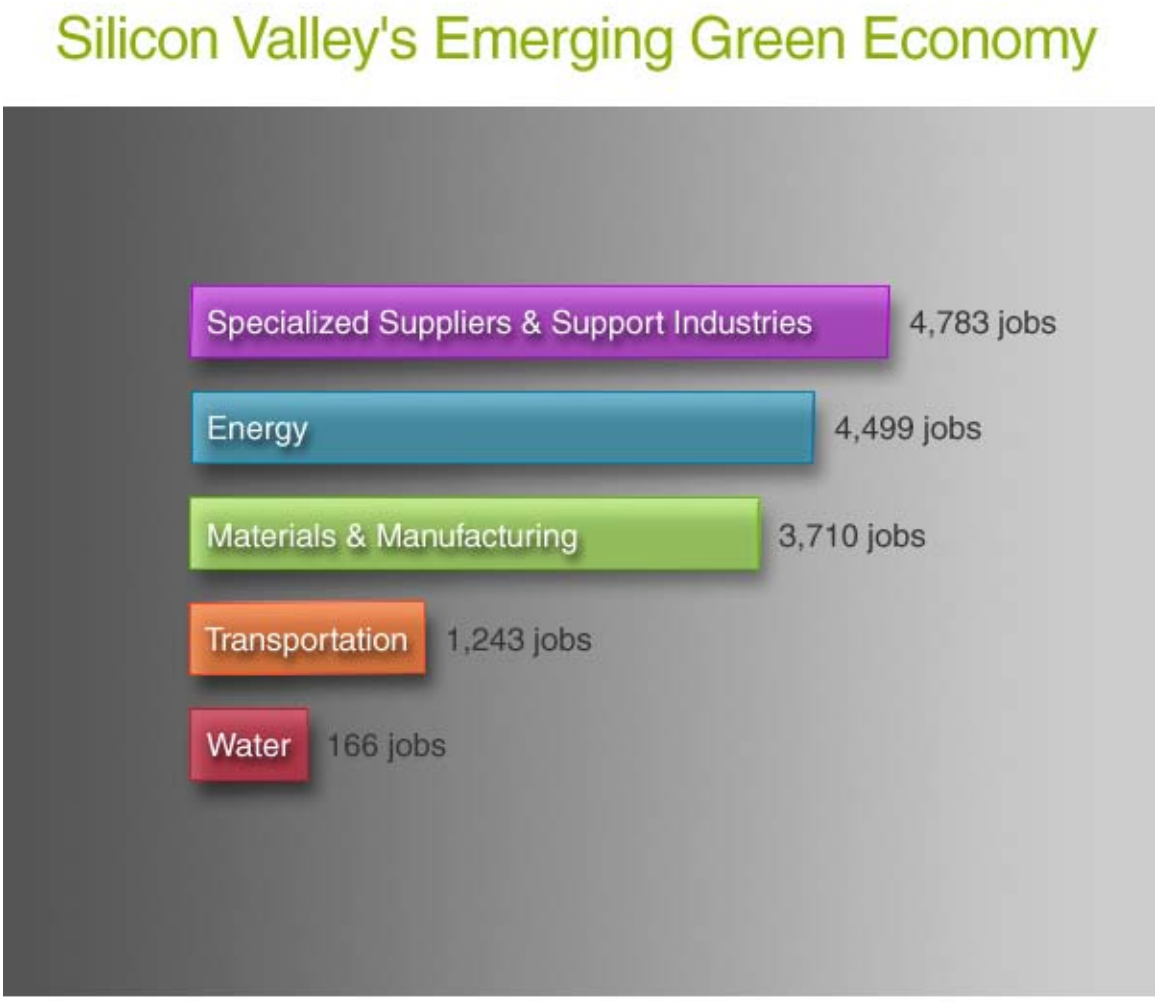
The "Green Economy" has been defined by different organizations in very different ways. Generally speaking, it includes all industries and occupations that provide goods and services that result in environmental benefits or a reduction of negative environmental impacts. Under that umbrella, there are firms focused on renewable energy production, energy efficiency products, water and waste management, recycling, and other segments within the green economy. In addition, there is a critical distinction between traditional, or established, green firms using mature technologies and processes that have already been developed, and new, emerging green firms that are developing new technologies and services.

> Emerging green employers are part of the larger green economy and represent the emerging technologies side of the green economic spectrum. The emerging technologies side is being built on new technologies. The other side of the green economic spectrum hosts the established green firms that are offering green products and services that have been available for several years and are merely replacing non-green products and services.

The emerging green sector is not based on any single unifying or related new technology but is instead a philosophy of using technology and innovation to overcome the environmental challenges we face as a region, as a country, and as a planet. From an economic perspective, these environmental innovators are being driven by consumer demand for more sustainable products and services, legislative requirements, and resource input costs that are responding to the threat of climate change and the growing volatility of the cost and availability of natural resources. These underlying drivers of the emerging green economy will only increase in importance in the immediate future.

> Please note that this study is not focused on defining and accounting for "Green Jobs" but is instead committed to understanding the workforce and economic development opportunities in five **emerging green sectors, namely (1) energy, (2) materials & manufacturing, (3) specialized suppliers & supporting industries, (4) transportation, and (5) water,** in and around Silicon Valley. While this distinction may appear minor, it has significant implications as we begin to examine the occupations and workforce opportunities associated with Silicon Valley's economy.

Figure 1 Silicon Valley's Emerging Green Employment Sectors



This study will focus on answering several fundamental questions.

1. How do we (a) define and categorize Silicon Valley's emerging green sectors to better understand their impact upon the regional economy and, more importantly, (b) identify and evaluate workforce and economic development strategies that support the continued growth of the emerging green economy?

2. What do Silicon Valley's emerging green employers look like, what technologies are they developing, and what are their workforce needs today and into the future?

3. What are the occupational opportunities that job seekers should consider in looking at Silicon Valley's emerging green economy?

4. What are the economic and workforce strategies that should be considered for the development of Silicon Valley's emerging green economy?

WHY EMERGING GREEN EMPLOYMENT SECTORS

The green economy has been an important oasis, both real and imaginary, for the larger economy as it has floundered with double-digit unemployment and the Great Recession. Researchers and economists have been actively measuring, assessing, and forecasting the economic opportunities associated with the entire green economy while elected officials and economic development decision makers have searched for new ways to leverage one of the few areas of economic growth in hopes of offsetting the losses in most other industries.

This study, rather than trying to take on the entire green economy, is focused on better understanding green employment in the five industry sectors that are central to emerging green or clean tech employment opportunities in Silicon Valley. This was done for several reasons. First, the research from this study is ultimately meant to empower workforce and economic development decision makers in Silicon Valley, and this study focuses on those employment sectors that not only define the region but where growth and change are most likely to occur. Second, employers do not necessarily see themselves as part of the green economy but typically feel more connected to a given industry, whether it is energy and the solar industry or materials & manufacturing and the development of new energy efficient windows and window films. Lastly, there are many valuable studies that have looked to evaluate and measure the greater green economy, both within California as well as specifically within the Bay Area and Silicon Valley. Our goal was not to recreate the existing research but to build upon that research and focus on a few aspects of the larger green economy and the opportunities that exist for workforce and economic development.

MAKING SENSE OF EMERGING GREEN IN THE LARGER GREEN ECONOMY

Unlike other industry clusters or economic sectors, green employers are not defined by shared supply chains, common industry verticals, or even necessarily related technologies, making the analysis of the "cluster" all the more challenging. The green economy is instead defined by their shared objectives to

- reduce or eliminate greenhouse gas emissions and other pollution that affects our air, water, and soil;
- conserve and/or reduce demand for scarce resources by developing alternative sources or provide goods and services that are more efficient in our consumption of these resources; and/or
- provide more ecologically sustainable development practices that lessen our impact upon the environment.

Given that green employers are defined by their shared objectives rather than a common technology or business practice, the universe of green employers—and the occupations connected to those employers—can be quite large and cover an almost universal range of industries and occupations. Due to the broad nature of the green economy, green

employers' workforce and economic development needs would be inherently diverse with potentially few if any strategies that would be universally applicable.

For this study, we have narrowed the definition of green employers to those firms that are actually selling green products or providing green services to customers or are in the process of developing such products or services. We have also included in our definition of an "emerging green employer" those firms that support the development or production of green products and services or provide research and/or technology to firms that are providing green products and/or services

"Green employers" are defined for the purpose of this study as those employers that

a. produce or manufacture green products or are in the process of developing green products;

b. provide green services or are in the process of developing green services; or

c. directly support the development or production of green products or services that will be provided to customers.

Those firms that are only engaged in green practices or using green products and/or services would not meet the definition of a green employer for this study.

CLASSIFYING SILICON VALLEY'S EMERGING GREEN ECONOMY

As is true with other emerging industries, there is no consensus on a classification scheme for examining the green economy. Depending on the purpose of the analysis, researchers have developed different green economy frameworks.

Why These Five Emerging Green Industries Were Selected

As part of the research for this study, the project team considered several green economy classification structures. Ultimately, because this report is primarily a workforce development study, the decision was made to largely borrow one of the simple segmentation models put forward by Clean Edge in their 2009 and 2010 Clean Tech Job Trends report. In these reports, Clean Edge identified the top clean tech job sectors in one of four categories; energy, water, transportation, and materials. These industry sectors not only include the industries that are growing fastest within the green economy but provide more distinct occupational opportunities compared to the broader green employer universe.

After spending considerable time talking to Silicon Valley's emerging green employers, it became clear that an additional sector would need to be added to support much of the specialized manufacturing and product development critical to firms developing green products and services. This sector includes those specialized suppliers and supporting industries (contract manufacturing, research services, and design firms) that play a critical role for much of Silicon Valley's technology employers, including those in the green economy.

Table 1 delineates the five key sectors that are the focus of this study. The table also includes some of the technologies that are typically associated with each sector. This is not meant to be an exhaustive list of the green technologies that can be found in each of the emerging green sectors but is instead meant to highlight some of the key green technologies.

Table 1 Key Sectors with Green Technologies

Key Sectors	Green Technologies
Energy	solar, wind, smart grid devices and networks, energy storage, and infrastructure
Materials & Manufacturing	bio-based materials, green building materials, and reuse and recycling
Specialized Suppliers & Supporting Industries	environmental testing and mitigation, contract manufacturing, engineering and design services
Transportation	hybrid and all-electric vehicles, advanced batteries, electric rail and transportation infrastructure
Water	energy-efficient desalination, water recovery & capture, and new filtration membranes

Both industry classification systems—the Standard Industry Classification (SIC) and North American Industry Classification System (NAICS)—fail to accurately delineate all of the emerging technologies and industries that make up the current green economy as

well as those that would fall under the more emerging aspect of the green economy. Through the course of the research, however, we have identified the industry classifications that are most likely to have emerging green employers. Table 2 includes some of the notable industry classifications.

Table 2 Key Sectors Defined by Traditional Industries

EG Sector	Traditional Industry Classification Groups
Energy	power generation, turbine, semiconductor, and related manufacturing
Materials & Manufacturing	electric lighting, control instrument manufacturing & remediation, and other waste management services
Specialized Suppliers & Supporting Industries	environmental consulting and scientific research & development services
Transportation	battery and transportation equipment manufacturing
Water	water, sewage, and related systems development, construction, and products. (Please note this does not include public sector water utilities and public sector water utility jobs were not included in our employment count.)

SILICON VALLEY'S EMERGING GREEN EMPLOYERS

Silicon Valley has been an important hub for the development of emerging green technologies (also referred to as clean technology). As a larger region, the Bay Area recently ranked as the top metropolitan area for clean tech job seekers in the United States according to Clean Edge[1].

Table 3 illustrates the total employment in Silicon Valley for the five sectors or industry groupings where emerging green employers are likely to be found. Employment in these sectors currently accounts for 14 percent of the 1.24 million jobs in Silicon Valley. It is within these five sectors that we find most of the emerging green employment in Silicon Valley.

Table 3 Silicon Valley's Key Industry Sectors for Emerging Green Employment

Silicon Valley's Key Industry Sectors	Total Employment[2]
Energy	47,136
Materials & Manufacturing	20,446
Specialized Suppliers & Supporting Industries	96,010
Transportation	10,776
Water	709
Total	**175,077**
Overall Silicon Valley Employment:	**1,241,100[3]**
Key Industry Sectors as a Percent of the Overall SV Economy:	**14.1%**

For this study, and for most data presented throughout this report, Silicon Valley is defined as San Mateo, Santa Clara, and Santa Cruz counties in their entirety and the southwest portion of Alameda County. Any data points that use an alternate definition of Silicon Valley are noted in the report.

A list of known green Silicon Valley employers in our five key sectors was compiled. These employers were either self-identified as providing green products or services or were found on a national list of green employers that have received funding from groups that invest in emerging green employers. We also created a list of potential green employers that were in the emerging green industries related to energy, materials & manufacturing, specialized suppliers & support industries, transportation, and water.

Table 4 provides a 2010 estimate for employment in what we consider to be Silicon Valley's five emerging green employment sectors: energy, materials & manufacturing, specialized suppliers & support industries, transportation, and water. As shown by the table below, energy and specialized suppliers & support industries account for just over two-thirds of all the emerging green employment in the region.

[1] See Table 13 Cleantech Employment Ranking by Metro Area.
[2] Total employment includes all employment in the identified sectors and is not limited to emerging green employment.
[3] Source: California Employment Development Department, Monthly Labor Force Data for Counties: December 2010.

Table 4 Estimate for Employment and Establishments in Silicon Valley's Emerging Green Sectors and Firms

Emerging Green Sector	SV Firms	SV Employees	% SV Emerging Green Sector Employment
Energy	331	4,499	31.2%
Materials & Manufacturing	310	3,710	25.8%
Specialized Suppliers & Support Industries	479	4,783	33.2%
Transportation	30	1,243	8.6%
Water	8	166	1.2%
Total	**1,158**	**14,401**	**100%**

SILICON VALLEY'S GREEN EMPLOYERS: GROWTH EXPECTATIONS

Understanding the size and scope of Silicon Valley's emerging green employment sectors as well as the available research on the emerging green economy is a valuable first step in understanding the workforce and economic development opportunities that exist in Silicon Valley. Just as important, though, is hearing what Silicon Valley green employers have to say about their expectations for the future and their need for skilled and trained workers.

> For this study, a quantitative telephone survey (n=150) was completed with known and potential green employers in Silicon Valley's emerging green sectors. The purpose of the survey was to understand how employers identified with the green economy, their hiring needs and expectations, and the occupations and skills they will be looking for in the future.

In November of 2010, California voters soundly rejected Proposition 23, a measure that would suspend California's goal of limiting greenhouse gas emissions until the unemployment rate was below five and a half percent. Ultimately, voters—like many policy makers—have come to believe that a profitable green economy can generate considerably more jobs than it takes away, and the results of our employer survey in Silicon Valley further supports that contention.

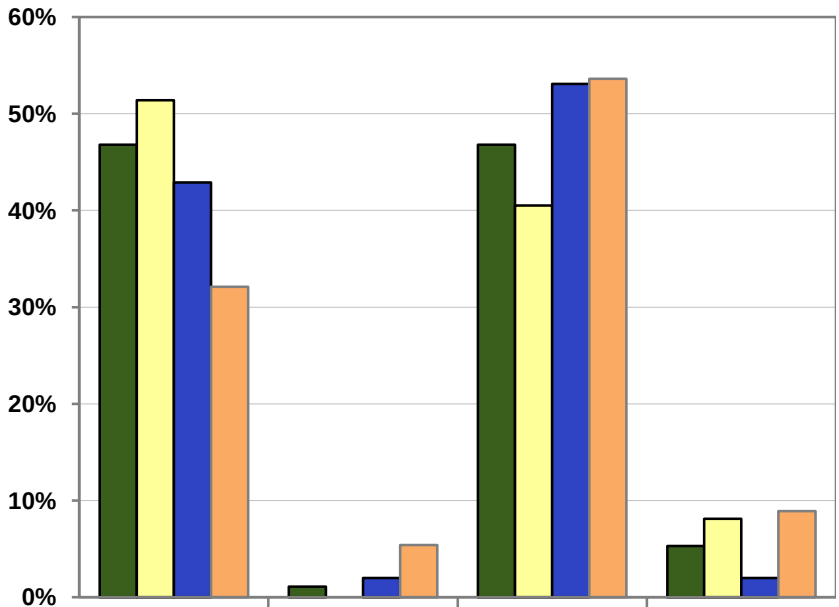
Figure 2 shows the overall hiring expectations of Silicon Valley employers in emerging green sectors. Based on responses to survey questions five, six, and seven, employers were identified as "green" and then broken down further into subsets of "more emerging green" and "more established green" on the basis of responses to questions twelve, thirteen, and fourteen. Non-green employers represented in the figure did not identify as green employers but were businesses in industries likely to have emerging green employers.

Overall, almost half (47%) of Silicon Valley green employers in emerging green sectors expect to increase their total number of employees over the next 12 months and an equal percentage indicated total staffing levels would stay the same (47%). Only one percent of green employers surveyed indicated they would decrease staffing levels, and the remaining five percent were not sure. These results show that green and non-green

employers in the five emerging green sectors have strong hiring expectations, but firms in the more emerging green group were the most optimistic about increased staffing, followed by more established green, and lastly by non-green employers.

The results also indicate a much higher than expected level of confidence in companies' ability to project their hiring needs over the next twelve months. Typically, in industries that are rapidly changing, and also during times of economic uncertainty, more firms will report being uncertain of their hiring needs. This trend is evident in that more emerging green firms answered "don't know or no answer" than more established green firms, but the overall low number illustrates a relatively confident employer base.

Figure 2 12-Month Staffing Expectations for Emerging Green Sector Employers (Self-Identified)



	Increase	Decrease	Stay the same	DK/NA
Green Employers	46.8%	1.1%	46.8%	5.3%
-More Emerging Green	51.4%	0.0%	40.5%	8.1%
-More Established Green	42.9%	2.0%	53.1%	2.0%
Non-Green Employers	32.1%	5.4%	53.6%	8.9%

The Manpower Employment Outlook Survey for the San José-Sunnyvale-Santa Clara Metropolitan Statistical Area (San José MSA) showed that 14 percent of employers expect to increase staff levels, 11 percent expect to decrease staff levels, and 71 percent expect staffing levels to remain flat, yielding a net employment outlook that is positive by three percent. While the survey was only looking at the first three months of 2011, compared to our emerging green survey that looked at the next 12 months (survey fielded in October and November of 2010), comparisons of the overall net employment outlook are still valid.

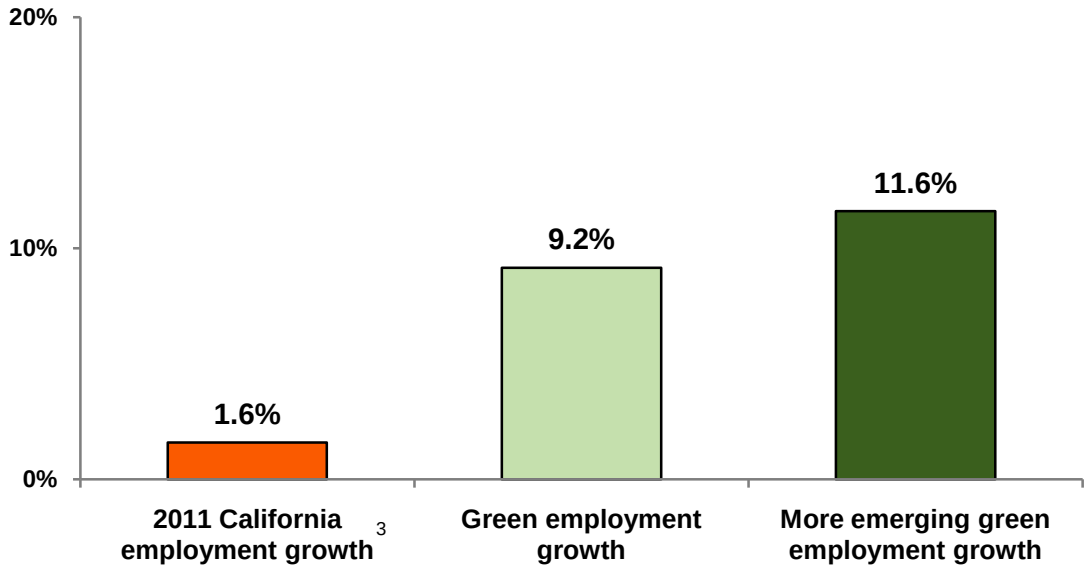
The net employment outlook is the difference between the percentage of employers that expect to increase staffing levels subtracted from the percentage of employers that expect to decrease staffing levels. The results are starkly different for the overall San José MSA area and green employers in Silicon Valley.

- Silicon Valley green employers net employment outlook: +46%
- San José MSA employers net employment outlook: +3%

In an economic environment of double-digit unemployment, the type of job growth expected by employers in Silicon Valley's emerging green sectors is a valuable foundation for economic and workforce development.

The Silicon Valley green firms surveyed expect to increase the number of employees at their location by 9.2 percent over the next year, with the percentage even higher among the more emerging green sub-groups. As shown in Figure 3, this is considerably stronger growth than the overall employment growth expected for California's economy in 2011.

Figure 3 Growth Expectations among Silicon Valley's Emerging Green Employers

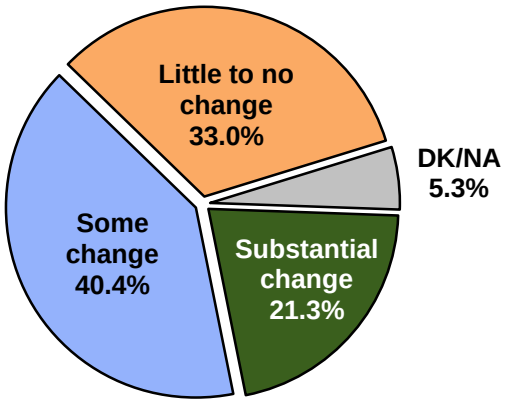


[4] UCLA Anderson Forecast.

Besides focusing on overall growth expectations, employers were asked about the stability of their workforce in the future. This is important because it tells us if our current expectations about occupational opportunities are ones that we should build upon, or as in this case, will likely continue to change in the near future.

Figure 4 shows that over the next 12 to 24 months, one in five (21%) green firms expects to see substantial change in the composition of its employees with regard to skills, education, and abilities. Forty percent expect some change in employee composition and 33 percent anticipate little to no change in the skills, education, and abilities of employees. More than three out of every five green employers in the region's emerging green sectors is expected to at least see some, if not substantial, change in the composition of their workforce.

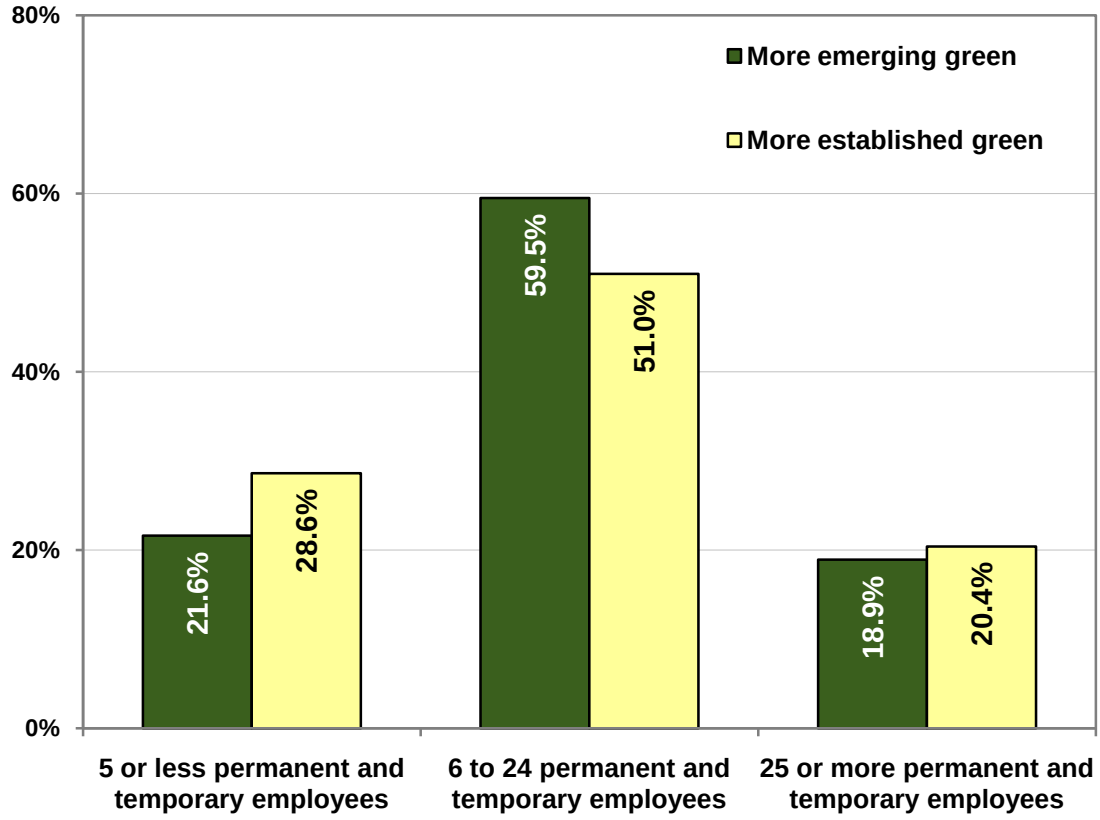
Figure 4 Expectations for Composition of Employees



EMERGING GREEN EMPLOYER PROFILE

Figure 5 shows the size distribution of Silicon Valley's emerging green employers. On average, almost four out of five emerging green employers in Silicon Valley have less than 25 employees (more emerging green, 81%; more established green, 80%). More emerging green employers are more likely to have 6 to 24 employees (60%) while more established green firms are more likely to have five or less employees (29%).

Figure 5 Size Profile of Silicon Valley Emerging Green Industry Employers



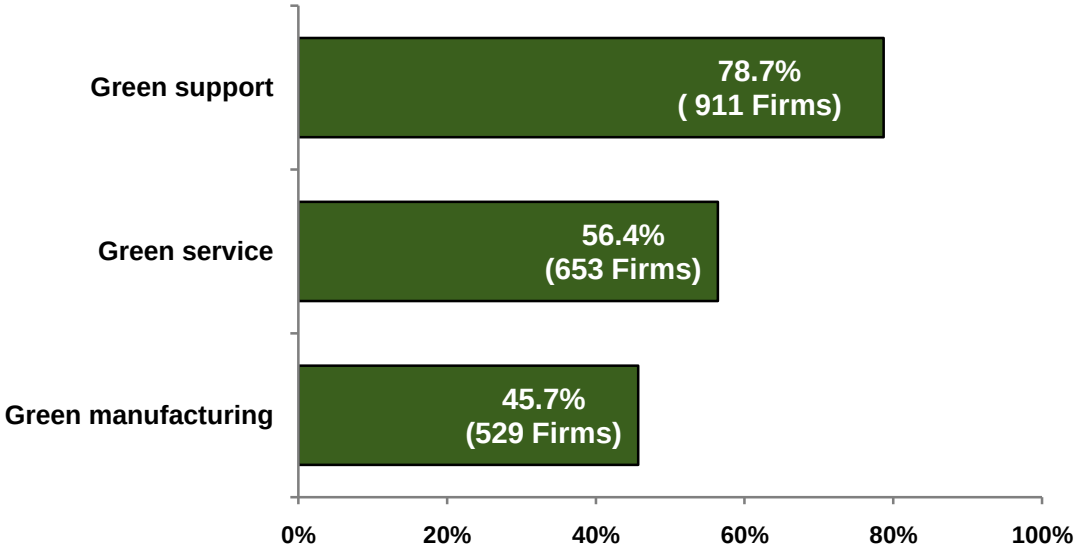
Again using responses to survey questions five, six, and seven, firms were classified as providing support, services, and/or manufacturing. Figure 6 reveals our extrapolations for the percent and number of emerging green firms in Silicon Valley that are in the three categories.

Seventy-nine percent of Silicon Valley's emerging green firms, or approximately 911 employers, would classify themselves as "green support" firms—supporting the development of green products or services or providing research and/or technology for green products or services.

Fifty-six percent, or approximately 653 firms, are "green service" firms—providing or in the process of developing green services.

Forty-six percent, or approximately 529 firms, are "green manufacturing" firms—producing or manufacturing green products or in the process of developing green products.

Figure 6 Emerging Green Firm Type[5]



[5] Derived from a series of three survey questions (Q5, Q6, Q7). Because many firms were classified in more than one category based on their responses, percentages will sum to more than 100%.

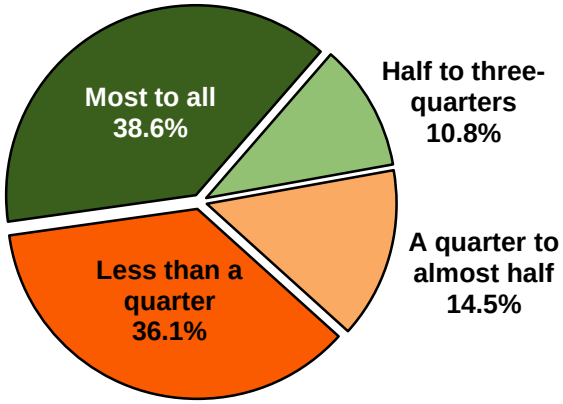
As shown in Table 5, most green firms identify with more than one of the preceding green categories. Eighty-six percent of green manufacturing firms also identify as a green support firm, and 72 percent of green service firms also classify themselves as green support.

Table 5 Green Firms by Type

Type	Overall	Also Identify as A:		
		Green manufacturing firm	Green service firm	Green support firm
Green support firms	**78.7%**	50.0%	51.4%	--
Green service firms	**56.4%**	43.4%	--	71.7%
Green manufacturing firms	**45.7%**	--	53.5%	86.0%

Figure 7 illustrates the percentage of revenue green employers are deriving from green products and services. Forty-nine percent of green firms derive at least half of their total revenue from green products or services (most to all, 39%; half to three-quarters, 11%). Not surprisingly, firms in the specialized suppliers & supporting industries category were more likely to derive less than a quarter of their revenue from green products and services.

Figure 7 Percentage of Revenue Derived from Green Products and Services[6]



[6] Percentages among firms who provided data at this question.

Figure 8 reveal green employers expectations for revenue from green products and services over the next 12 months. Two out of three green employers expect the percentage of their location's total revenues from green products or services to increase over the next 12 months.

Figure 8 12-Month Expectation for Revenues from Green Products or Services

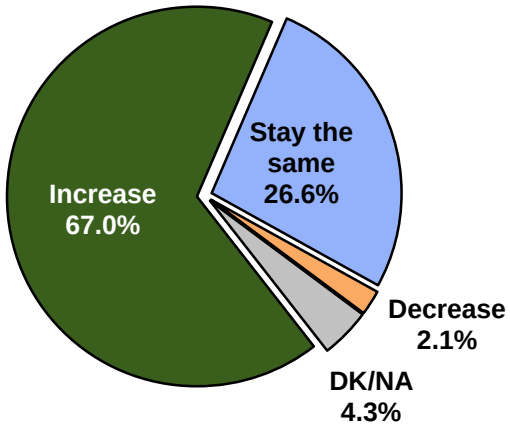
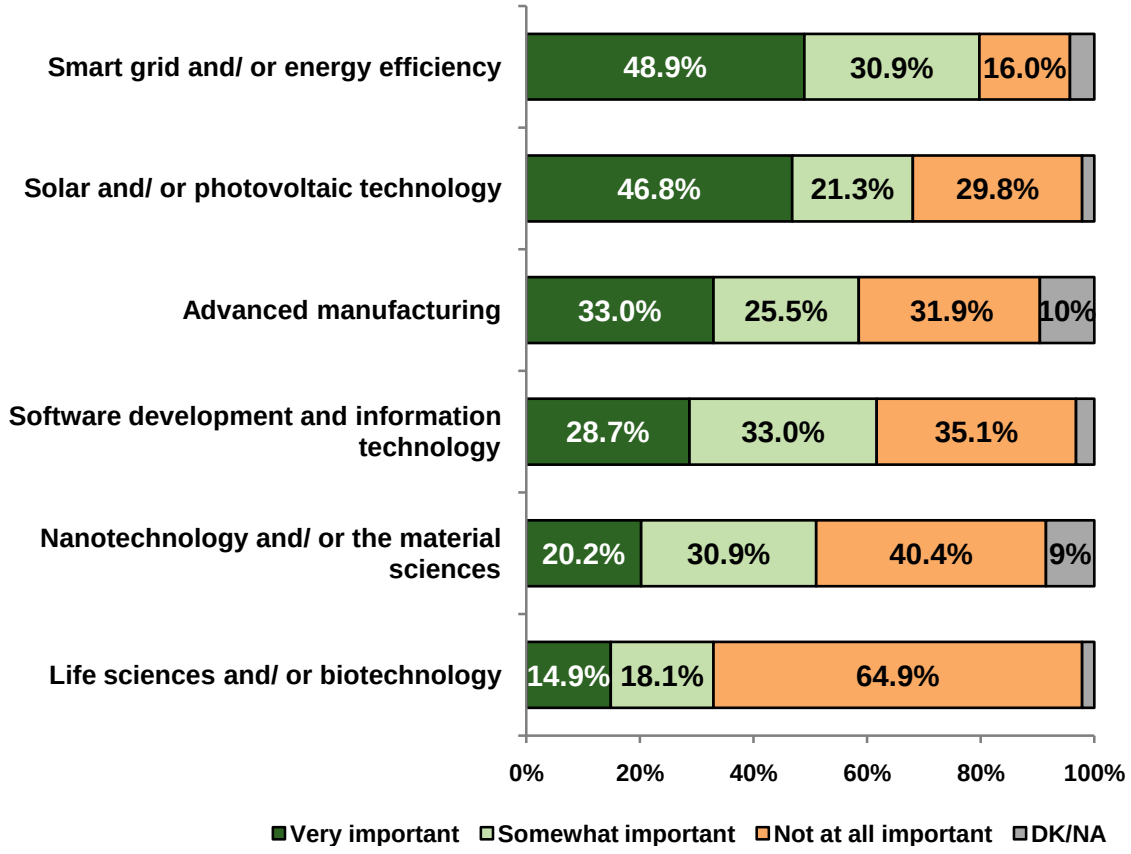


Figure 9 illustrates the importance of various technologies for Silicon Valley's green employers. Nearly a majority of green firms view smart grid and/or energy efficiency (49%) and solar and/or photovoltaic technology (47%) as "very important" technology areas for their business. This is also in accord with the previously reported venture capital findings that show the two largest areas of investment in the region are energy efficiency and renewable energy.

With the exception of life sciences and/or biotechnology, the majority of green firms feel each technology area is "somewhat" or "very" important for their business.

Figure 9 Importance of Various Technology Areas to Silicon Valley Green Employers[7]

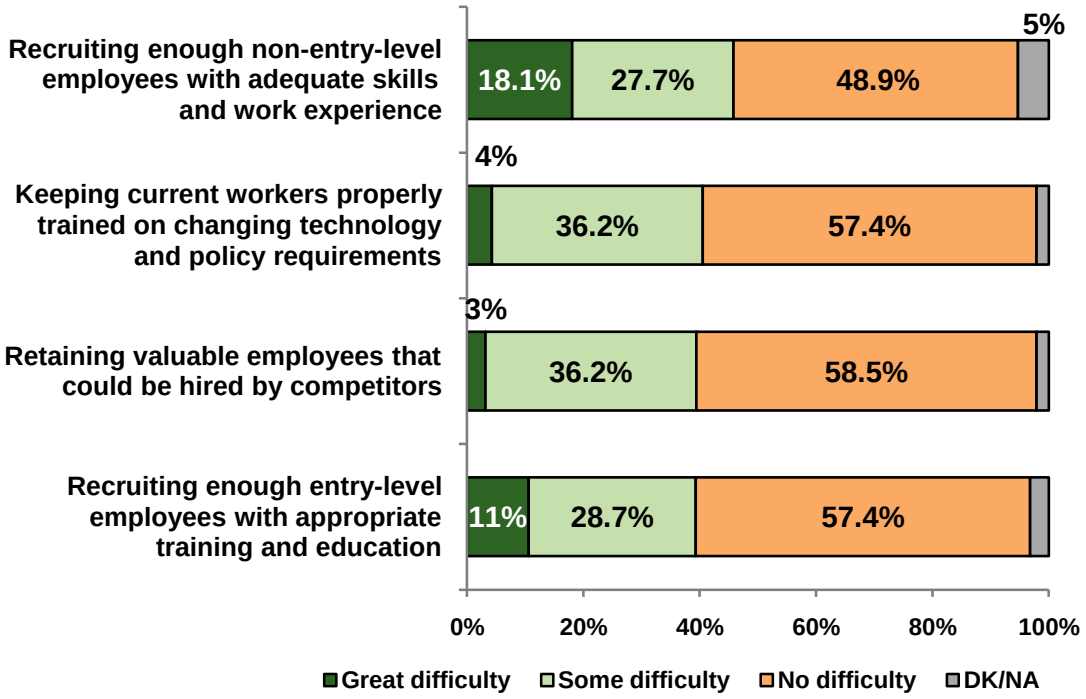


[7] Sorted by the percentage "very important."

WORKFORCE CHALLENGES

Figure 10 displays the level of difficulty employers face given various workforce challenges. Silicon Valley green employers report the most difficulty "recruiting enough non-entry-level employees with adequate skills and work experience" (46% total difficulty, 18% "great difficulty").

Figure 10 Workforce Challenges



HIRING EXPECTATIONS: EMPLOYEES WITH LESS THAN A MASTER'S DEGREE

In general, emerging green employers did not focus on degrees and formal education as key criteria to assess job applicants. Eighty-five percent of green firms have employees with less than an advanced degree, defined as a Master's degree or higher.

It should be noted that while a Master's degree or higher was not a significant barrier for employment in most emerging green firms, this should not be interpreted as evidence of a large percentage of entry-level employment opportunities. In fact, most employment opportunities with Silicon Valley's emerging green employers require industry experience and a thorough understanding of different technologies, which makes entry-level employment opportunities relatively few.

Figure 11 reveals the proportion of green employers that currently hire individuals who have less than a Master's degree as their highest level of educational attainment.

Figure 11 Currently Employ Individuals with Less than a Master's Degree

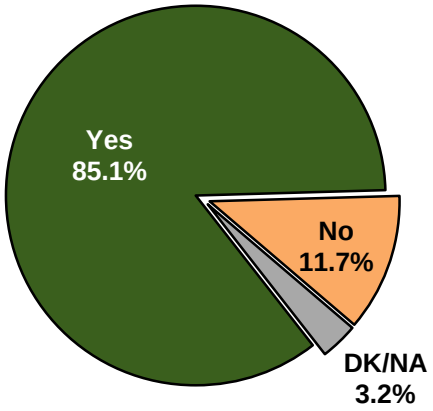
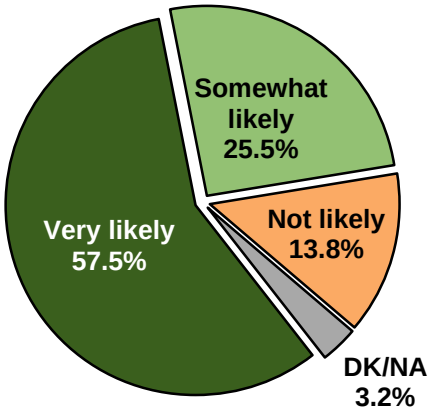


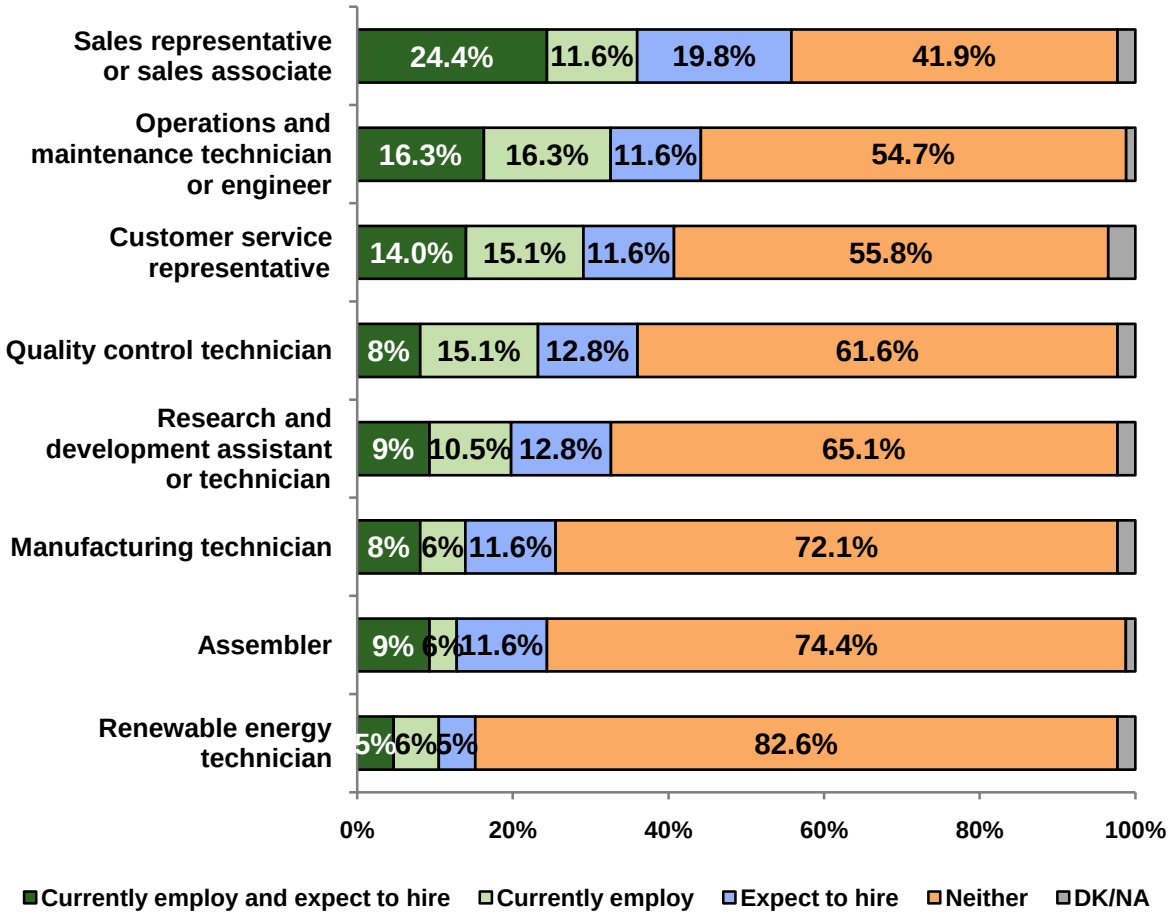
Figure 12 illustrates green employers expectations of hiring for positions in the next 12 to 24 months that do not require a Master's degree or higher. Eighty-three percent of green firms anticipate filling positions that will not require an advanced degree (Master's degree or higher) in the next one to two years.

Figure 12 Likelihood of Hiring for Positions in the Next 12 to 24 Months that Do Not Require a Master's Degree or Higher



Four out of ten green firms either currently employ or expect to hire (within the next 12 to 24 months) sales representatives or sales associates (56%), operations and maintenance technicians or engineers (44%), and customer service representatives (41%).

Figure 13 Hiring Expectations by Occupation



EMERGING GREEN EMPLOYER PROFILES

The employers within the five emerging green sectors exist in several industries and perform a wide range of activities. In-depth executive interviews were conducted with selected firms determined to be within our targeted sectors. The emerging green employers profiled in this section represent firms in varying lifecycle stages, sizes, and locations within Silicon Valley.

The emphasis of each interview was understanding the drivers of employment growth in each firm as well as their workforce training needs, employment projections, skill profiles, and career pathways. To place this information in context, a significant amount of time was dedicated to discussing each firm and the technology they work with. In addition to discussing their history and current positions, firms were asked about their expectations for expansion in terms of workforce, customer geography, and technology.

The workforce dialogue revolved around key occupations, for both entry-level positions and those occupations further up a given career ladder. The executive interviews also included discussion about critical skills sets, preferred experience, and educational requirements for successful applicants for the occupations discussed and the deficiencies that were noted with current applicants.

Six of the firms profiled are connected with the solar industry. These firms include those that design and install solar panel systems, advance solar technology, and one in particular that develops software to help the industry work more efficiently. Four profiles describe firms directly involved with solar energy production. The three profiles of firms involved with energy efficiency include the industries of controls, window film, lighting, and smart grid. Most profiled firms were involved in manufacturing and R&D or design.

PROFILE FINDINGS

The information obtained from the executive interviews and supporting research on these ten firms should not be generalized to the entirety of emerging green employers within Silicon Valley, but offer valuable insight into the decisions and choices facing the region's employers in these important industries. The profiles also offer valuable information regarding the challenges and opportunities facing job seekers who are looking for employment in these emerging green sectors.

The start-ups and the firms we profiled in the early growth lifecycle stage tended to expect their workforce to at least double in size each year. They are firms that have seen the Great Recession and still feel that dramatic growth is imminent. This group of necessarily optimistic decision makers tended to have had success with similar ventures in the past and have worked in the same or similar industries for decades.

- **The solar industry alone offers a broad array of occupational and industry employment opportunities.**

The solar design and installation firms believe that several contractors are flooding the solar panel installation market without the proper credentials or experience. Some firms focus on design and engineering while contracting out installation. Tom McCalmont of McCalmont Engineering describes the process of installation as a "headache." Michael Gumm based the firm SunPods on the idea that solar panel installation is a practice that

should be avoided. SunPods offers mobile solar panels that are assembled in a factory and require only a small team of electricians to install them onsite.

- **Making buildings, both old and new, more energy efficient will ultimately require new technology and provide new employment opportunities**

Firms specializing in energy efficiency, whether it is spectrally selective window film, LED lighting, or advanced controls, are focusing on existing buildings with inefficiencies. While many of these firms take advantage of opportunities to partner with builders, as new buildings are often built with energy efficiency in mind, other firms focus on the significant number of older buildings in need of retrofitting. Cypress Envirosystems has set its focus on lessening the burdens of retrofitting, including both cost and time; they advertise installing advanced efficiency controls in a matter of minutes.

Several of these firms believe they are offering the standard products of the future. Lunera designs and manufactures Light Emitting Doide (LED) lighting fixtures with a focus on office buildings, public venues, and other non-residential uses. They believe that within a matter of years, LED lighting, with its increased energy efficiency, longer life, and better light quality, will replace compact florescent lighting as the main source of commercial lighting.

- **Industry experience and passion for the technology can be more important than academic degrees or specific training requirements to emerging green sector employers.**

Those firms with operations geared towards R&D, design, and engineering tend to require at least four-year degrees, and in some cases advanced degrees, for nearly all positions. Most positions at these firms are in the fields of engineering, science, and technology, and they also tend to have positions in project management, supply chain management, and marketing.

Positions that do not require university degrees were found in installations, administration, and sales. Multiple firms identified experience, not education, as the most important qualification. A few firms also noted that a passion for the technology is as important as any skill set.

- **There are entry-level opportunities to be found with Silicon Valley's Emerging Green employers, but there are not a lot of them.**

Entry-level positions identified through the interviews were included in every discipline incorporated by these firms, including engineering, science, technology, manufacturing, marketing, construction/installations, and administrative roles. The smaller firms tended to employ proportionally fewer entry-level positions and were typically hesitant to hire applicants without experience until later in the development of the firm. Entry-level opportunities not requiring university degrees include assisting roles on installation teams, installers after training, machinery operators, assemblers, and administrative staff.

While some firms reported overwhelming responses to position openings, and several indicated no difficulty obtaining the appropriate talent, a few firms did indicate difficulty filling specific roles. Roles that require a business or technical skill set in addition to knowledge regarding a specific technology were cited multiple times. At Lunera, they found it difficult to find sales people with knowledge of the lighting industry. At Picarro,

they have had difficulty finding applicants with both scientific knowledge and the desire to work in a business role. SolarNexus has experienced difficulty finding software designers who are also versed in solar technology.

Silicon Valley's emerging green employers believe that a lot of new positions will be created. As these firms expand, more and more opportunities will be available at these firms for people without a university education.

· OWNS MORE THAN 8,000 PATENTS.

· INVESTS APPROXIMATELY $1 BILLION INTO R&D EACH YEAR.

· ENTERED THE FLAT PANEL DISPLAY AND SOLAR ENERGY MARKETS IN 2006.

History

Applied Materials is an equipment supplier to the semiconductor, liquid crystal (LDC) display, light emitting diode (LED) display, and solar photovoltaic (PV) industries. Since 1967, Applied Materials has been active in R&D around high tech manufacturing. In 1981 they entered the semiconductor equipment market.

In 2005, the firm received the Supplier Environmental Leadership Award from the International SEMATECH Manufacturing Initiative (ISIM) "in recognition of the company's dedication to resource conservation in the semiconductor equipment industry" demonstrating a commitment to greener practices. In 2006, the firm acquired Applied Films Corporation, entering into the flat panel display and solar markets.

Today, approximately 10 percent of the Applied Materials workforce is involved with the production of these energy efficiency and energy production end products.
In fiscal year 2010, the company brought in $9.5 billion in revenue.
Applied Materials has 92 locations in 21 countries and is headquartered in Santa Clara County, California.

Technology and Industry Connections

THE APPLIED MATERIALS MISSION IS TO "TURN NEXT GENERATION TECHNOLOGY INTO PROFITABLE NEW MARKET OPPORTUNITIES FOR OUR CUSTOMERS."

In 2010, Applied Materials invested $1.1 billion into R&D. According to their website, these R&D activities "generate many technologies that potentially have applications beyond the domains for which they were developed." The firm works with other firms to leverage these innovations. According to their website, Applied Materials holds more than 8,000 patents in the following areas:

Analytical techniques	Automation	Charged particle beams - electron and ion	CVD, PVD, ALD, ECP, CMP, RTP, Implant
Etching - conductive and nonconductive	Inspection	Metrology	Nanotechnology
Optics – lenses and display	Processes – High Volume Manufacturing (HVM)	Robots – wafers	Thin Films - including stress engineering

Workforce Profile

Applied Materials has approximately 13,000 full-time employees. Including temporary and contingent employees, the firm employs 21,000.

The energy group, which produces the display and solar market technology and machinery, employs 2,000, 600 of which are contingent or temporary. Last year, 300 were hired in the energy group alone.

Occupations at Applied Materials fall into the engineering, technology, manufacturing, marketing, materials, or technical support categories.

Due to the highly technical nature of the company, most positions require at least master's degrees. Many require PhD's. Some positions are filled by someone without an advanced degree, however this is uncommon.

The technical support category is an exception. Positions in this category can often be obtained with a four-year technical degree, or relevant military experience.

For the second year in a row Applied Materials Inc., has been named to NEWSWEEK Magazine's Green Rankings in its second annual environmental ranking of the 500 largest U.S. companies.

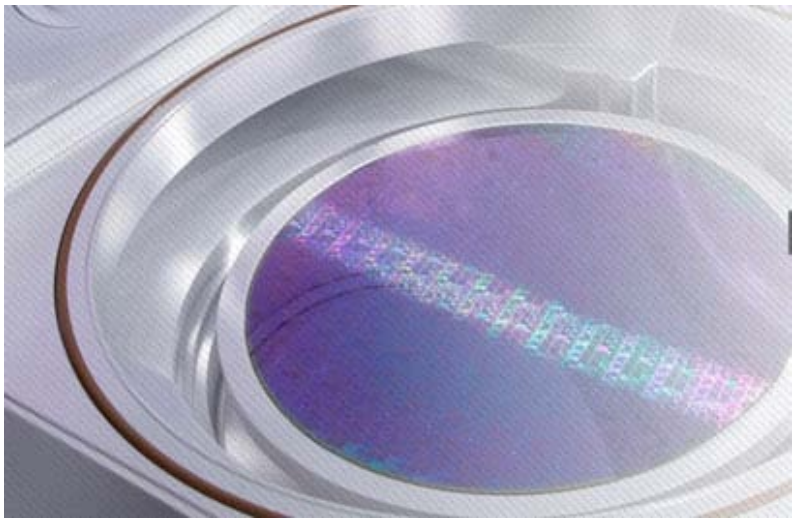
Newsweek GREEN RANKINGS 2010

ENTRY-LEVEL OPPORTUNITIES

There are several opportunities that do not require extensive experience. These opportunities can be found in each of the occupational categories, however, for the most part, they all require advanced degrees.

Final Notes

As a firm focused on engineering and R&D, Applied Materials needs employees with advance degrees. There will not be many opportunities for an applicant without one. While its core business line is semiconductors, a significant portion of the firm is dedicated to the green operations of solar panel as well as LCD & LED display production machinery.



· A CONTRACT MANUFACTURER IN SAN JOSE FOR 25 YEARS

· RECENTLY DEVELOPED THEIR OWN PRODUCT LINE OF SOLAR COMBINERS AND RE-COMBINERS

· THE FIRM HAS DOUBLED ITS WORKFORCE FROM 50 TO 100 IN THE LAST 12 MONTHS AND COULD DOUBLE AGAIN OVER THE NEXT FEW YEARS

History

Bentek has been a contract manufacturing firm in Silicon Valley for 25 years, providing complex assembly and manufacturing services for firms that were mostly within a 30 minute drive of their San José services were initially focused on the cable business and then work in the semiconductor industry but over time have focused more on power distribution and the assembly of different solar products.

Recently, Bentek has developed and produced its own product line in the solar industry of solar combiners and solar re-combiners. The firm is making the transition from being just a service-oriented company to one that is also focused on its own product line. The solar combiners currently only account for about 15 percent of the firms revenues but within a year, that could be as much as 40 percent of the firm's revenue, due to the dynamic growth opportunities associated with the solar combiner market.

In the last 12 months, Bentek has doubled its workforce from about 50 employees to approximately 100 and in two to three years could potentially add another 50 workers.
Mitchell Schoch, the President and CEO of Bentek, is committed to staying in Silicon Valley and believes that his firm and firms in a similar situation can stay and thrive in Silicon Valley as long as they stay focused on the higher value-added components of the production cycle. Mr. Schoch also believes the current growth opportunities for Silicon Valley in the solar industry are comparable to the growth this region saw 20 years ago in hardware and semi-conductors and over 10 years ago in the development of software and Internet services

Technology and Industry Connections

"BENTEK'S SOLAR COMBINERS AND RE-COMBINERS ARE LARGELY TARGETED TO SERVE THE LARGER COMMERCIAL AND UTILITY MARKET"

As a support industry employer, Bentek has worked with several large established photovoltaic manufacturers and will continue to provide contract manufacturing services to emerging green sector employers within and outside of Silicon Valley.

Recently, Bentek has drawn upon its design and engineering expertise to develop and produce its own product line in the solar industry with solar combiners and solar re-combiners. A combiner produces one feed from multiple solar panels. Bentek's combiners are designed to increase "reliability and flexibility while reducing installation time and costs. "

Bentek's solar combiners and re-combiners are largely targeted to serve the larger commercial and utility market which is expected to continue to see strong growth for the foreseeable future.

As a contract manufacturer most of the firms that Bentek served were within 30 minutes of its San José headquarters. However with the growth in demand for their solar combiners and re-combiners up to fifty percent of these products will be sold to firms outside of California and the growth in exports from Bentek is only expected to grow.

Workforce Profile

Most of Bentek's employment opportunities can be found in one of three occupational categories including engineers both electrical and manufacturing, sales professionals and assemblers. Successful sales applicants typically have solar industry experience and/or familiarity with the contract manufacturing environment and typically have at least a bachelor's degree.

For engineering positions, they are primarily focused on electrical engineers followed by manufacturing engineers and most require a four-year degree with some industry experience. Knowledge and experience with DC power distribution systems is an important asset for electrical engineers applying to Bentek.

Assembler positions at Bentek will often require experience working with electrical equipment and successful applicants will be able to read and work with complex diagrams and instructions. Currently there are job openings for electrical engineering positions and sales positions.

ENTRY-LEVEL OPPORTUNITIES

Assembler positions at Bentek offer what would be typically considered the most entry-level opportunity at the firm. These positions do require the ability to read and work with complex diagrams and instructions which would require a level of training and skills that is often times more advanced than typical entry-level assemblers.

Additional positions will likely be needed as Bentek's EMS and Solar products continue to grow.

Final Notes

Bentek is a valuable example of a firm that has established itself as one of Silicon Valley's supporting industries, contract manufacturing, but has also transitioned to develop its own product line and become a growing firm in the emerging green energy sector, more specifically in Silicon Valley's Solar market.

While Bentek has been a successful contract manufacturing firm the growth in the firm's solar combiners and re-combiners has been the real driver behind the increased demand for workers and is expected to continue drive employment growth.

Chevron Energy Solutions

· LAUNCHED CHEVRON ENERGY SOLUTIONS IN 2000

· HAS BEEN INVOLVED WITH SOLAR ENERGY AND GEOTHERMAL TECHNOLOGIES FOR 30 YEARS.

History and Future of Chevron Energy Solutions

Chevron Energy Solutions is a component of Chevron. Launched in 2000, Chevron became the "first petroleum firm to enter growing energy services market."

Before that, Chevron had been involved in Solar energy and geothermal technologies for over 20 years. Today Chevron is involved in Solar energy, geothermal energy, energy recovery from exhausted heat, biofuel research, and energy efficiency.

While alternative energy is not the primary business of Chevron, they are looking at alternative methods as business opportunities compared to other investments.

Technology and Industry Connections

The Energy Solutions unit is looking to make alternative energy sources make commercial sense, and be able to compete with traditional energy sources for capital investments.
The successful technologies out of Chevron Energy Solutions are those that are sustainable and scalable to commercial size. In renewable energy and energy efficiency services alone, Chevron expects investment and expenditures of $2.3 billion from 2010 and 2012.

"The heat exchanger and 900-kilowatt fuel cell shown here are part of an innovative system that will transform wastewater sludge and kitchen grease from local restaurants into clean, renewable power for the City of Rialto's wastewater treatment plant."—ChevronEnergy.com

Workforce Profile

Chevron Energy Solutions describes the occupations employed as in science and engineering. According to Chevron, skills that are most important to their workforce in general are imagination and innovation as well as "adherence to the application of the scientific method."
The firm expects the green workforce to follow the demand as business opportunities expand. They have had no trouble finding the candidates they need and have said that Chevron has generally been able to recruit excellent candidates.

ENTRY-LEVEL OPPORTUNITIES

Research scientists, engineers involved with energy technology, and project engineers are all entry-level opportunities.

The most important qualifications for Chevron entry-level candidates include communication skills, teamwork skills, and Bachelors of Science, Masters of Science, and PhD degrees depending on the position.

The multi-phase projects at U.S. Postal Service facilities throughout Northern California, which incorporated solar and fuel cell installations at select facilities, are helping the Postal Service save more than $4.2 million in energy costs each year.

Final Notes

As an energy company giant, Chevron has been involved in alternative energy for decades. A significant amount of investment from the firm has gone into Research and Development in particular.

Chevron Energy Solutions is working to utilize alternative energy to the extent that they make commercial sense, and are able to compete with traditional energy sources.

Chevron has also indicated that they believe it may take generations for the green energy alternatives to achieve significant percentages in relation to present energy sources.

The firm emphasized that energy efficiency is the most important "alternative energy" and that a great impact can be made through the use of lower-emission hydrocarbons, such as natural gas, during the transition period.

Cypress Envirosystems

- DESIGNS, MANUFACTURES, AND MARKETS WIRELESS PNEUMATIC THERMOSTATS AND OTHER TECHNOLOGIES.
- REPLACES THE "LEGACY" PNEUMATIC CONTROLS USED IN "70% OF THE COMMERCIAL OFFICE BUILDINGS IN THE US."
- CUSTOMERS INCLUDE GENETCH, STANFORD UNIVERSITY, VORNADO, TEXAS INSTRUMENTS, GOOGLE, AND KAISER PERMANENTE AMONG OTHERS.

History and Future of Cypress Envirosystems

Cypress Envirosystems is a subsidiary of Cypress Semiconductor. Cypress Semiconductor is therefore the sole investor in Cypress Envirosystems which operates as an otherwise separate company. The non-invasive nature of the firms controls products are designed to "enable older sites to adopt the latest automation technologies with a minimum of cost and disruption to existing equipment, processes and staff" according to their website.

"Wireless pneumatic thermostats, like this unit, can be a very cost-effective way to retrofit a building for greater control over heating and cooling. "

An example of a Cypress Envirosystems controls product is the Wireless Pneumatic Thermostat which "replaces existing pneumatic thermostats in minutes, and enables... lower energy consumption, less maintenance labor, and more comfortable occupants." Starting four years ago, their first products came out roughly one year later. Up to this point, the firm has seen rapid growth. They expect revenues to more than double for each of the next few years and their workforce to increase significantly as well. With many opportunities in large cities with established and aging buildings, Cypress Envirosystems are currently used in Asia, Europe, and across the US.

Technology and Industry Connections

CYPRESS ENVIROSYSTEMS FOCUSES ON USING A "NON-INVASIVE RETROFITTING APPROACH"

Facility managers of older commercial properties face the challenge of working with outdated technology. Retrofits can decrease energy usage, but can also come with high initial costs and take significant time to install. Cypress Envirosystems focuses on using a "non-invasive retrofitting approach." They are attempting to capitalize on the opportunities that come from a older energy-inefficient buildings and plants.

According to a September 2010 press release by Cypress Envirosystems, their newest wireless pneumatic thermostat delivers "direct digital control functionality in… under 20 minutes with minimal disruption of occupants" and "pays back in 18 months or shorter."

Because utilities can provide subsidies that reduce payback periods for retrofits, Cypress Envirosystems is currently working with multiple utility companies to ensure that they are an approved vendor and that their products are approved by the utility as well.

Workforce Profile

Cypress Envirosystems hires people for engineering, supply chain management, manufacturing, sales, marketing, and field operations. The supply chain management team includes buyers and inventory managers. The field team, which performs installations, trouble shooting and training, is relatively small.

Cypress Envirosystems does not expect positions in supply chain management and manufacturing to expand significantly in the near future since their model is highly scalable. Likewise, the firm does not intend on focusing on significant growth in their field team either. They would prefer to keep installation services limited as they expand in general and sell more through "channel partners."

The firm identified mechanical positions in the field team as those that trade school is an acceptable substitute for a university degree. Most other positions require four year degrees. The field team also requires employees with an ability to work with networks. This is the only skill set specifically cited by Cypress Envirosystems as difficult-to-find.

ENTRY-LEVEL OPPORTUNITIES

Cypress Envirosystems will have entry-level position opening in the future. Those opportunities may be in any business area; engineering, supply chain, manufacturing, sales, marketing, or installation.

Sales and marketing positions in particular are less likely to be filled by entry-level candidates as successful employees in those groups tend to have significant experience.

The field team is not expected to increase dramatically in size, which will limit opportunities including entry-level ones. Additionally, without substantial growth expected in supply chain or manufacturing positions, engineering positions will likely be the opportunities available for qualified entry-level candidates.

Cypress Envirosystems won the 2010 Golden Gas Award in the Cylinders/Packaging/Valves category for their wireless gauge reader.

Final Notes

Cypress attributes some of its success so far to stimulus funds, however recognized that stimulus also had drawbacks. Very few of the firm's clients received stimulus funds and clients have been known to wait to purchase products in hopes of better incentives. The firm estimates the net effect as neutral.

Policy and regulations, such as Building Star, are welcomed by Cypress Envirosystems, however they do not base business decisions, including pricing, on them. Cypress Envirosystems is a company that is attempting to capitalize on the inefficiencies in the majority of buildings through smart controls. Coupled with a "smart grid," "smart buildings" have the potential to dramatically increase energy efficiency. "smart."

· IS A RETAILER AND INSTALLER OF SPECTRALLY SELECTIVE FILM TO RESIDENTIAL AND COMMERCIAL PROPERTIES.

· CONTRACTS ARE ROUGHLY 90% COMMERCIAL AND 10% RESIDENTIAL CURRENTLY.

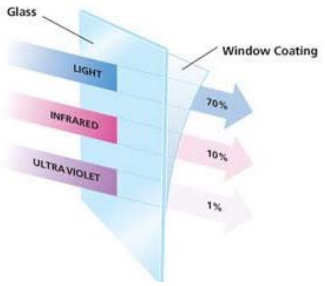
History and Industry Connections

Clear-Wall was founded in 2009 "on the premise that environmentally sound technology can be financially sound as well." The firm was self-funded relieving the need for venture capital.

According to Clear-wall, they are the only retailer and installer offering multiple brands of spectrally selective window films. One product highlighted on their web site, V-Kool, has received considerable media attention after being named one of the top 100 inventions of the last millennium by Popular Science Magazine.

Even where capital is available, economic uncertainty is holding firms back from going ahead with the purchase. This is one of the obstacles to expansion cited by Clear-Wall.

Clear-Wall contractors are spread across the state as is business. The current and expected expansions are taking the firm into other western sunny states (Nevada, Arizona, New Mexico, etc.) in the short term, and into other types of extreme weather states (Wyoming, Colorado, etc.) where the insulation benefits of some film products will be heavily valued, down the road.



V-Kool blocks out 90% of the sun's total heat while letting in at least 70% of visible light.

Technology and Industry Connections

"V-KOOL SOLAR WAS NAMED ONE OF THE TOP 100 INVENTIONS OF THE LAST MILLENNIUM BY POPULAR SCIENCE MAGAZINE."

Clear-Wall works directly with weatherization film technology designed to improve energy efficiency while maintaining natural light and visibility.

The firm is a retailer and installer of several weatherization film brands and products. In addition, they are currently working with manufacturers to design and produce further products.

Clear-Wall relies on the raw material markets for the inputs to the films. Aluminum is a key input for a good number of films, however other types of films are nickel-based.

Relationships with utility companies are important connection for firms such as Clear-Wall that offer energy efficiency products. Clear-Wall is working with utility companies to enable customers to pay for the films through utility bills. This could help to expand the business significantly and Clear-Wall hopes this could become a reality within a year.

Workforce Profile

According to Clear-Wall, they prefer using contractors to employees due to California tax law.
Currently, Clear-Wall uses a group of 8 to 10 contractors to manage and run operations. In addition, approximately 20 installers are working on Clear-Wall projects through contracts with installation firms at any given point. They expect to have double the contracted installers working on Clear-Wall projects within a year's time.

Commercial film aims to drastically cut energy and window replacements costs, enhance retail visibility, and protect merchandise while letting natural sunlight in.

Clear-Wall has had limited problems attaining qualified installers as of yet, however has hired contractors from across the country to maintain the preferred standards. For installers, experience with various films is important due to the potentially high cost of mistakes.

Although Clear-Wall doesn't currently train installers, they do expect to in the future. If the company and industry expand as projected, Clear-Wall expects to face a shortage of installers. A shortage would be the trigger to create training courses. The firm participated in the creation of what they say is the first union for installers in this industry. Having union installers will be beneficial for attaining government contracts.

ENTRY-LEVEL OPPORTUNITIES

Clear-Wall has shown that they prefer experienced installers by hiring contractors from far outside of California. They do however expect to design training courses when a consistent need for new installers exists, and then use installers with no experience.

There is a need for members of the installation team that do not work directly with the films. Ideally, the company would like entry-level installers to learn about the technology and the process of installing it in an assisting role before working directly with the products.

Final Notes

Currently Clear-Wall focuses on helping commercial clients identify the best fit of the several hundred products offered. In addition, they are working with manufacturers on product design in order to offer their own products as well in the near future. Increasing the size of operations in areas with older buildings like Los Angeles, and working with Utility companies are two of Clear-Wall's immediate expansion strategies. Although employing through installation contractors, the firm's expected growth in contracts would be responsible for employing an additional 20 people within a year's time, and roughly an additional 30 more within three years. Clear-Wall anticipates creating training programs to enable their contracted installation firms to employ prepared installers.

Lunera Lighting

· DESIGNS, MANUFACTURES, AND MARKETS LED LIGHTING FOR COMMERCIAL SPACES .

· "PRODUCES FIXTURES OFFERING TYPICALLY USING 30%-50% LESS ENERGY TO PRODUCE THE SAME LEVEL OF ILLUMINATION."

· HOLDS 12 PATENTS IN THE LED LIGHTING FIELD.

History and Future of Lunera Lighting

Lunera Lighting is a start-up located in San Mateo County. Don Peifer and Mark Walsh created the firm in December of 2007 as a developer of Light Emitting Diode (LED) technology. With the support of the Westly Group as the major investor materializing in April of 2008, their first LED fixtures were commercialized in late 2009.

Currently, compact florescent lighting (CFL) is the preferred energy saving option for most customers, and Lunera's biggest competition. Lunera's internal predictions have LED lighting becoming the prominent light source within just a few years due to lower energy consumption, longer lifetime, and better light distribution.

On their website, Lunera promotes their "ROI Calculator." Depending on several factors, including how often the lighting will be used, the payback period can be anywhere from a few months to four years. The promise of lower cost and better light is the basis of LED and Lunera. Lunera makes ballast fixtures by uniting "LED material scientists, lighting physicists, optical and power-supply experts plus thermal-management engineers to drive innovation and deliver superior lighting performance."

Technology and Industry Connections

LUNERA'S OPTICS "CREATE A SOFT LIGHT THAT MINIMIZES GLARE AND ELIMINATES EYE FATIGUE"

Lunera focuses on several markets: office buildings, parking garages, lab/research facilities, public venues, education, healthcare, and data centers. They design and manufacture high-performance commercial LED lighting fixtures and aim to replace fluorescent fixtures in these types of commercial institutions and firms. Lunera claims energy savings by: producing the same amount of light with 30%-50% less energy; dramatically reducing maintenance costs; lasting longer (15 to 18 years); integrating sophisticated controls; and government incentives.

The privately held firm currently operates with funding from "clean-tech investors" Westly Group, Kohlberg Ventures, and RCG Ventures. To date, roughly $10 million has been invested into the company and investment is expected to continue until the summer of 2011 when revenues, which have been increasing quarter to quarter, are expected to be sufficient.

Lunera expects its LED fixtures to have a service life of 15 -18

Workforce Profile

Lunera Lighting employs many typical manufacturing occupations including product designers, engineers and managers, along with teams in marketing and sales. The skill-sets and educational background typically required of employees are also standard among manufacturing with possibly one exception: experience working with high-tech products.

Lunera reports difficulty finding sales people with their preferred background. The firm also notes that the best salespeople often come from businesses that work with other lighting technology, and that have familiarity with competing technologies (primarily florescent lighting).
Sales experience in a similar role is the best predictor of success in this role.

Lunera expects its workforce make up to stay consistent in the near future however workforce needs may increase as the company grows and takes advantage of their expectation that LED will overtake fluorescent technology as the preferred lighting choice of consumers.
Lunera employed roughly 25 one year ago, 45 currently, and expect to employ 100 within two to three years.

Lunera is a 2010 finalist for the Red Herrin North America 100 award representing the year's most promising private technology ventures in North America.

ENTRY-LEVEL OPPORTUNITIES

Lunera describes the entry-level opportunities again, as typical to manufacturing such as machinery operators, assemblers, and engineers. Lunera has not experienced any difficulty with regards to finding candidates with the appropriate skill sets to be successful in these positions.

Sales people and product designers tend to need experience before entering those roles.

Final Notes

Lunera Lighting is a good example of a successful green employer in the start-up stage. While they are still receiving venture capital, Lunera cites revenues that are increasing each quarter and will enable them to be self sufficient and profitable relatively quickly. Although Lunera's products qualify for government incentives, the firm states that the incentives are not critical to their continued success. By looking to move from the start-up stage to the early growth stage next year, Lunera is expecting to be positioned to take advantage of a transition to LED technology by being an established manufacturer of LED fixtures when LED is the prominent source of commercial lighting.

· OPENED IN MID 2009.

· FOCUSES ON DESIGNING LARGE PHOTOVOLTAIC PROJECTS SIZED 1-100MW.

· CONTRACTS ARE CURRENTLY (ROUGHLY 80%) IN CALIFORNIA WITH QUICK AND SIGNIFICANT SERVICE AREA EXPANSION EXPECTED.

History and Future of McCalmont Engineering

McCalmont Engineering is a green start-up in Santa Clara County. The founders came directly from co-founder and VP positions at Regrid Power after selling the firm. McCalmont Engineering differs from Regrid primarily by shifting focus from installations to design and engineering. Regrid was also heavily into residential installations where McCalmont does mostly large projects sized one to 100 megawatts.

Fremont Union High School is one of five high schools with McCalmont designed solar carports in Cupertino and Sunnyvale, CA.

The primary obstacle identified by McCalmont is the nature of working in a fast-growing industry. This includes "growing pains" such as difficulties in the supply chain causing shortages of materials and temporary pricing pressures. Currently about 80 percent of McCalmont's work is within the state. They expect that within a year's time only half will be in California as they continue expanding territory into Utah, Arizona, Canada, Mexico, and India where they already have some work. In the future, they will expand to more extreme weather states such as Wyoming and Colorado where the systems can be used effectively as well. In addition, they are actively bidding on projects worldwide.

Technology and Industry Connections

MCCALMONT ALSO CONSULTS FOR MANUFACTURERS ON "FEATURE DEFINITION, CHANNEL CREATION, DISTRIBUTION STRATEGY, PARTNER SELECTION, AND PRODUCT ROLLOUTS."

McCalmont Engineering designs custom photovoltaic (PV) systems including concentrating photovoltaic tracker (CPV) systems. They have no interest in expanding to concentrated solar power (CSP) systems. Initial funding came in the form of (roughly $25,000-$100,000) private investments relieving the need for venture capital.

McCalmont is dependent on the silicon supply chain as well as the inverter supply chain. To a lesser degree, they also depends on the supply chains for natural materials other than silicon including copper and aluminum. McCalmont Engineering works closely with SolarTech which is a "not-for-profit consortium (that) eliminates barriers to solar PV market growth" according to their website. Tom McCalmont (CEO of McCalmont Engineering) is the sitting Chairman of their Board of Directors.

Workforce Profile

Currently McCalmont employs only four people including the founders, however they project to employ 30 to 50 within just a few years. Much of their expectations in regards to future workforce composition and size come from their experience with building their prior company Regrid.
Future occupations at McCalmont will primarily fall into the categories of engineering and operations. A few sales, administrative, and installation management positions will be available as well.

McCalmont Engineering designed this roof-mounted commercial solar system in Mountain View, CA, that produces 220 kWp for the Actel Corporation.

Engineers will range in experience level and responsibility and include both field and office engineers. Operations specialists will be the ones responsible for paperwork including permits and rebates. Experience in the solar industry will be the most important qualification when filling technical positions. Important skills include electrical calculations, analytical skills, and drafting skills. For all positions, and sales positions in particular, a passion for solar technology is really the difference between success and mediocrity.

ENTRY-LEVEL OPPORTUNITIES

Over the next few years entry-level opportunities at McCalmont will be scarce. The probable position openings without experience requirements will be for installers and administrative staff.

In the long run, McCalmont will employ engineers directly out of college.

Final Notes

State and federal incentives (which stimulus altered) do change the equation for where and when solar systems are practical. California incentives are designed to phase themselves out and are therefore less influential than they once were. Federal incentives were only for residential, but the stimulus (tax credit for 30% of systems until 2016) expanded that to all properties. The three components determining the feasibility of systems, according to McCalmont, include radiation exposure, competing energy rates, and rebates. McCalmont expects that within five years, the average person will be able to afford a system without subsidies.

PICARRO

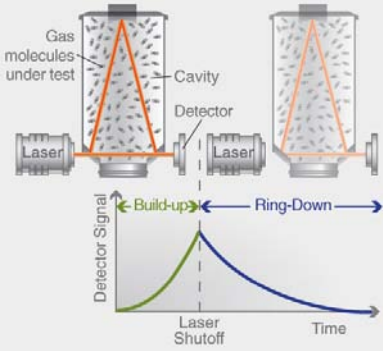
· DESIGNS AND MANUFACTURES GAS ANALYZERS.

· CONTROLS OR OWNS 17 PATENTS.

· BUSINESS IS ROUGHLY 50% IN THE US, 30% IN EUROPE, 15% IN CHINA, AND THE REST IS DISPERSED.

History

In 2007, Picarro shifted focus to greenhouse gas measurement technology as well as food safety, food origin testing, water cycle research, and air quality technologies. The company originally (from 1998 to 2007) focused on telecommunications lasers. Picarro's gas analyzers measure minute changes in concentrations of a variety of molecules including carbon, hydrogen, oxygen, nitrogen, ammonia, and methane. All of Picarro's products are manufactured in Silicon Valley.
The firm works around the world and expects to grow dramatically over the next few years.



Schematic of Picarro CRDS analyzer showing how a ring down measurement is carried out.

Technology and Industry Connections

"PICARRO'S SINGULAR MISSION IS TO PRODUCE THE WORLD'S HIGHEST PERFORMANCE AND EASIEST TO USE GAS ANALYZERS."

Picarro controls or owns 17 key patents around its core technology, Cavity Ring-Down Spectroscopy. The firm aims to produce analyzers that are both easy to use and extremely precise. Picarro serves numerous markets including atmospheric science, greenhouse gas measurement, air quality, food safety, life sciences, hydrology, biomaterials testing, ecology, and energy production.

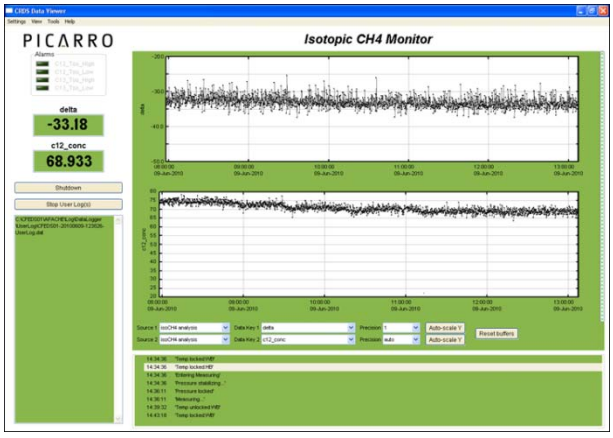
According to the firm, their growing list of deployments include measurement of biomaterials content in green packaging for one of the world's largest food companies, mapping the impacts of the Deepwater Horizon spill, and powering the world's largest greenhouse gas detection networks for the California Air Resources Board and the China Meteorological Agency. Further Picarro customers include some of the world's most respected scientific institutions including: Stanford, Harvard, CalTech, UC Berkeley, NASA, NOAA, the USDA, the U.S. Environmental Protection Agency, and Los Alamos National Laboratory. Corporate customers range from global giants such as Waste Management Incorporated and Alcan, to startups such as Calera.

Workforce Profile

CEO Michael Woelk told the San Jose Mercury news that the company was growing quickly and hiring "like crazy." Picarro seeks employees for its manufacturing arm with experience in electronics and optical product assembly, resource planning, inventory management and other related disciplines.

Manufacturing technicians must have experience but not necessarily a four year degree. Important skills for assembly technician applicants include laser alignment and high finesse optics experience. Research lab and R&D positions require undergraduate or graduate-level degrees in biology, chemistry, physics, or engineering. Many of its research personnel have Ph.D.'s. Picarro seeks candidates for sales and business positions who have degrees in chemistry or other sciences. These candidates are difficult to find.

Successful job candidates have passion for Picarro's technology and the "capability of making a product that is changing the world." The passion, entrepreneurial spirit, and intelligence of applicants are equally as important as any particular skill set.



Picarro's 2000 Series uses a "window's style GUI (that) is a snap to use and manipulate. View instrument data any way you want it from anywhere in the world - in real-time."

ENTRY-LEVEL OPPORTUNITIES

Picarro has many positions that can be filled by entry-level candidates. Chemists, marketers and salespeople as well as technicians and engineers have been hired with no prior directly related experience. Recent graduates with advanced degrees are also in demand at Picarro.out of college.

Final Notes

Legislative regulation is not necessary for significant growth according to Picarro. Their workforce has grown significantly in the past year alone and they project it to more than triple within the next few years. Currently, they are finding ways to expand through selling to "scientists all around the world." The current lack of national regulation has not concerned the firm. They believe the overall trend is that "governments, food companies, and consumers all are demanding greater transparency and accountability for food origin and safety" and more and more, "governments are mandating the measurement of emissions of carbon and other greenhouse gases." Picarro is involved in these markets and others. They anticipate continued rapid growth and further hiring of highly skilled workers.

· IS A WEB-BASED SOFTWARE PLATFORM FOR USE BY BUSINESSES IN THE SOLAR INDUSTRY.

· WAS FOUNDED IN 2009

History and Future of SolarNexus

SolarNexus develops web-based software for participants in the solar deployment value chain. This includes "manufacturers, distributors, integrators, financing providers, installers, and customers." While generic software is available, SolarNexus has industry specific process knowledge imbedded. The platform is designed help solar industry companies save time in nearly all aspects of operations including site visits, proposals, project management, paperwork, vendors, sales, design, etc.. The firm was founded in 2009 and identifies as a start-up.
Using the SolarNexus platform is free for up to 10 users. This demonstrates the firm's focus on smaller solar contractors.

Technology and Industry Connections

SOLARNEXUS IS "A WEB-BASED SOFTWARE PLATFORM AIMED AT ELIMINATING MUCH OF THE PAPERWORK THAT BOGS DOWN SOLAR INSTALLERS TODAY"-
PV MAGAZINE

SolarNexus estimates that the value chain equates to approximately 13,000 businesses nationwide. The firm further estimates that nationwide, approximately 2,000 of these businesses are contractors that work primarily on solar projects.

SolarNexus teams with SolarTech and SolarPro to provide SolarHub. According to the SolarHub website, "SolarHub is a free reference database of product specification data used by professionals in the solar energy market."Additionally, SolarNexus integrates its partners' products and services into its platform.

Current partners include-

· Getsolar.com which aims to help "residential and commercial customers find appropriate vendors for their solar energy and greenbuild projects;"

· Solmetric which provides SolarNexus' platform the capability "to help installers complete site survey information and configure systems;" and

· Clean Power Research which "provides SolarNexus with a world-class financial analysis engine and utility rate database.

Workforce Profile

Currently, SolarNexus employs seven people. Workforce growth is expected, however it is not clear how much. Positions can be classified under software design, business development, marketing and sales, or quality assurance. New positions are likely to be more common in programming. It is also expected that additional positions will be created in marketing and sales. Important qualifications for employees at SolarNexus include a thorough knowledge of the technology they are using, as well as industry experience. SolarNexus cited difficulty finding candidates with both knowledge of software design and the energy industry.
Successful candidates for most openings will need a four-year degree at the minimum.

ENTRY-LEVEL OPPORTUNITIES

SolarNexus does expect to hire entry-level candidates. Entry-level openings will most likely be marketing and customer service related.

Again, important qualifications for successful candidates will be software development skills, knowledge of the energy industry, and a university degree.

Final Notes

SolarNexus believes that stimulus spending has been necessary. It enabled projects to move forward and the industry to grow. However, they do not expect significant impacts from stimulus funds running out. They see a reality were solar energy costs have, and will continue, to come down, while traditional energy costs continue to rise. Solar Nexus is optimistic about the Solar industry, and its position in it.

· DESIGNS AND MANUFACTURES MOBILE SOLAR PANEL PRODUCTS.

· FIRST ROUND INVESTORS INCLUDED FAMILY AND FRIENDS AS WELL AS A BUILDING OWNER WHO ACCEPTED STOCK IN PLACE OF RENT.

· EXPECTS TO HIRE 8 TO 10 PEOPLE IN THE NEXT 30 TO 40 DAYS.

History and Future of SunPods

SunPods is based around the idea of decreasing the costs and time associated with solar panel installation. SunPods (Sun Power On Demand) photovoltaic systems require three or four electricians to install a system rather than a large construction team. They estimate their product to eliminate 95 percent of on-site installation work.

Incorporating in 2009, the first investors entered this year. SemiMaterials is the largest investor to date. SunPods is currently deciding between Riverside or Corona as locations for opening a second distribution center in early 2011. Within just a few years, they plan to have 15 to 20 centers nationwide. Starting in New Jersey and Texas, each center will have a territory radius of approximately 200 to 225 miles.

Technology and Industry Connections

"SUNPODS BENEFITTED FROM THE AWARD-WINNING CLEAN TECH INCUBATOR, ENVIRONMENTAL BUSINESS CLUSTER" ACCORDING TO THEIR WEBSITE.

SunPod's business model differs from other solar system companies by combining the steel frame, inverter, and all other parts at the center rather than on the project site. It turns a solar panel installation job into one of merely electrical interconnection.

The thin film panels are currently purchased "off the shelf" although they expect to settle in on a supplier. A particular steel that is not readily available, is used by SunPods and provided by a Washington state supplier. Additional parts used for making the SunPods mobile are purchased from a Kentucky firm. The modules are neutral and easily attainable.
SunPods outsources on-site work to a limited number of approved contractors.

Photo credit: Erin Milnes/Solar Home and Business Journal.
SunPods are factory-assembled solar arrays that can be used to recharge plug-in electric vehicles or provide solar energy at a variety of locations.

Workforce Profile

Moving from the traditional manufacturing methods where welders and other skilled labors would be needed, Sunpods processes include a five work-station assembly line. The steel comes pre-cut and workers to put them together need to be high school educated and hard working. Recent hiring has shown there to be overwhelming response for these positions of 50 to 100 respondents to a single posting.

Other occupations at SunPods include marketers, accountants, and account managers who work with contractors. In the future some engineers may be employed, however engineering work is currently being outsourced. In the future, they will start to add more managers to make the firm less dependent on the founders. SunPods uses approximately 55 contractors.

SP-300 Plug-N-Go, which weighs about 3,000 pounds and is 10-feet by 20-feet and uses up to 12 solar panels for each 2.4 kilowatt module.

ENTRY-LEVEL OPPORTUNITIES

Production workers are positions that can be held with little-to-no prior experience. These positions do not require any more education than a high school diploma.

Important skills include knowledge of and experience working with tools.

SunPods has also worked with San Jose State University to employ interns. To date, they have employed over 10 interns for a semester each. Currently, they have one accounting and one engineering intern.

Final Notes

SunPods currently employs 13. Planning to hire 8 to 10 employees in the next 30 to 40 days and open a new center in a matter of months, SunPods is growing fast. The company uses the model used by roofers and other traditional industries. Rather than being a contractor, they approve contractors to do the installations and sell their product. With a system they believe to be fully scalable, and easily replicated, they expect to be a national presence quickly. In a matter of years they expect to have 15 to 20 centers across the country and employ approximately 1,000 people.

The SunPods Sun Bus Power System "Developed in under six weeks in collaboration with Bauer Intelligent Transportation, the system will help Bauer to meet strict anti-pollution standards set by the State of California." - Energy Matters

AN OCCUPATIONAL ASSESSMENT OF EMERGING GREEN EMPLOYERS

With Silicon Valley's unemployment still in the double digits[8] and underemployment considerably higher, the most immediate workforce development priority for the large number of job seekers is finding a job as quickly as possible. However, the emerging green sectors are unlikely to generate substantial job opportunities for unemployed workers in the very near term although long-term prospects are more promising. Moreover, the quality and sustainability of these job opportunities will ultimately define the economic vitality of the region. Skill attainment, career pathways, and the sustainability of employment opportunities that allow people to not only work in Silicon Valley but also live in the community become important considerations.

EMERGING GREEN OCCUPATIONAL ASSESSMENT

A recent study by David Autor[9] revealed the changes in this country's occupational profile. He provided an in-depth examination of the quality and quantity of the jobs that employers have demanded over the last 30 years. In his analysis, Autor developed an occupational segmentation that BW Research has also used in regional occupational analyses. This occupational segmentation technique delineates all occupations into one of three tiers. [10] The occupational tiers are broadly defined as follows.

Tier 1 Occupations include managers (Chief Executives, Financial Managers, and Sales Managers), professional positions (Lawyers, Accountants, and Physicians) and highly-skilled technical occupations such as scientists, computer programmers, and engineers. These occupations are typically the highest paying, highest skilled occupations in the economy.

Tier 2 Occupations include sales positions (Sales Representatives), teachers, and librarians, office and administrative positions (Accounting Clerks and Secretaries), and manufacturing, operations, and production positions (Assemblers, Electricians, and Machinists). These occupations have historically provided the majority of employment opportunities and could be referred to as middle wage, middle skill positions.

Tier 3 Occupations include protective services (Security Guards), food service and retail positions (Waiters, Cooks, and Cashiers), building and grounds cleaning positions (Janitor), and personal care positions (Home Health Aides and Child Care Workers). These occupations typically represent lower-skilled service positions with lower wages that require little formal training and/or education.

[8] December 2010 Preliminary Unemployment for San Mateo, Santa Clara, and Santa Cruz is 10.2% combined for the three counties, according to California Employment Development Department.
[9] The Polarization of Job Opportunities in the US Labor Market; Implications for Employment and Earnings, April 2010.
[10] For a more complete description of how occupations were delineated by tier, see Appendix G: Occupational Tier Classification.

Autor's research provides three key findings that will provide a valuable foundation for analyzing Silicon Valley's emerging green workforce opportunities.

1. Tier 2 Occupations provide the bulk of the middle-wage and middle-class job opportunities, but over the last 30 years, these jobs have been shrinking relative to the employment opportunities in Tier 1 and Tier 3.

2. The most recent economic recession has only exacerbated this trend, as Tier 2 occupations were disproportionally affected by the downturn. From 2007 to 2009, the total number of jobs in Tier 1 and Tier 3 occupations has either increased or has not fallen by more than one percent. Tier 2 jobs, on the other hand, have decreased between seven and 15 percent depending on the occupational category.

3. Over the last 30 years, the rise in education levels of US workers "has not kept up with the rising demand for skilled workers . . . The result has been a sharp rise in the inequality of wages."

These findings provide a backdrop not only for examining occupational opportunities in Silicon Valley as they compare to California as a whole but, more importantly, for examining the opportunities that exist in those industries that are most likely to have emerging green employers.

As shown in Table 6, the emerging green workforce is strongly tilted towards Tier 1 occupations, the highest skill and higher wage occupations, with virtually no Tier 3 occupations.

Table 6 Occupational Tiers in CA, Silicon Valley & Emerging Green Industries (2009)

	Avg. Wage per hour (CA)	California Workforce	Silicon Valley Workforce	Emerging Green Industries Workforce
Tier 1 Occupations	$ 43.84	22.4%	34.0%	60.9%
Tier 2 Occupations	$ 20.53	58.6%	50.0%	38.7%
Tier 3 Occupations	$ 11.99	19.0%	16.0%	0.4%

This provides both a great opportunity and a great challenge for those considering workforce development opportunities in the region. Typically, workforce investment board clients come from and are seeking Tier 2 occupations, which is promising given that nearly 40% of all emerging green industry jobs are in Tier 2. It is, however, important to consider the overall number in light of the finding that the majority of emerging green occupations are highly skilled Tier 1 occupations.

OCCUPATIONS BY EMERGING GREEN SECTOR

Based on a review of primary and secondary data that were gathered for this report, energy, materials & manufacturing, and specialized suppliers & support industries show significantly more potential for employment growth as compared to transportation or water. Transportation and water occupations have been excluded from the following occupational analysis because (a) employment is significantly more connected to the public sector (e.g., public utilities, public transit districts, etc.) as opposed to private sector employers and (b) our findings indicate they have the least number of firms among the five targeted emerging green sectors (see Table 7).

Table 7 Total Silicon Valley Green Employers

	SV Firms	SV Employees	% of SV Employment
Energy	331	4,499	33.0%
Materials & Manufacturing	310	3,710	27.2%
Specialized Suppliers & Support Industries	479	4,783	35.1%
Transportation	30	463	3.4%
Water	8	166	1.2%
Total	**1,158**	**13,621**	**100%**

OCCUPATIONAL OPPORTUNITIES

Within these emerging green sectors, several trends have emerged. Most importantly, the data indicate that across industry segments, administrative, professional, sales, and skilled technical positions are the best occupational categories for finding a job with a green employer. Table 8 provides a breakdown of the various higher-demand occupations by sector. As illustrated below, the energy sector has the greatest need for administrative, sales, and technical positions. Materials & manufacturing companies also require more administrative, sales, and technical positions. Specialized suppliers & supporting industries demonstrate a need for administrative positions, professional positions, sales positions, and technicians.

Table 8 Higher-Demand Occupations by Key Emerging Green Sector

Sectors	Occupations
Energy	**Administrative positions:** executive secretaries, administrative assistants **Sales positions:** sales representatives, sales engineers, sales managers **Technicians:** quality control technicians and assemblers
Materials & Manufacturing	**Administrative positions:** customer service representatives,* executive secretaries, administrative assistants **Sales positions:** sales representatives, sales engineers, sales managers **Technicians:** quality control technicians and assemblers
Specialized Suppliers & Supporting Industries	**Administrative positions:** customer service representatives,* executive secretaries, administrative assistants **Professional positions:** graphic designers **Sales positions:** sales representatives, sales engineers, sales managers **Technicians:** quality control technicians and assemblers

*This occupation may also be classified as a sales position.

TRAINING AND EDUCATION

Silicon Valley hosts world class education and training institutions, with numerous programs that are designed for the occupations described above. The programs are offered at regional employment training centers, California community colleges, 4-year private universities and 4-year state universities (CSUs and UCs). A more detailed list of programs by occupations is included as Appendix H: Silicon Valley Occupational Training/ Educational Institutions.

Table 9 Silicon Valley Training/Educational Institutions for Sales Representatives

Institution	Number of Programs
The Art Institute of California Sunnyvale	1
BioHealth College	1
Canada College	1
College of San Mateo	4
De Anza College	5
Gavilan College	1
Mission College	2
San José City College	3
Skyline College	2
Stanford University	1
West Valley College	2

Table 10 Silicon Valley Training/Educational Institutions for Graphic Designers

Institution	Number of Programs
The Art Institute of California Sunnyvale	5
Cabrillo College	4
Canada College	2
College of San Mateo	7
De Anza College	3
Foothill College	3
Gavilan College	3
Mission College	5
Notre Dame de Namur University	1
San José City College	3
San José State University	2
Skyline College	2
Stanford University	1
University of California-Santa Cruz	1
West Valley College	3
Western Career College-San José	2

Table 11 Silicon Valley Training/Educational Institutions for Executive Secretaries and Administrative Assistants

Institution	Number of Programs
Cabrillo College	6
Canada College	2
CET-Gilroy	1
CET-Sobrato	1
College of San Mateo	2
De Anza College	4
Everest College-San José	1
Evergreen Valley College	3
Foothill College	3
Gavilan College	6
Mission College	2
San José City College	3
Skyline College	4
West Valley College	3

CONCLUSIONS AND RECOMMENDATIONS

The research findings allow for several clear conclusions and recommendations. From a general workforce perspective, it is clear that highly specialized and targeted programs that include experiential learning for small cohorts of trainees is most valuable to the region's emerging green employers. Specifically, the project team offers the following conclusions and recommendations from the Silicon Valley emerging green employers research:

> **Conclusion #1:** Silicon Valley's green employers in our five emerging employment sectors are expecting to increase employment by about 10 percent over the next 12 months, and over half of more emerging green employers expect to increase their staffing levels in the next 12 months.

The survey results came after several months of hearing anecdotally that Silicon Valley's emerging green employers have continued to hire people during the Great Recession and expect to continue to hire new people in 2011. It is also worth noting that strong employment growth is expected in all three of Silicon Valley's larger emerging green employment sectors, but especially in energy and materials & manufacturing.

For the region, this level of employment growth translates into approximately 1,300 new jobs every 12 months, and that does not account for the replacement jobs that will play some role in generating additional employment opportunities for job seekers in the region. While the overall quantity of new jobs is an important consideration in understanding the workforce development opportunities in a given region, the quality of those jobs may be an even more important factor when trying to understand the workforce development opportunities associated with a given industry or sector.

> **Conclusion #2:** Silicon Valley's emerging green occupational profile is almost entirely made up of high wage/high skill occupations (61%) and middle wage/middle skill occupations (38%) with virtually no low wage/low skill occupations.

The second conclusion identifies both the great hope and the great challenge in developing workforce development strategies targeted toward Silicon Valley's emerging green employment sectors. Silicon Valley's emerging green employment sectors have an inordinate number of high wage/high skill occupations that not only generate additional employment due to the higher incomes they create but also have specific and demanding educational and skill requirements. This is important because Tier 1 and Tier 2 occupations are more likely to have opportunities for developing new skills and include both career pathways for entry-level employees and career lattices for individuals who want to move from one industry into another, compared to Tier 3 occupations, which often have low skill requirements and provide less opportunity for promotion and advancement.

It is critically important to understand that based on statewide estimates that were confirmed in executive interviews in Silicon Valley, employers anticipate adding approximately 520 new Tier 2 jobs over the next 12 months. The challenge for workforce boards becomes even greater when attempting to identify the entry-level opportunities for the region's job-seekers. While these entry-level opportunities exist, their skill, training, and/or experiential requirements are often relatively high, and the total number

of entry-level jobs often make up a small portion of the available job openings. This should not, however, be interpreted as an argument against developing and implementing workforce development strategies around Silicon Valley's emerging green employers. Instead, workforce professionals should understand the challenges they face in connecting employers with job seekers and be able to communicate the long-term value of finding employment in these dynamic employment sectors.

Conclusion #3: Employment at emerging green firms is distributed broadly across technology areas and throughout the value chain, meaning that generic green certificates have little value and there are few pockets of large employment demand among employers.

The five categories of emerging green industries represent a vast array of specific technologies. Often, working with these technologies requires a slightly different skill set and results in the hiring of differently-skilled workers. In addition, each category includes a wide swath of the value chain. Though many firms are engaged in multiple segments of production (e.g., manufacturing and sales), others are highly specific. As previously mentioned, "green" is more of a philosophy than an organizing structure, and therefore, there are relatively few generally transferable green skills. This means that training programs must be specific to the technology and place in the value chain to be valuable to employers. It also means that the approximately 520 expected new Tier 2 occupations will be dispersed among many smaller and specific pockets of employment in the region.

Conclusion #4: Silicon Valley's emerging green employers were much more likely to identify deficiencies in applicants' experience and overall knowledge and understanding of an industry than any specific educational or training deficiency. Also, training programs designed to prepare workers for entry- or mid-level occupational opportunities are generally in adequate supply and are not overly congested.

Given the current and expected employment growth of Silicon Valley's emerging green employment sectors, there were relatively few employers that indicated they could not find employees or job applicants who had the appropriate education or training. Some of this can be attributed to the overall high unemployment rate both nationally and regionally. A similar study of Silicon Valley's healthcare industry conducted at the same time, however, found that, despite the lower overall growth expectations, that industry had a higher percentage of employers experiencing at least some difficulty finding applicants with the appropriate training and education, and they experienced that difficulty with respect to more occupations. That being said, the region's emerging green employers were more likely than not to have difficulty finding employees who had the right experience, and they often stated they were looking for people who understood the industry. For these employment sectors, experience and industry know-how does appear to trump courses or formal credentials. Workforce development strategies for the region's emerging green employment sectors should focus on developing opportunities to gain experience in specific industries and helping job seekers develop a better understanding of those industries.

Conclusion #5: The workforce for green employers is still in a state of flux. More than three out of five employers expect at least some change in the composition of their workforce, and one in five expects substantial change. This makes occupational forecasting challenging and less reliable.

The following details should be considered as we look at occupational forecasting and planning for Silicon Valley's emerging green employment sectors.

- The main sources of long-term industry and occupational forecasting do not have detailed projections for green industry sectors. BLS and EDD will add new industry and occupational categories over time, but they are unlikely to provide the level of detail or regional specificity required by work2future and NOVA's customers.

- Industry employers cannot be expected to be helpful in medium- or long-term forecasting. The industry is still emerging and changing, and employers reported that occupational needs will shift even in the coming year or two as their company activities change.

- It is hard to forecast the growth of an emerging industry, particularly from data on existing firms. We do not know which of the new products or services will find customer demand, and many of the new companies are competing against each other to develop the same new product or service and not all will succeed. The experience with long-term BLS and EDD occupational and industry projections is that even within established industries, it is hard to predict sales and employment trends five or ten years out.

- As a result, the study team recommends other approaches to monitoring growth trends in the emerging green sector (see Recommendation 2).

Recommendation #1: Do not focus on training, skills, and experience that is "green," but instead focus on one of the pillar segments within emerging green: energy, building materials & manufacturing, or the specialized suppliers & supporting industries.

The green economy and all of its variations (clean tech, emerging green, established green, the sustainability economy, clean and green, etc.) remains a valuable way to classify and understand the regional and national economy for elected officials, industry trade associations, non-profit organizations, and advocacy groups connected to environmental causes, but these broad objective-based classifications are almost always less important to employers than the specific industry verticals that they are a part of. Of the ten Silicon Valley emerging green employers profiled in this study, not a single one indicated they would like to have more job applicants with a better understanding of the green economy or the clean tech industry, but almost all of them wanted their job applicants to have specific experience in their industry or a related industry and a passion to understand the technology associated with their work.

- Any workforce training or education programs for the emerging green sectors should be short, focus on improving knowledge and understanding of the

industry, and assist job seekers in getting some type of hands-on experience within the industry.

- Workforce development strategies should coalesce around the specific industries—such as the solar industry and energy efficiency products and services, including those related to smart grid—rather than focusing more generally on green or emerging green employment opportunities.

- Occupational opportunities for many entry-level emerging green employers likely require customer service, sales, or administrative skills, or some combination of the three. These basic skill sets, along with industry understanding and/or experience, provide a valuable foundation for employment opportunities.

Recommendation #2: Develop relationships and metrics that continually inform our understanding of Silicon Valley's key emerging green sectors

Below are some strategies that should be considered for continually updating and building upon the findings developed in this research.

- Develop an agreement with EDD to track the employment of the 320 key emerging green firms identified in the study. Work2future and NOVA should be able to work out an arrangement that allows the information to be tracked without identifying specific firms.

- Provide annual funding for staff or a consultant to identify new emerging green firms and add them to the list of firms to be tracked.

- Track the annual green economy employment updates provided by Next 10 and EDD, and develop an understanding of how these trends relate to the emerging green sectors identified in this study.

- Participate in green economy events in Silicon Valley.

- Develop personal relationships with a selected set of firms identified in the study. One strategy for developing personal relationships is to convene emerging green employers for periodic meetings to exchange information of mutual interest. These meetings can support recommendation #5 as well by including specialized suppliers & support industries. There are several benefits from building these relationships.

    1) They provide a forum for work2future to build a program for getting regular non-proprietary information that will help track growth and change in the emerging green sector.

    2) The meetings will raise the profile of work2future in the emerging green community and help work2future develop specialized approaches to meeting the sector's workforce challenges.

3) By including suppliers and other support sectors, work2future will better understand the key role that these firms play in giving Silicon Valley its comparative advantage, and that will inform local economic development efforts in support of the emerging green sector.

- After emerging green employer relationships have been developed, provide convenient online tools to allow employers to regularly provide information and feedback on their changing occupational and training needs, potentially every six months.

- Provide feedback to EDD and BLS for their next round of industry and occupational category updates.

Recommendation #3: Industry experience and passion for specific emerging green technologies was often cited as the key attributes when deciding whether to hire a qualified entry-level applicant at an emerging green firm. Examine and develop new models for providing industry experience and a deeper understanding of industry technologies.

Emerging green employers tend to be insulated and smaller, making it particularly challenging to develop opportunities for industry experience. The project team recommends the following strategies for developing industry experience and/or understanding of specific technologies within the emerging green sectors.

- Identify and develop industry experience opportunities that are technology specific and not necessarily green. Job seekers can often get energy experience in large utilities that may not necessarily be considered green, but will provide experience that other emerging green employers may value in the future.

- Work with emerging green employers to develop short, concentrated internship or apprenticeship opportunities related to specific skill sets, such as customer service, business development, or project management. Only allow potential interns or apprentices who have foundational skills within the area in which they will be working. This will require a skills assessment of the job seekers who are applying for these internships or apprenticeship opportunities.

Recommendation #4: Provide more varied and specialized training to smaller cohorts of trainees as opposed to general green credentialing programs.

Emerging green employers do not value generic green certificates but rather prefer specific training and work experience for their new hires. Because opportunities for Tier 2 occupations are generally limited (roughly 520 new jobs over the next 12 months), and because there are already several existing training programs supplying the workforce with new graduates, workforce investment boards should limit the size of their training enrollments to focus on specific needs and prevent saturating the labor market.

Recommendation #5: Silicon Valley's specialized suppliers & support infrastructure for design and manufacturing in the emerging green economy are valuable but sometimes hidden players in Silicon Valley's emerging green growth. Additional research should be done on this diverse industry to understand its evolving workforce and training needs.

Joint Venture has identified these employer groups as "specialized suppliers" and "support infrastructure" in describing these critical support services to Silicon Valley's high technology ecosystem. They include employers in contract manufacturing, applied research and testing services, and engineering and design firms. Firms in this cluster account for over one-third of the green employment in our five emerging green sectors, and, in terms of size, the cluster is largely unique to Silicon Valley when compared to other regions' emerging green employment profiles.

Due to the fast moving and competitive environment for high-technology product development, many of the occupations and workforce needs of specialized suppliers & support industries are constantly changing. Employers in this sector are often unable to even describe the products or services they are developing or testing due to confidentiality agreements with the firms they are working for. These ingredients all contribute to an environment where change is constant and the ability to get clear feedback on workforce development opportunities is largely muted.

Given the importance of specialized suppliers & support industries to Silicon Valley's emerging green economy and its potential importance to other high-technology industries within Silicon Valley, the project team recommends developing a more complete workforce profile of this industry cluster and its workforce needs for not only emerging green industries but the entire Silicon Valley economy.

The relationship building meetings described in recommendation #2 will support the development of better information about this part of the emerging green cluster.

In addition, this work can be a prototype for developing an understanding of a key economic cluster in a fast-changing environment where research becomes outdated quickly and ongoing relationships are a necessary component of maintaining an understanding of the cluster. In view of the relevance of this kind of information gathering to other sectors in the state and national economy, recommendations #2 and #5 should be considered for grant application possibilities at the state and federal level.

APPENDIX A: THE EMERGING GREEN ECONOMY IN CALIFORNIA AND THE BAY AREA

Silicon Valley built its reputation on semiconductors and advanced manufacturing and is currently home to several technology giants including Google, Apple, Intel, and Yahoo. The same regional attributes that continue to provide the climate for high-tech success provides Silicon Valley an advantage as the region broadens its role into clean tech and the "green economy." Karen Chapple addressed these attributes when describing Silicon Valley in *Innovating the Green Economy in California Regions,* citing "local expertise, financial capital, labor pool and institutions, as well as excess capacity in manufacturing."

Being located in California is also beneficial to Silicon Valley. According to Chapple, one reason California has and will continue to see success in green technology, is due to having a "state government with some of the most stringent new climate change legislation in the country, which has spurred the largest concentration of green innovation in the country."

California is the national leader in both clean tech venture capital (VC) deals and total funding. The Cleantech Group reports in 2010 California accounted for 57% percent of North American clean tech VC deals[11]. Data from the Cleantech Group's *Market Insight Database* reveals nearly a third (32%) of total California clean tech VC, more than any other comparably-sized region, went to Silicon Valley (see Table 12). These are a substantially larger amount of VC deals compared to other regions in the state. However, VC deals do not fund all emerging green establishments; yet they do play a valuable role in the development of most emerging research-based industries.

[11] See slide number 3.

Table 12 California Venture Capital Investment/Funding by Emerging Green Sector

Industry Sector	California		Los Angeles		San Diego		Silicon Valley	
	VC deals	%	VC deals	CA%	VC deals	CA%	VC deals	CA%
Agriculture	27	3.3%	4	0.5%	2	0.2%	6	0.7%
Air & Environment	40	4.9%	2	0.2%	6	0.7%	13	1.6%
Energy Efficiency	129	15.7%	5	0.6%	10	1.2%	57	6.9%
Energy Generation	310	37.7%	36	4.4%	26	3.2%	101	12.3%
Energy Infrastructure	27	3.3%	1	0.1%	1	0.1%	11	1.3%
Energy Storage	61	7.4%	6	0.7%	5	0.6%	26	3.2%
Manufacturing/ Industrial	44	5.4%	4	0.5%	6	0.7%	7	0.9%
Materials	40	4.9%	7	0.9%	4	0.5%	15	1.8%
Recycling & Waste	19	2.3%	3	0.4%	3	0.4%	5	0.6%
Transportation	73	8.9%	17	2.1%	10	1.2%	14	1.7%
Water & Wastewater	52	6.3%	7	0.9%	6	0.7%	10	1.2%
Total	**822**	**100%**	**92**	**11.2%**	**79**	**9.6%**	**265**	**32.2%**

The Los Angeles region has also taken a leadership position in terms of clean tech innovation focusing on solar technology as well as fuel cells and vehicle technology. Los Angeles accounts for over one in five of all California clean tech patents.

According to Chapple, "Silicon Valley rightfully has a reputation as the leader in overall innovation, but this leadership did not directly spillover into green/clean tech fields, as it dropped to second on the clean tech ranking" behind Los Angeles based on their complex ranking algorithm. Los Angeles is ranked higher due to its sheer size, making Silicon Valley the highest in regards to concentration of clean tech innovation.

The San Francisco Bay Area, encompassing Silicon Valley, continues to provide talent prized by clean tech firms. In turn, those establishments provide numerous green employment opportunities. Clean Edge's report, *Cleantech Job Trends 2010,* ranks Silicon Valley combined with the Bay Area as the top metropolitan area in the United States for clean tech jobs. California has the strongest presence of any state on Clean Edge's list with four regions making the top fifteen (see Table 13).

Table 13 Cleantech Employment Ranking by Metro Area

Rank	Metro Area
1	San Francisco-Oakland-San Jose, CA
2	Los Angeles-Long Beach-Riverside, CA
3	Boston-Cambridge-Quincy, MA-NH
4	New York-Northern New Jersey-Long Island, NY-NJ
5	Denver-Aurora-Broomfield, CO
6	Washington-Arlington-Baltimore, DC-VA-MD
7	San Diego-Carlsbad-San Marcos, CA
8	Houston-Sugar Land-Baytown, TX
9	Chicago-Joliet-Naperville, IL-IN-WI
10	Austin-Round Rock-San Marcos, TX
11	Seattle-Tacoma-Bellevue, WA
12	Atlanta-Sandy Springs-Marietta, GA
13	Dallas-Fort Worth-Arlington, TX
14	Portland-Vancouver-Hillsboro, OR-WA
15	Sacramento–Arden-Arcade–Roseville, CA

Source: Clean Edge, Inc., 2010

APPENDIX B: BEST PRACTICES IN DEVELOPING THE EMERGING GREEN ECONOMY

Examining the best practices of other leading areas may offer insights into how Silicon Valley can expand both local green employment and its role in the emerging green economy. The three consistent components of leading emerging green regions are a large developed urban economy, government policies supporting clean tech, and research infrastructure including well respected universities.

Los Angeles is an emerging green economy leader, like Silicon Valley, largely due to its research infrastructure, California and local regulations, and sheer size. Chapple describes Los Angeles as "the leading region for clean tech idea generation" and points to the city's "vast research infrastructure, both in the form of universities and private R&D." The Mayor of Los Angeles as quoted by the CleanTech Los Angeles organization, points to two local policies in particular that are aimed at both cleaning their practices and bolstering the local clean tech economy: "LA will be a coal free city in 2020," and "in the next ten years, Los Angeles will cut both its water and energy consumption by 10%."

Boston shares much of the same major beneficial characteristics for a green economy as Los Angeles. Massachusetts "has made the growth of clean energy a clear legislative and economic development priority" according to the Clean Edge report *A Future of Innovation and Growth.* Additionally, Boston is home to several world-class research universities including the Massachusetts Institute of Technology (MIT) and Harvard. Similar to Silicon Valley, Boston's innovation is diverse "covering a wide swath of clean technologies under the very large umbrella of innovation." Where Boston falls short, is in its limited infrastructure capable of advanced manufacturing.

The New York City Investment Fund report, *Cleantech: A New Engine of Economic Growth for New York State* directly addresses that "most clean tech investment is going to America's traditional centers of entrepreneurial tech-sector activity, namely California and Massachusetts." Similar to Silicon Valley and San Diego, New York City business is strongly networked together. This is an asset to emerging industries in particular. Like LA, the size of the population alone is a strong asset, however that was not enough to keep the IT and biotech industries local.

Denver, and the state of Colorado's clean tech strength is in innovation. According to *Colorado's Cleantech Action Plan*, "the strength of Colorado's energy focused research capabilities is… one of the state's greatest clean tech assets." Policy support is also a key element driving Denver's clean tech success according to the plan. Denver, unlike New York however, also benefits from a local capacity to manufacture.

The workforce in San Diego includes a large number of scientists and engineers developed by the biotech, wireless telecommunications, and defense industries, as well as graduates from the multiple "world-class research institutions." The business community in San Diego is also relatively well-connected with "several angel investor networks, including the Tech Coast Angels and the Keiretsu Forum" according to the

Global Connect report *Cleantech Industry in San Diego.* This combination of talent and investment can primarily be credited with San Diego's innovation. Proximity to Mexico may turn into a major benefit as investment and access to cheap labor may soon result in solar photovoltaic end-assembly activities.

U.S. cities are not alone in vying for leadership in the clean tech industry. "Brazil and China account for the largest share of renewables employment globally" primarily focused on local jobs in installation, operations, and maintenance according to Clean Edge's report, *Cleantech Job Trends 2010*. Portugal is reportedly approaching half of its grid electricity to be produced by renewable sources and Ireland, Denmark and Britain are not far behind.

Clean Edge reports that "barring any significant policy changes by other nations, China-based companies are poised to increasingly dominate as clean-tech employers both domestically and abroad." China, as well as South Korea, Japan, Taiwan, and Singapore are "hiring thousands of factory workers to crank out solar panels, lithium-ion batteries, and a wide range of wind-turbine components." Germany and Denmark are also developing their clean-tech manufacturing capacity. Germany continues to be a leader in government policy supporting the clean-tech sector with Feed-In-Tarrifs (FIT). The United Kingdom is following suit and seeing job growth attributed to it.

APPENDIX C: WORKS CITED

Autor, D. (2010). *The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings*: Center for American Progress.

Centers of Excellence. (2009). *Environmental Scan: Environmental Technology Occupations (San Diego and Imperial Region)*.

Chapple, K. & Hutson, M. (2010). *Innovating the Green Economy in California Regions*: Center for Community Innovation.

The City of San Diego; & San Diego Regional Economic Development Corporation. *Cleantech Industry in San Diego: An Assessment of Assets and Capabilities*: Global Connect.

The City of San Diego: Economic Growth Services. (2010). *Cleantech Leadership Strategy: Cleantech Initiative.*

Cleantech Los Angeles. Retrieved January 2011, from http://www.cleantechlosangeles.org/

Collaborative Economics. (2009) *Many Shades of Green*: Next 10.

Collaborative Economics. (2011) *Many Shades of Green*: Next 10.

Colorado Cleantech Industry Association. (2010). *Colorado Cleantech Action Plan: A Roadmap to Guide the Development of Colorado's Clean Technology Industry*: Navigant Consulting Inc.

The Denver Office of Economic Development. Retrieved January 2011, from http://www.milehigh.com/business/greenerdenver/clean tech

Environmental Defense Fund. Retrieved October 2010, from http://www.edf.org/home.cfm

Haji, Sheeraz. (2011). *Q410/ FY 2010 Investment Trends Webinar*: Cleantech Group LLC.

Link Silicon Valley. Retrieved October 2010, from http://www.linksv.com/search.aspx?fIndex=1

Metro Denver Economic Development Corporation. Retrieved January 2011, from http://www.metrodenver.org/

New York City Investment Fund. (2007). *Cleantech: A New Engine of Economic Growth for New York State*.

Pernick, R., Wilder,C., Gauntlett, D., & Winnie, T. (2009) *Clean Tech Job Trends 2009*: Clean Edge.

Pernick, R., Wilder,C., & Winnie, T. (2010) *Clean Tech Job Trends 2010*: Clean Edge.

San Diego Office of the Mayor: Economic Growth Services. (2010). *Clean Tech Leadership Strategy*.

APPENDIX D: TOPLINES

Silicon Valley
Emerging Green Employers (n=150)
November 2010
Toplines

Emerging Green - Employer Survey

Introduction:

Hello, my name is _____. May I please speak to someone involved with planning or staffing at [organization]?

[IF NEITHER A PLANNER OR SOMEONE WITH STAFFING IS AVAILABLE] Can I speak to a decision maker at your location?

Hello, my name is _____ and I'm calling on behalf of **regional workforce investment boards** who would value your participation in a brief survey about the region's workforce.

(If needed): The survey should take approximately ten minutes of your time. By answering this survey, you can help the regional workforce investment system develop the appropriate type of training that will prepare the employees you will be looking for in the future.

(If needed): This survey has been commissioned by work2future and the City of San José, which are committed to developing the regional workforce. The survey is being conducted by BW Research, an independent research organization.

(If needed): Your individual responses will **not** be published; only aggregate information will be used in the reporting of the survey results.

PLEASE NOTE TRADITIONAL ROUNDING RULES APPLIED
NOT ALL PERCENTAGES WILL EQUAL EXACTLY 100%

I'd like to begin by asking you a few general questions about your location in or near Silicon Valley. Please answer for your physical location and not your corporate headquarters or any other locations.

A. In what county are you located?

61%	Santa Clara (continue)
17%	San Mateo (continue)
14%	Santa Cruz (continue)
6%	San Francisco (continue)
3%	Alameda (continue)

SECTION 1 – Organizational Growth Assessment

1. Including all full-time and part-time employees, how many **permanent and temporary** employees work at your location?

Total permanent and temporary employees	Mean	More Conservative Mean[12]	Median
5,059	34.41	19.99	10.00

Breakdown:

0%	No permanent or temporary employees
25%	5 or less permanent and temporary employees
29%	6 to 10 permanent and temporary employees
23%	11 to 24 permanent and temporary employees
9%	25 to 49 permanent and temporary employees
7%	50 to 99 permanent and temporary employees
4%	100 to 249 permanent and temporary employees
0%	250 to 499 permanent and temporary employees
0%	500 to 999 permanent and temporary employees
1%	1,000 or more permanent and temporary employees
2%	(DON'T READ) DK/NA

2. If you currently have [TAKE Q1 #] full-time and part-time **permanent and temporary** employees at your location, how many more or less employees do you expect to have at your location 12 months from now?

41%	More [record #_____]
3%	Less [record #_____]
49%	(DON'T READ) Same number of employees
7%	(DON'T READ) DK/NA

Expected Employment in 12 months
(Calculated by only examining employers with both current and projected data)

	Current	12 months
n	138	138
Mean	34.83	38.51
Median	9.50	11.00
Total Employees	4,806	5,314
New Employees		**508**
% Growth		**10.6%**

[12] With outliers (i.e. largest employers) removed: 2 firms with 1,000 or more employees

More Conservative – With One Firm Removed (Adding 100 employees, growing 1,000%)
(Calculated by only examining employers with both current and projected data)

	Current	12 months
n	137	137
Mean	35.07	38.05
Median	10.00	11.00
Total Employees	4,805	5,213
New Employees		**408**
% Growth		**8.5%**

[If amount differs by 10% or more in either direction, ask:]
Just to confirm, you currently have ____ employees and you expect to have _____ (more/less) employees, for a total of ____ employees 12 months from now.

Let me ask the same question again, but instead of 12 months out, please think about 24 months from now.

3. If you currently have [TAKE Q1 #] full-time and part-time **permanent and temporary** employees at your location, how many more or less employees do you expect to have at your location 24 months from now?

48%	More [record #_____]
3%	Less [record #_____]
29%	(DON'T READ) Same number of employees
19%	(DON'T READ) DK/NA

Expected Employment in 24 months
(Calculated by only examining employers with both current and projected data)

	Current	24 months
n	119	119
Mean	36.42	58.83
Median	8.00	12.00
Total Employees	4,334	7,001
New Employees		2667
% Growth		**61.5%**

More Conservative – With Two Firms Removed (One adding 1,800 employees, 180,000% growth and one adding 100 employees, 1,667% growth)
(Calculated by only examining employers with both current and projected data)

	Current	24 months
n	117	117
Mean	36.98	43.54
Median	8.00	12.00
Total Employees	4,327	5,094
New Employees		767
% Growth		**17.7%**

[If amount differs by 10% or more in either direction, ask:]
Just to confirm, you currently have ____ employees and you expect to have _____ (more/less) employees, for a total of ____ employees 24 months from now.

4. What industry or industries best describe the work your firm is most connected to? (DO NOT READ, ALLOW MORE THAN ONE RESPONSE)

29%	Professional and technical services
17%	Construction
12%	Manufacturing - high technology
10%	Manufacturing - semiconductors
8%	Solar and/ or photovoltaic industry
6%	Utility or energy
4%	Finance, insurance, or real estate
4%	Information technology (software, hardware, and internet service providers)
4%	Retail sales
4%	Wholesale distribution
3%	Smart grid and/ or energy efficiency
2%	Biofuels and biomaterials
2%	Biotechnology, medical devices, and/ or pharmaceuticals
2%	Traditional transportation and/ or logistics
2%	Other manufacturing
1%	Entertainment or recreation
1%	Healthcare or medical services
1%	Advanced transportation/ alternative vehicles
1%	Public administration or the public sector
5%	Other

SECTION 2 – GREEN Profile

Green or clean products and services can be defined as products or services that use energy and natural resources more efficiently, reduce or mitigate pollution, or reduce the amount of greenhouse gases that are produced.

I would like to ask a few questions about the products and/or services that your firm provides as they relate to green products and services.

5. Does your firm produce or manufacture green products or are you in the process of developing green products?

29%	Yes
67%	No our firm is not involved in developing or providing green products
4%	(DON'T READ) DK/NA

6. Does your firm provide green services or are you in the process of developing green services?

35%	Yes
61%	No our firm is not involved in developing or providing green services
4%	(DON'T READ) DK/NA

7. Does your firm support the development of green products or services OR provide research and/or technology for green products or services?

49%	Yes
45%	No our firm is not involved in supporting the developing of green products/ services OR providing research/ technology for green products or services
6%	(DON'T READ) DK/NA

[IF Q5=2 OR 3 AND Q6=2 OR 3 AND Q7=2 OR 3 THEN SKIP TO Q18]

Q8 – Q17 only asked of green firms – those that said yes to Q5, Q6, or Q7 (n=94)

8. Next, I would like to ask about how you identify your firm as it relates to green products and/or services. Is your firm involved in: _____?

Percentages among green firms (n=94)

RANDOMIZE

	Yes	No	(DON'T READ DK/NA
A. Reducing demand for energy, water, or other resources	67%	29%	4%
B. Expanding supply for energy, water, or other resources in a way that reduces the impact on the environment and/ or lessens the production of greenhouse gases	68%	28%	4%
C. Monitoring, planning to reduce, or mitigaing or otherwise cleaning up environmental damage	36%	62%	2%

IF NO OR DK/NA TO ALL THREE, ASK Q9 OTHERWISE SKIP TO Q10

9. What green products and/or services is your firm involved in?

Small sample size for this question (n=14). Verbatim text responses are archived in the data file.

10. Approximately how much of your firm's work, in terms of total revenue, is derived from green products or services?

Percentages among green firms (n=94)

34%	Most to all of it (76% to 100%)
10%	Half to three-quarters (50% to 75%)
13%	A quarter to almost half of it (25% to 49%)
32%	Less than a quarter (1% to 24%)
12%	(DON'T READ) DK/NA

11. Do you expect the ***percentage*** of your location's total revenues from green products or services to increase or decrease over the next 12 months?

Percentages among green firms (n=94)

67%	Increase
2%	Decrease
27%	(DON'T READ) Stay the same
4%	(DON'T READ) DK/NA

ASK Q12 IF Q5=1 OTHERWISE SKIP TO Q13

12. Which of the following situations best describes where your firm is currently focused with its green products?

Percentages among firms who produce or manufacture green products or are in the process of developing green products (n=43)

30%	Currently focused on research and development of green products
12%	Just beginning to manufacture or produce green products
56%	Green products are developed and the firm is selling and/or distributing them
0%	(DON'T READ) Other (Please specify_____)
2%	(DON'T READ) DK/NA

ASK Q13 IF Q6=1 OTHERWISE SKIP TO Q14

13. Which of the following situations best describes where your firm is currently focused with its green services?

Percentages among firms that provide green services or are in the process of developing green services (n=53)

11%	Currently focused on research and development of green services
15%	Just beginning to provide green services
60%	Green services are developed and the firm is focused on sales
2%	(DON'T READ) Other (Please specify_____)
11%	(DON'T READ) DK/NA

Next, I would like to ask about the role of new technology in the green-related work your firm is focused on.

14. Is your firm focused on developing or supporting the development of new technology for green products and services or is the technology you are using for green products and services largely established?

Percentages among green firms (n=94)

39%	Technology is being developed
52%	Technology is largely established
6%	(DON'T READ) Neither
2%	(DON'T READ) DK/NA

15. Please tell me how important the following areas of technology are for your business.

Here's the (first/next) one _____ (READ ITEM): Is this technology area very important, somewhat important, or not at all important in your business?

Percentages among green firms (n=94)

RANDOMIZE

	Very important	Somewhat important	Not at all important	(DON'T READ DK/NA
A. Advanced manufacturing	33%	26%	32%	10%
B. Solar and/or photovoltaic technology	47%	21%	30%	2%
C. Smart grid and/or energy efficiency	49%	31%	16%	4%
D. Nanotechnology and/or the material sciences	20%	31%	40%	9%
E. Software development and information technology	29%	33%	35%	3%
F. Life sciences and/or biotechnology	15%	18%	65%	2%

16. Please identify any areas of technology that we have not discussed that are important to your firm's green products and services.

Percentages among green firms (n=94)

68%	None
6%	Chemical engineering
5%	Green building
4%	Transportation
3%	Lighting
3%	Energy conservation/ recycling/ pollution control
2%	Solar
2%	Energy storage
5%	Other

17. How much has the American Recovery and Reinvestment Act, or the ARRA or stimulus package, affected demand for your firm's green products and services?

Percentages among green firms (n=94)

5%	Significant positive impact
19%	Moderate positive impact
53%	No impact
3%	Moderate negative impact
0%	Significant negative impact
19%	(DON'T READ) DK/NA

SECTION 3 – Workforce & Recruiting Assessment

Next, I would like to ask how your firm typically looks for and recruits new employees.

18. What are the most effective ways your firm will recruit or look for someone from outside your company to fill a new entry-level job opening? [DO NOT READ, ACCEPT TWO RESPONSES]

    (n=150)

31%	Referrals/ word of mouth/ networking
25%	Use online job finder, like Monster.com
16%	Advertise in local or regional newspapers, print, and online
9%	Work with education providers (universities or colleges)
8%	Put it up on company's website
6%	Use a recruiter/ headhunter
5%	Work with a temporary hiring firm
3%	Use social media sites, like LinkedIn, Twitter, or Facebook
3%	Professional organizations/ labor unions
3%	Job fairs/ trade shows
2%	Other internet
2%	Walk-ins/ sign in the window
1%	Hire within
5%	Other
7%	DK/NA

19. What are the most effective ways your firm will recruit or look for someone from outside your company to fill a new mid-to-senior-level job opening? [DO NOT READ, ACCEPT TWO RESPONSES]

    (n=150)

34%	Referrals/ word of mouth/ networking
16%	Use online job finder, like Monster.com
15%	Use a recruiter/ headhunter
14%	Advertise in local or regional newspapers, print, and online
5%	Put it up on company's website
3%	Use social media sites, like LinkedIn, Twitter, or Facebook
3%	Hire within
3%	Work with education providers (universities or colleges)
2%	Professional organizations/ journals/ websites
1%	Work with a temporary hiring firm
1%	Unions
5%	Other
19%	DK/NA

20. How much change do you expect to see in the skills, education, and abilities of your firm's employees over the next 12 to 24 months?

(n=150)

37%	Little to no change in the composition of our employees
42%	Some change in the composition of our employees
16%	Substantial change in the composition of our employees
5%	(DON'T READ) DK/NA

21. Please tell me how much difficulty your firm faces in addressing the following workforce issues.

Here's the (first/next) one _____ (READ ITEM): Please tell me whether your business has no difficulty, some difficulty, or great difficulty in dealing with this issue.

(n=150)

RANDOMIZE

	No difficulty	Some difficulty	Great difficulty	(DON'T READ DK/NA
A. Keeping current workers properly trained on changing technology and policy requirements	59%	34%	4%	3%
B. Recruiting enough entry-level employees with appropriate training and education	57%	29%	9%	6%
C. Recruiting enough non-entry-level employees with adequate skills and work experience	49%	26%	19%	6%
D. Retaining valuable employees that could be hired by competitors	62%	31%	5%	2%

22. Thinking in general about recent entry-level or mid-level hires at your organization, which skills would you say that recent hires tend to be **most deficient** in? [DO NOT READ - ACCEPT FIRST TWO RESPONSES]

(IF NEEDED: For this question, I would just like your general perception about skill deficiencies for recent hires across occupations at your organization)

(n=150)

31%	Technical competence specific to the position
10%	Interpersonal communication skills
5%	Ability to work independently
5%	Math/ English/ writing/ reading skills
4%	Technical writing skills
4%	Creative problem-solving skills
4%	General skills and conduct
3%	Computer skills
3%	Industry/ product knowledge
2%	Ability to work with different groups or departments
4%	Other (Please specify_____)
2%	(DON'T READ) Depends on occupation
13%	(DON'T READ) Have not hired entry or mid-level recently
19%	(DON'T READ) DK/NA

23. Do you currently employ individuals that do ***not*** have an advanced college degree, defined as a Master's degree or higher?

(n=150)

85%	Yes
11%	No
3%	(DON'T READ) DK/NA

24. How likely are you to hire individuals in the next 12 to 24 months that do ***not*** require a Master's degree or higher?

(n=150)

49%	Very likely
23%	Somewhat likely
23%	Not likely
5%	(DON'T READ) DK/NA

IF Q23 = 2 OR 3 AND Q24 = 3 OR 4, SKIP TO CLOSING

25. Next I am going to read some general occupational categories. For each one, please tell if you currently employee individuals who fall into the category or whether you expect to hire anyone like this in the next 12 to 24 months. (MULTIPLE RESPONSE ALLOWED)

Percentages among firms that either currently have employees without an advanced degree or are likely to hire them in the next 12 to 24 months (n=137)

	Yes, currently	Yes, expect to	Both currently & expect	Neither	DK/NA
A. Manufacturing technician……..	7%	8%	7%	75%	2%
B. Research and development assistant or technician……	8%	8%	7%	75%	1%
C. Quality control technician……..	15%	8%	7%	68%	1%
D. Assembler……	7%	7%	9%	75%	2%
E. Renewable energy technician……	4%	3%	3%	88%	2%
F. Customer service representative……	20%	10%	14%	53%	2%
G. Sales representative or sales associate….	15%	17%	20%	46%	2%
H. Operations and maintenance technician…	17%	9%	18%	55%	1%

26. Please identify any occupations not already discussed that you currently have, or expect to hire for in the future, that will **not** require a Master's degree or higher.

Percentages among firms that either currently have employees without an advanced degree or are likely to hire them in the next 12 to 24 months (n=137)

47%	None
16%	Technicians and laborers (construction, production, installation, and warehouse)
15%	Architecture, design, and engineering
8%	Office and administrative support
7%	Business and financial operations
5%	Management/ administrative
4%	Marketing and sales
3%	IT
3%	Drivers
1%	Lab technicians
1%	Customer service
4%	Other
2%	Refused

Thank you for completing the survey. Since it sometimes becomes necessary for the project manager to call back and confirm responses to certain questions, I would like to verify your contact information.

First and Last Name of Respondent _____

Position of Respondent _____

Phone of Respondent _____

Email of Respondent _____

Name of Company _____

Company Address (including City) _____

Those are all the questions I have.
Thank you very much for your time.

Date of Interview _____

Time of Interview _____

Name of Interviewer _____

County _____

APPENDIX E: DISCUSSION GUIDE

A- Basic Information:

1. Type of technology
2. Geographic location
3. News-worthy discussions

B- History of the Firm:

4. Year opened
5. Key drivers that lead to firm formation
6. Changes from inception to today
7. Opportunities most important as the firm attempts to continue expanding
8. Obstacles most important as the firm attempts to continue expanding

C- Technology & Industry Connections:

9. Technologies
10. Role played in developing technology
11. Business lifecycle stage
12. Additional technologies being developed or considered
13. Industry connections
14. Venture capital and/ or private investment

D- Workforce Profile:

15. Key occupations
16. Most important skill-sets
17. Preferred educational backgrounds
18. Workforce needs (occupations and skills) for the future
19. Difficulty finding qualified experienced candidates (skills/ qualities generally missing)

E- Entry-level Opportunities:

20. Entry-level occupations
21. Expect changes
22. Difficulty finding qualified entry-level candidates
23. Skills, qualities, and education levels that successful entry-level candidates have

F- Policy & Regulatory Issues:

24. The effect of stimulus spending
25. Expectations when stimulus ends
26. Any further regulatory issues

APPENDIX F: EMERGING GREEN NAICS INDUSTRIES

Silicon Valley Emerging Green Industry Sectors by NAICS		
Energy	2211	Electric Power Generation, Transmission and Distribution
	2371	Utility System Construction
	3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
	3344	Semiconductor and Other Electronic Component Manufacturing
	3359	Other Electrical Equipment and Component Manufacturing
Materials & Manufacturing	3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
	3351	Electric Lighting Equipment Manufacturing
	5622	Waste Treatment and Disposal
	5629	Remediation and Other Waste Management Services
Specialized Suppliers & Supporting Industries	5413	Architectural, Engineering, and Related Services
	5414	Specialized Design Services
	5416	Management, Scientific, and Technical Consulting Services
	5417	Scientific Research and Development Services
Transportation	336	Transportation Equipment Manufacturing
Water	2213	Water, Sewage and Other Systems

APPENDIX G: OCCUPATIONAL TIER CLASSIFICATION

Similar to the David Autor report, occupations in emerging green industries were assigned into three tiers based on skill level needed and wages paid. The occupational tiers are broadly defined as:

Tier 1 Occupations include managers (Chief Executives, Financial Managers and Sales Managers), professional positions (Lawyers, Accountants, and Physicians) and highly-skilled technical occupations such as scientists, computer programmers, and engineers. These occupations are typically the highest paying, highest skilled occupations in the economy.

Tier 2 Occupations include sales positions (Sales Representatives), teachers, and librarians, office and administrative positions (accounting clerks and secretaries), and manufacturing, operations, and production positions (assemblers, electricians, and machinists). These occupations have historically provided the majority of the employment opportunities and could be referred to as middle wage, middle skill positions.

Tier 3 Occupations include protective services (security guards), food service, and retail positions (waiters, cooks, and cashiers), building and grounds cleaning positions (Janitor), and personal care positions (Home Health Aides and Child Care Workers). These occupations typically represent lower-skilled service positions, with lower wages that require little formal training and/or education.

Emerging green occupations have been assigned to these three tiers below in Table 14, Table 15, and Table 16.

Table 14 Emerging Green Tier 1 Occupations

Occupational Tier	Occupation Code (SOC)	Occupation Title
1	11-2011	Advertising and Promotions Managers
1	11-2021	Marketing Managers
1	11-2022	Sales Managers
1	11-2031	Public Relations Managers
1	11-3011	Administrative Services Managers
1	11-3021	Computer and Information Systems Managers
1	11-3031	Financial Managers
1	11-3041	Compensation and Benefits Managers
1	11-3042	Training and Development Managers
1	11-3049	Human Resources Managers, All Other
1	11-3051	Industrial Production Managers
1	11-3061	Purchasing Managers
1	11-3071	Transportation, Storage, and Distribution Managers
1	11-9021	Construction Managers
1	11-9041	Engineering Managers
1	11-9111	Medical and Health Services Managers
1	11-9121	Natural Sciences Managers
1	11-9141	Property, Real Estate, and Community Association Managers
1	11-9199	Managers, All Other
1	11-1011	Chief Executives
1	11-1021	General and Operations Managers
1	13-1022	Wholesale and Retail Buyers, Except Farm Products
1	13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products
1	13-1031	Claims Adjusters, Examiners, and Investigators
1	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation
1	13-1051	Cost Estimators
1	13-1071	Employment, Recruitment, and Placement Specialists
1	13-1072	Compensation, Benefits, and Job Analysis Specialists
1	13-1073	Training and Development Specialists
1	13-1079	Human Resources, Training, and Labor Relations Specialists, All Other
1	13-1081	Logisticians
1	13-1111	Management Analysts
1	13-1121	Meeting and Convention Planners
1	13-1199	Business Operations Specialists, All Other
1	13-2011	Accountants and Auditors
1	13-2031	Budget Analysts
1	13-2041	Credit Analysts
1	13-2051	Financial Analysts
1	13-2052	Personal Financial Advisors
1	13-2072	Loan Officers

Occupational Tier	Occupation Code (SOC)	Occupation Title
1	13-2099	Financial Specialists, All Other
1	15-1011	Computer and Information Scientists, Research
1	15-1021	Computer Programmers
1	15-1031	Computer Software Engineers, Applications
1	15-1032	Computer Software Engineers, Systems Software
1	15-1041	Computer Support Specialists
1	15-1051	Computer Systems Analysts
1	15-1061	Database Administrators
1	15-1071	Network and Computer Systems Administrators
1	15-1081	Network Systems and Data Communications Analysts
1	15-1099	Computer Specialists, All Other
1	15-2031	Operations Research Analysts
1	15-2041	Statisticians
1	15-2099	Mathematical Science Occupations, All Other
1	17-1011	Architects, Except Landscape and Naval
1	17-1012	Landscape Architects
1	17-1021	Cartographers and Photogrammetrists
1	17-1022	Surveyors
1	17-2011	Aerospace Engineers
1	17-2031	Biomedical Engineers
1	17-2041	Chemical Engineers
1	17-2051	Civil Engineers
1	17-2061	Computer Hardware Engineers
1	17-2071	Electrical Engineers
1	17-2072	Electronics Engineers, Except Computer
1	17-2081	Environmental Engineers
1	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
1	17-2112	Industrial Engineers
1	17-2131	Materials Engineers
1	17-2141	Mechanical Engineers
1	17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
1	17-2161	Nuclear Engineers
1	17-2199	Engineers, All Other
1	17-3011	Architectural and Civil Drafters
1	17-3012	Electrical and Electronics Drafters
1	17-3013	Mechanical Drafters
1	17-3019	Drafters, All Other
1	17-3021	Aerospace Engineering and Operations Technicians
1	17-3022	Civil Engineering Technicians
1	17-3023	Electrical and Electronic Engineering Technicians
1	17-3024	Electro-Mechanical Technicians
1	17-3025	Environmental Engineering Technicians
1	17-3026	Industrial Engineering Technicians
1	17-3027	Mechanical Engineering Technicians

Occupational Tier	Occupation Code (SOC)	Occupation Title
1	17-3029	Engineering Technicians, Except Drafters, All Other
1	17-3031	Surveying and Mapping Technicians
1	19-1013	Soil and Plant Scientists
1	19-1021	Biochemists and Biophysicists
1	19-1022	Microbiologists
1	19-1023	Zoologists and Wildlife Biologists
1	19-1029	Biological Scientists, All Other
1	19-1042	Medical Scientists, Except Epidemiologists
1	19-1099	Life Scientists, All Other
1	19-2012	Physicists
1	19-2021	Atmospheric and Space Scientists
1	19-2031	Chemists
1	19-2041	Environmental Scientists and Specialists, Including Health
1	19-2042	Geoscientists, Except Hydrologists and Geographers
1	19-2043	Hydrologists
1	19-2099	Physical Scientists, All Other
1	19-3011	Economists
1	19-3021	Market Research Analysts
1	19-3022	Survey Researchers
1	19-3031	Clinical, Counseling, and School Psychologists
1	19-3041	Sociologists
1	19-3051	Urban and Regional Planners
1	19-3091	Anthropologists and Archeologists
1	19-3099	Social Scientists and Related Workers, All Other
1	19-4011	Agricultural and Food Science Technicians
1	19-4021	Biological Technicians
1	19-4031	Chemical Technicians
1	19-4041	Geological and Petroleum Technicians
1	19-4061	Social Science Research Assistants
1	19-4091	Environmental Science and Protection Technicians, Including Health
1	19-4093	Forest and Conservation Technicians
1	19-4099	Life, Physical, and Social Science Technicians, All Other
1	23-1011	Lawyers
1	23-2011	Paralegals and Legal Assistants
1	23-2099	Legal Support Workers, All Other
1	29-1111	Registered Nurses
1	29-2011	Medical and Clinical Laboratory Technologists
1	29-2056	Veterinary Technologists and Technicians
1	29-9011	Occupational Health and Safety Specialists

Table 15 Emerging Green Tier 2 Occupations

Occupational Tier	Occupation Code (SOC)	Occupation Title
2	21-1012	Educational, Vocational, and School Counselors
2	21-1023	Mental Health and Substance Abuse Social Workers
2	21-1099	Community and Social Service Specialists, All Other
2	25-4021	Librarians
2	25-9031	Instructional Coordinators
2	27-1011	Art Directors
2	27-1014	Multi-Media Artists and Animators
2	27-1021	Commercial and Industrial Designers
2	27-1022	Fashion Designers
2	27-1024	Graphic Designers
2	27-1025	Interior Designers
2	27-1026	Merchandise Displayers and Window Trimmers
2	27-1027	Set and Exhibit Designers
2	27-1029	Designers, All Other
2	27-3031	Public Relations Specialists
2	27-3041	Editors
2	27-3042	Technical Writers
2	27-3043	Writers and Authors
2	41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers
2	41-3011	Advertising Sales Agents
2	41-3099	Sales Representatives, Services, All Other
2	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
2	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
2	41-9031	Sales Engineers
2	41-9041	Telemarketers
2	41-9099	Sales and Related Workers, All Other
2	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers
2	43-3011	Bill and Account Collectors
2	43-3021	Billing and Posting Clerks and Machine Operators
2	43-3031	Bookkeeping, Accounting, and Auditing Clerks
2	43-3051	Payroll and Timekeeping Clerks
2	43-3061	Procurement Clerks
2	43-4051	Customer Service Representatives
2	43-4071	File Clerks
2	43-4111	Interviewers, Except Eligibility and Loan
2	43-4151	Order Clerks
2	43-4161	Human Resources Assistants, Except Payroll and Timekeeping
2	43-4171	Receptionists and Information Clerks
2	43-4199	Information and Record Clerks, All Other
2	43-5021	Couriers and Messengers
2	43-5041	Meter Readers, Utilities
2	43-5061	Production, Planning, and Expediting Clerks

Occupational Tier	Occupation Code (SOC)	Occupation Title
2	43-5071	Shipping, Receiving, and Traffic Clerks
2	43-5081	Stock Clerks and Order Fillers
2	43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping
2	43-6011	Executive Secretaries and Administrative Assistants
2	43-6014	Secretaries, Except Legal, Medical, and Executive
2	43-9011	Computer Operators
2	43-9021	Data Entry Keyers
2	43-9022	Word Processors and Typists
2	43-9041	Insurance Claims and Policy Processing Clerks
2	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service
2	43-9061	Office Clerks, General
2	43-9111	Statistical Assistants
2	43-9199	Office and Administrative Support Workers, All Other
2	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers
2	47-2031	Carpenters
2	47-2051	Cement Masons and Concrete Finishers
2	47-2061	Construction Laborers
2	47-2071	Paving, Surfacing, and Tamping Equipment Operators
2	47-2073	Operating Engineers and Other Construction Equipment Operators
2	47-2111	Electricians
2	47-2151	Pipelayers
2	47-2152	Plumbers, Pipefitters, and Steamfitters
2	47-2211	Sheet Metal Workers
2	47-2221	Structural Iron and Steel Workers
2	47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters
2	47-4011	Construction and Building Inspectors
2	47-5081	Helpers--Extraction Workers
2	49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers
2	49-2011	Computer, Automated Teller, and Office Machine Repairers
2	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers
2	49-2091	Avionics Technicians
2	49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
2	49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
2	49-3011	Aircraft Mechanics and Service Technicians
2	49-3023	Automotive Service Technicians and Mechanics
2	49-3042	Mobile Heavy Equipment Mechanics, Except Engines
2	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door
2	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
2	49-9041	Industrial Machinery Mechanics

Occupational Tier	Occupation Code (SOC)	Occupation Title
2	49-9042	Maintenance and Repair Workers, General
2	49-9044	Millwrights
2	49-9051	Electrical Power-Line Installers and Repairers
2	49-9052	Telecommunications Line Installers and Repairers
2	49-9069	Precision Instrument and Equipment Repairers, All Other
2	49-9098	Helpers--Installation, Maintenance, and Repair Workers
2	49-9099	Installation, Maintenance, and Repair Workers, All Other
2	51-1011	First-Line Supervisors/Managers of Production and Operating Workers
2	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
2	51-2021	Coil Winders, Tapers, and Finishers
2	51-2022	Electrical and Electronic Equipment Assemblers
2	51-2023	Electromechanical Equipment Assemblers
2	51-2041	Structural Metal Fabricators and Fitters
2	51-2091	Fiberglass Laminators and Fabricators
2	51-2092	Team Assemblers
2	51-2099	Assemblers and Fabricators, All Other
2	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic
2	51-4012	Numerical Tool and Process Control Programmers
2	51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
2	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
2	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
2	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic
2	51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic
2	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic
2	51-4041	Machinists
2	51-4061	Model Makers, Metal and Plastic
2	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
2	51-4111	Tool and Die Makers
2	51-4121	Welders, Cutters, Solderers, and Brazers
2	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
2	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic
2	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic
2	51-4199	Metal Workers and Plastic Workers, All Other
2	51-5022	Prepress Technicians and Workers
2	51-5023	Printing Machine Operators
2	51-6031	Sewing Machine Operators

Occupational Tier	Occupation Code (SOC)	Occupation Title
2	51-8012	Power Distributors and Dispatchers
2	51-8013	Power Plant Operators
2	51-9022	Grinding and Polishing Workers, Hand
2	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
2	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
2	51-9122	Painters, Transportation Equipment
2	51-9141	Semiconductor Processors
2	51-9198	Helpers--Production Workers

Table 16 Emerging Green Tier 3 Occupations

Occupational Tier	Occupation Code (SOC)	Occupation Title
3	31-9093	Medical Equipment Preparers
3	31-9096	Veterinary Assistants and Laboratory Animal Caretakers
3	31-9099	Healthcare Support Workers, All Other
3	33-1099	First-Line Supervisors/Managers, Protective Service Workers, All Other
3	33-9032	Security Guards
3	33-9032	Security Guards
3	33-9032	Security Guards
3	33-9099	Protective Service Workers, All Other
3	37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners
3	45-2011	Agricultural Inspectors
3	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse

APPENDIX H: SILICON VALLEY OCCUPATIONAL TRAINING/ EDUCATIONAL INSTITUTIONS

Occupation	Program Title	Institution	Award Level
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Cabrillo College	Associate's degree
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Cabrillo College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Canada College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	College of San Mateo	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	De Anza College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Evergreen Valley College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Foothill College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Gavilan College	Associate's degree
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Gavilan College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Mission College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	San Jose City College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Skyline College	Associate's degree
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Skyline College	Associate's degree
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	West Valley College	Associate's degree
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Cabrillo College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Cabrillo College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	De Anza College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Evergreen Valley College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Foothill College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Gavilan College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Gavilan College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	San Jose City College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	West Valley College	At least 1 year but less than 2 years
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Cabrillo College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Cabrillo College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Canada College	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	CET-Gilroy	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	CET-Sobrato	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	College of San Mateo	Less than 1 year

Occupation	Program Title	Institution	Award Level
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	De Anza College	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	De Anza College	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Everest College-San Jose	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Evergreen Valley College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Foothill College	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Gavilan College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Gavilan College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Mission College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	San Jose City College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	Skyline College	Less than 1 year
Executive Secretaries & Administrative Assistants	Medical Administrative/Executive Assistant and Medical Secretary	Skyline College	Less than 1 year
Executive Secretaries & Administrative Assistants	Administrative Assistant and Secretarial Science, General	West Valley College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Cabrillo College	Associate's degree
Graphic Designer	Computer Graphics	College of San Mateo	Associate's degree
Graphic Designer	Graphic Design	College of San Mateo	Associate's degree
Graphic Designer	Commercial and Advertising Art	College of San Mateo	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	College of San Mateo	Associate's degree
Graphic Designer	Graphic Design	De Anza College	Associate's degree
Graphic Designer	Graphic Design	Foothill College	Associate's degree
Graphic Designer	Computer Graphics	Gavilan College	Associate's degree
Graphic Designer	Graphic Design	Mission College	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	San Jose City College	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Skyline College	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	The Art Institute of California Sunnyvale	Associate's degree
Graphic Designer	Graphic Design	The Art Institute of California Sunnyvale	Associate's degree
Graphic Designer	Graphic Design	Western Career College-San Jose	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	West Valley College	Associate's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Cabrillo College	At least 1 year but less than 2 years
Graphic Designer	Graphic Design	College of San Mateo	At least 1 year but less than 2 years
Graphic Designer	Graphic Design	De Anza College	At least 1 year but less than 2 years
Graphic Designer	Graphic Design	Foothill College	At least 1 year but less than 2 years
Graphic Designer	Graphic Design	Mission College	At least 1 year but less than 2 years
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	San Jose City College	At least 1 year but less than 2 years
Graphic Designer	Graphic Design	Western Career College-San Jose	At least 1 year but less than 2 years

Occupation	Program Title	Institution	Award Level
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	West Valley College	At least 1 year but less than 2 years
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Cabrillo College	Less than 1 year
Graphic Designer	Computer Graphics	Cabrillo College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Canada College	Less than 1 year
Graphic Designer	Computer Graphics	Canada College	Less than 1 year
Graphic Designer	Computer Graphics	College of San Mateo	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	College of San Mateo	Less than 1 year
Graphic Designer	Graphic Design	De Anza College	Less than 1 year
Graphic Designer	Graphic Design	Foothill College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Gavilan College	Less than 1 year
Graphic Designer	Computer Graphics	Gavilan College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Mission College	Less than 1 year
Graphic Designer	Computer Graphics	Mission College	Less than 1 year
Graphic Designer	Graphic Design	Mission College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	San Jose City College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	Skyline College	Less than 1 year
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	West Valley College	Less than 1 year
Graphic Designer	Graphic Design	Notre Dame de Namur University	Bachelor's degree
Graphic Designer	Industrial Design	San Jose State University	Bachelor's degree
Graphic Designer	Graphic Design	San Jose State University	Bachelor's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	The Art Institute of California Sunnyvale	Bachelor's degree
Graphic Designer	Graphic Design	The Art Institute of California Sunnyvale	Bachelor's degree
Graphic Designer	Computer Graphics	The Art Institute of California Sunnyvale	Bachelor's degree
Graphic Designer	Web Page, Digital/Multimedia and Information Resources Design	University of California-Santa Cruz	Bachelor's degree
Graphic Designer	Industrial Design	Stanford University	Master's degree
Sales Representatives	Insurance	College of San Mateo	Associate's degree
Sales Representatives	Sales, Distribution, and Marketing Operations, General	College of San Mateo	Associate's degree
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	De Anza College	Associate's degree
Sales Representatives	Sales, Distribution, and Marketing Operations, General	De Anza College	Associate's degree
Sales Representatives	Sales, Distribution, and Marketing Operations, General	Mission College	Associate's degree
Sales Representatives	Sales, Distribution, and Marketing Operations, General	San Jose City College	Associate's degree
Sales Representatives	Sales, Distribution, and Marketing Operations, General	Skyline College	Associate's degree
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	BioHealth College	At least 1 year but less than 2 years
Sales Representatives	Insurance	College of San Mateo	At least 1 year but less than 2 years

Occupation	Program Title	Institution	Award Level
Sales Representatives	Sales, Distribution, and Marketing Operations, General	De Anza College	At least 1 year but less than 2 years
Sales Representatives	Sales, Distribution, and Marketing Operations, General	Gavilan College	At least 1 year but less than 2 years
Sales Representatives	Sales, Distribution, and Marketing Operations, General	San Jose City College	At least 1 year but less than 2 years
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	Canada College	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	College of San Mateo	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	De Anza College	Less than 1 year
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	De Anza College	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	Mission College	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	San Jose City College	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	Skyline College	Less than 1 year
Sales Representatives	Sales, Distribution, and Marketing Operations, General	West Valley College	Less than 1 year
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	West Valley College	Less than 1 year
Sales Representatives	Fashion Merchandising	The Art Institute of California Sunnyvale	Bachelor's degree
Sales Representatives	Business, Management, Marketing & Related Support Services, Other	Stanford University	Master's degree

APPENDIX I: METHODOLOGY

Data compiled for this report were drawn from both primary and secondary data sources. Table 17 provides a brief overview of the methodology utilized for the project.

Table 17 Overview of Project Methodology

Method	Secondary Research of Emerging Green Employers and the Green Economy Using Existing Data Sources Telephone Survey of Emerging Green Sector Firms Executive Interviews with Emerging Green Sector Firms
Number of Participants	150 Firms in the Emerging Green Sectors Completed a Telephone Survey 10 Participants Completed an Executive Interview
Field Dates for Primary Research	Telephone Survey: November 4 – November 15, 2010 Executive Interviews: November 1 – December 15, 2010
Survey Universe	328 Known Emerging Green Sector Firms and 1,796 Unknown Emerging Green Sector Firms in San Mateo, Santa Clara, Santa Cruz and Southwestern Alameda[13] Counties
Survey Margin of Error	The *maximum* margin of error for questions answered by all 150 respondents was +/-7.72% at the 95% level of confidence.

SECONDARY RESEARCH

Please see Appendix F: Emerging Green NAICS Industries for the NAICS codes that were used to define the emerging green industry sectors. As footnoted throughout the report, a variety of secondary data sources were utilized in compiling data for this report, including information from EMSI, InfoUSA, the California Employment Development Department, and the Cleantech Group LLC Market Insight Database.

A database of known green firms in Silicon Valley (n=328) was gathered from the Cleantech database, the Environmental Defense Fund, LinkSV, and word-of-mouth referrals. For the unknown universe (n=1,796), records were purchased for all firms with telephone numbers in Silicon Valley that were classified in the NAICS codes identified as the most likely to be an emerging green business.

PRIMARY RESEARCH

Two phases of primary research were conducted as part of this project – qualitative executive interviews with 10 industry leaders, prominent employers, and human resource directors within the emerging green sectors and a quantitative telephone survey of 150 employers identified in our databases as likely to be emerging green firms.

[13] The cities of Fremont, Newark and Union City.

SURVEY AND DISCUSSION GUIDE DESIGN

Through an iterative process, the project team worked closely with the City of San José, work2future, and NOVA to develop a survey instrument and executive interview discussion guide that met all the research objectives of the study. In developing the survey instrument, BW Research utilized techniques to overcome known biases in survey research and minimize potential sources of measurement error within the survey.

EXECUTIVE INTERVIEWS

Ten executive interviews were conducted by telephone as part of the project from November 1, through December 15, 2010. The executive interviews were designed to provide additional perspective on workforce development for the emerging green sectors in Silicon Valley. Participants included both firms using established and emerging technologies. These firms varied in size from just a few, to tens of thousands. They varied in lifecycle stage from startups that have yet to bring their products to market, to recognized industry giants.

The emphasis of each interview was to understand drivers of employment growth, workforce training needs, employment projections, skill profiles, and career pathways. To place this information in context, a significant amount of time was dedicated to discussing each firm and the technology they work with. In addition to discussing their history and current positions, firms were asked about their expectations for expansion in terms of workforce, customer geography, and technology.

The workforce dialogue revolved around key occupations. For both entry-level positions and those occupations farther up a given career ladder. The executive interviews also included discussion about critical skills sets, preferred experience, and educational requirements for successful applicants for the occupations discussed and the deficiencies that were noted with current applicants.

For additional information regarding executive interview content, please see the discussion guide in Appendix E: Discussion Guide.

TELEPHONE SURVEY

Sampling Method

Using both the known and unknown databases, the firms were stratified based on industry sector, geographic area, and size within Silicon Valley and efforts were made to gather data from a representative sampling of firms.

Data Collection

Prior to beginning data collection, BW Research conducted interviewer training and also pre-tested the survey instrument to ensure that all the words and questions were easily understood by respondents. Telephone interviews were generally conducted from 9:00am to 4:30pm Monday through Friday. The data collection period was November 4 through November 15, 2010.

A Note about Margin of Error and Analysis of Sub-Groups

The overall margin of error for the survey, at the 95 percent level of confidence, is +/- 7.72 percent (depending on the distribution of each question) for questions answered by all 150 respondents.

However, it is important to note that questions asked of smaller groups of respondents (such as questions that were only asked of firms that were in a specific field of interest for the study) will have a margin of error greater than +/-7.72 percent, with the exact margin of error dependent on the number of respondents in each sub-group.