Green Building Manufacturing

Los Angeles County

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Executive Summary

Los Angeles has gained considerable social and political momentum in the environmental movement. Public green building projects, media attention, public awareness, and political support favoring the environment all indicate movement towards a greener future. Despite such positive trends, there is little to no dialogue or research about the manufacturing industry used to support what seems to be the beginning of a larger, ubiquitous green building movement. The primary goal of this report was to tackle this issue, provide preliminary research, and create a profile of the green manufacturing industry in Los Angeles County.

Highlights from our research include the following:

- **California and Los Angeles County are the West Coast leaders in manufacturing potentially green products.**
  When comparing California and Los Angeles to Washington and Oregon, California has a substantially larger number of manufacturing firms that may be related to green manufacturing than Washington and Oregon. Los Angeles, as a county alone, comes out ahead of both Washington and Oregon in the number of establishments and number of employees.

- **Fifty-nine green manufacturing firms were identified throughout Los Angeles County.**
  The fifty-nine firms were broken down into six sub-sectors. Seven building envelope, two HVAC, twenty-two lighting system, sixteen finishes, three water conservation, and nine green energy firms were identified. Of these:
  - Lighting, green energy, and finishes employ the largest number of workers and are the most lucrative sub-sectors
  - Lighting and green energy firms have a stronger presence in Los Angeles than the rest of the nation
  - A majority of the firms are in the small to medium size range; two-thirds of the firms have fewer than 50 employees
  - The three largest green manufacturing firms in Los Angeles County produce carpet and lighting fixtures.

- **The work force associated with the green manufacturing industry in Los Angeles County is characterized by a high percentage of males and Latino workers. A vast majority of the workforce has a high school education or less.**

- **The market for green building products is driven by policies, incentives, and environmentally conscious consumers.**

- **Tenure for manufacturing occupations tends to be higher than the national average for all occupations.**

The report concludes with a positive outlook on the future of green manufacturing in Los Angeles. Given the existing manufacturing infrastructure, favorable political climate, and growing environmental consciousness in Los Angeles, Los Angeles appears to be in a favorable position to potentially become a regional leader in green manufacturing. The potential of Los Angeles, does however, hinge upon linking the green building movement to the local manufacturing industry. Without such a link, the green building movement can continue to move forward without having much impact on local manufacturing.

Introduction

The last decade has brought consensus among scientist and government leaders over the dangers posed by global warming. Experts agree there is a direct link between rising global temperatures and increases in greenhouse emissions, primarily those from carbon dioxide (CO_2). Warnings state that if emissions are not drastically reduced, our planet will suffer irreversible damage. It is also clear that the largest source of emissions is conventional energy generation and the largest demand for energy comes from buildings, approximately 50%.

Many cities have begun to heed these warnings and have grown cautious of their energy consumption. Understanding that buildings are a large source of waste and emissions, regions are starting to implement sustainable construction practices that increase the efficiency with which buildings and their sites use energy and reduce their impact on the environment. Such strategies are gaining momentum quickly thanks to organizations like the U.S. Green Building Council, which has created the *Leadership in Energy and Environmental Design* (LEED) standards to facilitate sustainable building. Los Angeles County cities such as Santa Monica, Culver City, Pasadena, West Hollywood and Los Angeles, have taken initiative in green building through displays of political support and incentive programs. Growth in the green building sector has the potential to fuel demand for green building products, which have the ability to produce renewable energies and reduce pollutants.

This report examines the manufacturing sector of green building products in Los Angeles County. It has four main objectives: 1) to place green building and green manufacturing in the context of a larger movement, 2) to identify the type of green manufacturing taking place locally, 3) to create a profile of the green manufacturing industry in Los Angeles, and 4) to discuss the prospects of green manufacturing in Los Angeles. The process for identifying local green manufacturing firms was based on extensive internet directories searches, conversations with green industry practitioners, attendance of sustainability conferences and site visits to manufacturing plants. For industry characteristics this report relied on published data from government agencies such as the Bureau of Labor Statistics and the U.S. Census Bureau, and classification systems such as the North American Industry Classification System (NAICS) and Standard Occupational Codes (SOC).

A Background/Overview of the Green Manufacturing Industry

History of the Green Manufacturing Industry

While there is expansive literature and knowledge on the history of green building, specific information regarding the green manufacturing industry is limited at best. Green building practices have been well documented as far back as the nineteenth century. Yet, there is scant literature and information on the manufacturing of materials used to implement green building principles.

The fragmentation of the green manufacturing industry might be one explanation for the lack of information. Numerous green manufactures exist, but there is very little evidence indicating that there is an easily identifiable green manufacturing industry. New York City is a prime example of the lack of an identifiable green manufacturing industry. New York City, who is experiencing a green building boom, has dramatically increased the market for green products. However, the problem is that green builders have little knowledge of and difficulty accessing manufacturers that produce green products, such as low toxic carpeting, solar panels, efficient light bulbs, and other materials used in green building. In response to this problem, the City's Green Manufacturing Initiative created a database of the City's green products and services that link builders to manufactures.[1] Traci Spencer of the Santa Monica Green Resource Center described a similar knowledge and access gap between green builders and manufactures in Los Angeles.[2] To our knowledge, Los Angeles has yet to develop a system to organize the industry and bridge the gap that exists between the parties.

The lack of information and history of the green manufacturing industry might also be explained by the sheer infancy of the industry. While LEED standards dominate the green building industry, standards for manufactured products are just beginning to emerge. At this point, it is difficult to define what is and to what level is a product green. Multiple third party certifiers for green products are emerging to create standards by which manufactured products can be rated for greenness. At this point, the greenness of a product is speculative, and it is difficult to assess what third party certifiers will lead the charge to bring standards to manufactured goods.

The green manufacturing industry is also difficult to accurately pinpoint. Green products are often produced my manufactures by default. That is, manufactures produce products without the true intention to produce them green; their products just happen to be green and are used in the green building process. Consequently, there are situations where a green end-product can be produced in the most environmentally damaging manner. Conversely, non-green end-products can be produced in the most environmentally friendly manner. The ambiguity of “green” and the inability to clearly identify green products and manufactures contributes to lack of information about the green manufacturing industry.

Dynamics of the Green Manufacturing Industry

Competition to be an Industry Leader

There is consensus that the boom in green building is creating new markets for the green manufacturing industry at the local, regional, and global level. Given the ubiquitous emergence of the green movement and the projected growth of the green market at the domestic and global level, it is believed that there is a race to become a major regional center for the green economic sector. This is an opportune time for a region to take control of the green market early and become a recognized global leader in the green sector.

Dynamics in Los Angeles

The dynamics in Los Angeles County provide an opportunity for green manufacturing. As the strongest manufacturing center in the nation, Los Angeles County benefits from an existing manufacturing infrastructure. Increasing public awareness associated with the environment has led to federal, state, and local policies and standards to minimize the impact that buildings have on the environment. As a result, both public and private sector entities throughout the Los Angeles region have adopted green building policies and clean energy standards. As the demand for green building products continues to grow, regional and local markets around Los Angeles County will continue to become stronger creating a tremendous opportunity for the green building manufacturing sector within Los Angeles County to grow and establish itself as a leader.

Cost to Build Green and Manufacture Green

The financial cost has often outweighed the environmental and social benefits of building green. Only in the last few years have studies begun to analyze the financial cost versus benefits of building green. Recent studies have found that total financial benefits of green building exceed the average initial investment required to build green.[3] Savings from energy reduction alone have been found to exceed the increased initial cost to build green. Additionally, studies have found that building green has led to increases in productivity and health gains for employees, which indirectly translate to greater financial benefits.[4] Similarly, the cost to manufacture green products, such as solar panels, has decreased with advances in technology and continuous research and development. Such findings and advances in technology support the advancement of the green manufacturing industry.

NAICS Definition of Green Manufacturing

Methodology*:*
The North American Industry Classification System does not have a specific classification code for the Green Manufacturing sector. In order to determine which codes were most applicable, we first looked to the Economic Roundtable's report, "Jobs in LA's Green Technology Sector." They developed their list of Green Technology businesses using "business directories, Internet searches, newspaper articles, and existing lists from L.A.'s Department of Water and Power and the California Energy Commission"[5]. Through this process they were able to identify and categorize the various NAICS codes into the type of green business.

We used their table to select Manufacturing NAICS codes that may be relevant to our sector[6]. We also obtained additional NAICS Codes that are related to Green Energy through the Renewable Energy Policy Project's report, "Renewable Energy Demand: A Case Study of California"[7]. **The list below includes codes that we believe pertain to the manufacturing of components for green building.**

The Limitations of NAICS:
The challenge for our team in identifying the NAICS codes is that there is not a recognized Green Industry. We had to defer to the Economic Roundtable's list of codes as a starting point as we strived to develop our own knowledge base of components that are used in green building. Throughout the quarter we have continually refined our list of applicable codes and our final list for this report includes **a total of 28 NAICS Codes that fit into our six sub-sectors.**

Findings:

BUILDING ENVELOPE	
326140	Polystyrene Foam Product Manufacturing
FINISHES	
321219	Reconstituted Wood Product Manufacturing
325510	Paint and Coating Manufacturing
325520	Adhesive Manufacturing
GREEN ENERGY	
3272	Glass and Glass Product Manufacturing
3314	Nonferrous Metal (except aluminum) Production and Processing
325211	Plastics Material and Resin Manufacturing
326113	Unsupported Plastics Film and Sheet (except packaging) Manufacturing
332322	Sheet Metal Work Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
334413	Semiconductor and Related Device Manufacturing
334515	Electricity Measuring and Testing Instrument Manufacturing
335313	Switchgear & Switchboard Apparatus Manufacturing
335911	Storage Battery Manufacturing
335931	Current-Carrying Wiring Device Manufacturing
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing
HVAC	
333411	Air Purification Equipment Manufacturing Shops
333412	Industrial and Commercial Fan and Blower Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333415	Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing
334512	Automatic Environmental Control Mfg. for Res. and Commercial Use
334519	Other Measuring and Controlling Device Manufacturing
LIGHTING	
335110	Electric Lamp Bulb and Part Manufacturing
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing
335311	Power, Distribution, and Specialty Transformer Manufacturing
WATER CONSERVATION (INDOOR/OUTDOOR)	
333319	Other Commercial and Service Industry Machinery Manufacturing
333911	Pump and Pumping Equipment Manufacturing
334514	Totalizing Fluid Meter and Counting Device Manufacturing

Industry Size

We have identified 59 firms that manufacture products in Los Angeles County. These firms fall into 6 sub-sectors: Lighting, Building Envelope, Heating Ventilation and Air Conditioning, Finishes, Water Conservation, and Green Energy. The highest concentrations of firms fall under Lighting and Finishes with 22 and 16 firms respectively.

Green Building Products

Green building is the practice of increasing the efficiency with which buildings and their sites use energy, water and materials, and reducing their impact on the environment. Buildings can do this by integrating green building products which have the ability to produce renewable and less polluting energies and capacity to mitigate existing polluting sources[8]. They offer benefits to building owners and occupants including reduced maintenance and replacement costs, energy conservation and improved health for building occupants.

Our initial goal was to identify manufacturing firms of green building products in Los Angeles county. Our process included searches of internet databases, such as Oikos and the Energy Source Guide, interviews and site visits to local green building resource centers, and attending "green" building events such as the Eco-Expo in downtown Los Angeles. We verified that the firms we identified were indeed manufacturing firms and not distributors by making direct inquiries through phone calls. Ultimately we compiled a list of 59 local green manufacturing firms. **Appendix A** displays a table with detail information about the firms and the sources where we found them.

After evaluating the green building product market it became apparent to us that six broad product sub-sectors existed: Building envelope, finishes, green energy, HVAC, lighting, and water conservation.

Literature Highlights about the Industry

a. Cradle to Cradle: Remaking the Way We Make Things by William McDonough and Michael Braungart[9]
In *Cradle to Cradle* the authors present a strategy for eliminating waste. The authors argue that producers should make products so they can be re-used to make other products. To make this happen, the process of making products have to become greener by eliminating the use of harmful chemicals that can later hurt the consumer if the product is broken down and remade into something else.

b. Natural Capitalism by Paul Hawken et. al[10]
This book calls for a new form of industrial revolution. The author argues for a change in current business/capitalist practices to promote environmental responsibility. As a result businesses are socially and environmentally responsible and make a profit.

c. Green Building Handbook: A Companion Guide to Building Products and Their Impact on the Environment, Volume 2 by Tom Woolley[11]
From the back of the cover:
"Learning how to construct more environmentally friendly buildings is increasingly a commercial and legal necessity. This new handbook provides a detailed reference for environmentally concerned purchasers of building products, complementing the Green Building Handbook Volume 1. Invaluable for the specifier, this companion handbook will be useful to all those interested in finding greener ways of designing and making buildings."

d. Handbook of Sustainable Buliding: An Environmental Preference Method for Selection of Materials for Use in Construction and Refurbishment by David Anink et. al[12]
From the publisher:
"Sustainable building is attracting increasing interest. Many architects and planners wish to lessen the impact of building activities upon the environment. This handbook is the first to give concise, comprehensive guidance to the selection of building materials from an environmentally conscious viewpoint. Covering every aspect of both new building and refurbishment, the handbook clearly and simply grades the options available at each stage of construction. The recommendations made in the handbook are based upon extensive evaluation of the environmental impact of the materials, and practical experience of projects and pilot studies conducted in the Netherlands. The accessible presentation makes this an appropriate reference tool for all members of the building planning team."

e. The Ecology of Commerce by Paul Hawken[13]
From Publishers Weekly:
"Hawken touches on a raw nerve here. How might millions of people live and work in a complex business environment while causing 'as little suffering as possible to all and everything around us?' Hawken, no Luddite, believes that 'we need a design for business that will ensure that the industrial world as it is presently constituted ceases and is replaced with human-centered enterprises that are sustainable producers.' Avoiding stormy rhetoric, Hawken thoughtfully reviews ecological theories and disasters and insists that 'ecology offers a way to examine all present economic and resource activities from a biological rather than a monetary point of view.' Calling for a restorative economy, he proposes rational, achievable goals: stop 'accelerating the rate that we draw down capacity'; refrain from 'buying or degrading other people's environment;' and avoid displacing 'other species by taking over their habitats.' This noteworthy study should kindle debates within the business community."

f. "Green Technology: Strategy and Leadership for Clean and Sustainable Communities" Magazine, Fall 2006[14]
Relevant Stories:

- **"Greening the Golden State"** – Governor Schwarzeneggar's commitment to California's Sustainable Future

- **"Savings Fund: Public Utilities Invest in California"** – California's four largest utilities companies will invest in implementing energy savings programs in its buildings

- **"Green Milestone"** – California's Department of Education headquarters is the first state-owned building to receive the highest "green building" certification

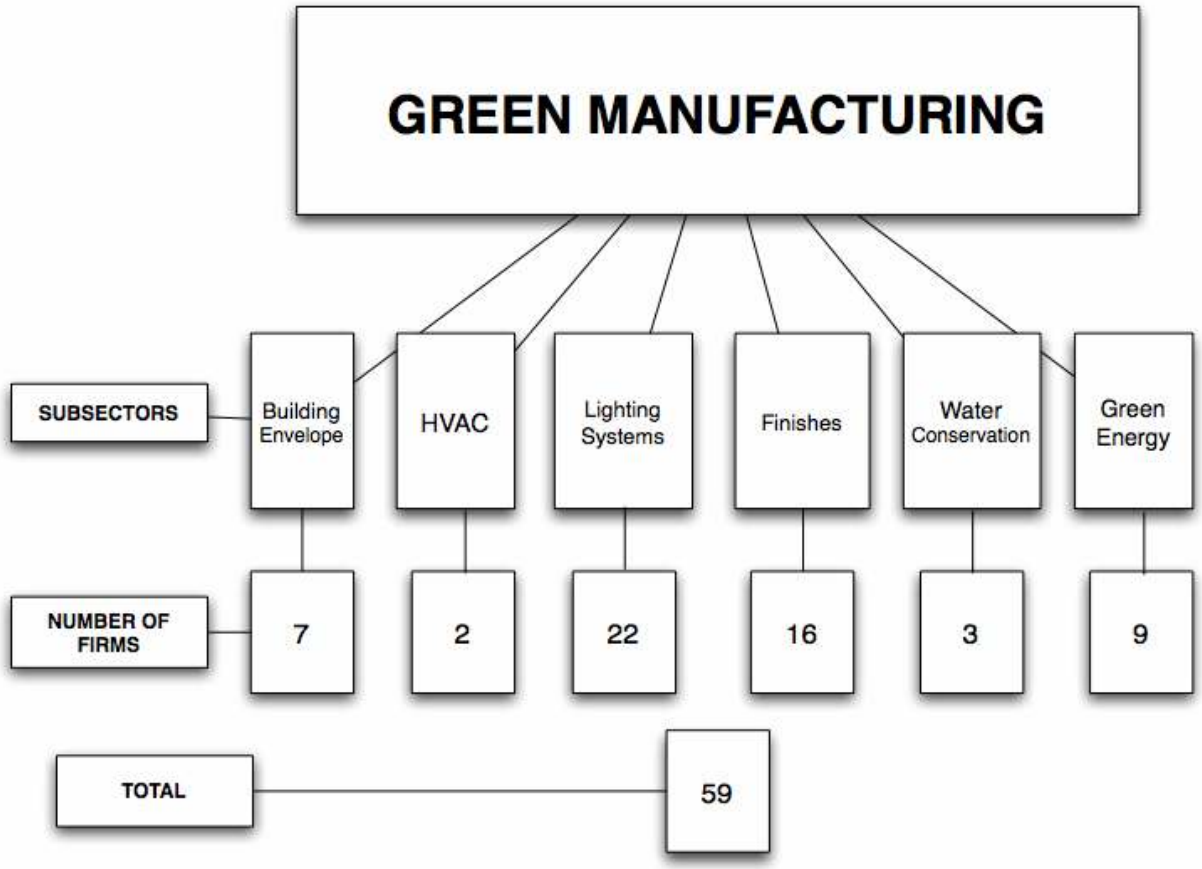
- **"California Gold"** – New standards for sustainable carpet

- **"The Organic Nature of Sustainable Buildings**" – The process of obtaining green certification for existing buildings

- **"Retro-Commissioning: Back to the Future"** – By 2011, all buildings over 50,000 sq. ft. owned by the Executive Branch of the State of California will have been retro-commissioned

- **"Buying Green"** – a new online guide on the CA state website

The Structure of Green Manufacturing
Our Findings

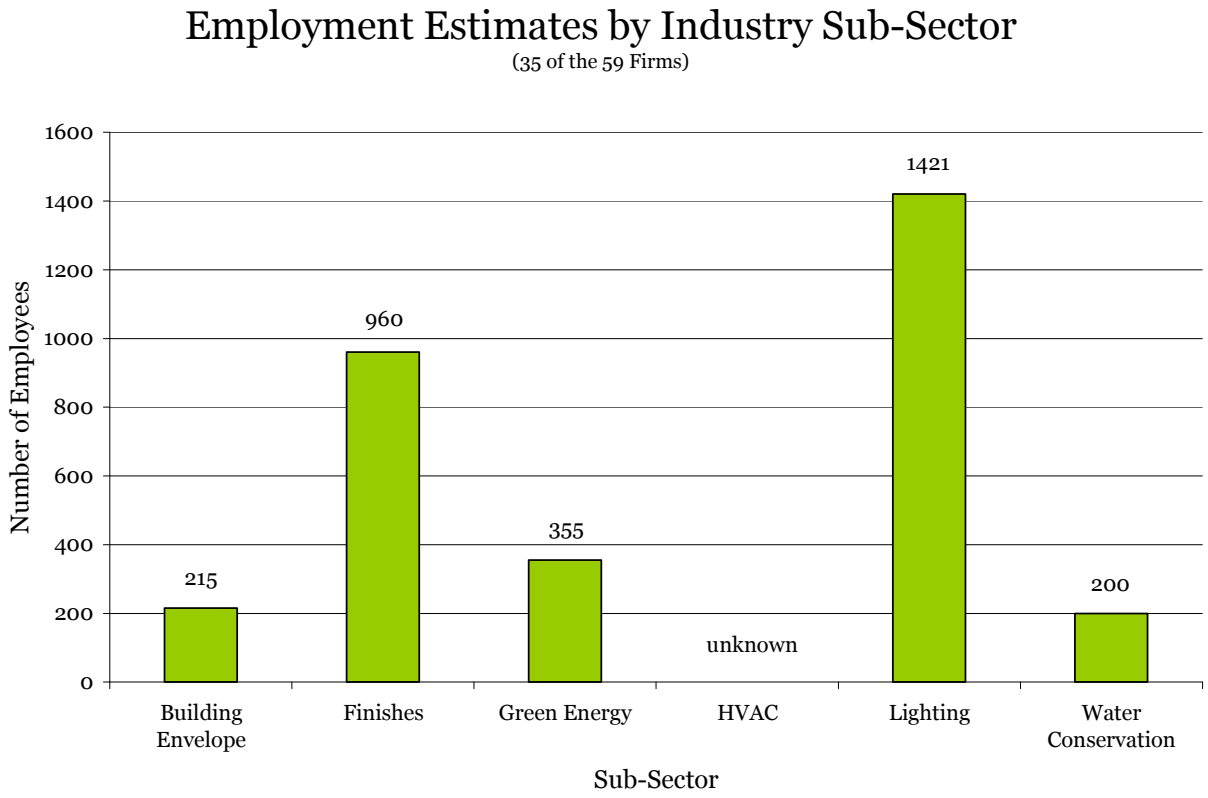


Source: US Business Directory, OIKOS, GreenSpec, EnergyStar, FlexYourPower, Energy Source Guide, MacRae's Blue Book, Google, IESNA, ThomasNet

Industry Overview

Methodology:
Once our team had confirmed the 59 firms manufacturing green building products in LA County, we were able to access information about firm size (number of employees) and the value of their sales/outputs for **35 of the 59 companies.** The data was taken from the U.S. Business Directory and Hoovers via the Lexis Nexis "Company Profiles" search option[15].

Findings:

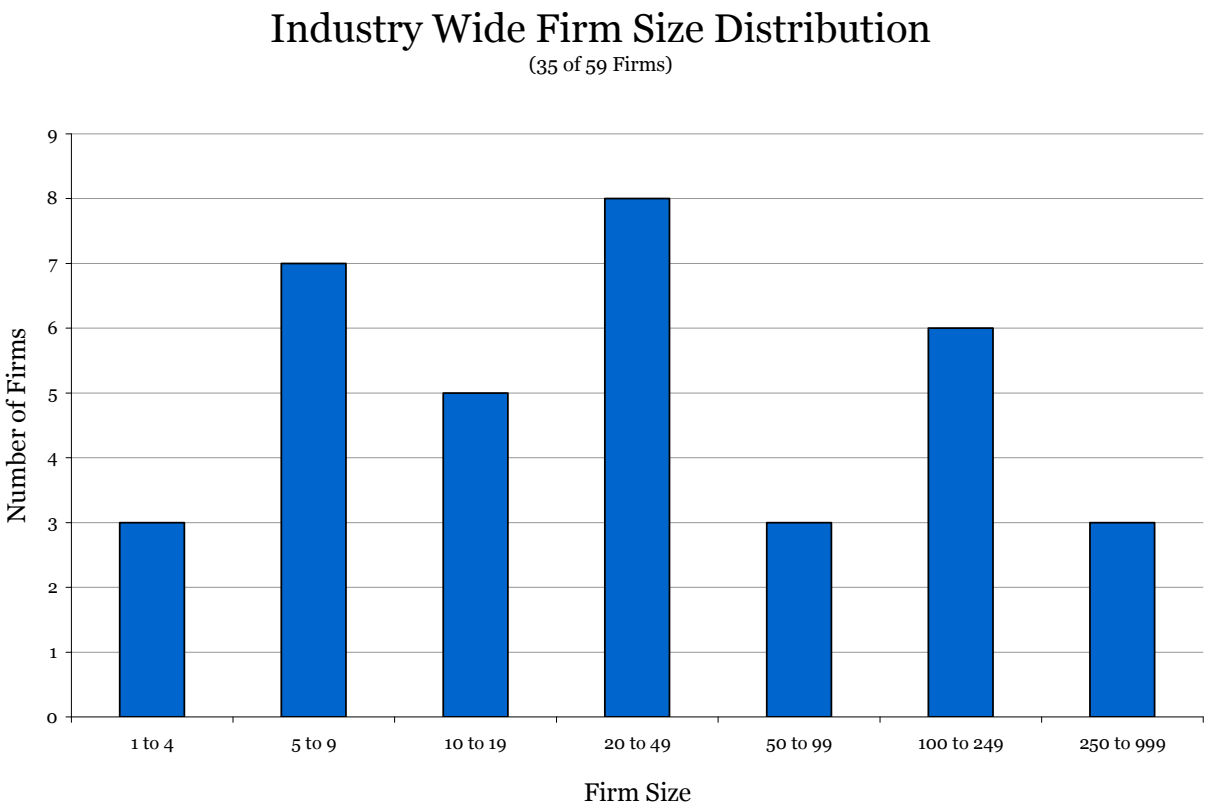


- **The total estimated number of workers employed in green manufacturing is between 3131 and 3307.** This number is a range because the U.S. Business Directory and Hoovers often reports the firm size as a range (i.e. 1-4, 5-9, etc). We calculated employment using both ends of the ranges and came up with our estimated total number of workers.

- Since this data only reflects 35 of the 59 firms we identified, that tells us that **there are *at least* 3131 workers in the green manufacturing industry**.

- **Lighting** by far employs the greatest number of workers in the industry.

- **Finishes** and **Green Energy** are also large employers in the green manufacturing industry. In the category of finishes, it is important to note that **545 employees of this sub-sector work for Bentley Prince Street, a carpet manufacturing firm.** In the category of Green Energy, **243 of the employees work for Capstone Turbine Corporation.**

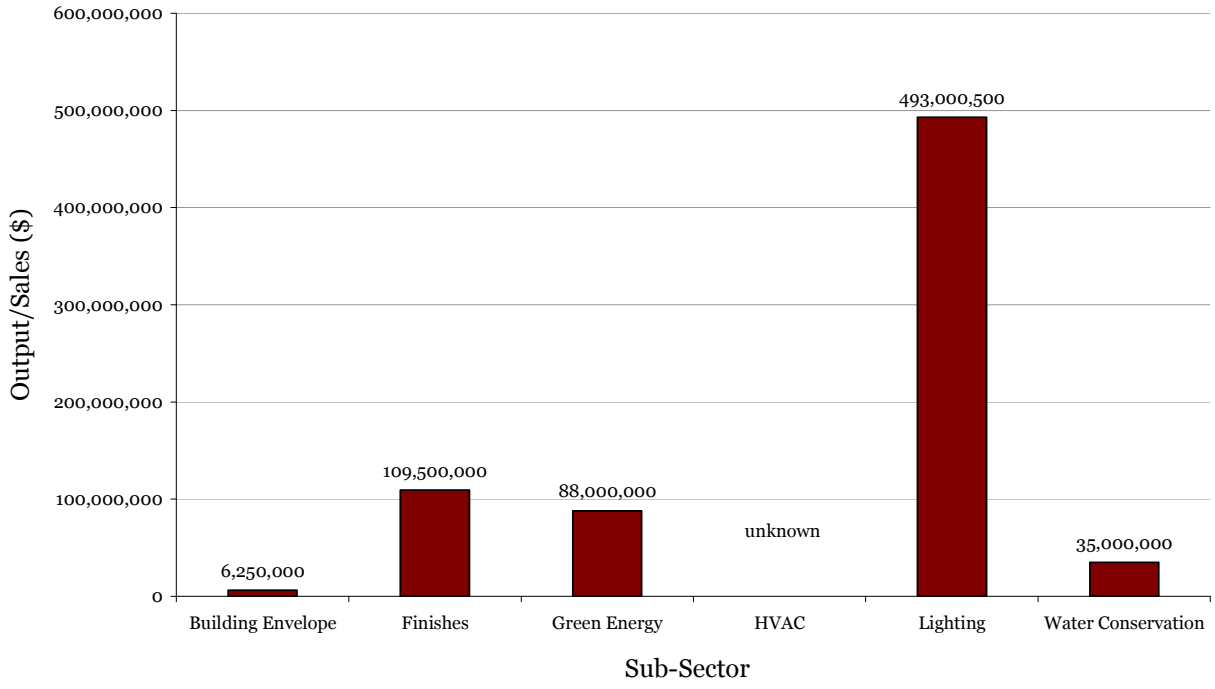


- Green Manufacturing firms tend to be smaller – **two-thirds of the 35 firms employ fewer than 50 employees**. We did not find this to be surprising given that many green building products have are unique products with a very small customer base. When we spoke with green product/building experts at the Eco-Expo, Livingreen[16], and the Green Building Resource Center[17], we were told that the typical customers for these products are designers and architects who have a green agenda. Therefore green building products are not currently produced at a large scale.

- The three largest firms (with 250 to 999 employees) produce carpet **and lighting fixtures**.

Estimated Output/Sales Distribution by Sub-Sector

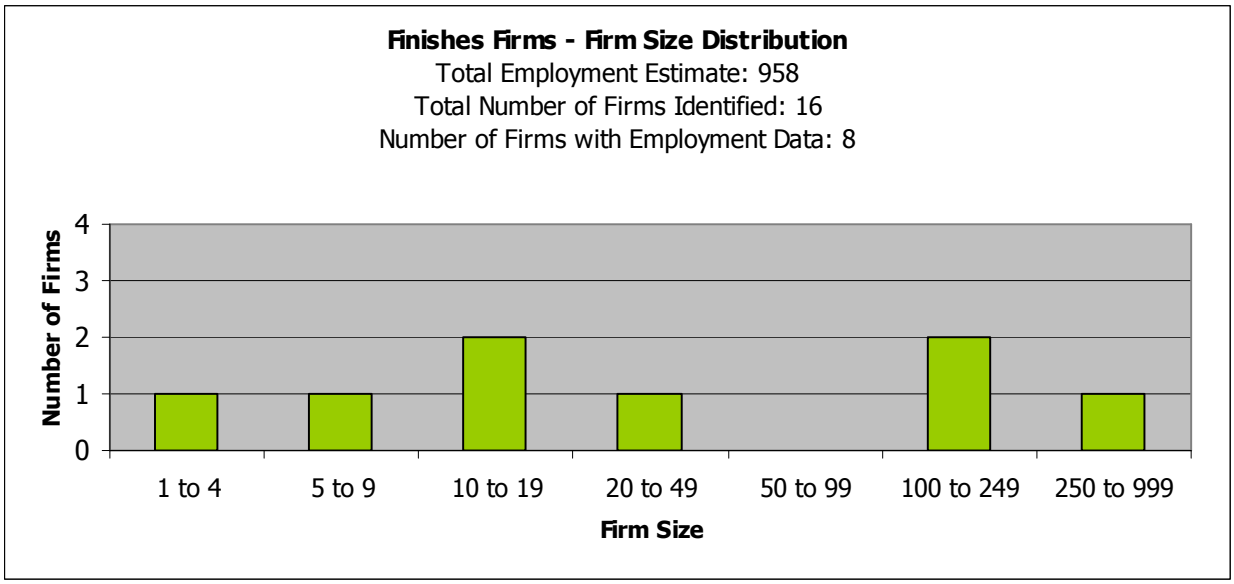
(35 of 59 Firms)

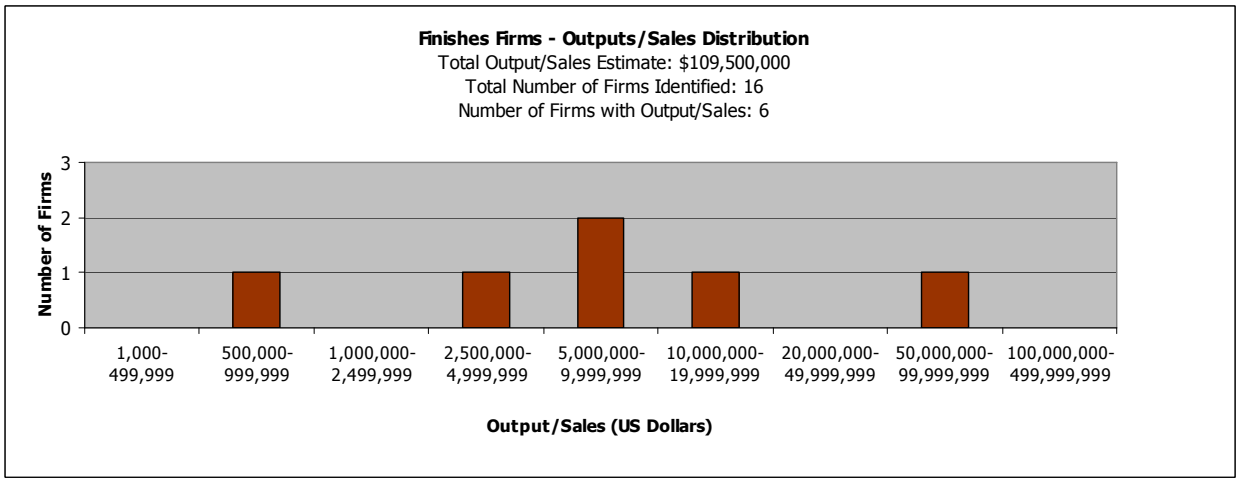


- **Lighting** by far has the greatest number of output/sales.
- **Finishes** and **Green Energy** also have substantially higher values compared to the other sub-sectors.

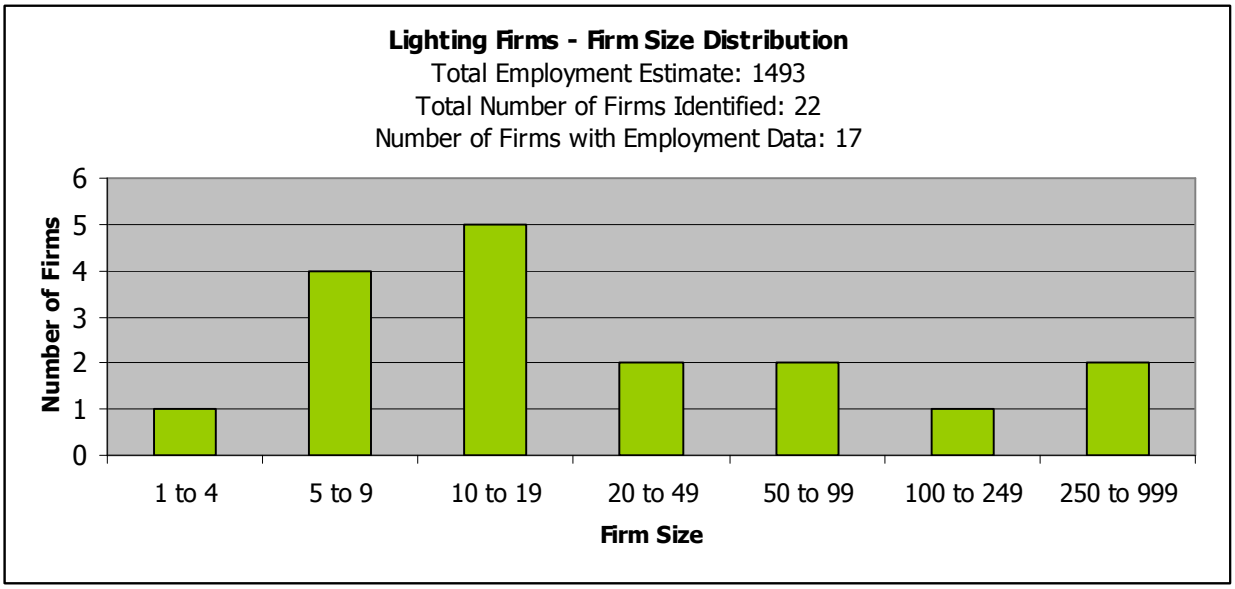
Firm Size and Output/Sales by Green Sub-Sectors

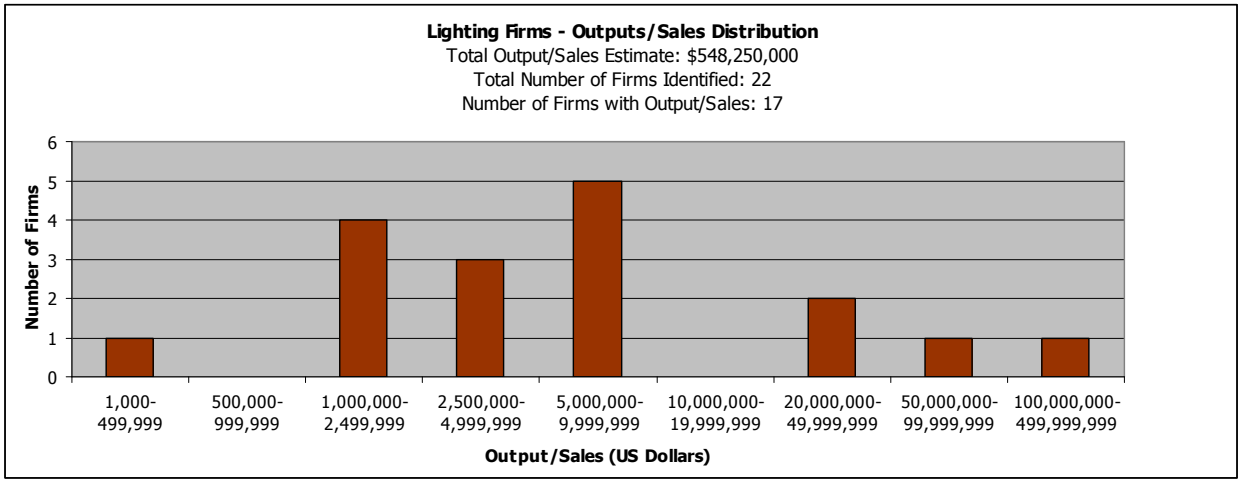
a. **Finishes**





b. **Lighting**


Lighting Firms - Firm Size Distribution
Total Employment Estimate: 1493
Total Number of Firms Identified: 22
Number of Firms with Employment Data: 17
Number of Firms
0
1
2
3
4
5
6
1 to 4
5 to 9
10 to 19
20 to 49
50 to 99
100 to 249
250 to 999
Firm Size


Lighting Firms - Outputs/Sales Distribution
Total Output/Sales Estimate: $548,250,000
Total Number of Firms Identified: 22
Number of Firms with Output/Sales: 17
Number of Firms
0
1
2
3
4
5
6
1,000-499,999
500,000-999,999
1,000,000-2,499,999
2,500,000-4,999,999
5,000,000-9,999,999
10,000,000-19,999,999
20,000,000-49,999,999
50,000,000-99,999,999
100,000,000-499,999,999
Output/Sales (US Dollars)

c. **Building Envelope, Green Energy, Water Conservation, and HVAC**

	Green Sub-Sectors			
	Building Envelope	**Green Energy**	**Water Conservation**	**HVAC**
Total Employment Estimates (# of Employees)	215	355	200	Unknown
Total Output/Sales Estimate (US Dollars)	6,250,000	88,000,000	35,000,000	Unknown
Total Number of Firms Identified	7	9	3	2
Number of Firms with Data	4	5	1	0

Concentration Ratios

Concentration data for our 28 NAICS industries related to green manufacturing was only available at the national level. While this is not very useful for our local evaluation of the green manufacturing sector, it does give insight at the larger scale. Our source was the 2002 Economic Census[18].

Based on four-firm concentration ratios, our findings below indicate the highest market concentrations in the areas of turbine generator manufacturing (333611) at 88%, electric lamp bulb and parts manufacturing (335110) at 89% and storage battery manufacturing (335911) at 61%. Roughly half of the industries have concentrations between 20% to 40%.

NAICS Code	NAICS Industry Names Concentration Ration for 4 Largest Companies 2002 Source: 2002 Economic Census - http://www.census.gov/epcd/www/concentration.html	Value Added (%)
BUILDING ENVELOPE		
326140	Polystyrene Foam Product Manufacturing	46
FINISHES		
321219	Reconstituted Wood Product Manufacturing	37.5
325510	Paint and Coating Manufacturing	34.4
325520	Adhesive Manufacturing	24.7
GREEN ENERGY		
333611	Turbine and Turbine Generator Set Units Manufacturing	88
334413	Semiconductor and Related Device Manufacturing	40.9
325211	Plastics Material & Resin Manufacturing	36.8
326113	Unsupported Plastics Film & Sheet (except packaging) Manufacturing	23.8
3272	Glass & Glass Product Manufacturing	25.9
3314	Nonferrous Metal (except aluminum) Production & Processing	17.4
332322	Sheet Metal Work Manufacturing	5.4
334515	Electricity Measuring & Testing Instrument Manufacturing	37.4
335313	Switchgear & Switchboard Apparatus Manufacturing	49.5
335911	Storage Battery Manufacturing	61.2
335931	Current-Carrying Wiring Device Manufacturing	28.9
335999	All Other Miscellaneous Electrical Equipment & Component Manufacturing	19.6
HVAC		
333411	Air Purification Equipment Manufacturing Shops	28.3
333412	Industrial and Commercial Fan and Blower Manufacturing	29.2
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	24.7
333415	Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing	39.1
334512	Automatic Environmental Control Mfg. for Res. and Commercial Use	48.9
334519	Other Measuring and Controlling Device Manufacturing	19.2
LIGHTING		
335110	Electric Lamp Bulb and Part Manufacturing	89.6
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	48.7
335311	Power, Distribution, and Specialty Transformer Manufacturing	40.7
WATER CONSERVATION (INDOOR/OUTDOOR)		
333319	Other Commercial and Service Industry Machinery Manufacturing	19.4
333911	Pump and Pumping Equipment Manufacturing	28.2
334514	Totalizing Fluid Meter and Counting Device Manufacturing	48.1

Geographic Dimensions of the Industry

Geographic Turning Points

Green building manufacturing is an emerging sector. As a result, it has been a challenge to ascertain whether or not there have been significant geographic turning points at both the local and national level that could be attributed to this sector. As the industry becomes more defined, economic census reports can be used to identify geographic shifts in production by looking at changes in outputs over time. Ideally, information could be gathered that could help point out certain geographic production centers, which could then be tracked over time to see when they have emerged or declined over time.

Spatial Concentration
A Comparison of the Green States of the West Coast

Methodology:
Given that the green sector is still very young and only beginning to develop, many different regions are aggressively trying to establish themselves as green leaders. One report in particular, "The Economic Development Potential of the Green Sector," by Professor Paul Ong and Varisa Patraporn included a section on cities and metropolitan areas that are developing policies and initiatives to promote the green sector[19]. This list includes all of the major west coast cities – Los Angeles, Portland, San Francisco, and Seattle. For that reason, we wanted to compare Los Angeles County to other "Green Counties" of the west coast to see how they rank up against one another in manufacturing potentially green products.

Initially we had conducted our analysis at the county level comparing King County (WA), Multnomah County (OR), County of San Francisco (CA), and Los Angeles County (CA). Using data from the 2002 Economic Census State reports on Manufacturing, we pulled data on **Number of Establishments, Number of Production Workers, and Total Value of Shipments for the 28 NAICS codes related to green manufacturing[20]**. However, the data revealed that King County, Multnomah County, and the County of San Francisco do not have values reported for those NAICS Codes – possibly meaning that they either do not manufacture those particular products in their counties or the data has been withheld to avoid disclosing data of individual companies.

We then considered comparing the counties in each of the three states that have the largest manufacturing base (King County in Washington, Washington County in Oregon, and LA County in California), but still found the values for King County and Washington County to be incomparable because they reported manufacturing only several our 28 NAICS Codes. **We finally decided that the best level of comparison would be at the state level, but also including values for LA County**.

Refer to **Appendix B** for detailed findings for each state.

Findings:

Number of Establishments

	Washington	Oregon	California	LA County
Building Envelope	9	6	91	27
Finishes	47	40	275	92
Green Energy	307	246	2,109	740
HVAC	66	25	384	60
Lighting	8	4	125	48
Water Conservation	30	28	292	80
TOTAL	**467**	**349**	**3,276**	**1,047**

Number of Production Workers

	Washington	Oregon	California	LA County
Building Envelope	346	134	3,327	837
Finishes	596	1,963	4,383	1,513
Green Energy	9,762	10,003	62,117	17,512
HVAC	1,189	462	8,529	1,438
Lighting	492	-	2,778	971
Water Conservation	473	548	6,331	1,314
TOTAL	**12,858**	**13,110**	**87,465**	**23,585**

Total Value of Shipments ($1000)

	Washington	Oregon	California	LA County
Building Envelope	81,858	35,352	860,132	186,797
Finishes	297,690	702,949	3,033,084	1,107,900
Green Energy	2,673,466	10,758,368	24,260,457	3,916,797
HVAC	312,248	122,325	2,756,344	301,091
Lighting	77,600	-	732,811	222,151
Water Conservation	154,559	195,629	2,096,923	420,167
TOTAL	**3,597,421**	**11,814,623**	**33,739,751**	**6,154,903**

When compared at a state level, **California has a substantially larger number (n=3276) of manufacturing firms that may be related to green manufacturing** than Washington (n=467) and Oregon (n=349). **California employs approximately 87,465 production workers** in these industries, whereas Washington only employs 12,858 and Oregon employs 13,110.

When we include LA County in this comparison, **LA County comes out ahead of both Washington and Oregon in the number of establishments and number of employees**. Oregon **has a greater total value of shipment than LA County** because they seem to have a strong manufacturing base for Semiconductors and Related Devices – which accounts for $9,184,906,000 of their $10,758,368,000 total value of shipments in the Green Energy sub-sector.

Although this comparison does not accurately reflect values for just the green manufacturing industry, **it still paints a very favorable picture for LA County**. If the NAICS codes do capture green manufacturing industries, then LA County has a stronger manufacturing base for green building materials than both Washington and Oregon. **Also, even though these firms may not yet be green, their mere presence in the region presents opportunities to transition them into green producing firms with sustainable practices**.

Green Manufacturing Firms in LA County:
Location, Sales Output, and Firm Size

Location:
Fifty-nine green building manufacturers were identified throughout Los Angeles County. Map 1 shows that green manufactures are located in various areas of Los Angeles, with a higher concentration found in the southern and eastern sections of the county. Generally, there are little to no trends in concentration patterns when examining our six green manufacturing sub-sectors. Given the small number of "building envelope," "HVAC," and "water conservation" firms, trends are not apparent. "Green energy" firms are dispersed across the county, "lighting" firms are found more readily in the eastern and southern sections of the county, and "finishing" firms tend to be located towards the south-eastern section of the county. The smaller number of manufacturing/industrial areas in the western section of the county accounts for the scant number of firms located in this area.

Map 1: **Green Building Manufacturers**

Sales Output and Firm Size

Maps 2 and 3 show the spatial distribution of green manufacturing firms throughout Los Angeles County with regards to sales output and firm size. On average, only fifty-seven percent of our fifty-nine identified green manufactures had sales output and firm size data. The absence of such data makes it difficult to assess the spatial concentration of manufactures based on these characteristics. However, based on available information, larger firms with higher sales output are generally located in the eastern and southern sections of the county. There are a few similar firms located in the San Fernando Valley, close to the Ventura County border. It is important to note that we suspect that a majority of firms without data are characterized by smaller sales outputs and smaller workforces.

Map 2: **Green Building Manufacturers by Firm Size (Number of Employees)**

Map 3: **Green Building Manufacturers by Sales Output**

Location Quotient

Definition:
Location quotient (LQ) is a measure of an industry's concentration in an area relative to the rest of the nation. The equation for location quotient is:

$$\text{Industry Location Quotient} = \frac{(\text{Employment in Industry} \ / \ \text{Total Employment in Base})}{(\text{National Employment in Industry} \ / \ \text{Total National Employment})}$$

Methodology:
Using the 28 NAICS codes that we identified with green manufacturing, location quotients were calculated for both output and employment. Location quotients were calculated with data collected from the 2002 Economic Census, Manufacturing, Geographic Area Series. Output was defined as the total value of shipments in dollars, and employment was defined as the total number of production workers.

Location Quotient for Employment (total # of production workers)
Of the twenty-eight NAICS codes, only 14 location quotients were calculated due to incomplete data for all the sub-sectors. Just under two-thirds of the sub-sectors had an employment LQ of lower than one implying that the industry's share of local employment is smaller than its share of national employment.

- The highest LQ was for lighting sub-sector 335122, *Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing,* with 1.27. This high LQ could be indicative of the large lighting industry that exists in the Los Angeles region relative to the rest of the nation. Also, being that this is the highest LQ among the group we can infer that it is a key sub-sector in Los Angeles for employment among the Green Building Manufacturing Industry.
- The lowest LQ was for *Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing* (*333415)*, which was .29. This low LQ could be reflective of the fact that the NAICS code is not detailed enough to adequately capture all of the production within this sub-sector, therefore providing an inaccurate picture of the industry in the Los Angeles region in relation to employment.

Location Quotient for Output (total value of shipment in dollars)
Data for the output location quotient was restricted to just 16 of the sub-sectors. Of the output LQs calculated, five were higher than 1, and four were lower than .4. The highest output LQs were for:

- *Paint & Coating Manufacturing (325510)* at 1.66
- *Electricity Measuring & Testing Instrument Manufacturing Equipment (334515)* with 1.44
- *Commercial*, *Industrial, and Institutional Electric Lighting Fixture Manufacturing (335122)* at 1.37
- *Other Commercial & Service Industry Machinery Manufacturing (333319)* with an LQ of 1.32.

Findings:
Based on the location quotients for *Commercial*, *Industrial, and Institutional Electric Lighting Fixture Manufacturing (335122),* a lighting sub-sector, there are stronger regional employment and output shares in terms in relation to the rest of the nation.

See **Appendix C** for Location Quotient Table

Shift-Share Analysis

Methodology:
Our NAICS codes were grouped into six green building manufacturing sub-sectors. Shift Shares were calculated for both output and employment for the NAICS industries. In order to calculate the shift shares, data was pulled from the 2002 and 1997 Economic Census[21], Manufacturing, Geographic Area Series for Los Angeles county. The year 1997 was chosen as the base year due to its perceived neutral position in the business cycle (i.e. not a downturn or upswing period). The year 2002 was selected as the recent year since the Economic Census is published every five year and 2002 provides the latest data set. Output was defined as the total value of shipments in dollars, and employment was defined as the total number of production workers.

Shift Share for Employment:
Los Angeles County
Data could only be accurately compiled for 10 NAICS categories due to incomplete Economic Census data. In two instances four and five digit NAICS codes were used rather than the more detailed six digit codes.

Shift-share analysis provides the portion of total growth due to: growth of the national economy, a mix of faster or slower than average growing industries, and the competitive nature of the industries in the region.

- The National Average Growth Rate was found to be –11.1%.

- The Total Regional National Growth Component indicates that 12,733 jobs should have been attributed to the growth of the national economy, however, the sector only experienced the creation of 12,604 total jobs.

- The Industry Mix Component told us that the number of jobs attributed to the region's mix of industries was –10. The negative number means the growth rate was unfavorable and that the industries as a whole grew less quickly than the national growth rate. The Green Energy and Lighting sub-sectors had the most unfavorable Industry National Growth Rates, –17.9% and –27.5% respectively. The Building Envelope sub-sector had the most favorable Industry National Growth Rate 20.2%.

- The Total Competitiveness Component indicates that the number of jobs created as a result of the region's competitiveness was –119. Although the overall Competitiveness Employment Change was negative, the Green Energy sub-sector and Electric Lighting Equipment Manufacturing industry displayed strong regional competitiveness with 205 and 336 jobs created respectively.

Shift Share for Outputs:
Los Angeles County
Data could only be accurately compiled for 8 NAICS categories. This is due to data suppression and gaps in data collection by the Economic Census. Although we are basing our assessment on a limited number of NAICS codes, it is enough to gain a general overview of overall growth in the region.

Shift Share for Output:
- The National Average Growth Rate is -8.6%.

- The total Regional National Growth Component tells us that overall manufacturing output fell to $2,527,847 between 1997 and 2002. However, the local sector experienced a sharper drop, falling to $2,532,023 between 1997 and 2002.

- The Industry Mix Component tells us that the amount of output attributed to the region's mix of industries was $287,913. Green energy (-21.7%) and lighting (-8.9%) showed the least favorable growth. Building envelope (30.9%), and HVAC (17.8%), showed the most favorable growth.

- The Total Competitiveness Component tells us the local industry earned $-283,737 based on the region's competitiveness. This shows that the competitiveness component has had an overall negative impact on the total local industry output by lending to the sharp decline in output between 1997 and 2002. We can speculate that a rise in competition will drive up the amount of yearly output.

See **Appendix D and E** for Shift Share Tables

Characteristics of the Labor Force

Wages by Standard Occupational Codes

Methodology:
The group utilized the Bureau of Labor Statistics (BLS) – Occupational Employment Statistics to identify sixteen SOC codes related to occupations we observed during our site visits to Solar Integrated Technologies and LA Lighting. SOC codes were only selected from the "Production Occupations" category from the Los Angeles-Long Beach-Glendale, CA metropolitan division. We believe that similar occupations will be found throughout the solar power, lighting, and like industries throughout the area.

Findings:
The table below contains most recent employment estimates and hourly wages for the sixteen SOC codes we identified. The top four occupations with the largest employment numbers were supervisors/managers (51-1011), team assemblers (51-2092), assemblers and fabricators (51-2099), and other production workers (51-9199). As expected, supervisors/managers had one of the highest hourly wages. The three other occupations (team assemblers, assemblers/fabricators, and other production workers) characterized by high employment numbers were also characterized by having the three lowest hourly wages.

Occupational Employment & Wage by SOC Code

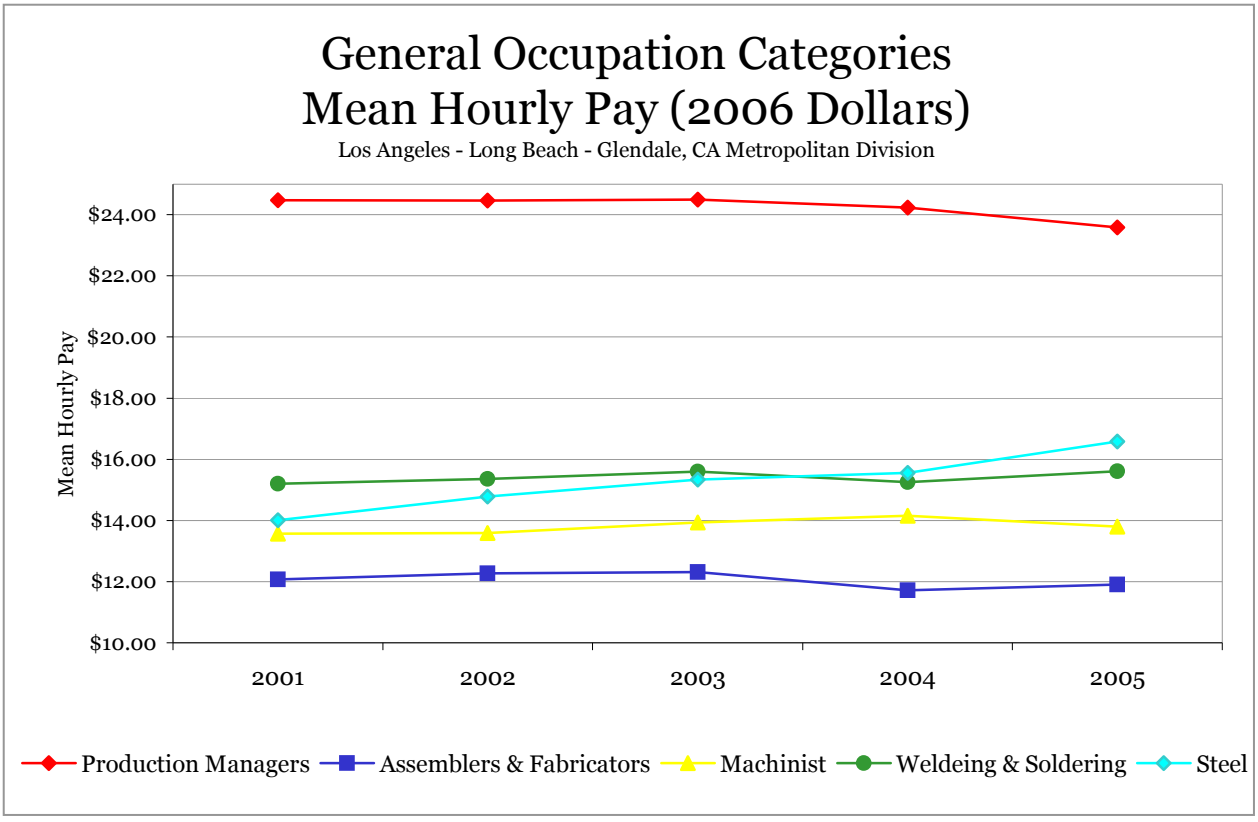
Los Angeles - Long Beach - Glendale, CA Metropolitan Division

General Occupation	SOC Code	Occupational Title	May 2005 Employment Estimates	Mean Hourly Wage (2006 - 1st Quarter)
Assemblers & Fabricators	51-2023	Electromechanical Equipment Assemblers	3,350	$11.68
	51-2041	Structural Metal Fabricators and Fitters	2,540	$15.04
	51-2092	Team Assemblers	25,060	$10.84
	51-2099	Assemblers and Fabricators, All Other	10,300	$10.23
	51-9199	Production Workers, All Other	11,620	$10.02
Machinists	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	3,360	$15.45
	51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	1,230	$13.40
	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	7,090	$12.81
	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	1,280	$13.22
	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	780	$14.03
	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	1,400	$12.21
Welding & Soldering	51-4121	Welders, Cutters, Solderers, and Brazers	7,930	$14.17
Steel Manufacturing	51-4192	Lay-Out Workers, Metal and Plastic	100	$12.89
	51-4199	Metal Workers and Plastic Workers, All Other	1,030	$12.32
	51-4062	Patternmakers, Metal and Plastic	Not available	$24.08
Production Managers	51-1011	First-Line Supervisors/Managers of Production and Operating Workers	21,360	$22.78

Source: U.S. Department of Labor - Bureau of Labor Statistics - Occupational Employment Statistics Survey

We categorized our 16 SOC codes into 5 general occupational categories found in the *BLS – Career Guide to Industries* so that we could cross reference our occupation codes with skill requirement and occupational ladder information that was only available in the 5 general categories. These will be discussed later in the report.

Based on these 5 categories, hourly wage trends were plotted between 2001 and 2005. Wages were rebased to 2006 dollars base on Consumer Price Index changes. The graph below illustrates our findings. One can see that hourly wages have remained relatively steady for most categories with the exception of Steel Manufacturing where wages have increase 18% over the last 5 years and Production Managers where wages have decreased approximately 4%.



Wage Data Analysis by NAICS Codes

Methodology:
Given that we were not able to thoroughly identify all of the SOC Codes related to Green Manufacturing because of our limited knowledge of the specific occupations associated with the industry, we also looked at wage data around the NAICS codes to make larger generalizations about the sub-sectors. The wage data by NAICS Codes for 2001-2005 was retrieved through the BLS Quarterly Census for Wage Data on Los Angeles County[22]. We pulled data for a time span of five years so that we could do a small time series analysis of wage growth/decline/stagnation.

To calculate the change in wages for each NAICS Code over time, the wages were first put into 2006 dollars by doing the following:

1. 2001, 2002, 2003, 2004, and 2005 CPI-U were rebased to the 2006 CPI-U (September 2006 CPI-U was used)
ex: [(CPI-U 2001) / (CPI-U 2006)] * 100
2. Then the average annual pay data was adjusted to 2006 dollars
ex: [(2001 average annual pay) / (CPI-U 2001 rebased to 2006)] * 100

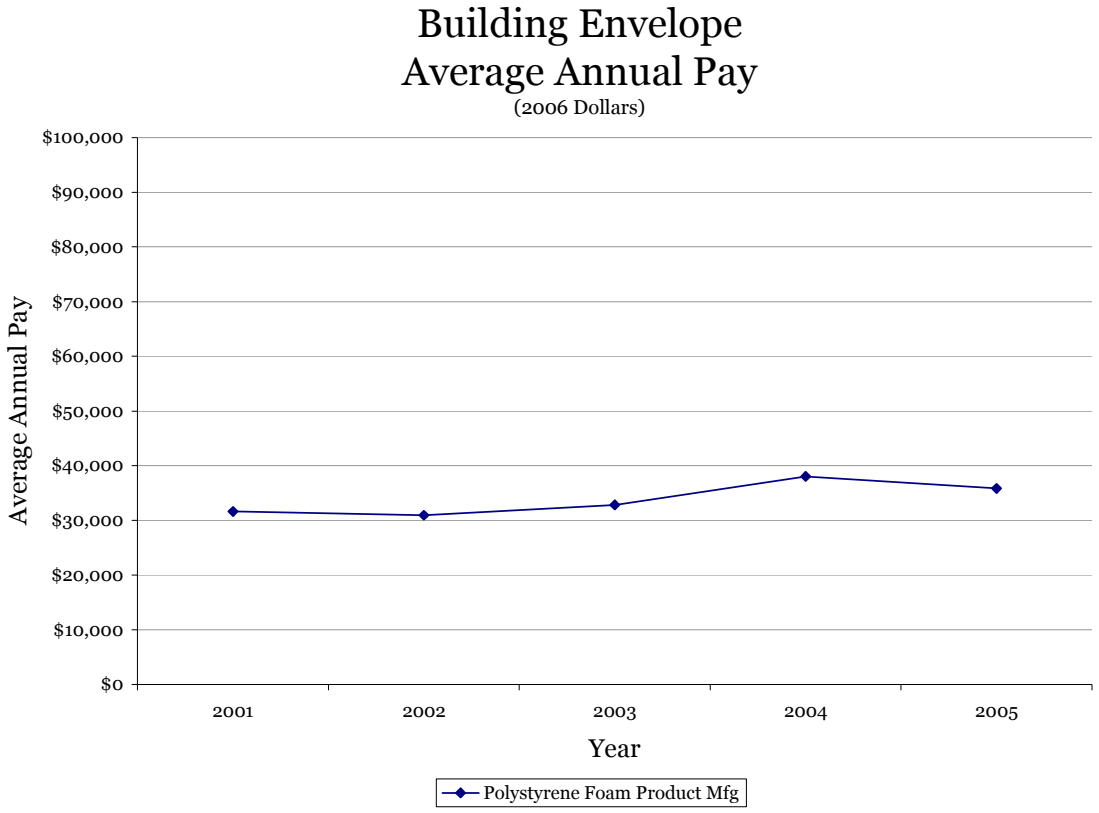
Percent increase/decline in average annual pay was calculated after all of the values were put into 2006 dollars by doing the following formula:

[(2006 average annual pay) - (2001 average annual pay)] / (2001 average annual pay)

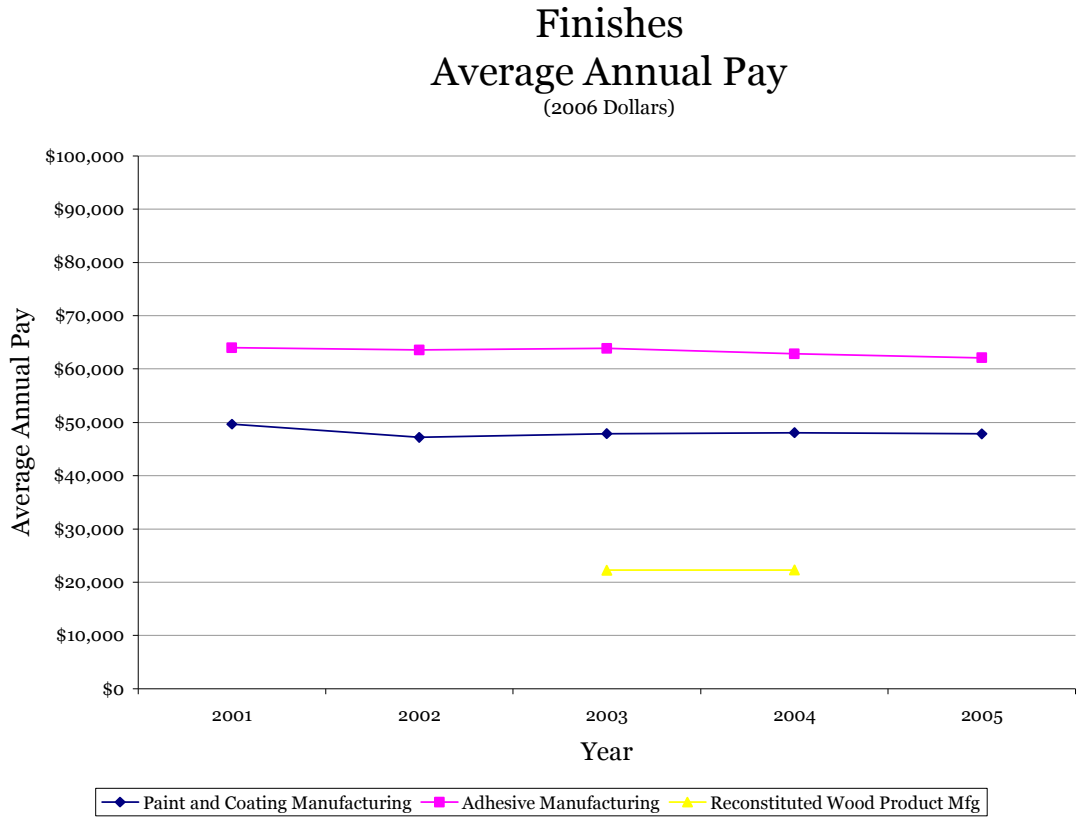
For a detailed breakdown of the calculations, refer to **Appendix F.**

Findings:

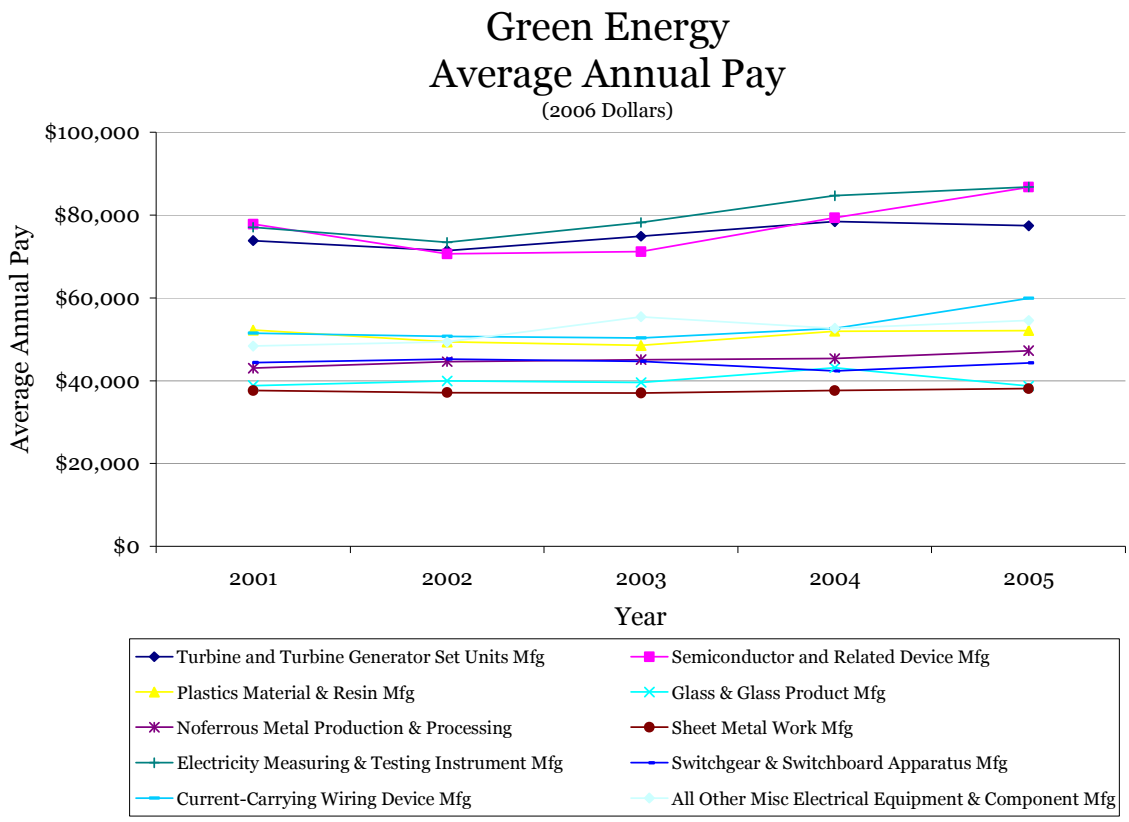
1. **Building Envelope**: Wages in Polystyrene Foam Product Manufacturing have fluctuated over the past five years, reaching a low of $30,950 in 2002 and a high of $38,054 in 2004. In 2005 the average annual pay declined 6.24% from $38,054 to $35,818.



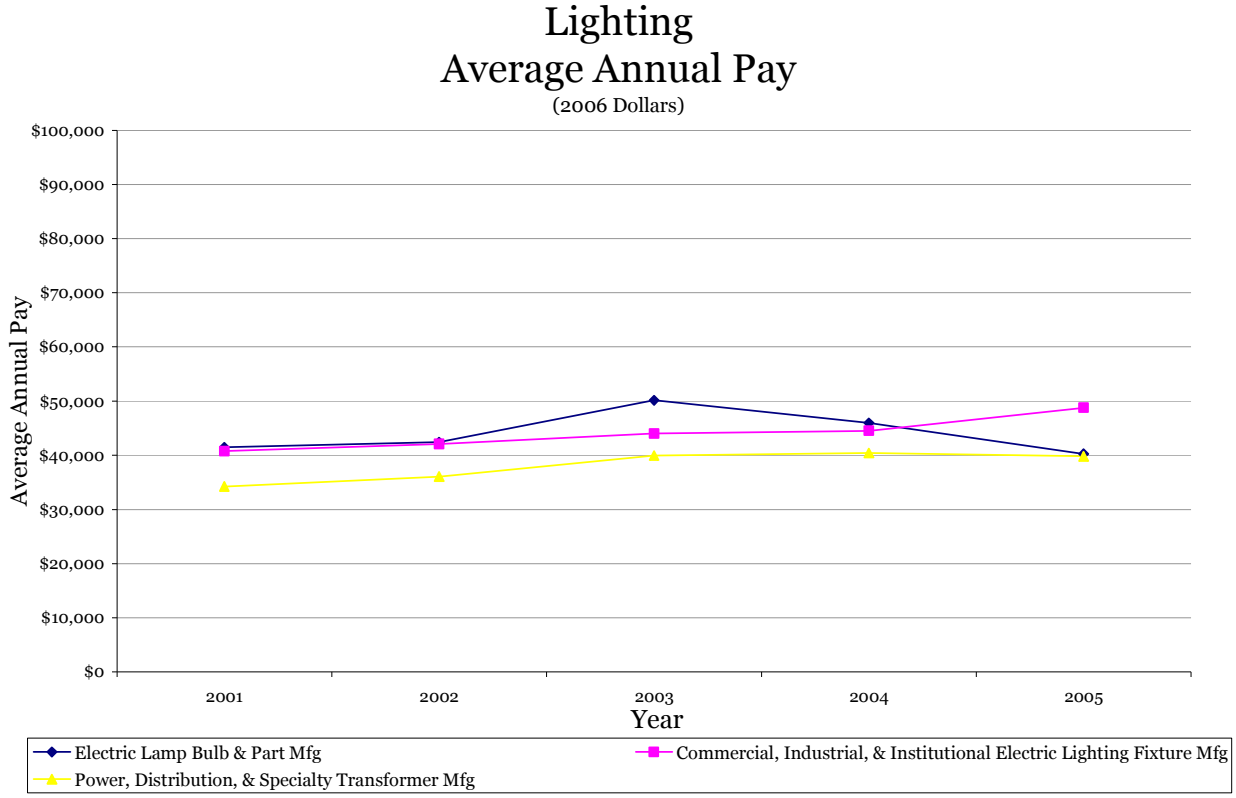
2. **Finishes:** Average annual salaries in the Finishes sector vary significantly throughout the three NAICS codes that fall into this category. Average annual pay in the Reconstituted Wood Product Manufacturing sector remained steady in the low $20,000s for the two years that data was available. Paint and Coating Manufacturing wages were constant in the upper $49,000s. Adhesive Manufacturing had the highest wages in this sub-sector with average annual wages in the lower-mid $60,000 range. Overall, none of these NAICS codes experienced a significant increase over the five-year period. They were either stagnant or experienced slight declines.



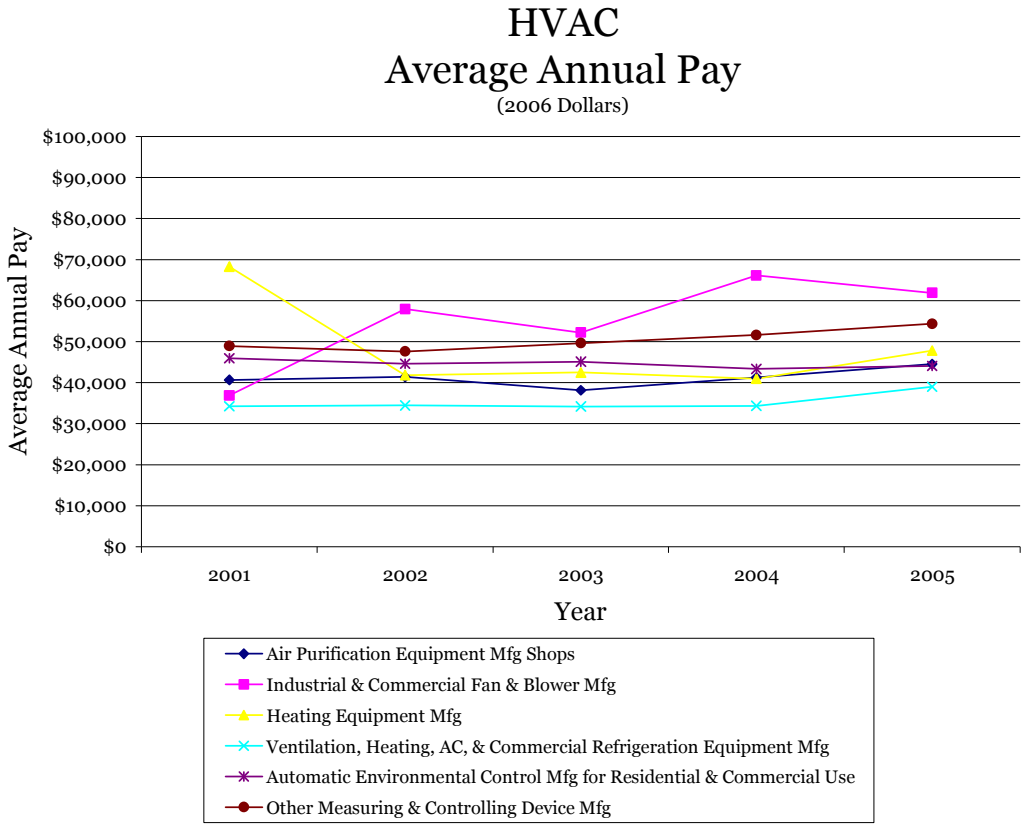
3. **Green Energy:** The highest wages in 2005 in the Green Energy sub-sector are in Turbine and Turbine Generator Set Units Manufacturing ($77,455/year), Semiconductor and Related Device Manufacturing ($86,784), and Electricity Measuring and Testing Instrument Manufacturing ($86,817). It is also worth noting that both Semiconductor and Related Device Manufacturing and Electricity Measuring and Testing Instrument Manufacturing have experienced significant positive increases in average annual pay since 2003. The positive increases overall for all of the NAICS codes in this section, except for Glass and Glass Product Manufacturing and Turbine and Turbine Generator Set Units Manufacturing, paints an optimistic picture of the outlook for this sub-sector. These numbers correspond with some of the current literature on the growth of the green industry in Los Angeles that sites solar energy as a regional niche that would also provide high paying, quality jobs to local residents.



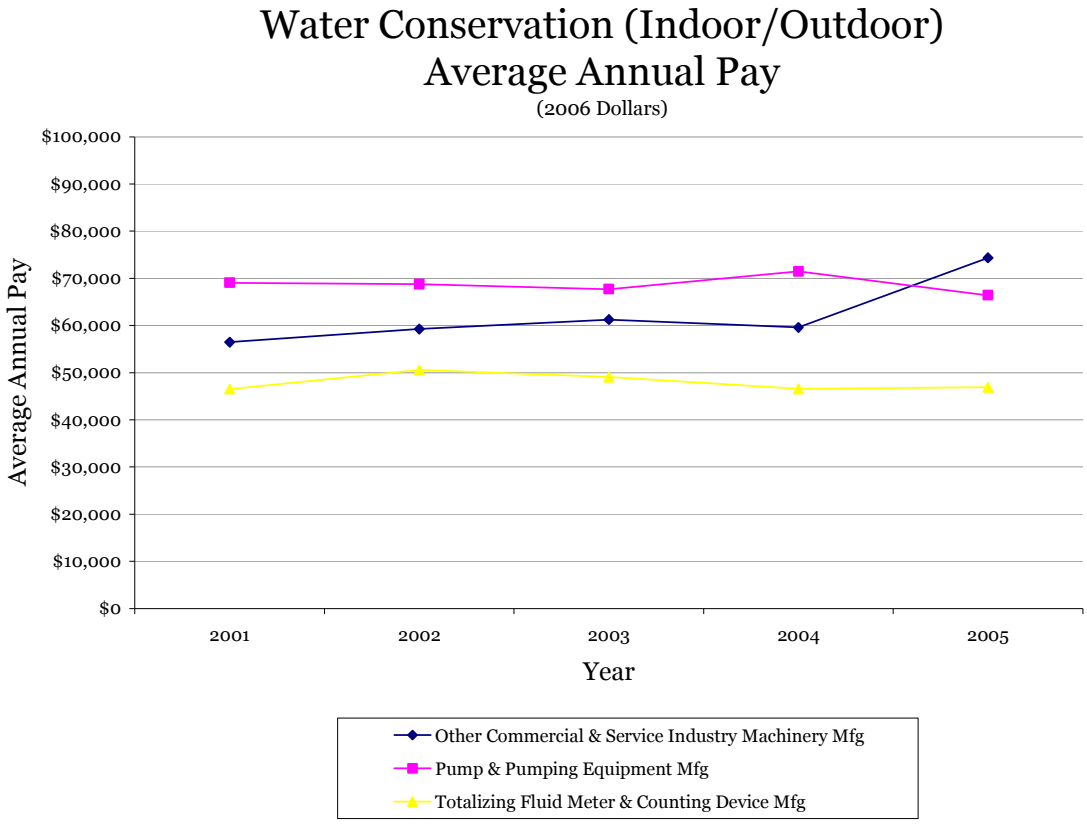
4. **Lighting:** Of the three NAICS codes that fall into the Lighting sub-sector, only Electric Lamp Bulb and Part Manufacturing experienced wage declines. When visited LA Lighting Company and spoke with the firm's president, Bill Shapiro, he said that bulbs are typically no longer manufactured in the states. Large international companies, such as Philips and GE, dominate the light bulb manufacturing industry typically produce them in China[23]. In 2003, the average annual pay for this sub-sector was $50,138. In 2005 the average annual pay decreased 14.27% to $40,247/year.



5. **HVAC:** Average annual pay in the HVAC sub-sector in 2005 ranged from $38,999 (Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing) to $61,873 (Industrial and Commercial Fan and Blower Manufacturing). The most notable decline in this sub-sector was when wages for Heating Equipment Manufacturing dropped 63.11% from $68,246 to $41,841 in 2002. When we researched this further on the BLS website, we found that this may have been related to the massive layoffs following 9-11 and "manufacturing industries with the highest number of initial claimants were transportation equipment (25,524, mostly in motor vehicles and car bodies), electronic and other electrical equipment (13,080, primarily in semiconductors and related devices), and industrial machinery and equipment (**11,988, largely in refrigeration and heating equipment**)." All NAICS codes in this sector have experience percentage increase in annual average pay in recent years except for Industrial and Commercial Fan and Blower Manufacturing.



6. **Water Conservation (Indoor/Outdoor):** The NAICS Code with the largest pay increase (19.91%) in 2005 was Other Commercial and Service Industry Machinery Manufacturing. From 2004 to 2005, the average annual pay went from $59,553 to $74,360. Pumping and Pumping Equipment Manufacturing and Totalizing Fluid Meter and Counting Device Manufacturing have both remained constant over the five year time span.



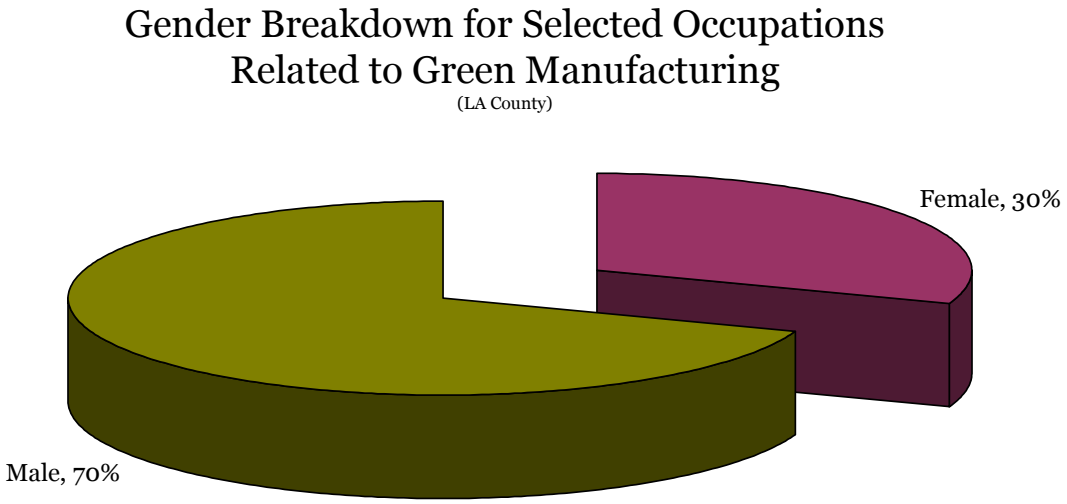
Race/Ethnicity and Gender

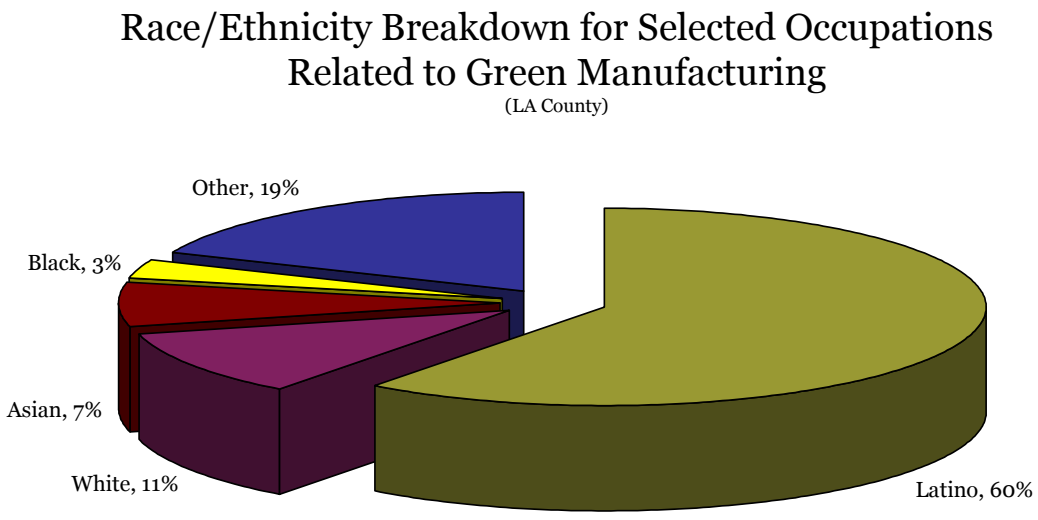
Methodology:
Race/Ethnicity and Gender data for our selected SOC codes were taken from California Employment Development Department Data for Affirmative Action/Equal Employment Opportunity Plans[24].

Findings:
The data, although is not comprehensive of all occupations in Green Manufacturing, seems to correspond with our observations at our site visits at the Solar Integrated Technologies, Los Angeles Lighting Manufacturing Company, Bentley Prince Streets where their production workers were almost completely Latino and predominantly male.

The total number of workers we identified with our SOC codes was 171,570. Approximately 30% of these workers are female and 70% are male. In regards to race/ethnicity, Latinos comprise a majority of the workforce (60%), followed by Whites (11%), Asians (7%), and Blacks (3%). Latinos represent the largest proportion of all of the SOC codes except for Structural Metal Fabricators and Fitters and Model Makers and Patternmakers, Metal and Plastic where Whites have the largest proportion.

For a detailed breakdown of the Race/Ethnicity and Gender composition of specific occupations, please refer to **Appendix G.**





Immigration Status

It was not feasible for our team to accurately assess the immigration status of the labor force associated with our green manufacturing industries. However, base on observations from our plant tours to LA Lighting and Solar Integrated Technologies it was obvious that the vast majority of the work force was Latino with origins in Mexico and Central America.

According to Randal Jurisch, Vice President of SIT, his labor force is hired locally from the surrounding region which is predominantly Latino. Bill Shapiro, President of LA Lighting made similar remarks and mention that to the best of his knowledge his employees had legal status.

Age

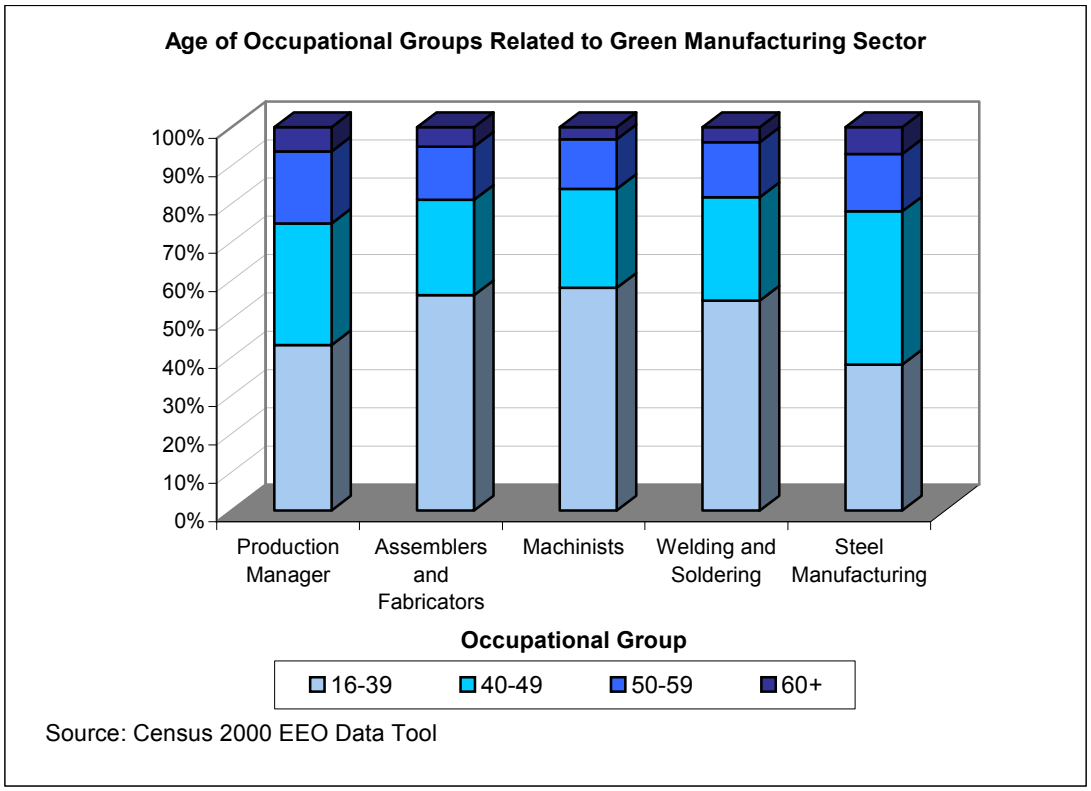
Methodology:
Age information for the local green manufacturing sector was base on our SOC categories and observations made during site visits to companies. We used the Census 2000 Equal Employment Opportunity (EEO) Data Tool, which provides age distribution data by SOC codes and breaks down age into four groups: 16-39, 40-49, 50-59, and 60+. The data table used was titled *Employment by Census Occupation Codes and Older Age Groups*[25].

Data was only available for 15 SOC codes.

Census 2000 EEO Data
Occupations are classified using the Standard Occupational Classification (SOC) codes
Counties: Los Angeles
http://www.census.gov/eeo2000/index.html

		Age			
SOC Code	**Occupational Title**	**16-39**	**40-49**	**50-59**	**60+**
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	17,395	12,752	7,564	2,560
51-2020	Electrical, Electronics, and Electromechanical Assemblers	4,185	2,460	1,171	575
51-2041	Structural Metal Fabricators and Fitters	175	54	12	30
51-2090	Miscellaneous Assemblers and Fabricators	15,799	6,814	4,050	1,254
51-4010	Computer-Controlled Machine Tool Operators, Metal and Plastic	497	330	63	25
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	60	38	43	10
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	1,279	349	265	53
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	149	4	14	4
51-4060	Model Makers and Patternmakers, Metal and Plastic	260	189	43	16
51-4120	Welding, Soldering, and Brazing Workers	7,139	3,525	1,875	507
51-4192	Lay-Out Workers, Metal and Plastic	69	54	34	4
51-4194	Tool Grinders, Filers, and Sharpeners	54	159	74	50
51-4XXX	Other Metalworkers and Plastic Workers, Including Milling, Planing, and Multiple Machine Tool Operators	10,239	5,047	2,560	682
51-9198	Helpers--Production Workers	1,817	439	180	139
51-9XXX	Other Production Workers, Including Semiconductor Processors and Cooling and Freezing Equipment Operators	23,084	9,930	4,858	1,170
Total		**82,201**	**42,144**	**22,806**	**7,079**
Percent		**53%**	**27%**	**15%**	**5%**

The bar graph below simplifies the table above and provides a better visual of the age distribution within the 5 general occupational categories that group our SOC codes. One can see that the majority of the work force falls under the 16-39 age group. This is to be expected given the larger age window in this group. Production Manager and Steel Manufacturing seem to have a larger portion of workers in the 40-49 grouping. This may correspond to the fact that these general occupational categories have higher hourly wages.

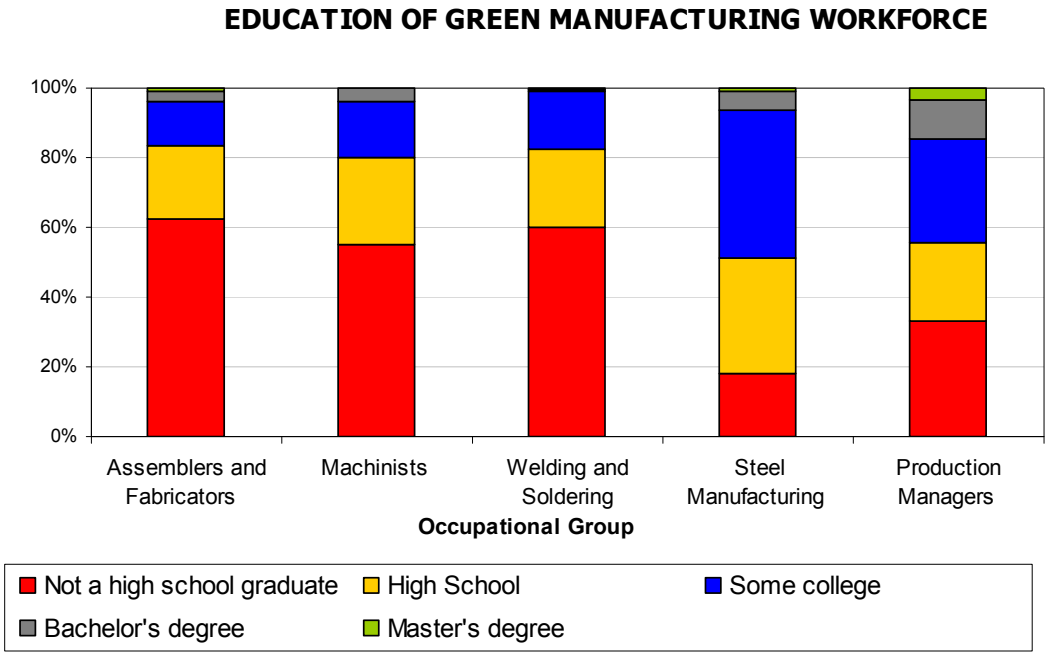


Source: Census 2000 EEO Data Tool

Education

Methodology:
The Equal Employment Opportunity Census 2000 provides a variety of information about workers listed by Standard Occupation Classification Code[26]. We selected the appropriate occupation data by SOC Codes to measure the highest level of education that workers have completed. Since our observations are based on three site visits there is the possibility that our graph below is not a comprehensive outlook of on the highest level of education completed by workers.

Findings:



This graph summarizes the highest level of education completed per occupation category. Our findings indicate that workers like machinists, assemblers and welders or solders, have not completed a high school education. Some categories, however, have a higher rate of attending college like production managers and steel manufacturers. Both of these categories have a greater tendency to include engineers, businessmen, or other occupations that require college or advanced degrees.

Education, Skill Requirements, and Occupational Ladders by General Occupation Groups

Methodology:
The Bureau of Labor Statistics' "Career Guide to Industries" was utilized to research education, skill requirements, and occupational ladders for the sixteen SOC codes we identified. Since the career guide does not breakdown occupations into SOC codes, we categorized the sixteen codes into five general occupation categories found in the guide – assemblers and fabricators, machinists, welding and soldering, steel manufacturing, and production managers. Once again, we only used the SOC codes related to the occupations we observed during our site visits.

Findings:
The table in **Appendix H** summarizes the type of education, skills, and occupational ladders associated with the five general production occupation categories. From a hierarchical perspective, assemblers and fabricators are the lower-skilled occupations; machinists, welders/solders, and steel manufactures are more-skilled occupations; production managers are the higher-skilled occupation. Generally, most occupations require only a high school education with the exception of production managers. Additional training from certificate programs and vocational or community colleges are preferred, but can be easily supplanted by on-the-job training. Computer training is universally desired as the use of technology and computer-controlled machinery becomes more prevalent. Opportunities for upward mobility are available, but it is unclear how often such opportunities for advancement exist. Generally, as workers gain more skills over time and through training and education, there are some opportunities to gain more responsibilities and advance into higher skilled occupations. Please refer to the table for more detailed information.

Levels of Unemployment

Data on unemployment is gathered by the Local Area Unemployment Statistics (LAUS). Research looking at the LAUS, shows that detailed unemployment information by specific geographic area has yet to be categorized by specific industries. Unemployment data by broad industry classification is currently available at the national level. According to the BLS, the unemployment rate for durable manufacturing in 2005 was 4.6%, compared to the national unemployment rate of 5.1%.[27] Although this by itself does not reflect the unemployment characteristics of the green manufacturing sector, it may provide context when describing overall employment characteristics. Ideally, the LAUS will begin to track unemployment data in terms of detailed industry sector, as well as geography. Doing this would allow to draw a better picture of the unemployment characteristics of the green manufacturing sector.

Labor Management Practices

Unionization

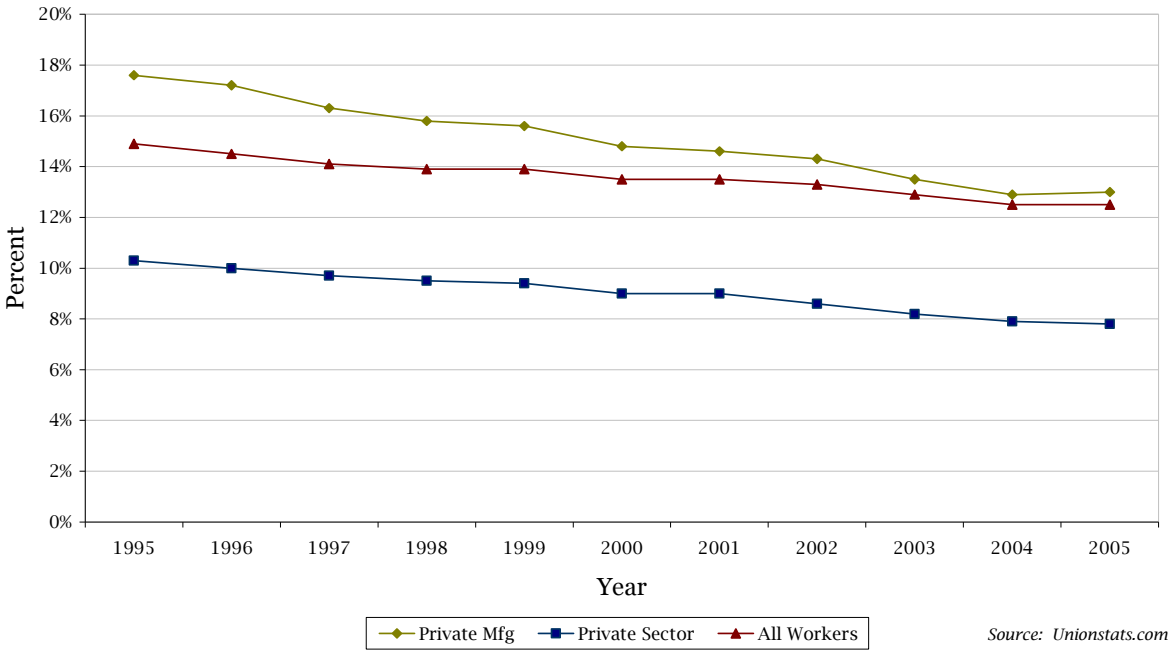
Union Membership and Collective Bargaining Agreements: Private Manufacturing vs. the Private Sector vs. All Wage & Salary Workers in the United States

Methodology:
Data on union membership rates and the number of workers represented by collective bargaining agreements was collected from unionstats.com[28]. **The data to compare Private Manufacturing against the Private Sector and All Workers was available only on a national level.** The data was graphed over a ten year period to make note of any trends over time.

Findings:
Union membership has experienced a steady decline over the past ten years. **Private manufacturing workers have consistently had higher rates of unionization than all wage and salary workers and private sector workers in the United States**. When private manufacturing is compared to the private sector, there is a significant difference in the percentage of workers that are union members. **Thirteen percent of private manufacturing workers in the United States were members of unions, whereas only 7.8% of workers in the private sector were union members**. From 2004 to 2005 there was a *slight* increase in the number of workers in private manufacturing that were union members (from 12.9% to 13%). **These statistics tend to correlate with the BLS Occupational Outlook Handbook which noted that many of these occupation groups are represented by unions[29]**.

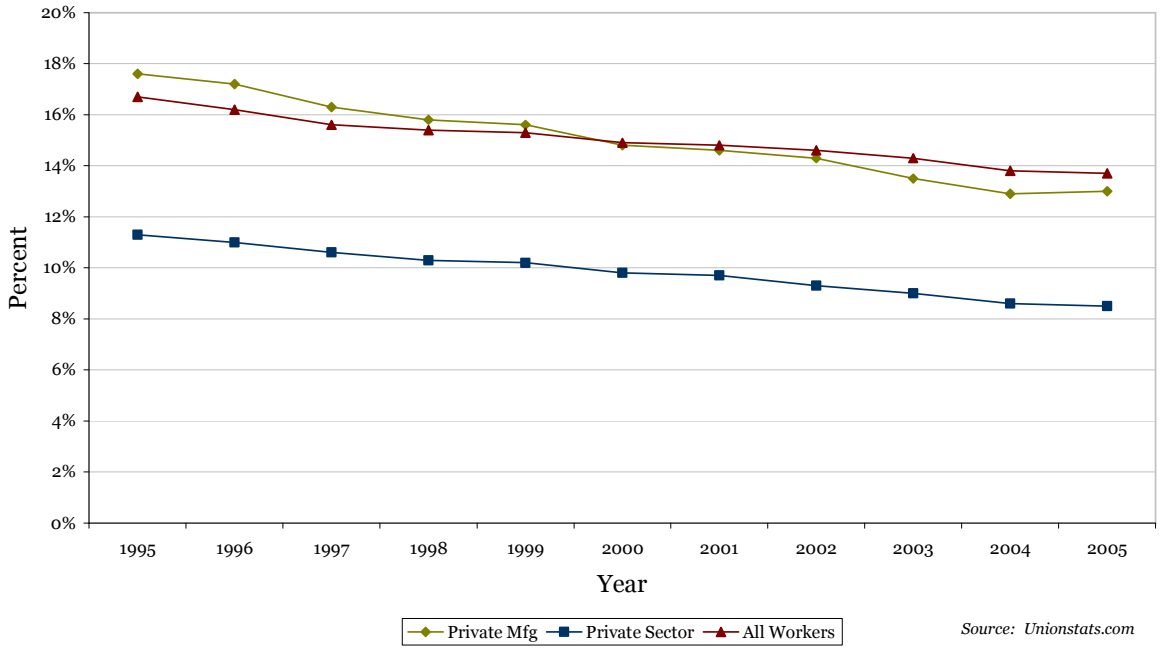
Relative to the private sector overall, private manufacturing has a substantially higher percentage of workers that fall under collective bargaining agreements. Consistent with the trends for union membership, the number of workers covered by collective bargaining agreements in the United States has also declined over the past ten years.

Union Density in the United States



Source: Unionstats.com

Percent of U.S. Workers Covered by a Collective Bargaining Agreement



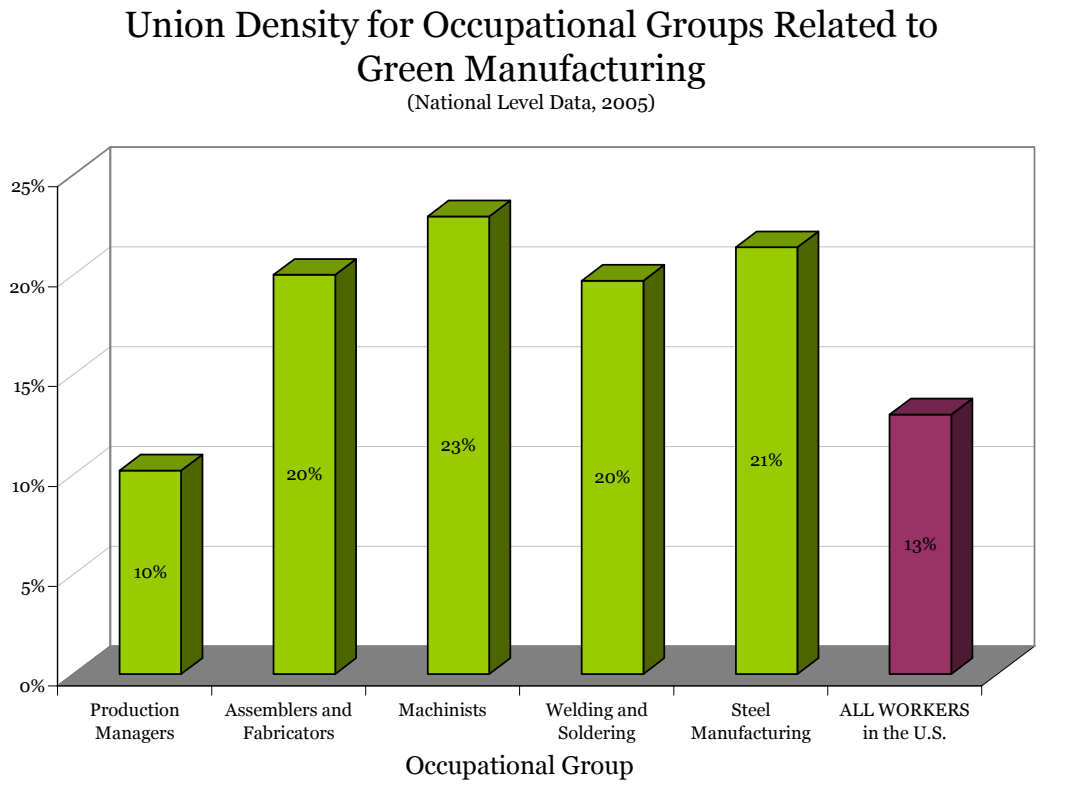
Source: Unionstats.com

Union Membership by General Occupational Groupings

Methodology:
Using the data from unionstats.com, national level data on union membership and percentage of workers represented in collective bargaining agreements was collected for SOC codes related to the Green Manufacturing industry.

Findings:
All of the occupational groups have approximately 20-23% of their workforce unionized – except for Production Mangers (10%), which may be because of the Taft-Hartley Act which prevents supervisors from becoming union members. **When we compare these percentages to private manufacturing overall, these occupational groups have much higher rates of unionization.** As mentioned before, approximately 13% of the private manufacturing workforce belonged to unions in 2005.

For detail numbers on union membership and collective bargaining agreements for SOC codes related to Green Manufacturing, please refer to **Appendix I.**



Source: Unionstats.com

Unions that May Represent Occupations Related to Green Manufacturing

Methodology:
To identify which unions were associated with the trades, we first referred to the BLS Occupational Outlook Handbook. Within the descriptions of the various general occupations there is usually mention of affiliated unions. If the Occupational Outlook Handbook did not specify any unions then a general Google search was conducted.

Findings:
Below is a list of unions for each of the general occupation groups. We also tried our best to identify the various locals serving the Los Angeles area by searching their websites and contacting them by telephone. **It is important to note that this list may not be comprehensive since many of the locals do not have their own websites.** Also, we contacted headquarters by telephone to ask about locals in Los Angeles, the person who answered did not always sound completely confident in their responses.

Assemblers and Fabricators:

- International Association of Machinists and Aerospace Workers (IAM). The IAM is organized by Local lodges and is composed of union members in one or more shops in a given area.
    - Lodge Locals 1186, 1932, 102, 201, 620
- International Brotherhood of Electrical Workers (IBEW)
    - Local 11, 18, 889, 946, 1710, 2139, 2295
- United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)
    - Local 509, 435
- United Electrical, Radio and Machine Workers of America (UE)
    - No locals in Los Angeles
- United Steelworkers of America (USW)
    - Local 675

Welding and Soldering Workers:

- International Association of Machinists and Aerospace Workers (IAM)
    - See above
- International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers
    - No locals in Los Angeles
- United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)
    - See above
- United Association of Journeymen and Apprentices of the Plumbing, Pipefitting, Sprinkler Fitting Industry of the United States and Canada (UA)
    - Local 78 (Plumbers), 709 (Sprinkler Fitters), 250 (Air Conditioning and Refrigeration)
- United Electrical, Radio, and Machine Workers of America (UE)
    - No locals in Los Angeles

Steel Manufacturing: "The iron and steel industry traditionally has been highly unionized. The overall decline of employment in traditional integrated steel mills, together with the growth of EAFs, have caused union membership to decline in recent years." (BLS Occupational Outlook Handbook)

- United Steelworkers of America (USW) Local 675

Machinists: Earnings for machine operators can vary by size of the company, union or nonunion status, industry, and skill level and experience of the operator. Also, temporary employees, who are being hired in greater numbers, usually get paid less than company-employed workers.

- International Association of Machinists and Aerospace Workers (IAM)
    - See above

Worker Displacement

Definition:
Displaced workers are defined as persons 20 years of age and older who lost or left jobs because their plant or company closed or moved, there was insufficient work for them to do, or their position or shift was abolished.

Methodology:
Data was acquired using the Current Population Survey[30] (CPS) from the Bureau of Labor Statistics (BLS). [31] Industry and class of worker categories were selected based on the larger NAICS codes associated to green manufacturing. These categories were:

- Primary metals and fabricated metal products
- Computers and electronic products
- Electrical equipment

Findings:
Durable goods manufacturing made up 30% of total displaced workers in the Private nonagricultural wage and salary workers sector. Of that, the three sub-sectors identified as most likely to have green building product manufacturing jobs made up 30% of all displaced durable goods manufacturing jobs. Among the three sub-sectors, displaced workers of the *Primary metals and fabricated metal products* category, experienced the lowest levels of employment after being displaced at 61.3 percent along with the highest levels of unemployment at 22.5 percent.

Displaced workers by industry and class of worker of lost job and employment status in January 2006					
		Percent distribution by employment status			
Industry and class of worker of lost job	Total (thousands)	Total	Employed	Unemployed	Not in the labor force
Private nonagricultural wage and salary workers	3,551	100	70.4	13.2	16.4
Durable goods manufacturing	1,085	100	62.1	15.2	20.2
Primary metals and fabricated metal products	137	100	61.3	22.5	16.2
Computers and electronic products	145	100	77.2	4.4	18.4
Electrical equipment	47	100	*	*	*

*data not shown where base is less than 75,000

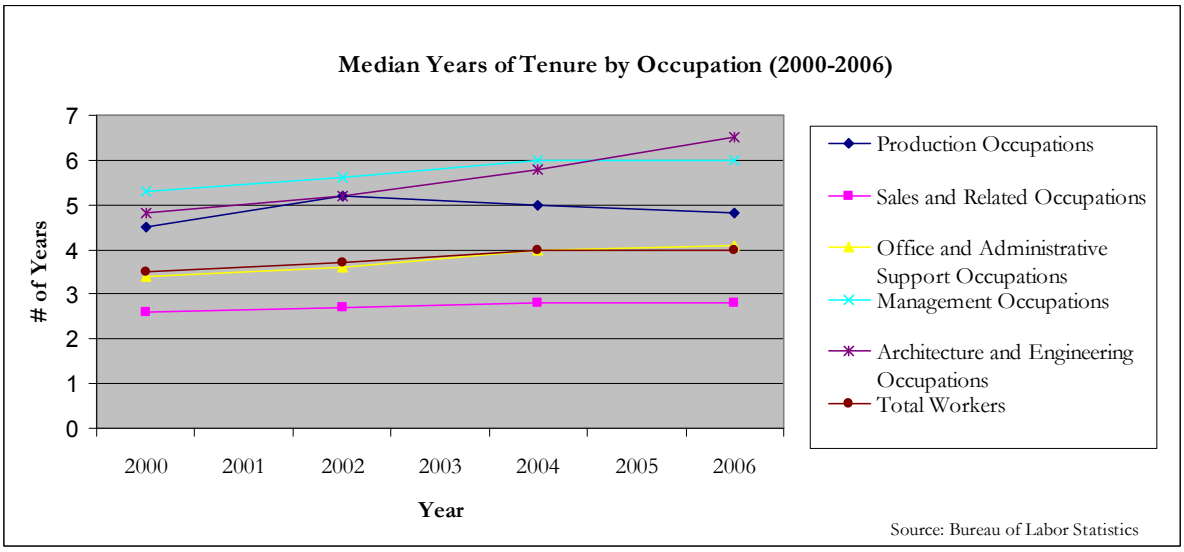
Tenure by Occupation and Industry

Methodology:
Data was acquired from the Bureau of Labor Statistics (BLS). Occupation titles were hand selected from the list of available occupations listed on the BLS tenure report; they were selected based on the types of occupations we observed during site visits and on occupations we anticipate to see throughout the green manufacturing sector. Similarly, industries were hand selected based on the types of manufacturing industries we identified in the green manufacturing sector.

Findings:

- *Occupation*

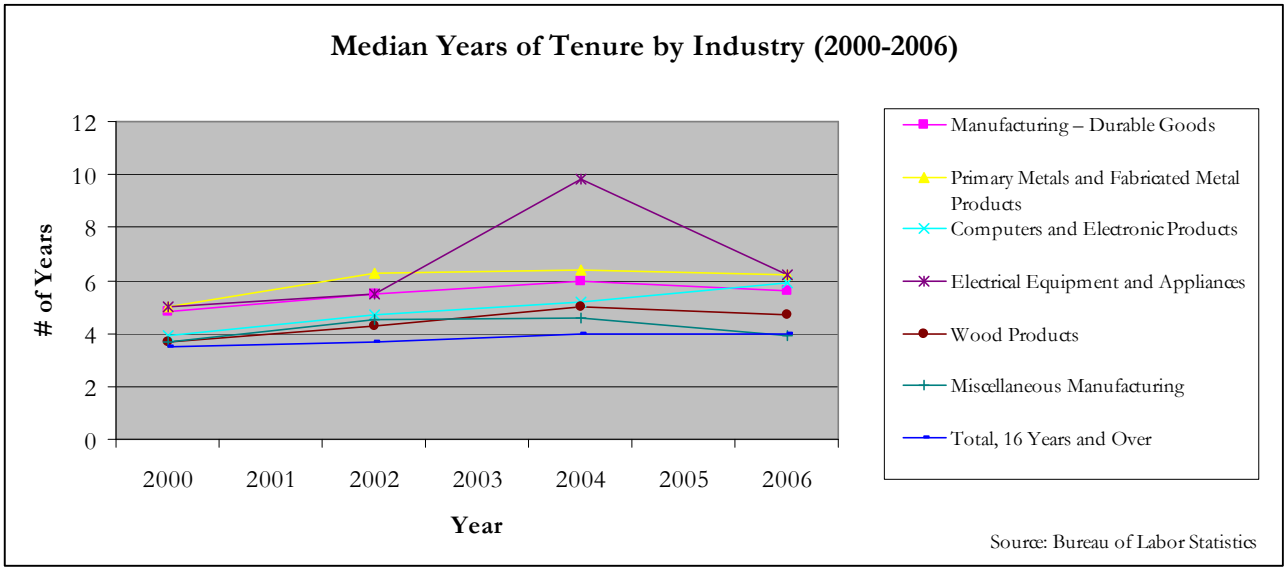
On average, the median tenure for all workers regardless of occupation was 3.8 years. "Sales and Related" occupations experienced more turnover, as the average median tenure for this occupation was 2.7 years. "Office and Administrative Support" occupations hovered at the same tenure level as the median tenure for all workers, while "Production," "Management," and "Architecture and Engineering" occupations experienced less turnover and longer years of tenure at 4.9, 5.7, and 5.6 years respectively. In general, the years of tenure for each occupation either remained relatively stable or increased in length from 2000 to 2006, with the exception of "Production" occupations**. "Production" occupations experienced an increase in length of tenure from 2000 to 2002, but have seen a gradual and steady decrease since 2002.** Conversely, "Architecture and Engineering" occupations have seen a significant and steady increase in length of tenure from 2000 to 2006 – tenure has increased from 4.8 years in 2000 to 6.5 years in 2006.



Median years of tenure with current employer for employed wage and salary workers (16 years and over) by occupation for 2000-2006 (National Data) Source: Bureau of Labor Statistics					
Occupation	**Feb 2000**	**Jan 2002**	**Jan 2004**	**Jan 2006**	**Average Years**
Production Occupations	4.5	5.2	5.0	4.8	4.9
Sales and Related Occupations	2.6	2.7	2.8	2.8	2.7
Office and Administrative Support Occupations	3.4	3.6	4.0	4.1	3.8
Management Occupations	5.3	5.6	6.0	6.0	5.7
Architecture and Engineering Occupations	4.8	5.2	5.8	6.5	5.6
Total Workers	*3.5*	*3.7*	*4.0*	*4.0*	*3.8*

- *Industry*
  On average, the median tenure for all workers regardless of industry was 3.8 years. **Workers in the industry of manufacturing durable goods, as a whole, and the five other industries we identified as potentially being in the green sector had an average tenure greater than that of all workers**. Of the five industries, **workers in the "Primary Metals and Fabricated Metal Products" and "Electrical Equipment and Appliance" industries had the longest years of tenure** at 6.0 and 6.6 years respectively. Workers in the "Miscellaneous Manufacturing" and "Wood Products" industries have the shortest tenure at 4.2 and 4.4 years respectively.

  When examining the trend of tenure length from 2000 to 2006, each industry, with the exception of "Computers and Electronic Products," experienced an increase in tenure length from 2000 to 2004, but experienced a decline in tenure length from 2004 to 2006. The sharpest decline took place in the "Electrical Equipment and Appliances" industry; median years of tenure dropped from 9.8 years in 2004 to 6.2 years in 2006. Tenure lengths may have peaked during 2004 due to unstable job outlooks. Opportunities to move from company to company may have been limited during this time period, forcing workers to stay with current employer for longer durations. The "Computer and Electronic Products" industry is the only industry that continues to show a steady increase in worker tenure from 2000 to 2006; worker tenure has increased from 3.9 years in 2000 to 5.9 years in 2006.



Median years of tenure with current employer for employed wage and salary workers (16 years and over) by industry for 2000-2006 (National Data)
Source: Bureau of Labor Statistics

Industry	Feb 2000	Jan 2002	Jan 2004	Jan 2006	Average Years
Manufacturing – Durable Goods	4.8	5.5	6.0	5.6	5.5
1) Primary Metals and Fabricated Metal Products	5.0	6.3	6.4	6.2	6.0
2) Computers and Electronic Products	3.9	4.7	5.2	5.9	4.9
3) Electrical Equipment and Appliances	5.0	5.5	9.8	6.2	6.6
4) Wood Products	3.7	4.3	5.0	4.7	4.4
5) Miscellaneous Manufacturing	3.7	4.5	4.6	3.9	4.2
Total Workers	3.5	3.7	4.0	4.0	3.8

Working Conditions and OSHA Issues/Records

Methodology:
We pulled data from the Bureau of Labor Statistics to show the average number of cases of non-fatal injuries occurring nationwide. The table shows information broken down by establishment size per NAICS code. We resorted to using more general NAICS code categories where the 6 digit code was unavailable. Data represents the number of injuries per 100 workers.

Findings:
It appears that the cases of nonfatal injuries among the green manufacturing industries are rather low with firms reporting between 3 and 4 cases for every 100 workers.

Both of the largest sub-sectors, lighting and finishes, show low rates of workplace incidences also. Between both sub-sectors, finishes had one instance of about 7 incidences (per 100 workers) that were reported in the previous year.

See **Appendix J** for complete table.

New Management Methods: A Case Study of Bentley Prince Street

A good example of new management methods utilized in the green manufacturing sector came from our site visit to the Bentley Prince Street carpet manufacturing plant. In 1994 Ray Anderson, chairman of Bentley Prince Street's parent company Interface Inc., had a epiphany after reading the *Ecology of Commerce* by Paul Hawken. In August of that year he decided to move Bentley Prince Street's production process towards sustainability with the goal of achieving a zero environmental footprint by the year 2020, 'Mission Zero'. Soon after that the company launched a new sustainability task force headed by Judy Pike, its Sustainability director.

In order to meet its promise to eliminate any negative impact the company has on the environment by the year 2020, Bentley Prince Street has implemented a 7 front approach.

ELIMINATE WASTE
As the Interface group of companies grew, management created a single program that unified each company's efficiency and quality programs. Interface Inc. established the *QUEST*™ program (Quality Utilizing Employee Suggestions & Teamwork) which identifies, measures and reduces waste. It aims to increase employees' overall environmental awareness at home as well as in the workplace and is designed to stimulate competition and spur ideas. Cross-functional teams of employees brainstorm ways to conserve time and materials and bonuses reward a unit's waste reduction performance.

Since 1994 Bentley Prince Street has reduced water intake by 56% and waste to landfill by 92% per unit of product output. Once a month each department volunteers personnel to participate in a 'dumpster dive' to identify materials that should have been recycled.

Two carpet tile products, *Scan* and *UPC*, use post-production "tail outs", a small cone of yarn left at the end of a production run. Each one of these tail outs reclaims from several ounce to several pounds of yarn. In addition, Prestige Plus RC, a recycled content backing has also been added as a production input. These activities have avoided over $40 million in cumulative costs as of 2005.

BENIGN EMISSIONS
Bentley Prince Street has all its products certified to meet requirements of the Carpet and Rug Institute's (CRI) Green Label Plus test protocol for VOC emissions. Their products have also been tested to qualify under the Collaborative for High Performance Schools (CHPS) program through the CRI Green Label Plus program.

To eliminate harmful emissions the company offers a *Cool Carpet*™ option on every product. This means that customers can purchase products for which the greenhouse gas (GHG) emissions associated with the lifecycle of the product are offset with certified emission reduction credits that are third party verified by the Climate Neutral Network. This has led to the reduction of GHG and Nitrogen Oxide (NOx) emissions by 70% and 36% respectively. Bentley Prince Street is also part of the Chicago Climate Exchange, the only North American market mechanism for GHG reduction and trading.

RENEWABLE ENERGY
All of the electrical energy used in the manufacturing process is made renewable through a combination of green tag purchases, green energy purchases through the grid, and a small amount of electricity that is generated by an on-site photovoltaic array. The green tags are third party certified by Green-e to come from renewable energy projects. Overall, energy consumption has been reduced by 56%.

CLOSED LOOP
A Re-Entry program was established for Bentley Prince Street customers to take old carpet products from any commercial manufacturer and find the most environmentally responsible solution for reclamation, including repurposing into other settings, recycling into new products or using for energy capture and conversion to create steam or electricity.

EFFICIENT TRANSPORTATION
Alternative commuting methods are used by 21% or the workforce. These span from carpooling, walking, riding bikes and public transportation. In addition, Carbon Dioxide (CO_2) emission are offset through a *Cool Fuel* program where fuel providers give rebates based on gallons of fuel purchased and those rebates are used by Bentley Prince Street to purchase certified emission reduction credits. The company also tries to ensure that trucks are always leaving and entering with full loads in order to maximize fuel consumption.

INTEGRATED SUSTAINABILITY
Two International Standards Organization (ISO) certifications from the British Standards Institution (BSI) Management Systems has been established at Bentley Prince Street:

- Environmental Management System (EMS) ISO 14001:2004
- Quality Management System ISO 9001

The overall aim of ISO 14001 is to support environmental protection and prevention of pollution in balance with socio-economic needs. It follows five EMS principles: commitment and policy, planning, implementation, measurement and evaluation, and review and improvement.

ISO 9000 is more in reference to making sure the product -- any product -- has been produced in the most efficient and effective manner possible. It does not guarantee the quality of end products and services; rather, it certifies that consistent business processes are being applied.

REDESIGN COMMERCE
By changing its purchasing practices and taking part in third party certifications of its products Bentley Prince Street is supporting initiatives to bring about market base-incentives for sustainable commerce. In addition to the above mentioned certifications, all of the companies broadloom and tile products have received the Environmentally Preferable Product (EPP) Certification from Scientific Certification Systems (SCS), a entities that certifies environmental claims. Element are put through a rigorous evaluation process to receive EPP Certification and it examines life cycle, starting with the raw materials and including resource consumption, manufacturing, use and end-of-life.

Comparing Labor Management Practices of Three Firms in the Green Manufacturing Industry

We have developed a matrix that compares management practices by each of the firms that our group visited to highlight best practices and management styles. Through the matrix it is clear that Bentley Prince Street has emerged as a frontrunner for its management practices by encouraging workers to internalize and support the vision and mission of sustainability. Bentley Prince Street is the only firm to offer bonuses to workers, ensure safety, and provide trainings that educate workers on sustainable practices related to the company. However, Solar Integrated Technologies and Los Angeles Lighting Manufacturing Co. respectively hire their workers hired from the local community while Bentley Prince Street does not. And, Solar Integrated Technologies have a segment of unionized workers that install solar panels.

See **Appendix K** for the complete matrix.

Markets for Green Manufacturing Products

Markets, Customers, and Competition

Methodology:
In order to answer these questions about the markets, customers, and competition of each of the different sub-sectors, we inferred from our site visit interviews, the industry experts that we have heard speak or have spoken to at the Eco-Expo, Sustainable Energy Forum, and the Green Building Resource Center, and through our general research throughout the quarter. For a comparison of the Markets, Customers, and Competition of the three green manufacturing firms we visited and interviewed, please refer to **Appendix L.**

Key Findings:

- **Markets:**
  The market for green products is driven by either policy/incentive programs or by a very small segment of consumers who are environmentally conscious. As we have mentioned in previous memos, given that the movement around green building is just beginning to pick up momentum, green products have barely entered the mainstream market. Also because they are not yet manufactured on a large scale, the cost of green products is not very affordable to the average consumer. Therefore the role of incentive programs or policies to promote the purchase of green products is critical in developing markets for the products. In the United States there are examples of cities that have taken the lead on green building and in California alone, 18 local jurisdictions have implemented green building programs[32]. **These programs have generated a demand that is geographically concentrated for green, energy efficient products**. In Europe, the solar energy incentive programs have driven the demand for consumers to convert to green energy sources. In our conversations with Solar Integrated Technologies, they noted that 50% of their products are exported to Germany and France[33].

- **Basis of Competition**
  The basis of competition for green products is based on quality and distinctiveness. Green products are unique when compared to their counterparts on the market. It is currently not possible for green products, with the exception of lighting, to compete with non-green products in regards to price because they are not produced on the same scale and because the cost of the product is inevitably greater at this moment in time. **Lighting is the exception because the manufacturing of energy efficient light bulbs and systems has been around for several decades now and is being produced by most lighting manufacturers**. Currently green products are mostly being manufactured by small entrepreneurial firms who cannot produce their products quickly.

- **Sources of Competition**
  Competition for building products comes mostly from non-green building products manufacturers. They have a significant cost advantage and for most consumers it comes down to affordability. Competition in the production of green products comes from other states in the U.S. where firms are able to do business at a lower cost, therefore may be able to sell the product at a lower price. The firms (Bentley Prince Street, Solar Integrated Technologies, and LA Lighting Manufacturing Company) we visited and conducted interviews with have all said that there are not any financial advantages to staying in Los Angeles.

Trade Patterns

Methodology:
Trade data at the county level for Los Angeles was available through the SCAG website[34]. **The data is not very detailed, nor is it very current. Since the data is not categorized by NAICS codes, we pulled data for broader product descriptions that fit into our green building categories.**

Findings:
The findings for Los Angeles and Orange Counties Exports between 1993 and 1999 for potentially green products showed a positive percentage increase in exports over time. However, since the data is eight years old, it is difficult to infer what the current trends are. Although the specifics are not available, we know that Los Angeles is still the metro area with the largest number of manufacturing jobs in the nation[35].

Table VI-11 Los Angeles and Orange Counties Exports to World by Selected Merchandise (EL Series), 1993 to 1999

	(Thousands of Dollars)							%
Product Description	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**Change 1993-1999**
Lumber & Wood Products	79,689	93,479	115,668	118,363	114,912	101,050	95,948	20.4
Chemical Products	895,639	930,209	1,106,431	1,066,599	1,277,483	1,240,491	1,169,931	30.6
Rubber & Plastic Products	268,756	278,778	298,052	350,845	367,673	333,588	340,966	26.9
Stone, Clay, & Glass Products	89,866	94,174	126,275	118,278	136,042	130,488	129,318	43.9
Primary Metals	288,295	302,502	442,490	485,361	448,232	428,196	427,827	48.4
Fabricated Metal Products	434,955	433,275	528,529	592,952	628,867	654,012	820,743	88.7
Industrial Machinery & Computers	2,336,036	2,553,795	2,836,861	3,382,344	3,350,221	2,980,216	2,910,219	24.6
Electric & Electronic Equipment	2,289,389	2,467,777	2,617,907	2,548,729	2,836,707	2,903,808	2,640,608	15.3
Misc. Manufactures	558,886	596,839	779,567	823,399	903,703	802,664	873,761	56.3

If we compare the above product categories to national export trends, there have been **declines in national exports of lumber & wood products, primary metals and fabricated metal products, and electric and electronic equipment** – therefore it may be possible to assume that those trends also hold true in Los Angeles County exports.

Export and Import Trends

Methodology:
Export and import data was gathered from the International Trade Administration website. The data is taken at the national level from 1998 to 2003. We were able to acquire data for 26 of 28 NAICS codes we previously identified being linked to the green manufacturing sector. NAICS codes 326140 (polystyrene foam product manufacturing) and 335122 (commercial, industrial, and institutional electric lighting fixture manufacturing) were not included in this section because they were not found in our source. For the purpose of **Appendix M**, trade balance (T Balance) refers to the difference between exports and imports. A negative number indicates that the total imports exceeded the total exports by the particular dollar amount; conversely, a positive number indicates that the total exports exceeded the total imports by the particular dollar amount.

Findings - Highlights:
The following findings are simply highlights from the export and import data we gathered. Please refer to **Appendix M** for a detailed table of export and import trends.

1) 12 of the 26 industries experienced positive growth in exports from 1998 to 2003. The following table outlines the industries that experienced a growth and decrease in exports.

Increase in Exports from 1998 to 2003		**Decrease in Exports from 1998 to 2003**	
NAICS	Industry	NAICS	Industry
325510	PAINTS AND COATINGS	321219	RECONSTITUTED WOOD
325520	ADHESIVES	333611	TURBINES & TURBINE GENERATOR SETS
334413	SEMICONDUCTORS & RELATED DEVICES	3314	NONFERROUS (EXC ALUM) & PROCESSING
325211	PLASTICS MATERIALS & RESINS	332322	SHEET METAL WORKS
326113	NOT REIN PLASTICS PLATES, SHEETS, ETC (EXC PKG)	334515	ELECTRICITY MEASURING/TESTING INSTRUMENTS
3272	GLASS & GLASS PRODUCTS	335911	STORAGE BATTERIES
335313	SWITCHGEAR & SWITCHBOARD APPARATUS	333411	AIR PURIFICATION EQUIPMENT
335931	CURRENT-CARRYING WIRING DEVICES	333414	HEATING EQUIPMENT (EXC WARM AIR FURNACES)
335999	MISC ELECTRICAL EQUIPMENT & COMPONENTS, NESOI	333415	AC/WARM AIR HTG & COMMERCIAL REFRIG EQUIP
333412	INDUSTRIAL & COMMERCIAL FANS & BLOWERS	334512	AUTOMATIC ENVIRONMENTAL CONTROLS
333911	PUMPS & PUMPING EQUIPMENT	334519	OTHER MEASURING & CONTROLLING DEVICES
334514	TOTAL FLUID METERS & COUNTING DEVICES	335110	ELECTRIC LAMP BULBS & PARTS
		335311	POWER/DISTRIBUTION/SPECIALTY TRANSFORMERS
		333319	OTH COMMERCIAL/SERVICE INDUSTRY MACHINERY

2) 23 of 26 industries experienced positive growth in imports from 1998 to 2003. "Semiconductors and related devices," "nonferrous and processing," and "storage batteries" industries were the only three industries to experience a decline in imports during this time period.

3) Nine industries have been traditionally dominated by imports.
    1. Reconstituted Wood
    2. Glass and Glass Products
    3. Nonferrous and Processing
    4. Storage Batteries
    5. Industrial and Commercial Fans and Blowers
    6. Heating Equipment
    7. Automatic Environmental Controls
    8. Electric Lamp Bulbs and Parts
    9. Power/Distribution/Specialty Transformers

4) Two industries – "switchgear and switchboard apparatus" and "air purification equipment" – have transitioned from being an export industry to an import industry during this time period. From 1998 to 2000, the "switchgear and switchboard apparatus" industry was primarily exports; in 2001, it transitioned to an import industry. The "air purification equipment" industry was primarily exports from 1998 to 1999 and transitioned to imports from 2000 to 2003.

5) Virtually no industry has transitioned from being an import industry to an export industry from 1998 to 2003. The "current-carrying wiring devices" industry is the only industry that may have made this transition during this time period. In 1998, this industry was predominately imports, but it has been predominately an export industry since then. A longer time series is necessary to draw further conclusions.

6) Only two industries experienced, both, a drop in exports and imports from 1998 to 2003. The "storage battery" industry exports and imports grew from 1998 to 2000, peaked in 2000, and consistently declined from 2000 to 2003. The decline may be attributed to a shift in technology where storage batteries were replaced by a new energy storage system. The "nonferrous and processing" industry also experienced a drop in exports and imports from 1998 to 2003.

Export-Related Jobs

Methodology:
The data for export-related manufacturing jobs was acquired from the International Trade Administration website. The data was narrowed down to nine, state-level, 3-digit NAICS codes associated with the twenty-eight 6-digit NAICS codes we previously identified as being linked to the green manufacturing sector. Given the broadness of 3-digit NAICS codes, export-related job figures for the green manufacturing sector are grossly generalized.

Findings:
Over 868,000 (53 percent) of California's manufacturing jobs fall under the nine green-associated NAICS codes we identified. Of these jobs, fewer than 234,000 (27 percent) were export-related jobs. The percent of export-related jobs for each of the nine industries ranged from a little over 5 percent to 39 percent. The "wood product" and "nonmetallic mineral product" industries had the smallest percentage of export-related jobs at 5 and 7.6 percent, respectively. On the high end, one-third or more of the jobs in the "machinery," "computer and electronic products," and "electrical equipment, appliances, and components" industries were export-related jobs.

Export-Related Jobs by 3-Digit NAICS Codes Associated with Green Manufacturing
California, 2002
(Thousands of Jobs)

NAICS Industry Code	Industry Title	Total Jobs From Manufactured Exports	Total State Manufacturing Jobs	Export-Related Jobs as Percent of Manufacturing Employment
321	Wood Products	2	39.2	5.1
325	Chemicals	11.5	76.4	15.1
326	Plastics and Rubber Products	12.7	87.1	14.6
327	Nonmetallic Mineral Products	3.4	44.8	7.6
331	Primary Metals	5	21.8	22.9
332	Fabricated Metal Products	32.5	158.5	20.5
333	Machinery	32.8	91.6	35.8
334	Computers and Electronic Products	120.3	308.6	39
335	Electrical Equipment, Appliances, and Components	13.6	40.2	33.8
	Total: Green-Associated Industries	233.8	868.2	26.9
	TOTAL: Manufacturing	324.6	1,638.40	19.8
	TOTAL: Non-Manufacturing	382.6		
	TOTAL: All Sectors	707.2		

Source: Bureau of the Census, U.S. Department of Commerce
Prepared by the Office of Trade and Industry Information, International Trade Administration, U.S. Department of Commerce
These numbers were revised on 07/20/06

Financial Situation of Firms and Sources of Capital

Given that nearly all of the 59 firms we identified were small, private firms, we had insufficient data to develop firm profiles and to answer questions about their:

- Profitability
- Ownership
- Assets and Liability
- Sources of Capital
- Reinvestment
- Financial Pressures
- Stability

There were two firms that had public information available: International Aluminum Corporation and Capstone Turbine Corporation. To see what information was available, please refer to **Appendix N**.

Relationship of Industry to Government

Government's Role in Regulating the Industry's Economic Structure

Green building manufacturing is split up into manufacturing sub sectors making it a challenge to pinpoint one overall economic structure, and thus, how government regulates that structure. For issues of simplicity, we can look at manufacturing overall as an indicator of the types of regulation government has on the economic structure of green building manufacturing. Clearly, issues such as worker's compensation, and health care impact the economic structure of manufacturing, but this effect is not isolated and is related to all industries in California. The same can be said regarding other regulations involving wages, hours, and working conditions in the manufacturing industry.

Regulatory Agencies

1. **Federal Level**

- *United States Environmental Protection Agency (US EPA)*
  The mission of US EPA is to protect the environment and human health. The agency creates and enforces regulations, standards, and programs that are implemented to meet environmental laws enacted by Congress. As the federal authority, the US EPA delegates the responsibility of monitoring compliance and issuing permits to state and local governments.

- *Title V*
  Title V is a federal operating permit program established by the US EPA; it is derived from Title V of the 1990 federal Clean Air Act Amendments. The program standardizes air quality permits and its processes for major emissions producers. The US EPA requires states and local permitting authorities to develop and submit a federally enforceable operating permit program for approval. In Los Angeles, the local permitting authority is the South Coast Air Quality Management District (SCAQMD). Please see the SCAQMD section below for further information on how Title V impacts local manufacturing.

2. **State Level**

California is recognized as a leader in adopting laws and policies that protect the environment and public health. The state has often enacted laws prior to the passage of similar laws by other states and the federal government. Not only is California progressive with implementing environmental laws, the State's laws are often set at more stringent levels when compared to federal and other state laws.

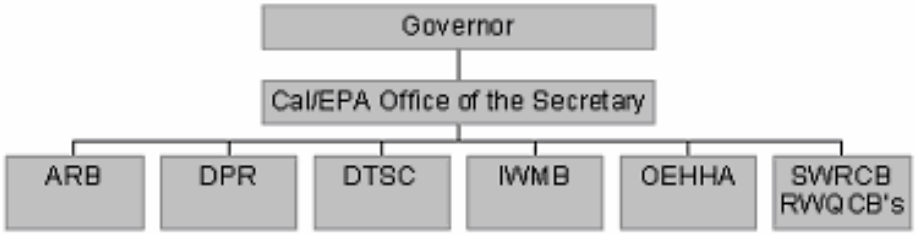
- *California Code of Regulations (CCR)*
  California's environmental laws, which are found in various codes and acts, are implemented through regulations found in the California Code of Regulations. The main environmental laws are found in the California Health and Safety Code (H&S Code) and the Water Code. There are a total of twenty-eight titles in the CCR, which contain the regulations of approximately 200 regulatory agencies.

    - *Title 24, Part 6 and California Building Standards Commission(BSC)*
      Beyond laws and regulations pertaining to the H&S Code and Water Code, *Title 24, Part 6* of the California Code of Regulations pertains to energy efficient building standards for all occupancies within the state. Title 24 is the California Building Standards Code, and Part 6 is known as the California Energy Code. It consists of energy efficient regulations that apply to the following building components: building envelope, space-conditioning systems, water-heating systems, and indoor/outdoor lighting systems. The California Building Standards Code is published every three years and supplements are published in intervening years. The state codes represent minimal standards, leaving local jurisdictions with the authority to implement more restrictive standards to account for climactic, geographical, and topographical differences.

      The California Building Standards Commission administers the state's building codes by adopting, approving, publishing, and implementing codes and standards. The Department of Housing and Community Development (HCD), Division of the State Architect (DSA), Office of Statewide Health Planning and Development (OSHPD), and the Office of the State Fire Marshal may propose building standards only through the annual adoption cycle process. However, all other state agencies, excluding the four previously mentioned, may at anytime

submit proposed building standards for BSC approval. For example, in July 2006, the California Energy Commission had their cool roof energy standards for design and construction approved by the BSC, which will be published as a supplement to the CCR, Title 24, Part 6. State agencies, as a result, have great power to impact universal state building standards for energy efficiency and environmental sustainability. Such policy changes may increase the demand for manufactured products used to meet environmental building standards.

- *California Environmental Protection Agency (Cal/EPA)*
  Cal/EPA is the umbrella agency for six departments, boards, and offices and has the overall responsibility of implementing the State's environmental laws. It oversees the Air Resources Board (ARB), State Water Resources Control Board (SWRCB)/Regional Water Quality Control Boards (RWQCBs), Integrated Waste Management Board (IWMB), Department of Toxic Substances Control (DTSC), Office of Environmental Health Hazard Assessment (OEHHA) and Department of Pesticide Regulation (DPR).



Source: Cal/EPA

DTSC and SWRCB/RWQCBs are particularly import regulatory agencies as they are the designated state agencies responsible for the enforcement of laws in the Health and Safety Code and Water Code, both of which contain California's primary environmental laws. DTSC enforces the H&S code, which focuses on the management of hazardous substances. SWRCB/RWQCBs enforce the Water Code, which focuses on the protection of water quality and the management of hazardous substance that may endanger water quality.

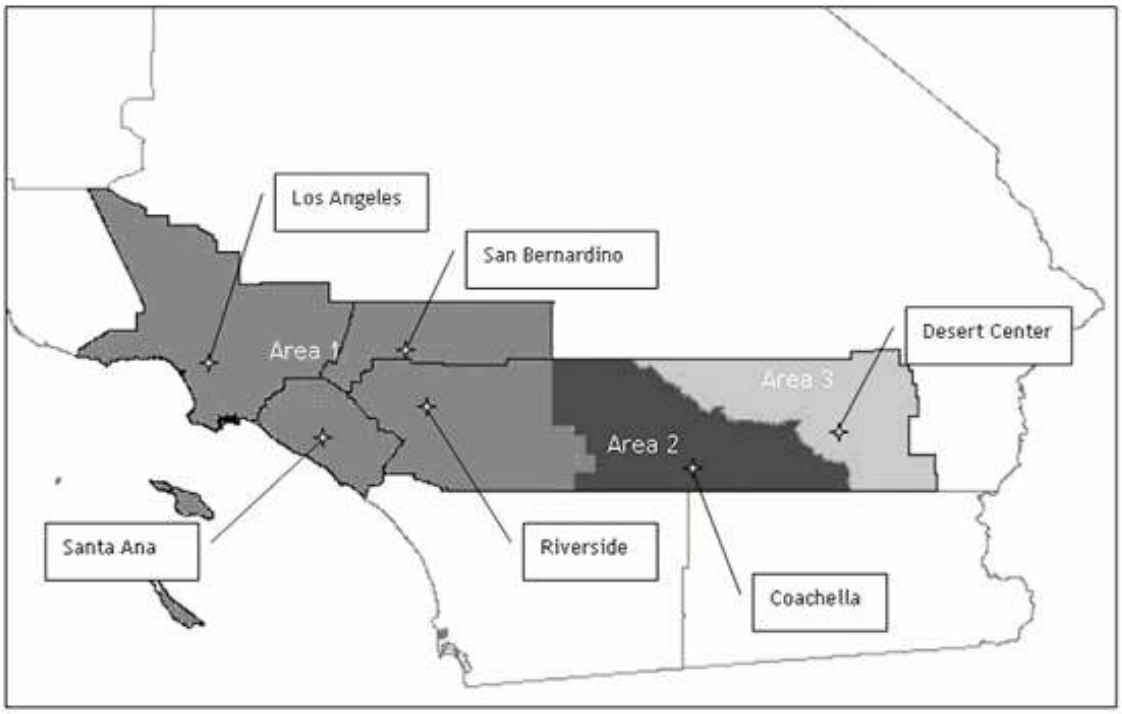
The California Air Resource Board (ARB) is also a critical regulatory agency as it ensures compliance with the federal Clean Air Act. It oversees the South Coast Air Quality Management District and governs the state air pollution control program. Many of the requirements established by the board address the regulation of hazardous substances released in the air.

c. **Local/Regional Agencies**

- *South Coast Air Quality Management District (SCAQMD)*
  The South Coast Air Quality Management District is the air pollution control agency for 10,743 square miles of Southern California, which encompasses all of Orange County, and the urban areas of Los Angeles, Riverside, and San Bernardino counties. While state and federal agencies establish emission standards for mobile sources, the SCAQMD is primarily charged with controlling emissions from stationary sources. Stationary sources include anything from power plants to manufactures that produce furniture, paints or varnishes. Stationary sources account for approximately 23% of the area's ozone forming air pollution.

The SCAQMD develops and implements an Air Quality Management Plan, which serves to concurrently meet federal and state clean air standards. To reduce emissions, their regulations impact the types of equipment and processes used to manufacture goods. The SCAQMD has a US EPA approved Title V program to issue permits to businesses and industries that ensure compliance with air quality standards. Title V only applies to "major sources" or facilities that emit or have the potential to emit pollutants in the air beyond the thresholds established by the SCAQMD. The following map indicates the area-breakdown of the district, and the chart outlines threshold standards in the district.

SCAQMD Location and Area-Breakdown (Source: SCAQMD)



Major Source Potential to Emit Emission Thresholds (tons per year) (Source: SCAQMD)			
Pollutant	**South Coast Air Basin**	**Riverside County Portion of Salton Sea Air Basin**	**Riverside County Portion of Mojave Desert Air Basin**
VOC	10	25	100
NOx	10	25	100
SOx	100	100	100
CO	50	100	100
PM-10	70	70	100
Single HAP	10	10	10
Combination of HAPs	25	25	25

As indicated by the chart, the South Coast Air Basin in which Los Angeles is situated has the lowest emission threshold levels. The stringent emission standards in this area undoubtedly abets the public health and environmental justice movement, but poses several challenges to Los Angeles based manufactures. Challenges such as higher operating costs, more expensive raw materials, altering manufacturing processes, and pollution mitigation measures may cause or lead businesses to consider moving their practices where they would be held to less stringent standards. As supported by discussions during our site visits, Tom Mee of Bentley Prince Street indicated that there is very little incentive to stay in Los Angeles. He reiterated the fact that competitor carpet manufacturers in Georgia are able to operate their businesses at VOC threshold levels of 100 tons per year while Bentley Prince Street is held to 10 tons of VOC per year. Without a clear "green" agenda or a competitive advantage to be located in the South Coast Air Basin, businesses and industries are likely to locate themselves in less regulated states or regional areas.

Green Building Subsidies

To our knowledge, there are no existing subsidy programs that directly benefit green building or green manufacturing. While the greening of buildings has gained considerable momentum over the years, it still appears that government subsidies favor energy use. An article by Ethan Goffman (2006) – "Green Buildings: Conserving the Human Habitat" – emphasizes that government subsidies lean towards supply-side efficiency, with $35.1 billion going to the supply-side and only $1 billion going to end-use efficiency. Supply-side efficiency refers to energy extraction, conversion, transportation, and distribution. Conversely, end-use efficiency refers to efficient use of final energy in industry, services, households, and other areas.

Our research and site visits also confirm that there are no direct subsidies for green building and green manufacturing. Despite socio-environmental benefits and energy savings, higher costs and long pay-back periods are always associated with building green. Similarly, green manufacturing processes (such as those seen at Bentley Prince Street) are viewed as burdensome by operators and more importantly, raise operating costs. Representative at Bentley Prince Street reiterated at several points that their green efforts were not supported by incentives or subsidies. Rather, their efforts reflected their belief in sustainable business practices. Beyond energy incentives, we have yet to encounter direct subsidies that offset the costs of going green.

Impact of Tax and Investment Policy on the Industry

The California Labor & Workforce Development Agency publishes the California Investment Guide, which provides an overview of advantages, assistance, taxes, and permits available to businesses in California. California does not currently have specific tax and investment policies for green building manufacturing, rather the tax and investment policies that affect the industry are the same as those that influence the manufacturing industry in general. Below is a list of those policies that directly and indirectly affect the green building manufacturing industry.

Proposition 13: *Still making an impact*
Proposition 13 impacts the way local governments think about land use. As a result of local governments inability to control property taxes, it is more inclined to promote land uses that generate sales revenue so that they can then collect a percentage of that revenue. A report by the Los Angeles County Economic Development Council argues that there exists a preference of local governments to promote the redevelopment of obsolete industrial land towards retail rather than modern manufacturing facilities. This is important, because manufacturing space is experiencing low vacancy rates, which leads us then to the assumption that Los Angeles is losing out on potential manufacturing jobs. In terms of promoting a larger green building manufacturing industry in Los Angeles, the lack of manufacturing space could be detrimental to achieving that goal.
(Source: Redeveloping Obsolete Industrial Land with Modern Manufacturing Facilities: The Job, Wage and Tax Implications for State and Local Government)

Economic Development Areas: *Enterprise Zones as a tool to draw manufacturers to economically depressed areas*
Enterprise Zones are designations given to economically depressed areas, in order to stimulate investment and job creation. The incentives given to companies within the boundaries of the Enterprise Zones come in the form of tax credits. The first tax credit is available for qualified machinery used to manufacture, process, fabricate, or otherwise assemble a product; produce renewable energy sources; or control air or water pollution. The second tax credit is tied to local employee hiring. A tax credit equivalent to the percentage of the qualified employee's wages is available. (Source: California Investment Guide)

The City of Los Angeles has five State Enterprise Zones. According to a 2006 report by the California Budget Project, in 2003, just under 25% of all Enterprise Zone tax credits given went to a manufacturing corporation. Up until now, the lack of data collected has prohibited research findings to support the claim of Enterprise Zones as a tool for economic development. Likewise, the effect that Enterprise Zones have on the manufacturing sector and specifically those manufacturing sub sectors that make up the Green Building Manufacturing industry is unclear. (Source: California's Enterprise Zones Miss the Mark)

Industrial Development Bonds (IDB's): *Financing for manufacturers* –Issued through the California Industrial Development Financing Advisory Commission (CIDFAC), IDB's are specifically designed to promote investment in land, buildings, and new equipments associated with domestic manufacturing and processing operations. IDB's provide low cost, low interest financing for capital expenditures on the condition that the company receiving the financing provides public benefits. An example of a public benefits is job creation. Guidelines established by CIDFAC determine that one new job be created for every $75,000 financed.[36] The impact of IDB's on Green Building Manufacturing is not clear at this point due to the infancy of the industry as well as to the fact that the industry is composed of many manufacturing sub sectors.
(Source: http://www.treasurer.ca.gov/cidfac/eligibility.asp)

Research and Development Tax Credit:
California offers a 15% R&D tax credit for in-house research and 24% for contract research - the highest in the nation. Considering that Los Angeles has a wealth of research capital when looking at the research institutions that lie within close proximity, this tax credit could provide some incentives to green building manufacturers. (Source: California Investment Guide)

Manufacturers Investment Tax Credit: *No longer active, and still questionable as to whether it was an effective tool for stimulating investment and creating new jobs.*

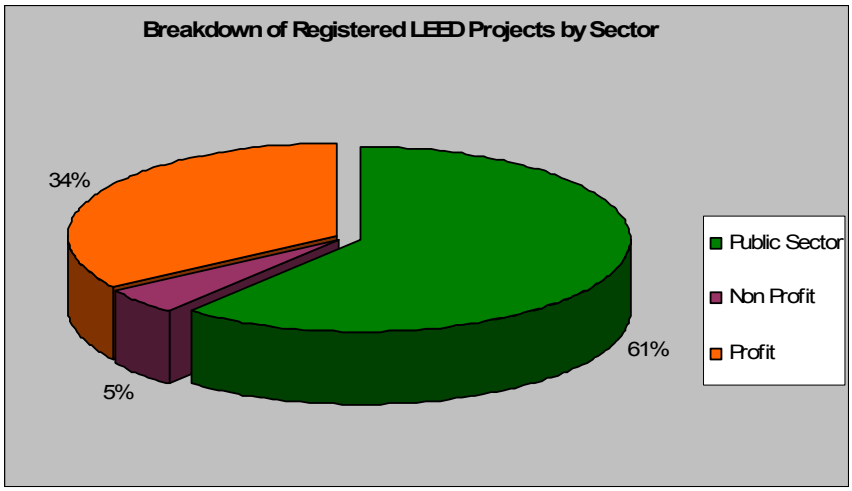
The Manufacturers' Investment Credit (MIC) is a tax credit for businesses that purchase specified manufacturing equipment. Introduced in 1993, the MIC was proposed as a way to ameliorate the high loss in manufacturing jobs, by providing incentives to manufacturers, which would as a result create more jobs. Data compiled by AUS Consultants and the Employment Development Department and used in the California Budget Project report on the MIC suggests that target levels of manufacturing job creation were not met as had been proposed by the proponents of SB 671. As a result of these low job creation numbers, SB 671 was not renewed in 2004.
(Source: Budget Brief: California's Manufacturer's Investment Tax Credit)

Currently, the CMTA argues for reinstatement of an MIC as one of its policy objectives. California is one of only four states that impose a sales tax on manufacturing equipment purchases. The CMTA argues that an MIC would make California a more favorable location to expand operations and add or retain employees. (Source: www.cmta.net/policy_objective.php)

Public Sector: As a Major Customer or Supplier

Using the U.S. Green Building Council's list of LEED certified and LEED registered projects to indicate which sector builds more green buildings, we found that the public sector is a significant customer of the green manufacturing industry. Below is a breakdown of the number of LEED certified and registered projects by sector. Certified projects are those projects that have already met the mandatory minimum LEED guidelines. On the other hand, LEED registered projects are projects that are undergoing the evaluation process and have not yet met the mandatory guidelines for each level of certification.

Currently, there are 12 LEED certified buildings[37] located in Los Angeles County. Out of these projects, nearly 60% are being constructed by the public sector. Public sector projects consist of new buildings for the City, the County and for public learning institutions.



There are 64 LEED Registered projects[38] located in Los Angeles County. The public sector composes 61% of the projects or 39 projects. This means that the public sector once again leads in the total number of green projects under construction followed by the private sector at 34%.

Community Concerns with the Industry

There are several concerns over green manufacturing even though greener buildings are widely supported by the public. First, evidence shows that green products are not always manufactured through a process that is also "green." Many green products still incorporate environmentally unsafe materials and harmful chemicals that reduce the product's positive impact on the environment. For example many eco-friendly carpet tile goods still use nylon even though it degrades over an extended period of time and release toxic chemicals.

Next, the process of recycling green products poses another community concern because products can emit toxic chemicals in the recycling process and potentially harm those living near the recycling plants as well as consumers. When products are made, manufacturers do not generally utilize materials with the intention that the materials are safely recycled into another product. This means that products that are green in their original state can become harmful once they are recycled.

Lastly, manufacturing firms that have "green" product lines in addition to their regular products, or the parent companies of "green" subsidiaries do not always uphold their responsibility toward the environment. For example, BP Solar's parent company British Petroleum found itself in the midst of a controversy when its Alaskan pipeline burst several times causing large oil spills (McKibben 2006).[39] On a smaller level, firms with green product lines may produce environmentally friendly products and even seek to reduce some of the environmental damage in their production process, yet the regular lines may be made through highly polluting processes. Therefore companies are not always interested in decreasing their ecological footprint.

Power Structure of the Industry

Trade Associations and Networks

Below is a list of associations and networks that we believe to be the major players in the green building movement – thus potentially the key drivers in green manufacturing. They are grouped into the following categories: Government-Related Organizations, Non-Profit and Community Networks, and Trade Associations. **This list is *not* comprehensive given that the green industry is incredibly broad and fragmented. We have listed the ones that we believe to be the most applicable to this research project and to the California and Los Angeles geographic region**.

1. **Government-Related Associations**

- California Green Action Team[40]: The interagency team was created to carry out the **Green California Initiative** (Executive Order S-20-04) and is chaired by the Secretary of the State and Consumer Services Agency. The team also includes the Director of the Department of Finance, and the Secretaries of Business, Transportation, and Housing; Environmental Protection; Resources; Education, and a commissioner from the California Public Utility Commission.

2. **Non-Profit Organizations and Community Networks**

- Apollo Alliance[41]: "a broad coalition within the labor, environmental, business, urban, and faith communities in support of good jobs and energy independence. It has been endorsed by the AFL-CIO and 23 international labor unions as well as a majority of national environmental organizations. The Alliance is developing public education campaigns and communications strategies to link allies and build a new national constituency for a bold, broad based, and immediate program of public policy to achieve energy independence."

- Collaborative for High Performance Schools (CHPS)[42]: a consortium of public agencies and California utilities that was formed with the goal of building the next generation of schools: facilities that improve the learning environment while saving energy, resources and money.

- Communities for a Better Environment (CBE)[43]: an environmental health and justice non-profit organization in California (offices in Oakland and Huntington Park), promoting clean air, clean water and the development of toxin-free communities.

- Environmental Defense[44]: a leading national nonprofit organization representing more than 500,000 members. They have California offices in Oakland and Los Angeles.

- Global Green[45]: Global Green USA is a national environmental organization. Locally in Southern California they have launched The Green Schools for Southern California Initiative which incorporates CHPS standards into K-12 school construction. In Santa Monica they have opened a Green Building Resource Center as a place for those interested in green building to obtain design advice and information about environmentally-friendly building products and strategies.

- Natural Resources Defense Council (NRDC)[46]: "NRDC is the nation's most effective environmental action organization." They "use law, science and the support of 1.2 million members and online activists to protect the planet's wildlife and wild places and to ensure a safe and healthy environment for all living things." In California they have offices in San Francisco and Santa Monica.

- U.S. Green Building Council – Los Angeles Chapter[47]: "USGBC-LA represents over 400 individuals from over 100 organizations in the greater Los Angeles area who are committed to making their communities better places to live through smarter planning, better public policy, and greener development."

- World Resources Institute (WRI) [48]: an environmental think tank that conducts policy research and works with institutions worldwide. "WRI has built a global network of international organizations, local activists, scientists, governments, entrepreneurs, and businesses throughout the world. Working closely with nearly 400 partners in more than 50 countries on a broad spectrum of sustainable development issues."

3. **Trade Associations**

- California Manufacturers and Technology Association[49]: works to improve and preserve a strong business climate for California's 30,000 manufacturers, processors and technology based companies.

- North American Coalition on Green Building[50]: a coalition of 34 trade and manufacturing associations with an interest in green building.

- Small Manufacturers Association (SMA) of California[51]: The association serves manufactures with fewer than 500 employees and advocates on their behalf to improve "regulation, vocational priorities, profitability, and public pride in a strong manufacturing base."

Key Issues that Concern the Industry

1. Legislative: *Implementing Policies*
As we have mentioned in previous memos, we believe that the demand for green building products is driven by policies. When we spoke with Randy Jurisch at Solar Integrated Technologies, he discussed how it was policies and incentive programs that generated demand for their product[52]. When asked about SIT's involvement in the LAUSD projects, he said that while they have aspirations for being involved, the main challenges are in the cost of their products and in overcoming conservative thought on how green building is beneficial – especially given that the short-term cost can be heavier and the pay back period can be longer. **A key obstacle to overcome is to change the core values of consumers and institutions to make sustainability a priority over initial expenses**. It is critical for policy to take the lead by setting the standard for green building products. We have previously noted that the manufacturing of low- and no-VOC paints was driven by the standards established by the EPA and SCAQMD. **The challenge presently is in developing more legislation that further drives green building so that the demand for green building products will follow**. Governor Schwarzenegger's Executive Order S-20-04 is an example of an order that establishes a building-centered energy and resource efficiency agenda – creating green building standards for state public buildings[53].

2. Community: *Developing an Inclusionary Green Economy that is Environmentally Just*
Groups such as the Apollo Alliance combines an agenda of environmental justice, economic development, and social justice. In an article titled "Want Environmental Justice?," the Urban Habitat discusses how the debate has always been between jobs versus the environment[54]. When high polluting and toxic facilities enter a low-income community and make promises of bringing jobs to a community, those jobs are often are not quality jobs and can be dangerous – therefore it is important that as the green economy develops, it should include low-income communities that have historically suffered from environmental injustice. The debate should not be an issue of jobs or the environment. **The jobs created in the green economy should be quality jobs and the manufacturing that takes place to produce products for the green economy should be done in an environmentally-friendly manner that does not do harm to communities where the firms are located**.

3. Corporate: *Transitioning their Products to a Broader Customer Base*
Through our interviews with green manufacturers (Solar Integrated Technologies and Bentley Prince Streets), **there were concerns expressed around how to transition their products to mainstream customers**. We had learned conversations with SIT's Vice President of Manufacturing that their market relies heavily on incentives – which is why 50% if their products are exported to Europe where solar incentive programs are much stronger than here in the U.S. Bentley Prince's Vice President shared with us that the people that usually order their products are architects and interior decorators that are more informed about "green" carpets[55]. **The average consumer is typically unaware that carpets off-gas, therefore the obstacle for them is in informing consumers that there is a value to purchasing green carpets.** We believe that this trend is true of all green products. Green products are not currently being produced in large quantities because there is not yet a demand. **Demand needs to come from a consumer base that is more educated about the benefits of purchasing green products. Once there is a strong enough demand to produce at a larger quantity, the prices of green products may be lowered**.

4. Trends: *Making all Manufacturing Products and Practices Green?*
Overall the trends that we have seen/heard throughout the quarter from the events we have attended, interviews we have conducted, and literature that we have read all describe an increasing trend towards more green, sustainable development. Whether or not the gradually increasing demand will lead to more local manufacturing jobs for these products is another question. Perhaps the trend may not be new job creation, but rather the transition of existing firms that produce building products to greener practices.

Some of the arguments that we have heard from industry experts (Walker Wells of Global Green and Laura Doll of California's Public Utilities Commission[56]) is that **there should not be a differentiation between green manufacturing and manufacturing**. **Ideally we should aim for all manufacturing practices and products to be green.** The green industry should not be a niche or a specialty, but rather it should be the standard. If we think about green manufacturing in that sense, then it is not about new green firms, but transforming the existing firms in Los Angeles County into firms with green practices and green products. For the green firms at do currently exist in our region, which are typically smaller firms (fewer than 50 employees), creating policies and incentive programs that generate a greater demand for their products may stimulate growth for their company and that *may* be where the new jobs may lie. However, these small firms right now exist and are able to sustain themselves because they have a unique niche in the market. If existing larger manufacturers become green and begin producing similar products then the challenge for smaller firms will be to reinvent their product to find their niche in the market once again.

Government/Utility/Community Programs and Resources to Assist the Industry

- California Division of State Architect (DSA)[57]: "The Division of the State Architect (DSA) acts as California's policy leader for building design and construction, and provides design and construction oversight for K–12 schools and community colleges." The DSA has a Sustainable Schools program and manages the Environmentally Preferable Products list on the state's website. They also list all of the financing and incentive opportunities on their site for high performing school development. There is DSA office located in Los Angeles.

- California Energy Commission[58]: the state's main energy planning and policy agency. In regards to their role in green building, they are responsible for promoting energy efficiency through appliance and building standards. They also play an integral role in developing energy technologies and supporting renewable energy.

- California Public Utilities Commission (CPUC)[59]: the CPUC regulates rates and services of privately owned utility companies in California. They work in conjunction with the California Energy Commission to oversee the state's Energy Action Plan and Solar Initiative which aim to bring down the cost of solar to consumers in order to attain their goals of energy efficiency.

- City of Los Angeles, Environmental Affairs Department (EAD)[60]: The Environmental Affairs Department has an Environmental Information Center (EIC). The EIC "provides a comprehensive array of services, publications and information on emerging environmental issues, public involvement opportunities and potential funding for community environmental projects" as a community service. Their website also has links to additional information on the city's Sustainable Growth and Development resources.

- City of Los Angeles' Green Architecture and Sustainable Building Program[61]: According to the Sustain LA website, in April 2002 the City Council adopted the Sustainable Building Initiative (AB939) that incorporates policies and program development for city-owned buildings. We were unable to locate additional information about the current status of this program.

- City of Los Angeles' Sustainable Design and Implementation Program (SDIP) (Department of Public Works, Bureau of Engineering under the City Architect)[62]: The SDIP website has information on guidelines, resources, specifications, case studies, obtaining lead certifications, projects, etc.

- DWP's Green LA Program[63]: A set of environmental programs implemented by the DWP that include recycling, tree planting, solar energy, green energy, energy efficiency, electric vehicles, and educational services.

- DWP's Solar Incentives Program[64]: The Solar Incentives Program is a rebate program for residential and commercial buildings implementing solar systems. "The LADWP currently is providing residential customers an incentive of $.14/kWh for qualified PV equipment . . . the solar program includes an LA Manufacturing Credit, in which a system will qualify for an additional incentive if it is manufactured in Los Angeles. The incentive for PV systems made by a qualified Los Angeles manufacturer is currently an additional $.02/kWh, for a total maximum incentive of $.16/kWh."

- Energy Star[65]: Energy Star homes and products qualify for a federal tax credit under the Energy Policy Act of 2005. There are also tax credits for home builders and appliance manufacturers and tax deductions for commercial buildings.

- Flex Your Power[66]: The website has a search engine that will identify rebates, incentives and services for residential, commercial, industrial, institutional, and agricultural facilities by zip code.

- Green Building Resource Center, Santa Monica[67]: The Green Building Resource Center was established by Global Green and the City of Santa Monica. The space is a center for homeowners, building professionals, design professionals, and all interested parties to obtain information on various products, practices, technical information, etc. Given the city's strong push for Green development, this facility serves as a valuable resource for the local community.

Links to Public Officials

Methodology:
A number of public officials have been vocal and supportive of green building practices in Los Angeles. However, officials are not focused on the promotion of green product manufacturing, but rather the implementation or exploration of broad sustainable policies, which can indirectly impact demand for locally manufactured green building products.

Data regarding support form public officials was gathered from a wide range of sustainability websites including, the US Green Building Council – Los Angeles Chapter, Los Angeles Apollo Alliance, press releases from public officials, and general Google searches.

Findings:

- **Antonio Villaraigosa**

Los Angeles Mayor Antonio Villaraigosa has a history of supporting sustainable building practices. In August of 2003 he nominated the Los Angeles Community College District (LACCD) for the prestigious Governor's Environmental and Economic Leadership Award (GEELA). This was in recognition of their pioneering efforts to integrate sound environmental values into management and practice decisions that are leading to the creation of at least 40 LEED certified buildings. This has resulted in world wide acclaim for the project. As a whole it is considered the largest LEED undertaking in the United States[68].

The Mayor also facilitated the inauguration of President Clinton's Climate Change Initiative (CCI) on August 2006 in Los Angeles. Although CCI is a broad policy designed to reduce greenhouse gas emissions, its focus includes implementing common measurement tools in the areas of building, power, water and transportation performance, improving green purchasing power and mobilizing and deploying technical expertise.

- **Eric Garcetti**

Los Angeles District 13 Council member Eric Garcetti has been one of the most outspoken supporters of green building efforts. In 2002, he led a successful call for adopting Green Building Standards for city buildings which require that all new city construction use sustainable practices starting in July of 2003. Under the mandate, all new buildings will be designed to be more water and energy efficient, use recycled or renewable materials, and be more environmentally friendly. These standards will also reduce expenses generated from wasteful energy use in city buildings[69].

- **Fabian Nunez**

Authored AB 32, the landmark Global Warming Solutions Act which caps the state's Greenhouse gas emissions at 1990 levels by 2020. It establishes a comprehensive program of regulatory and market mechanisms, to achieve quantifiable reductions of greenhouse gases. This bill was also signed and supported by Governor Arnold Schwarzenegger.

- **Arnold Schwarzenegger**

Governor Arnold Schwarzenegger signed Executive Order S-20-04 regarding Green Buildings on December 14, 2004. It established the State's priority for energy and resource-efficient high performance buildings.

> The Executive Order sets a goal of reducing energy use in state-owned buildings by 20 percent by 2015 (from a 2003 baseline) and encourages the private commercial sector to set the same goal. The order also directs compliance to a Green Building Action Plan, which details the measures the state will take to meet these goals[70].

Based on this information, one can draw the conclusion that public officials have a tendency to support broad sustainability policies such as green building standards and use of renewable energies that will lead to greater demand for green products. It is through this method that one can see their support for green building manufacturing.

Industry Leaders

Although there has been an upsurge in the discussion of sustainable building in Los Angeles, our research has not found a similar upsurge in the manufacturing of green products within the region. Outspoken green building proponents such as Bharat Patel (Chair of US Green Building Council – LA), Walker Wells (Program Director – Global Green USA), and Greig Reitz (Green Building Advisor – City of Santa Monica), are predominantly focused in the design, consulting, and policy realms.

Recent policies meant to increase reliance on renewable energies and decrease greenhouse gases would indicate potential growth in the solar energy or photovoltaic manufacturing industry. However, base on our site visit with Solar Integrated Technologies (SIT), one of LA's largest solar energy system manufacturers, they are not seeing the demand that would call for production expansion. In fact, their manufacturing plant operates at approximately ¼ capacity.

Our visit to the Bentley Prince Street carpet manufacturing plant provided a substantial education on sustainability. The company has an internal culture that preaches sustainability. Much of this has been driven by their parent company founder, Ray Anderson, who has become a national advocate for responsible manufacturing. Bentley Prince Street's internal agenda of achieving a zero environmental footprint by the year 2020 makes them the most forward thinking company we encountered during our research.

Possible Linkages Beyond the Manufacturing Industry

Third Party Certifiers:
Give the broad range of inputs that make up green building products it was not feasible to pin point a direct linkage to a distinct group of suppliers, however, due to the sustainability "common denominator" there was a direct linkage to third party certifiers and independent rating entities that approve performance and standards.

The following is a list of certifications applicable to green building products:

CRI Indoor Air Quality (IAQ) label

Label assigned by the Carpet and Rug Institute that indicates that the manufacturer voluntarily participates in green testing programs. The manufacturer is committed to developing ways to minimize any adverse effects on indoor air quality.
(http://www.carpet-rug.org)

Green-e Certified

Nationally recognized symbol for certified renewable energy. Green-e is the nation's leading independent certification and verification program for renewable energy and companies that use renewable energy.
(http://www.green-e.org/about_whatis.shtml)

Climate Neutral Network "Climate Cool"

To offset the climate impacts of products, services, or operations, certification requires creating a portfolio of projects that include internal, on-site reductions of greenhouse gas emissions, and external offset projects. (http://climateneutralnetwork.org/)

Environmental Preferable Product (EPP) Certification

To address the growing demand for products that have the least impact on the environment. Program development followed Executive Order 13101, which directs federal agencies and their contractors to identify and purchase products designated as "environmentally preferable."
(http://www.scscertified.com/manufacturing/manufacture_epp.html)

Energy Star

An energy-efficiency rating system sponsored by the Environmental Protection Agency (EPA). A high Energy Star rating means that the product is designed to minimize its energy consumption.
(www.energy_star.gov)

Forest Stewardship Council

A third party certification for wood, wood products, and forest. The FSC tracks the wood from its forest of origin all the way through the chain of custody to where the product is sold. An FSC certified product has been harvested and produced in a stringently eco-sensitive manner which avoids clear-cut harvesting. (www.fsc.org)

Formaldehyde-free MDF

Construction particleboard made with adhesives that do not contain formaldehyde.
(http://www.advancedbuildings.org/_frames/fr_t_finishes_formaldehyde.htm)

Leadership in Energy and Environmental Design (LEED)

Developed and administered by the U.S. Green Building Council, the LEED rating system is the most widely known and accepted green building certification program. (www.usgbc.org/leed)

National Fenestration Rating Council (NFRC)

NFRC is a non-profit organization that administers the only uniform, independent rating and labeling system for the energy performance of windows, doors, skylights, and attachment products. (http://www.nfrc.org/about.aspx)

Alternative Energy Installation:

Another link with indications of growth is that of green product installers, particularly the installation of solar photovoltaic systems. According to our discussion with William Korthof, owner of Energy Efficient Solar a Los Angeles base company, the demand for PV systems installation is growing at a 20-30% annual rate.

Demand for skilled photovoltaic installers creates a link to educational institutions that can provide skills training. According to Brian Hurd, Instructor at the East Los Angeles Skills Center, they have been tapped by the Division of Adult and Career Education, LAUSD, to develop a program in alternative energy and sustainable constructions. Their first course will be "The Photovoltaic Installer, " which is being developed in cooperation with the North American Board of Certified Energy Practitioners (NABCEP). This course is slated to begin in January of 2007. (Source: Horizon Industries Forum – Green Industries Jobs in 2016)

Recommendations

Through our analysis of green manufacturing in Los Angeles County we have concluded that there exists a potential for growth in this sector. This is highlighted by six factors: 1) existing manufacturing infrastructure, 2) a growing demand for green products, 3) a favorable political climate, 4) an increasing public awareness about the benefits of being green, 5) strong local and regional markets, and 6) new legislation and programs promoting green. To capitalize on the favorable climate, we recommend that policies and actions follow three objectives that: 1) increase demand for green manufacturing products, 2) support manufacturers, and 3) increase public education programs relating to the environment, energy efficiency, and green manufacturing processes.

RECOMMENDATION #1: INCREASE DEMAND

- First and foremost we need to cultivate the demand for green building. We urge public agencies to pass policies and programs that encourage purchasing locally manufactured products. This type of policy will become the foundation for encouraging growth in the local market.

- Public agencies should also continue supporting energy efficiency targets to encourage consumers to purchase green products. By promoting energy efficiency targets in building standards, agencies can create a long-term demand for green products geared toward efficiency. At the same time, building codes should encourage the use of green products wherever possible.

- Next, LEED standards contain provisions for purchasing locally manufactured products as one step toward meeting certification requirements. However, these products do not require

- We recommend that members of the U.S. Green Building Council should change LEED standards that call for purchasing locally manufactured products. Instead LEED standards must require the purchase of green products that are locally manufactured.

- Lastly, officials should encourage a link between local projects and local manufacturing. For instance, groups such as the LACCD should hire contractors that incorporate locally manufactured green products into their building's design.

RECOMMENDATION #2: SUPPORT MANUFACTURERS

- Critical to the success of any industry is the business climate in which they operate. Providing a skilled workforce, incentives for innovation, and a good quality of life help to provide a climate welcoming to manufacturers.

- A commitment to increasing career technical education to meet the growth of a green manufacturing industry should be a priority. Doing this ensures that manufacturers have access to a skilled workforce, helping them remain competitive in California. This can be done through partnerships with trade schools, and community colleges.

- Developing and offering incentives for green manufacturing processes would help support existing green manufacturers who have taken the initiative to be green. Incentives would focus, but not be limited to manufactures that are innovators in green practices, realizing the investment in developing and implementing new processes.

- Create a California Commission that deals with the green manufacturing industry. This would recommend policies to maintain and increase the size of the green manufacturing industry in California.

- Provide access to affordable health insurance, reducing cost pressures on manufacturers, and providing higher qualities of life for their employees.

RECOMMENDATION #3: PUBLIC EDUCATION PROGRAMS
Aggressively Outreach to General Public and Private Sector

- Education serves as a necessary factor to increasing the demand for green building and green products. Agencies at the local, county, and state levels should aggressively reach out to the public and private sectors that increases interest in green building within a framework of sustainability and practical monetary savings.

- Public agencies should also organize awareness programs that educate manufacturers on the benefits of greening the production process. These programs should emphasize the savings earned when a firm incorporates a greener manufacturing process. Agencies should link interested firms with the resources and materials that help them achieve this goal.

- Agencies must re-evaluate current educational programs to make them more effective and visible in the public. For example, although the Flex Your Power website is a powerful resource that links residents and firms with incentives in their areas, this program is not highly visible within the community. Therefore it is necessary to highlight the existing resources.

FUTURE RESEARCH RECOMMENDATIONS:
Through our analysis of the green sector we realize that it is important to continue researching the potential for green manufacturing within Los Angeles County and beyond. As we have provided an overview of this industry through this document, we believe future research should focus on particular sub-sectors to gain a clear view of places for job creation. The following is a list of our recommendations:

- Analyze some of the larger sub-sectors that we have already identified like lighting and finishes. Researchers could analyze one sub-sector as a cluster to identify their supply chains with the intention to identify specific areas of job creation.

- Expand research area beyond Los Angeles County. We did not use a significant number of manufacturing firms because they were located outside of the project area. In addition the outlook beyond Los Angeles County may inform local work.

- Expand research beyond the seven sub-sectors that we have identified. For example consider some products that are being used by large green building contracts such as LACCD or LAUSD.

- Increase the number of site visits in your study.

Conclusion

Our greatest challenge in writing this research report throughout the quarter was in trying to find ways to provide structure and meaning to an industry that is still undefined. To begin with, we chose a definition of "Green Manufacturing" that may not be a widely accepted definition in the broader green movement. We defined it as the production of products that go into green building – not necessarily taking into consideration whether or not the firms' manufacturing processes and inputs are also "green" or "sustainable." However, given our constraints and the limited and fragmented nature of the resources available, we moved forward with this definition of Green Manufacturing.

What we aspired to do in this report was to piece together a broader picture of the industry. We fully acknowledge that there are still gaps in the final product and many questions remain unanswered, but we hope to have built a strong foundation upon which future research on the industry can be conducted. We tried our best to disclose our methodology and incidences where assumptions were made using the knowledge we have acquired throughout the quarter by actively attending relevant "green" events, speaking to as many industry experts as possible, and reading up on current literature.

This research is a product of data we gathered through government data sources, site visits to manufacturing facilities, and through our interviews. Much of the data we gathered using NAICS and SOC Codes are generalizations of what may be occurring in the Green Manufacturing sector, however we believe that given what we heard/saw from interviews and site visits, green manufacturing is not too different from the larger manufacturing industry in terms of wages, unionization rates, skills, education, and so on.

What we believe to be the greatest finding of this report is that Los Angeles County, if it is not already, has the potential to become the leading Green Manufacturing center in the United States. As a county, we produce more potentially green building products than both the states of Washington and Oregon. Aside from having an already strong manufacturing base, there are also government programs and a favorable political climate in place to support the demand for green building products. If we act quickly to seize the opportunity and work towards transitioning all firms to sustainable practices, then we can become the first to establish ourselves as the leader of Green Manufacturing.

There is a greener future for Los Angeles County when we imagine the opportunities for our manufacturing base. It is not only about reviving our manufacturing industry or job creation, but also about improving the quality of life for all residents, reducing our negative impact on the global environment, and most importantly, about learning how to manage ourselves so that we can better manage the environment.

Glossary

Building Envelope: Floors, walls, ceilings, doors and windows all combine to make up the "envelope" of your home or business (www.flexyourpower.org)

Carpet Cushion: A variety of materials placed under carpet to provide softness and longer wear when it is walked on. In some cases, the carpet cushion is attached to the carpet when it is manufactured. Terms also used: lining, padding, or underlay. (www.flooringamerica.com)

Collaborative for High Performance Schools (CHPS): A consortium of public agencies and California utilities that was formed with the goal of building the next generation of schools: facilities that improve the learning environment while saving energy, resources and money. (http://www.chps.net/)

Collective Bargaining Agreement: The process of negotiation between trade unions (or labor unions, as they are called in the USA) and employers (represented by management) in respect of the terms and conditions of employment of employees, such as wages, hours of work, working conditions and grievance procedures, and about the rights and responsibilities of trade unions. (http://en.wikipedia.org/wiki/Collective_bargaining_agreement)

Compact Fluorescent Light Bulb: A small fluorescent lamp that is often used as an alternative to incandescent lighting. The lamp life is about 10 times longer than incandescent lamps and is 3-4 times more efficacious. Also called PL, Twin-Tube, CFL, or BIAX lamps. (http://www.archlighting.com/architecturallighting/al/glossaries/terms.jsp)

Concentration ratio: The concentration ratio of an industry is used as an indicator of the relative size of firms in relation to the industry as a whole. (Wikipedia: http://en.wikipedia.org/wiki/Concentration_ratio)

Cork Flooring: One of the earliest of modern resilient floor coverings, the flooring is made from the bark of cork oak trees, a replenishable material. Cork flooring is available in tiles and sheet goods in natural unfinished cork, waxed cork, resin-reinforced waxed and vinyl impregnated cork in many colors including natural shades. (www.flooringamerica.com)

CRI Indoor Air Quality (IAQ) label: Is a label assigned by the Carpet and Rug Institute that indicates that: the manufacturer voluntarily participates in green testing programs. The manufacturer is committed to developing ways to minimize any adverse effects on indoor air quality. A representative sample of the product type is tested by an independent laboratory and meets the established requirements for each program. (The Carpet & Rug Institute: http://www.carpet-rug.org)

Environmental Protection Agency: Environmental Protection Agency. A part of the US federal government that enforces environmental laws and provides information and guidance to policy makers. (http://www.sustainabletable.org/intro/dictionary/)

Equal Employment Opportunity (EEO): Embodies the principle of fair treatment in Federal employment and personnel matters without regard to race, color, sex, religion, national origin, age or physical or mental disability. (www.ofa.noaa.gov/~civilr/glossary.htms)

Gray Water: Gray water consists of wastewater from lavatories, showers, washing machines, and other building activities that do not involve human waste or food processing. For example, carwashes and truck maintenance facilities generate large volumes of gray water that can be effectively treated and reused. These gray water volumes can be stored in cisterns. Also, storm water volumes can be collected from hardscape surfaces on the site, such as roofing, and used in the landscape irrigation system. (http://www.greenbiz.com/sites/greenerbuildings/backgrounders_detail.cfm?UseKeyword=Water%20Use)

Green: Meeting the needs of the present without compromising the ability of future generations to meet their needs. (Green Building Resource Center: http://www.globalgreen.org/gbrc/index.htm)

Green Building: the practice of 1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and 2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal — the complete building life cycle. (Office of the Federal Environmental Executive: http://www.ofee.gov/)

Green Building Products: Products that are generally defined by their ability to produce renewable and less polluting energies and capacity to mitigate existing polluting sources

Greenhouse Gas (GHG): Greenhouse gas and refers to any of the atmospheric gases that contribute to the greenhouse effect, the warming of the environment due to high concentrations of these gases that serve to trap heat in the atmosphere and contribute to the higher temperatures. The most recognized is carbon dioxide (CO_2). (www.bentleyprincestreet.com)

Energy Star: An energy-efficiency rating system sponsored by the Environmental Protection Agency (EPA). A high Energy Star rating means that the product is designed to minimize its energy consumption. (www.energy_star.gov)

Flyash Concrete: An environmentally-friendly alternative to concrete that significantly reduces greenhouse gas emissions. (http://oikos.com/)

Forest Stewardship Council: A third party certification for wood, wood products, and forest. The FSC tracks the wood from its forest of origin all the way through the chain of custody to where the product is sold. An FSC certified product has been harvested and produced in a stringently eco-sensitive manner which avoids clear-cut harvesting. (www.fsc.org)

Formaldehyde-free MDF: Construction particleboard made with adhesives that do not contain formaldehyde. (Advanced Buildings Technologies and Practices: http://www.advancedbuildings.org/_frames/fr_t_finishes_formaldehyde.htm)

Heating, Ventilation and Air Conditioning (HVAC): Refers to the heating, ventilation, air conditioning system installed in a building to regulate temperature. This includes air conditioning plants, chillers and ducting systems, which ensure the uniform transfer of the cold or hot air, as the case may be throughout the building. (http://narains.com/glossary.htm)

International Standards Organization (ISO): An organization established to develop standards to facilitate the international exchanges of goods and services and to develop mutual cooperation in areas of intellectual, scientific, technological, and economic activity. (www.sivideo.com/9pcterms.htm)

ISO 9001: ISO 9000 specifies requirements for a Quality Management System overseeing the production of a product or service. It is not a standard for ensuring a product or service is of quality;

rather, it attests to the process of production, and how it will be managed and reviewed. (en.wikipedia.org/wiki/ISO_9001)

ISO 14001: International standard from the International Organization for Standardization "Environmental management systems - Specification with guidance for use." Details the required elements for an environmental management system, following five EMS principles: commitment and policy, planning, implementation, measurement and evaluation, and review and improvement. (http://www.bsiamericas.com/Environment/index.xalter)

Leadership in Energy and Environmental Design (LEED): Developed and administered by the U.S. Green Building Council, the LEED rating system is the most widely known and accepted green building certification program. (www.usgbc.org/leed)

Life Cycle Analysis: The process of tracing a product, material or practice from its origin through its final disposal or reuse, from factory to landfill or recycling plant. Looking at the whole picture is a principle of green philosophy. (Green Building Resource Center: http://www.globalgreen.org/gbrc/index.htm)

Manufacturing Sector: The Manufacturing sector comprises establishments engaged in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. **The assembling of component parts of manufactured products is considered manufacturing**, except in cases where the activity is appropriately classified in Sector 23, Construction. (http://www.census.gov/epcd/naics02/def/NDEF31-33.HTM)

National Fenestration Rating Council (NFRC): NFRC is a non-profit organization that administers the only uniform, independent rating and labeling system for the energy performance of windows, doors, skylights, and attachment products. (http://www.nfrc.org/about.aspx)

Off-gassing: Many of those "new house" smells are actually hazardous to our health. The emissions from building materials and other products in the home accumulate in the bloodstream and have been linked to increasing rates of asthma and some cancers, particularly in children. The best way to avoid off-gassing is to look for natural products that don't contain toxins such as formaldehyde. (Green Building Resource Center: http://www.globalgreen.org/gbrc/index.htm)

Parquet Flooring: Flooring made up of wood that is laid or inlaid to create patterns, most often geometric ones. (www.flooringamerica.com)

Retrofitting: Adding or replacing items on existing buildings. Typical retrofit products are replacement doors and windows, insulation, storm windows, caulking, weather-stripping, vents, landscaping.

Recycled content: The amount of recycled (reused) material in a given product. Post-industrial recycled content refers to the use of scraps from industrial manufacturing. Post-consumer content is the reuse of products that consumers have used and thrown away. (Green Building Resource Center: http://www.globalgreen.org/gbrc/index.htm)

Section 01350: Section 01350 contains specification language on environmental and public health considerations for building projects. This specification establishes goals and provides an overview of special environmental requirements. It covers guidelines for energy, materials, and water efficiency, indoor air quality (IAQ), nontoxic performance standards for cleaning and maintenance products, and

sustainable site planning and landscaping considerations, among other measures. Some key elements of Section 01350 are procedures to ensure good indoor air quality to protect human health. This part of the specification, which includes product selection guidelines and emission-testing protocols to distinguish low-emitting materials, was recently revised and updated.
(http://www.ciwmb.ca.gov/GreenBuilding/Specs/Section01350/)

Solar Heat Gain Coefficient (SHGC): The solar heat gain coefficient, also called a shading coefficient, is a measure of how well a window absorbs or reflects heat from the sun. The lower the coefficient, the better the window is at blocking the sun's heat. Windows in hot or temperate climates should have a low SHGC; south-facing windows in cold climates should have a high SHGC. Storm Windows - An extra pane of glass or plastic added to a window to reduce air infiltration and boost the insulation value of a window. (www.airdfw.com/heating-glossary.htm)

Solar Energy: Energy derived from the sun. The solar panels that most of us associate with solar energy are called photovoltaic panels; they transform the sun' rays into electricity. Solar thermal processes can be used to heat our hot water. (Green Building Resource Center:
http://www.globalgreen.org/gbrc/index.htm)

Standard Occupational Classification (SOC) system: The 2000 Standard Occupational Classification (SOC) system is used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data.
(www.bls.gov/soc/home.htm)

Sustainability: The ability to provide for the needs of the world's current population without damaging the ability of future generations to provide for themselves. When a process is sustainable, it can be carried out over and over without negative environmental effects or impossibly high costs to anyone involved.
(http://www.sustainabletable.org/intro/dictionary/)

U-Factor: A measure of how well heat is transferred by a window, thus affecting heating and air conditioning costs. U-factor is the inverse of R-value. The lower the U-factor, the better the window will retain heat on a cold day or cooling on a hot day. (www.think-energy.net/energy_glossary.htm)

Volatile Organic Compound (VOC): The toxic or noxious chemicals that are found in or released from plants, stains, adhesives, and sealants. Whenever possible, look for products labeled as having Low, No or Zero VOCs. (Green Building Resource Center: http://www.globalgreen.org/gbrc/index.htm)

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Appendices

Appendix A

	#	Name	Products	Services	Address	City	State	Zip	County	Phone	Website	Source	Firm Size	Output
Building Envelope	1	Alumafold Pacific, Inc.	Roofs	manufacturer	3730 S. Capitol Avenue	Whittier	CA	90601	Los Angeles	800-705-4550	http://www.afpinc.com	www.flexyourpower.org, www.energystar.gov	Unknown	Unknown
	2	Green Sandwich	Engineered structural concrete insulating panels (SCIPs) for the residential, commercial, industrial, institutional and agricultural building industries.	manufacturer	4717 Van Nuys Blvd.	Sherman Oaks	CA	91403	Los Angeles	818-771-5200 818-380-0112	www.greensandwichtech.com	Oikos	1	500,000 - 999,999
	3	International Window Corporation	Super Energy Efficient Windows, Wood Framed Windows	manufacturer	5625 E. Firestone Blvd.	South Gate	CA	90280	Los Angeles	562-928-6411	http://www.intlwindow.com/	Oikos	200	Unknown
	4	Maxitile, Inc	Roofing Tiles, Siding, Fiber-Cement Roofing Tiles, Fiber-Cement Siding	manufacturer	17141 S. Kingsview Ave.	Carson	CA	90746	Los Angeles	310-217-0316	http://www.maxitile.com/	Oikos	8	1,000,000 - 2,499,999
	5	PolyPavement	Paving and Surfacing, Walkway Surfacing, Road Paving, Soil Solidifier	manufacturer	502 N Citrus Ave	Los Angeles	CA	90036	Los Angeles	323-954-2240	http://www.polypavement.com/	Oikos	6	2,500,000 - 4,999,999
	6	Rubbersidewalks	Modular sidewalk system made from recycled tires	manufacturer	2622 W. 157th st	Gardena	CA	90249	Los Angeles	310-515-5814	www.rubbersidewalks.com	GreenSpec	Unknown	Unknown
	7	Superior Radiant Insulation	Radiant barrier and insulation products	manufacturer	451 Covina Blvd.	San Dimas	CA	91773	Los Angeles	909-305-1450	www.superiorrb.com	GreenSpec	Unknown	Unknown
		Total Firms: 7												
Green Energy	1	Amonix, Inc.	PV modules	manufacturer	3425 Fujita St.	Torrance	CA	90505	Los Angeles	310-325-8091		Oikos	32	10,000,000 - 19,999,999
	2	Capstone Turbine Corp.	Microturbine electric generators Micro-cogeneration systems	manufacturer	21211 Nordhoff Street	Chatsworth	CA	91311	Los Angeles	818-734-5300	http://www.microturbine.com	Energy Source	243	58,000,000
	3	Concorde Battery, Inc.	PV Modules	manufacturer	2009 San Bernardino Road	West Covina	CA	91790	Los Angeles	626-813-1234		Oikos	Unknown	Unknown
	4	MacroEnergy LLC	photovoltaic systems, solar water heating systems, combined solar electric & liquid heat transfer systems	manufacturer, wholesale supplier, exporter	23903 Malibu Knolls Road	Malibu	CA	90265	Los Angeles	310-456-1291	www.solarcombo.com	Energy Source Guide	Unknown	Unknown
	5	Polar Power Inc	photovoltaic systems, hybrid power systems, air cooling systems, backup power systems, carthodic protection systems, telecommunications, DC generators, charge controllers, solar & DC refridgerators/freezers, heat exchangers	manufacturing, engineering	22520 Avalon Boulevard	Carson	CA	90745	Los Angeles	310-830-9153		Energy Source Guide	10	2,500,000 - 4,999,999
	6	Solar Integrated Technologies	solar panels	manufacturer	1837 E. Martin Luther King Jr. Blvd	Los Angeles	CA	90058	Los Angeles	323-231-0411	www.solarintegrated.com	Energy Source Guide	60	5,000,000 - 9,999,999
	7	Solec International Inc. (SANYO SOLAR)	solar	manufacturer	970 E. 236th St.	Carson	CA	90745	Los Angeles			Oikos	Unknown	Unknown
	8	Specialty Concepts Inc.	Solar Charge Controllers	manufacturer	8954 Mason Avenue	Chatsworth	CA	91311	Los Angeles	818-998-5238		Energy Source	10	2,500,000 - 4,999,999
	9	Western Technology Development , Inc.	Photovoltaic Cells & Modules, Sun Trackers, Solar water pumping systems,Solar Agriculture and Domectic Pumps, Solar Mist Coolers for Domestic & Industrial applications	manufacturer	13361 Golden Valley Lane	Granada Hills	CA	91344	Los Angeles	(818) 360 - 3244		Energy Source	Unknown	Unknown
		Total Firms: 9												
Finishes	1	Amazon Environmental Inc	Recycled Paint	manufacturer	7048 Elmer Ave	Whittier	CA	90602	Los Angeles	800-566-2396	http://www.nvo.com/amazon/door/	http://www.productstewardship.us/displayPage.php?pageid=75	8	2,500,000 - 4,999,999
	2	APOC	Roof Coating	manufacturer	5903 Paramount Blvd.	Long Beach	CA	90805	Los Angeles	562-423-6471	http://www.apoc.com/	Oikos	Unknown	Unknown
	3	Bentley Prince Street	18 carpet tile products that contain recycled products	manufacturer	14641 E. Don Julian Rd.	City of Industry	CA	91746	Los Angeles	800-423-4709	www.bentleyprincestreet.com	GreenSpec	545	Unknown
	4	Davis Colors	additive for portland cement-based concrete paving and finished floor surfaces, concrete products, and structures	manufacturer	3700 E. Olympic Blvd	Los Angeles	CA	90023	Los Angeles	323-269-7311	www.daviscolors.com	GreenSpec	Unknown	Unknown
	5	Designweave	Reused Carpet Tile	manufacturer	15305 Valley View Ave.	Sante Fe Springs	CA	90670	Los Angeles	888-393-2830		Oikos	Unknown	Unknown
	6	Dunn-Edwards Corp	Paint	manufacturing	4885 E 52nd Pl	Los Angeles	CA	90040	Los Angeles	323-771-3330	http://www.dunnedwards.com/	MacRae's Blue Book website	200	Unknown
	7	EVR-Gard Coatings Corporation	Paint	manufacturer and exporter	16400 Garfield Ave.	Paramount	CA	90723	Los Angeles	562-531-0131	http://www.evr-gard.com	MacRae's Blue Book website	25	10,000,000 - 19,999,999
	8	Johnson Window Films, Inc.	Solar Control Films	manufacturer	20655 Annalee Ave.	Carson	CA	90746	Los Angeles	310-631-6672	http://www.johnsonwindowfilms.com/	Oikos	Unknown	Unknown
	9	L.M. Scofield Company	Sealants and Caulking	manufacturer	6533 Bandini Blvd.	Los Angeles	CA	90040	Los Angeles	323-723-5285	http://www.scofield.com/	Oikos	Unknown	Unknown
	10	Norton & Son of California Inc	Manufactures plastics based paints & varnishes; manufactures brooms & brushes	manufacturer	5928 Garfield Ave	Commerce	CA	90040	Los Angeles	323-685-7220	www.muralo.com	MacRae's Blue Book website	13	5,000,000 - 9,999,999
	11	Parquet By Dian	flooring	manufacturer	16601 S. Main St.	Gardena	CA	90248	Los Angeles	310-527-3779	www.parquet.com	GreenSpec	Unknown	Unknown
	12	Reliance Carpet Cushion Division	carpet cushion porducts are made from recycled textile waste fibers	manufacturer	15902 S. Main St.	Gardena	CA	90248	Los Angeles	323-321-2300		GreenSpec	Unknown	Unknown
	13	Surface Protection Industries	Paint	manufacturer	3411 E 15th Street	Los Angeles	CA	90023	Los Angeles	323-269-9231		MacRae's Blue Book website	150	50,000,000 - 99,999,999
	14	Syndecrete	cement-based, precast lightweight composite containing fly ash and post-industrial recycled polypropylene fiber waste from carpet manufacturing. Used for countertops, table tops, tiles, firecplace surrounds, landscape elements, sinks, bathtubs, and showers	manufacturer	2908 Colorado Ave.	Santa Monica	CA	90404	Los Angeles	310-829-9704	www.syndesisinc.com	GreenSpec	1 to 4	500,000 - 999,999
	15	Textured Coatings of America	Decorative and protective high-build architectural coatings for commercial, industrial, transportation and residential applications.	manufacturer	5950 Avalon Blvd	Los Angeles	CA	90003	Los Angeles	323-233-3111	http://www.texcote.com/index.asp	http://www.ecobusinesslinks.com/natural_paint_manufacturers.htm	10 to 19	5,000,000 - 9,999,999
	16	Ultra Glas, Inc.	Glazing, Decorative Glass, Countertops, Recycled Glass Tile	manufacturer	9200 Gazette Ave.	Chatsworth	CA	91311	Los Angeles	818-772-7744	http://www.ultraglas.com/	Oikos	Unknown	Unknown
		Total Firms: 16												

	#	Name	Products	Services	Address	City	State	Zip	County	Phone	Website	Source	Firm Size	Output
Lighting	1	Airey-Thompson Co	Interior Compact Fluorescent light fixtures, undercabinet fixtures, extruded aluminum linear lighting	manufacturer	5310 N. Irwindale Avenue	Irwindale	CA	91706	Los Angeles	626-960-3355	http://www.airey-thompson.com/	Oikos	12	2,500,000 - 4,999,999
	2	ALP. Lighting & Ceiling Products, Inc.	Lenses, louvers, aluminum/plastic parabolics, fluorescent fixture reflectors	manufacturer	6489 Corvette St.	City of Commerce	CA	90040	Los Angeles	877-257-5841	http://www.alplighting.com/index.aspx	ThomasNet	10 - 49	5,000,000 - 9,999,999
	3	America Ace Lighting Inc	fluorescent light bulbs, fixtures and ballasts, tubular skylights, energy saving lamps, FCC, UL, Energy Star approved/listed lamps	manufacturer	865 Woodward Blvd	Pasadena	CA	91107	Los Angeles			Energy Source Guide	Unknown	Unknown
	4	American Permalight, Inc.	Photoluminescent safety products, exit signs	manufacturer	2531 W. 237th St. #113	Torrance	CA	90505	Los Angeles	310-891-0924	http://www.americanpermalight.com/	Oikos	5 - 9	1,000,000 - 2,499,999
	5	American Top Lighting	energy efficient appliances, compact fluorescent lighting fixtures and ballasts, HID	manufacturer, wholesale supplier, importer	10501 Valley Blvd #858	El Monte	CA	91731	Los Angeles	626-444-2133	http://www.top-lite.com/eb.htm	Energy Source Guide	5 to 9	2,500,000 - 4,999,999
	6	Aurio Lighting Technology Inc.	HID lamps, compact fluorescent lighting fixtures and ballasts, t8 fluorescent tube	manufacturer, wholesale supplier, importer	5460 N. Peck Road Suite B	Arcadia	CA	91006	Los Angeles			Energy Source Guide	Unknown	Unknown
	7	Broada, Inc	Compact fluorescent lamps - spirals, minicoil spirals, reflectors, A-tye, High Lumen U-tube, Torpedoes, and LEDs	manufacturer, distributor	148 8th Ave. Suite H	City of Industry	CA	91746	Los Angeles	626-961-6661	http://www.broadalighting.com/	Retail Store	2	1,000,000 - 2,499,999
	8	C-Light LLC	Sunlight viewable CCFL backlighting for AMLCD, DC to DC power converters.	manufacturer	5447 Pine Cone Road	La Crescenta	CA	91214	Los Angeles			Energy Source	Unknown	Unknown
	9	Engineered Lighting Products	Interior & exterior compact fluorescent fixtures, Interior HID fixtures	manufacturer	10768 Lower Azusa Road	El Monte	CA	91731	Los Angeles	626-579-0943	http://www.elplighting.com/	Oikos	40	5,000,000 - 9,999,999
	10	Evergreen Lighting Div., FSC Inc.	decorative energy-efficient lighting & fixtures.	manufacturer, designer	1379-T Ridgeway St.	Pomona	CA	91768	Los Angeles	909-865-5599	http://www.evergreenlighting.com	ThomasNet	10 - 49	1,000 - 500,000
	11	Hevi Lite, Inc.	Accent Lights, Wall Mounted Fixtures, Step Lights	manufacturer	7524 Deering Ave.	Canoga Park	CA	91303	Los Angeles	818-710-0728	http://www.hevilite.com/index.html	IESNA website	5	2,500,000 - 4,999,999
	12	Janmar Lighting	Compact fluorescent screw base lamps, exterior and interior compact fluorescent fixtures	manufacturer	730 W Golden Grove Way	Covina	CA	91722	Los Angeles	626-858-6776		Oikos	25	5,000,000 - 9,999,999
	13	Kim Lighting	Interior compact fluorescent fixtures, cutoff area lighting	manufacturer	16555 East Gale Avenue	City of Industry	CA	91716	Los Angeles	626-968-5666	http://www.kimlighting.com/	Oikos	400	20,000,000 - 49,999,999
	14	Kingbright Corporation	LED Lamps, Displays, SMD Lamps and other LED related products	manufacturer	225 Brea Canyon Road	City of Industry	CA	91745	Los Angeles	909-468-0500	http://www.us.kingbright.com/	IESNA website	Unknown	Unknown
	15	Ledtronics, Inc.	White LED lamps, Cutoff area lighting, exterior LED fixtures	manufacturer	23105 Kashiwa Ct.	Torrance	CA	90505	Los Angeles	310-534-1505	http://www.ledtronics.com/	Oikos	155	50,000,000 - 99,999,999
	16	Lights of America	Manufactures residential fluorescent lighting fixtures; electrical equipment repair & maintenance services; manufactures commercial fluorescent lighting fixtures; manufactures electric lamps	manufacturer	611 Reyes Drive	Walnut	CA	91789	Los Angeles	909-594-7883	http://www.lightsofamerica.com/	Energy Source Guide	600	100,000,000 - 499,999,999
	17	Lite Extrusions	Fluorescent Lighting Fixture	manufacturer	15025 S. Main St.	Gardena	CA	90248	Los Angeles	310-329-4149		ThomasNet	10 - 49	1,000,000 - 4,999,999
	18	Los Angeles Lighting Mfg Co	Commercial and Industrial Fluorescent Lighting Fixtures and Custom Designed Fluorescent Lighting Fixtures	manufacturer	10141 Olney Street	El Monte	CA	91731	Los Angeles	626-454-8300	http://www.lalighting.com/index2.html	IESNA website	55	9,000,000
	19	Lumux Lighting Inc	Step lights, wall luminaries, floods, up/down luminaries, roadway & street, path luminaries, indoor luminaries	manufacturer	3408 E. Fowler Street	Los Angeles	CA	90063	Los Angeles	323-266-2866	http://lumux.com/	IESNA website	5	500,000 - 999,999
	20	Malcolite Corp.	Plastic, For Fluorescent Lighting Fixtures	manufacturer	590 Monterey Pass Rd.	Monterey Park	CA	91754	Los Angeles	626-289-0115	http://www.malcolite.com	ThomasNet	60	20,000,000 - 49,999,999
	21	Nora Lighting	Types of lighting: Nora rail, recessed, exit & emergency, track, accent, under cabinet, mulk multiples	manufacturer	6505 Gayhart Street	City of Commerce	CA	90040	Los Angeles	800-686-6672	http://www.noralighting.com/fr_home.html	IESNA website	Unknown	Unknown
	22	Sequoia Lighting Corp.	Light fixtures, HID starters	manufacturer, distributor	617 S. Walnut St.	La Habra	CA	90631	Los Angeles	562-691-8774		ThomasNet	10 - 49	1,000,000 - 4,999,999
		Total Firms: 22												
Water Conservation	1	Chronomite Laboratories, Inc.	lo flo	manufacturer	1420 W. 240th St.	Harbor City	CA	90710	Los Angeles			Oikos	Unknown	Unknown
	2	Taiko USA	Hands-Free Faucets	manufacturer	3451 S. Main St.	Los Angeles	CA	90007	Los Angeles	323-232-6688 x100		Oikos	Unknown	Unknown
	3	Interbath, Inc	Low-Flow Showerheads, Low Flow Hand Showers	manufacturer	665 N. Baldwin Park Blvd.	Industry	CA	91746	Los Angeles	800-423-9485	http://www.interbath.com/	Oikos	200	20,000,000-49,999,999
		Total Firms: 3												
HVAC	1	Angeles Steel Services	water storage tanks, heat exchangers, wind energy towers and structures (small), Fabricator: Pressure Vessels, Tanks, Silo's, Hopper's, Structural, Poles & Towers.	manufacturer	9747 S. Norwalk Blvd	Santa Fe Springs	CA	90670	Los Angeles	562-692-0876	http://www.angelessteel.com/	Energy Source Guide	Unknown	Unknown
	2	Camfil Farr	Extended Surface Pleated Filters	manufacturer	2121 Paulhan St.	Rancho Dominguez	CA	90220	Los Angeles	800-333-7320	http://www.camfilfarr.com/	Oikos	Unknown	Unknown
		Total Firms: 2												

Appendix B

Number of Establishments

		Washington	Oregon	California	LA County
BUILDING ENVELOPE					
326140	Polystyrene Foam Product Manufacturing	9	6	91	27
FINISHES					
321219	Reconstituted Wood Product Manufacturing	7	21	22	-
325510	Paint & Coating Manufacturing	32	19	183	67
325520	Adhesive Manufacturing	8	-	70	25
GREEN ENERGY					
333611	Turbine and Turbine Generator Set Units Manufacturing	-	-	6	-
334413	Semiconductor and Related Device Manufacturing	24	27	391	254
325211	Plastics Material & Resin Manufacturing	6	11	63	30
326113	Unsupported Plastics Film & Sheet (except packaging) Manufacturing	13	8	74	27
3272	Glass & Glass Product Manufacturing	81	57	318	94
3314	Nonferrous Metal (except aluminum) Production & Processing	18	6	91	30
332322	Sheet Metal Work Manufacturing	112	88	631	182
334515	Electricity Measuring & Testing Instrument Manufacturing	18	24	219	36
335313	Switchgear & Switchboard Apparatus Manufacturing	10	5	55	18
335911	Storage Battery Manufacturing	3	4	21	8
335931	Current-Carrying Wiring Device Manufacturing	2	5	59	15
335999	All Other Misc Electrical Equipment & Component Manufacturing	20	11	181	46
HVAC					
333411	Air Purification Equipment Manufacturing Shops	3	4	43	-
333412	Industrial & Commercial Fan & Blower Manufacturing	-	-	11	-
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	14	-	54	-

333415	Ventilation, Heating, AC, & Commercial Refrigeration Equipment Manufacturing	14	7	92	30
334512	Automatic Environmental Control Manufacturing for Residential & Commercial Use	4	-	46	-
334519	Other Measuring & Controlling Device Manufacturing	31	14	138	30
LIGHTING					
335110	Electric Lamp Bulb & Part Manufacturing	-	-	10	-
335122	Commercial, Industrial, & Institutional Electric Lighting Fixture Manufacturing	8	-	78	34
335311	Power, Distribution, & Specialty Transformer Manufacturing	-	4	37	14
WATER CONSERVATION (INDOOR/OUTDOOR)					
333319	Other Commercial & Service Industry Machinery Manufacturing	21	16	197	61
333911	Pump & Pumping Equipment Manufacturing	4	7	62	19
334514	Totalizing Fluid Meter & Counting Device Manufacturing	5	5	33	-
TOTAL		**467**	**349**	**3276**	**1047**

Number of Production Employees

		Washington	Oregon	California	LA County
BUILDING ENVELOPE					
326140	Polystyrene Foam Product Manufacturing	346	134	3327	837
FINISHES					
321219	Reconstituted Wood Product Manufacturing	256	1750	757	-
325510	Paint & Coating Manufacturing	277	213	2406	1019
325520	Adhesive Manufacturing	63	-	1220	494

GREEN ENERGY					
333611	Turbine and Turbine Generator Set Units Manufacturing	-	-	1920	-
334413	Semiconductor and Related Device Manufacturing	3484	5749	19567	9093
325211	Plastics Material & Resin Manufacturing	82	D	1649	860
326113	Unsupported Plastics Film & Sheet (except packaging) Manufacturing	732	352	1707	704
3272	Glass & Glass Product Manufacturing	1811	955	7791	2616
3314	Nonferrous Metal (except aluminum) Production & Processing	D	D	1523	D
332322	Sheet Metal Work Manufacturing	1784	1389	12032	2598
334515	Electricity Measuring & Testing Instrument Manufacturing	1159	1020	6212	583
335313	Switchgear & Switchboard Apparatus Manufacturing	76	123	1402	537
335911	Storage Battery Manufacturing	D	D	1348	D
335931	Current-Carrying Wiring Device Manufacturing	D	59	1569	521
335999	All Other Misc Electrical Equipment & Component Manufacturing	634	356	5397	D
HVAC					
333411	Air Purification Equipment Manufacturing Shops	D	271	660	-
333412	Industrial & Commercial Fan & Blower Manufacturing	-	-	367	-
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	673	-	1917	-
333415	Ventilation, Heating, AC, & Commercial Refrigeration Equipment Manufacturing	228	84	2760	796
334512	Automatic Environmental Control Manufacturing for Residential & Commercial Use	D	-	856	-
334519	Other Measuring & Controlling Device Manufacturing	288	107	1969	642
LIGHTING					
335110	Electric Lamp Bulb & Part Manufacturing	-	-	171	-
335122	Commercial, Industrial, & Institutional Electric Lighting Fixture Manufacturing	492	-	1479	635

335311	Power, Distribution, & Specialty Transformer Manufacturing	-	D	1128	336
WATER CONSERVATION (INDOOR/OUTDOOR)					
333319	Other Commercial & Service Industry Machinery Manufacturing	473	193	3409	1314
333911	Pump & Pumping Equipment Manufacturing	D	200	2260	D
334514	Totalizing Fluid Meter & Counting Device Manufacturing	D	155	662	-
TOTAL		**12858**	**13110**	**87465**	**23585**

Total Value of Shipments ($1000)

		Washington	Oregon	California	LA County
BUILDING ENVELOPE					
326140	Polystyrene Foam Product Manufacturing	81858	35352	860132	186797
FINISHES					
321219	Reconstituted Wood Product Manufacturing	69635	564180	240858	-
325510	Paint & Coating Manufacturing	186330	138769	2206641	911339
325520	Adhesive Manufacturing	41725	-	585585	196561
GREEN ENERGY					
333611	Turbine and Turbine Generator Set Units Manufacturing	-	-	1707127	-
334413	Semiconductor and Related Device Manufacturing	866776	9184906	9862342	1564152
325211	Plastics Material & Resin Manufacturing	25285	D	903602	561898
326113	Unsupported Plastics Film & Sheet (except packaging) Manufacturing	183494	113940	596185	225894
3272	Glass & Glass Product Manufacturing	424675	189066	1847978	526060
3314	Nonferrous Metal (except aluminum) Production & Processing	D	D	637718	D
332322	Sheet Metal Work Manufacturing	358563	241443	1953849	382666

334515	Electricity Measuring & Testing Instrument Manufacturing	610026	818343	3779664	403913
335313	Switchgear & Switchboard Apparatus Manufacturing	25748	39339	387958	141922
335911	Storage Battery Manufacturing	D	D	399496	D
335931	Current-Carrying Wiring Device Manufacturing	D	18014	331136	110292
335999	All Other Misc Electrical Equipment & Component Manufacturing	178899	153317	1853402	D
HVAC					
333411	Air Purification Equipment Manufacturing Shops	D	61344	120212	-
333412	Industrial & Commercial Fan & Blower Manufacturing	-	-	61732	-
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	147002	-	487057	-
333415	Ventilation, Heating, AC, & Commercial Refrigeration Equipment Manufacturing	76693	20481	611984	157131
334512	Automatic Environmental Control Manufacturing for Residential & Commercial Use	D	-	509317	-
334519	Other Measuring & Controlling Device Manufacturing	88553	40500	966042	143960
LIGHTING					
335110	Electric Lamp Bulb & Part Manufacturing	-	-	29981	-
335122	Commercial, Industrial, & Institutional Electric Lighting Fixture Manufacturing	77600	-	430854	140799
335311	Power, Distribution, & Specialty Transformer Manufacturing	-	D	271976	81352
WATER CONSERVATION (INDOOR/OUTDOOR)					
333319	Other Commercial & Service Industry Machinery Manufacturing	154559	44258	1124232	420167
333911	Pump & Pumping Equipment Manufacturing	D	122109	804631	D
334514	Totalizing Fluid Meter & Counting Device Manufacturing	D	29262	168060	-
TOTAL		**3597421**	**11814623**	**33739751**	**6154903**

Appendix C

OUTPUT LOCATION QUOTIENT FOR LOS ANGELES GREEN INDUSTRIES

		Region's Output by Manufacturing Subsector	Region's Total Output for Manufacturing Sector	National Output by Manufacturing Subsector	Total National Output for Manufacturing Sector	Industry Location Quotient
BUILDING ENVELOPE						
326140	Polystyrene Foam Product Manufacturing	186797	108052135	6412465	3916136712	1.06
FINISHES						
321219	Reconstituted Wood Product Manufacturing	N/A	108052135	5828833	3916136712	N/A
325510	Paint and Coating Manufacturing	911339	108052135	19921979	3916136712	1.66
325520	Adhesive Manufacturing	196561	108052135	7446419	3916136712	0.96
GREEN ENERGY						
333611	Turbine and Turbine Generator Set Units Manufacturing	N/A	108052135	14966426	3916136712	N/A
334413	Semiconductor and Related Device Manufacturing	532400	108052135	61471483	3916136712	0.31
325211	Plastics Material & Resin Manufacturing	561898	108052135	46825479	3916136712	0.43
326113	Unsupported Plastics Film & Sheet (Except Manufacturing)	225894	108052135	14287644	3916136712	0.57
3272	Glass & Glass Product Manufacturing	524060	108052135	22434247	3916136712	0.85
3314	Nonferrous Metal (Except Aluminum) Production & Processing	D	108052135	22252493	3916136712	N/A
332322	Sheet Metal Work Manufacturing	384666	108052135	15338818	3916136712	0.91
334515	Electricity Measuring & Testing Instrument Manufacturing	403913	108052135	10147354	3916136712	1.44
335313	Switchgear & Switchboard Apparatus Manufacturing	141922	108052135	8188207	3916136712	0.63
335911	Storage Battery Manufacturing	D	108052135	3536966	3916136712	N/A
335931	Current-Carrying Wiring Device Manufacturing	110292	108052135	6907342	3916136712	0.58
335999	All Other Miscellaneous Electrical Equipment & Component Manufacturing	D	108052135	7056129	3916136712	N/A
HVAC						
33341	Air Purification Equipment Manufacturing Shops	279703	108052135	31993185	3916136712	0.32
333412	Industrial and Commercial Fan and Blower Manufacturing	D	108052135	1848864	3916136712	N/A
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	D	108052135	3982961	3916136712	N/A
333415	Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing	157131	108052135	23864162	3916136712	0.24
334512	Automatic Environmental Control Manufacturing for Residential and Commercial Use	D	108052135	3149680	3916136712	N/A
334519	Other Measuring and Controlling Device Manufacturing	143960	108052135	5987419	3916136712	0.87
LIGHTING						
335110	Electric Lamp Bulb and Part Manufacturing	N/A	108052135	2626825	3916136712	N/A
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	140799	108052135	3736427	3916136712	1.37
335311	Power, Distribution, and Specialty Transformer Manufacturing	81352	108052135	4123277	3916136712	0.72
WATER CONSERVATION (INDOOR/OUTDOOR)						
333319	Other Commercial and Service Industry Machinery Manufacturing	420167	108052135	11518261	3916136712	1.32
333911	Pump and Pumping Equipment Manufacturing	N/A	108052135	7045761	3916136712	N/A
334514	Totalizing Fluid Meter and Counting Device Manufacturing	N/A	108052135	4821321	3916136712	N/A

D = Withheld to avoid disclosing data of individual companies; data are included in higher level totals
Output = Value of Shipments

Source: 2002 Economic Census, Manufacturing Geographic Area Series

SHIFT SHARE ANALYSIS - EMPLOYMENT - LOS ANGELES GREEN INDUSTRIES

ASSUMPTIONS			
1997 was chosen as base year **National Average Growth Rate** = [(Recent Total National Employment)/(Base Year Total Employment)-1] **Industry National Growth Component** = (Local Industry Base Year Employment)*(National Average Growth Rate) **Total Regional National Growth Component** = Sum of National Growth Components for each Industry	-11.1%	**Industry National Growth Rate** = [(Industry's Recent National Employment)/(Industry's Base Year Employment) – 1] **Industry Mix Differential** = (Industry's National Growth Rate) – (National Growth Rate) **Industry Mix Employment Change** = (Differential) * (Local Industry's Base Year Employment) **Total Industry Mix Component** = Sum of Industry Mix Employment Changes for each Industry	**Industry's Local Growth Rate** = [(Industry's Recent Local Employment)/(Industry's Base Year Local Employment) – 1] **Competitiveness Differential** = (Industry's Local Growth Rate) - (Industry's National Growth Rate) **Competitiveness Employment Change** = Differential * Local Industry's Base Year Employment **Total Competitiveness Component** = Sum of Competitiveness Employment Change for each Industry

		National Employment		Local Employment		Industry National Growth Component	Industry National Growth Rate	Industry Mix Differential	Industry Mix Employment Change	Industry Local Growth Rate	Competitiveness Differential	Competitiveness Employment Change
		1997	2002	1997	2002							
BUILDING ENVELOPE												
326140	Polystyrene Foam Product Manufacturing	21,651	26,018	564	837	502	20.2%	31.2%	176	48.4%	28.2%	159
FINISHES												
325510	Paint and Coating Manufacturing	28,231	25,261	1,325	1,019	1179	-10.5%	0.5%	7	-23.1%	-12.6%	-167
325520	Adhesive Manufacturing	12,623	13,082	449	494	399	3.6%	14.7%	66	10.0%	6.4%	29
GREEN ENERGY												
334413	Semiconductor and Related Device Manufacturing	106,484	87,437	2,653	2,383	2360	-17.9%	-6.8%	-181	-10.2%	7.7%	205
HVAC												
33341	Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing	128,068	113,359	1,785	1,445	1588	-11.5%	-0.4%	-8	-19.0%	-7.6%	-135
334519	Other Measuring and Controlling Device Manufacturing	17,900	16,021	619	642	551	-10.5%	0.6%	3	3.7%	14.2%	88
LIGHTING												
3351	Electric Lighting Equipment Manufacturing	55,744	47,586	3,364	3,208	2992	-14.6%	-3.6%	-120	-4.6%	10.0%	336
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	16,409	14,295	1,128	635	1003	-12.9%	-1.8%	-21	-43.7%	-30.8%	-348
WATER CONSERVATION (INDOOR/OUTDOOR)												
333319	Other Commercial and Service Industry Machinery Manufacturing	33,235	30,931	1,727	1,314	1536	-6.9%	4.1%	71	-23.9%	-17.0%	-293
333911	Pump and Pumping Equipment Manufacturing	20,774	18,369	701	627	624	-11.6%	-0.5%	-4	-10.6%	1.0%	7
Total		**441,119**	**392,359**	**14,315**	**12,604**							
Total Regional National Growth Component						**12,733**						
Total Industry Mix Component									**-10**			
Total Competitiveness Component												**-119**

Appendix E

SHIFT SHARE ANALYSIS - OUTPUT- LOS ANGELES GREEN INDUSTRIES

ASSUMPTIONS			
1997 was chosen as base year **National Average Growth Rate** = [(Recent Total National Output)/(Base Year Total Output)-1] **Industry National Growth Component** = (Local Industry Base Year Output)*(National Average Growth Rate) **Total Regional National Growth Component** = Sum of National Growth Components for each Industry	-8.6%	**Industry National Growth Rate** = [(Industry's Recent National Output)/(Industry's Base Year Output) – 1] **Industry Mix Differential** = (Industry's National Growth Rate) – (National Growth Rate) **Industry Mix Output Change** = (Differential) * (Local Industry's Base Year Output) **Total Industry Mix Component** = Sum of Industry Mix Output Changes for each Industry	**Industry's Local Growth Rate** = [(Industry's Recent Local Output)/(Industry's Base Year Local Output) – 1] **Competitiveness Differential** = (Industry's Local Growth Rate) - (Industry's National Growth Rate) **Competitiveness Output Change** = Differential * Local Industry's Base Year Output **Total Competitiveness Component** = Sum of Competitiveness Output Change for each Industry

		National Output		Local Output		Industry National Growth	Industry National Growth Rate	Industry Mix Differential	Industry Mix Output Change	Industry Local Growth Rate	Competitiveness Differential	Competitiveness Output Change
		1997	2002	1997	2002							
BUILDING ENVELOPE												
326140	Polystyrene Foam Product Manufacturing	4899240	6412465	106,041	186,797	96931	30.9%	39.5%	41863	76.2%	45.3%	48003
FINISHES												
325510	Paint and Coating Manufacturing	19,057,194	19,921,979	766,494	911,339	700645	4.5%	13.1%	100632	18.9%	14.4%	110063
325520	Adhesive Manufacturing	7,312,435	7,446,419	243,754	196,561	222813	1.8%	10.4%	25407	-19.4%	-21.2%	-51659
GREEN ENERGY												
334413	Semiconductor and Related Device Manufacturing	78,479,496	61,471,483	525,059	532,400	479951	-21.7%	-13.1%	-68683	1.4%	23.1%	121131
HVAC												
334519	Other Measuring and Controlling Device Manufacturing	5,082,777	5,987,419	139,515	143,960	127529	17.8%	26.4%	36817	3.2%	-14.6%	-20386
LIGHTING												
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	4,101,442	3,736,427	329,567	140,799	301254	-8.9%	-0.3%	-1017	-57.3%	-48.4%	-159438
WATER CONSERVATION (INDOOR/OUTDOOR)												
333319	Other Commercial and Service Industry Machinery Manufacturing	9,483,274	11,518,261	394,238	420,167	360369	21.5%	30.0%	118467	6.6%	-14.9%	-58669
333911	Pump and Pumping Equipment Manufacturing	6,735,133	7,045,761	260,756	0	238355	4.6%	13.2%	34428	-100.0%	-104.6%	-272782
Total		**135,150,991**	**123,540,214**	**2,765,424**	**2,532,023**							
Total Regional National Growth Component						**2,527,847**						
Total Industry Mix Component									**287913**			
Total Competitiveness Component												**-283737**

Appendix F

BUILDING ENVELOPE
326140 Polystyrene Foam Product Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$27,600	$31,621	
2002	179.9	88.66	$27,442	$30,950	-2.17%
2003	184.6	90.98	$29,883	$32,845	5.77%
2004	190.2	93.74	$35,672	$38,054	13.69%
2005	193.2	95.22	$34,106	$35,818	-6.24%
Sep-06	202.9				

FINISHES
321219 Reconstituted Wood Product Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28			
2002	179.9	88.66			
2003	184.6	90.98	$20,249	$22,256	
2004	190.2	93.74	$20,901	$22,297	0.18%
2005	193.2	95.22			
Sep-06	202.9				

325510 Paint and Coating Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$43,347	$49,662	
2002	179.9	88.66	$41,839	$47,188	-5.24%
2003	184.6	90.98	$43,581	$47,901	1.49%
2004	190.2	93.74	$45,047	$48,055	0.32%
2005	193.2	95.22	$45,563	$47,851	-0.43%
Sep-06	202.9				

325520 Adhesive Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$55,867	$64,006	
2002	179.9	88.66	$56,382	$63,590	-0.65%
2003	184.6	90.98	$58,137	$63,900	0.49%
2004	190.2	93.74	$58,935	$62,870	-1.64%
2005	193.2	95.22	$59,127	$62,096	-1.25%
Sep-06	202.9				

GREEN ENERGY

333611 Turbine and Turbine Generator Set Units Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$64,463	$73,854	
2002	179.9	88.66	$63,363	$71,464	-3.34%
2003	184.6	90.98	$68,142	$74,897	4.58%
2004	190.2	93.74	$73,520	$78,429	4.50%
2005	193.2	95.22	$73,752	$77,455	-1.26%
Sep-06	202.9				

334413 Semiconductor and Related Device Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$67,935	$77,832	
2002	179.9	88.66	$62,680	$70,694	-10.10%
2003	184.6	90.98	$64,782	$71,204	0.72%
2004	190.2	93.74	$74,433	$79,403	10.33%
2005	193.2	95.22	$82,635	$86,784	8.50%
Sep-06	202.9				

325211 Plastics Material & Resin Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$45,598	$52,241	
2002	179.9	88.66	$43,794	$49,393	-5.77%
2003	184.6	90.98	$44,173	$48,552	-1.73%
2004	190.2	93.74	$48,710	$51,962	6.56%
2005	193.2	95.22	$49,661	$52,154	0.37%
Sep-06	202.9				

3272 Glass & Glass Product Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$33,894	$38,832	
2002	179.9	88.66	$35,428	$39,957	2.82%
2003	184.6	90.98	$36,005	$39,574	-0.97%
2004	190.2	93.74	$40,435	$43,135	8.25%
2005	193.2	95.22	$36,891	$38,743	-11.34%
Sep-06	202.9				

3314 Nonferrous Metal (except aluminum) Production & Processing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$37,558	$43,029	
2002	179.9	88.66	$39,572	$44,631	3.59%
2003	184.6	90.98	$41,045	$45,114	1.07%
2004	190.2	93.74	$42,550	$45,391	0.61%
2005	193.2	95.22	$45,021	$47,281	4.00%
Sep-06	202.9				

332322 Sheet Metal Work Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$32,833	$37,616	
2002	179.9	88.66	$32,929	$37,139	-1.28%
2003	184.6	90.98	$33,718	$37,061	-0.21%
2004	190.2	93.74	$35,262	$37,617	1.48%
2005	193.2	95.22	$36,311	$38,134	1.36%
Sep-06	202.9				

334515 Electricity Measuring & Testing Instrument Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$67,269	$77,069	
2002	179.9	88.66	$65,116	$73,441	-4.94%
2003	184.6	90.98	$71,192	$78,249	6.15%
2004	190.2	93.74	$79,380	$84,680	7.59%
2005	193.2	95.22	$82,667	$86,817	2.46%
Sep-06	202.9				

335313 Switchgear & Switchboard Apparatus Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$38,752	$44,397	
2002	179.9	88.66	$40,109	$45,237	1.86%
2003	184.6	90.98	$40,700	$44,735	-1.12%
2004	190.2	93.74	$39,676	$42,325	-5.69%
2005	193.2	95.22	$42,187	$44,305	4.47%
Sep-06	202.9				

335931 Current-Carrying Wiring Device Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$44,971	$51,522	
2002	179.9	88.66	$44,964	$50,713	-1.60%
2003	184.6	90.98	$45,796	$50,336	-0.75%
2004	190.2	93.74	$49,320	$52,613	4.33%
2005	193.2	95.22	$57,074	$59,940	12.22%
Sep-06	202.9				

335999 All Other Miscellaneous Electrical Equipment & Component Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$42,238	$48,391	
2002	179.9	88.66	$43,800	$49,400	2.04%
2003	184.6	90.98	$50,482	$55,486	10.97%
2004	190.2	93.74	$49,390	$52,688	-5.31%
2005	193.2	95.22	$51,971	$54,580	3.47%
Sep-06	202.9				

LIGHTING

335110 Electric Lamp Bulb and Part Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$36,198	$41,471	
2002	179.9	88.66	$37,599	$42,406	2.20%
2003	184.6	90.98	$45,616	$50,138	15.42%
2004	190.2	93.74	$43,112	$45,991	-9.02%
2005	193.2	95.22	$38,323	$40,247	-14.27%
Sep-06	202.9				

335122 Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$35,565	$40,746	
2002	179.9	88.66	$37,320	$42,091	3.20%
2003	184.6	90.98	$40,071	$44,043	4.43%
2004	190.2	93.74	$41,731	$44,517	1.06%
2005	193.2	95.22	$46,450	$48,782	8.74%
Sep-06	202.9				

335311 Power, Distribution, and Specialty Transformer Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$29,874	$34,226	
2002	179.9	88.66	$31,962	$36,048	5.06%
2003	184.6	90.98	$36,330	$39,932	9.72%
2004	190.2	93.74	$37,893	$40,423	1.22%
2005	193.2	95.22	$37,916	$39,820	-1.52%
Sep-06	202.9				

HVAC

333411 Air Purification Equipment Manufacturing Shops

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$35,493	$40,664	
2002	179.9	88.66	$36,689	$41,380	1.73%
2003	184.6	90.98	$34,686	$38,125	-8.54%
2004	190.2	93.74	$38,679	$41,262	7.60%
2005	193.2	95.22	$42,379	$44,507	7.29%
Sep-06	202.9				

333412 Industrial and Commercial Fan and Blower Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$32,175	$36,862	
2002	179.9	88.66	$51,344	$57,908	36.34%
2003	184.6	90.98	$47,477	$52,184	-10.97%
2004	190.2	93.74	$62,010	$66,151	21.11%
2005	193.2	95.22	$58,915	$61,873	-6.91%
Sep-06	202.9				

333414 Heating Equipment (except Warm Air Furnaces) Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$59,568	$68,246	
2002	179.9	88.66	$37,098	$41,841	-63.11%
2003	184.6	90.98	$38,641	$42,472	1.48%
2004	190.2	93.74	$38,391	$40,954	-3.70%
2005	193.2	95.22	$45,534	$47,820	14.36%
Sep-06	202.9				

333415 Ventilation, Heating, AC, and Commercial Refrigeration Equipment Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$29,908	$34,265	
2002	179.9	88.66	$30,538	$34,442	0.51%
2003	184.6	90.98	$31,108	$34,192	-0.73%
2004	190.2	93.74	$32,218	$34,369	0.52%
2005	193.2	95.22	$37,135	$38,999	11.87%
Sep-06	202.9				

334512 Automatic Environmental Control Mfg. for Res. and Commercial Use

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$40,115	$45,959	
2002	179.9	88.66	$39,543	$44,599	-3.05%
2003	184.6	90.98	$41,040	$45,108	1.13%
2004	190.2	93.74	$40,586	$43,296	-4.19%
2005	193.2	95.22	$41,944	$44,050	1.71%
Sep-06	202.9				

334519 Other Measuring and Controlling Device Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$42,708	$48,930	
2002	179.9	88.66	$42,224	$47,622	-2.75%
2003	184.6	90.98	$45,160	$49,637	4.06%
2004	190.2	93.74	$48,395	$51,626	3.85%
2005	193.2	95.22	$51,722	$54,319	4.96%
Sep-06	202.9				

WATER CONSERVATION (INDOOR/OUTDOOR)

333319 Other Commercial and Service Industry Machinery Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$49,282	$56,461	
2002	179.9	88.66	$52,531	$59,247	4.70%
2003	184.6	90.98	$55,738	$61,263	3.29%
2004	190.2	93.74	$55,825	$59,553	-2.87%
2005	193.2	95.22	$70,805	$74,360	19.91%
Sep-06	202.9				

333911 Pump and Pumping Equipment Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$60,286	$69,068	
2002	179.9	88.66	$60,995	$68,793	-0.40%
2003	184.6	90.98	$61,613	$67,721	-1.58%
2004	190.2	93.74	$66,994	$71,467	5.24%
2005	193.2	95.22	$63,214	$66,388	-7.65%
Sep-06	202.9				

334514 Totalizing Fluid Meter and Counting Device Manufacturing

Year	CPI-U	CPI-U rebased to 2006	Average Annual Pay	Average Annual Pay in 2006 dollars	Average Annual Pay in 2006 dollars Percentage Change
2001	177.1	87.28	$40,586	$46,499	
2002	179.9	88.66	$44,837	$50,569	8.05%
2003	184.6	90.98	$44,644	$49,070	-3.06%
2004	190.2	93.74	$43,629	$46,542	-5.43%
2005	193.2	95.22	$44,630	$46,871	0.70%
Sep-06	202.9				

Appendix G

GENDER AND RACE/ETHNICTY OF SELECTED SOC CODES RELATED TO GREEN MANUFACTURING
LOS ANGELES COUNTY

			Gender				Race/Ethnicity							
SOC Code	Occupational Title	TOTAL	Female	Percent Female	Male	Percent Male	White	Percent White	Latino	Percent Latino	Black	Percent Black	Asian	Percent Asian
51-0000	**Production Occupations**													
51-1011	First-Line Supervisors/Managers of Production and Operating Workers	39835	9920	24.90%	29910	75.08%	8380	21.04%	16375	41.11%	1475	3.70%	2970	7.46%
51-2020	Electrical, Electronics, and Electromechanical Assemblers	9665	5717	59.15%	3933	40.69%	840	8.69%	6165	63.79%	345	3.57%	2140	22.14%
51-2041	Structural Metal Fabricators and Fitters	270	4	1.48%	269	99.63%	135	50.00%	109	40.37%	10	3.70%	15	5.56%
51-2090	Miscellaneous Assemblers and Fabricators	33415	13515	40.45%	19900	59.55%	915	2.74%	10325	30.90%	550	1.65%	1550	4.64%
51-4010	Computer Control Programmers and Operators	1050	39	3.71%	998	95.05%	205	19.52%	665	63.33%	35	3.33%	134	12.76%
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	140	34	24.29%	110	78.57%	25	17.86%	70	50.00%	15	10.71%	0	0.00%
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	2175	295	13.56%	1873	86.11%	130	5.98%	2010	92.41%	4	0.18%	20	0.92%
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	245	39	15.92%	209	85.31%	35	14.29%	174	71.02%	25	10.20%	10	4.08%
51-4060	Model Makers and Patternmakers, Metal and Plastic	625	249	39.84%	369	59.04%	245	39.20%	170	27.20%	24	3.84%	165	26.40%
51-4120	Welding, Soldering, and Brazing Workers	14550	1185	8.14%	13359	91.81%	2065	14.19%	10985	75.50%	545	3.75%	685	4.71%
51-4192	Lay-Out Workers, Metal and Plastic	185	23	12.43%	155	83.78%	39	21.08%	124	67.03%	0	0.00%	15	8.11%
51-4194	Tool Grinders, Filers, and Sharpeners	370	19	5.14%	348	94.05%	150	40.54%	199	53.78%	10	2.70%	4	1.08%
51-4xxx	Other Metalworkers and Plastic Workers, Including Milling, Planing, and Multiple Machine Tool Operators	21100	4693	22.24%	16400	77.73%	1035	4.91%	18030	85.45%	345	1.64%	1470	6.97%
51-9198	Helpers--Production Workers	3025	635	20.99%	2384	78.81%	320	10.58%	2180	72.07%	75	2.48%	395	13.06%
51-91xx	Other Production Workers, Including Semiconductor Processors and Cooling and Freezing Equipment Operators	44920	15830	35.24%	29090	64.76%	4155	9.25%	35685	79.44%	1495	3.33%	3095	6.89%
	TOTAL	**171570**	**52197**	**30.42%**	**119307**	**69.54%**	**18674**	**10.88%**	**103266**	**60.19%**	**4953**	**2.89%**	**12668**	**7.38%**

Source: California Employment Development Department, Data for Affirmative Action/Equal Employment Opportunity Plans. http://www.census.gov/cgi-bin/broker

Appendix H

Education, Skill Requirements, and Occupational Ladders by General Occupation

General Occupation	SOC Code	Occupational Title	Education	Skill Requirements	Occupational Ladders
Assemblers & Fabricators	51-2023	Electromechanical Equipment Assemblers	High school diploma is preferred for most positions. Technical school graduates for specialized assembly may be necessary. Many positions require only on-the-job training.	Accurate work at a rapid pace; Follow detailed instructions; Basic reading skills; Read pictures and diagrams; Specialized electronic assembly; Good eyesight and color vision; Manual dexterity;	New assemblers and fabricators are entry-level positions. Experienced workers may become product repairers, quality controllers, supervisors, and members of R&D teams. Workers may have the opportunity to be trained as a machinist or operator of automated production equipment.
	51-2041	Structural Metal Fabricators and Fitters			
	51-2092	Team Assemblers			
	51-2099	Assemblers and Fabricators, All Other			
	51-9199	Production Workers, All Other			
Machinists	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	High school or vocation school courses in mathematics (especially trigonometry), physics, blueprint reading, metalworking, and drafting is highly recommended. Machinists train in apprenticeship programs, on-the-job, vocational schools, and community or technical colleges. Training to operate computer-controlled equipment (i.e. CNC machine tools) has become essential.	Mechanically inclined; Problem-solving abilities; Work independently; Perform highly accurate work; Computers	Many entrants previously worked as machine setters, operators, or tenders. Completing a certification program (such as the National Institute of Metalworking Skills) may provide better career opportunities. Experienced machinists can advance to become CNC programmers, tool and die makers, mold makers, or be promoted to supervisors or administrative positions.
	51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic			
	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic			
	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic			
	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic			
	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic			
Welding & Soldering	51-4121	Welders, Cutters, Solderers, and Brazers	Formal training is available in high schools, vocational schools, and private welding schools. Courses in blueprint reading, shop mathematics, mechanical drawing, physics, chemistry, and metallurgy are helpful. Computer knowledge to program computer-controlled machines is gaining importance.	Good eyesight; Hand-eye coordination; Manual dexterity; Computers	Employers prefer workers with experience or formal training. Welders, with additional training and experience, can advance to become welding technicians, supervisors, inspectors, or instructors.
Steel Manufacturing	51-4192	Lay-Out Workers, Metal and Plastic	Many jobs require only a high school education. Employees prefer to hire graduates from technical or trade schools. Two-year degrees in mechanical or electrical technology or 2 to 4 year apprenticeships are recommended for those who seed to advance into the best production jobs. Workers must learn to operate computers and other advanced equipment.	On-the-job training to acquire new skills; Flexibility to acquire multiple skills to perform multiple functions; Computers	New workers enter as lower skilled operators and maintenance personnel who assist more experienced workers. Workers begin to specialize in particular processes as they gain more experience. It can take 2 to 5 years to advance to a skilled position.
	51-4199	Metal Workers and Plastic Workers, All Other			
	51-4062	Patternmakers, Metal and Plastic			
Production Managers	51-1011	First-Line Supervisors/Managers of Production and Operating Workers	There is no standard preparation for this job; some have college degrees and others have been trained on the job. Employers prefer a college degree in business administration, management, industrial technology, or industrial engineering.	Interpersonal skills; Ability to compromise, persuade, and negotiate; Well-rounded individual with excellent communication skills	Many companies hire college graduates as first-line supervisors and promote them later. Workers can advance by obtaining college degrees, demonstrating leadership qualities, or by taking company-sponsored management courses. They can advance to plant managers or vice president for manufacturing.

Source: U.S. Department of Labor - Bureau of Labor Statistics - "Career Guide to Industries"

Appendix I

Union Membership and Collective Bargaining Agreements: National Data for Selected SOC Codes Related to Green Manufacturing, 2005

(Source: Unionstats.com. U.S. Historical Tables: Union Membership, Coverage, Density and Employment, 1973-2005)

SOC	Occupation (Standard Occupational Classification)	Obs	Employment	Members	Covered	Percent Members	Percent Covered
Production Managers							
51-1011	First-line supervisors/managers of production and operating workers	1,194	842,946	85,895	95,652	10.2%	11.3%
Assemblers and Fabricators							
51-2023	Electrical, electronics, and electromechanical assemblers	282	199,984	30,723	31,629	15.4%	15.8%
51-2041	Structural metal fabricators and fitters	37	32,273	4,400	4,400	13.6%	13.6%
51-2092	Team Assemblers	ND	ND	ND	ND	ND	ND
51-2099	Miscellaneous assemblers and fabricators	1,508	1,101,433	227,244	232,420	20.6%	21.1%
51-9199	Production workers, all other	1,215	875,518	179,441	189,579	20.5%	21.7%
Machinists							
51-4011	Computer-controlled machine tool operators, metal and plastic	ND	ND	ND	ND	ND	ND
51-4023	Rolling machine setters, operators, and tenders, metal and plastic	22	15,829	5,005	5,572	31.6%	35.2%
51-4031	Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	166	122,555	28,122	28,122	22.9%	22.9%
51-4032	Drilling and boring machine tool setters, operators, and tenders, metal and plastic	11	6,799	500	500	7.3%	7.3%
51-4035	Milling and planing machine setters, operators, and tenders, metal and plastic	9	5,182	0	0	0.0%	0.0%
51-4081	Multiple machine tool setters, operators, and tenders, metal and plastic	11	8,072	2,690	2,690	33.3%	33.3%
Welding and Soldering							
51-4121	Welding, soldering, and brazing workers	771	556,258	109,322	115,425	19.7%	20.8%
Steel Manufacturing							
51-4192	Lay-out workers, metal and plastic	11	9,035	2,014	2,014	22.3%	22.3%
51-4199	Metalworkers and plastic workers, all other	585	460,408	99,138	100,988	21.5%	21.9%
51-4062	Model makers and patternmakers, metal and plastic	9	6,822	681	681	10.0%	10.0%

Definitions:

- ND: No Data available
- COC: 1990 Census Occupation Code
- Obs: CPS sample size
- Members: Number of union members
- Covered: Number of workers covered by collective bargaining agreement
- Percent Members: Percent of employed workers who are members
- Percent Covered: Percent covered by collective bargaining agreements

Appendix J

Average Incidences of Reported Injuries (Non-Fatal)
OSHA

BUILDING ENVELOPE		
NAICS Code	**Establishment Size**	**Mean**
32614	1-10	*
	50-249	5.5
	250-999	3.3

FINISHES		
NAICS Code	**Establishment Size**	**Mean**
321219	11-49	7.1
	50 - 249	3.9
	250-999	2.1
32551	11-49	4.4
	50 - 249	3.5
	250-999	2.2
3255	11-49	5.9
	50 - 249	3.5
	250-999	2.7

GREEN ENERGY		
NAICS Code	**Establishment Size**	**Mean**
333611	1-10	*
	50 - 249	3.7
	1000+	2.8
334413	50-249	2.4
	250-999	1.7
	1000+	1
332322	1-10	2.4
	11-49	1.7
	50-249	10.5
	250-999	6.7

335931	1-10	*
	11-49	4
	50-249	5.6
	250-999	4
325211	11-49	7.2
	50-249	2.2
	250-999	1.5
	1000+	1.8
326113	1-10	*
	11-49	10.9
	50-249	7.7
	250-999	6.1
3272	1-10	4.9
	11-49	6.0
	50-249	8.1
	250-999	10.6
3314	All Firms	6.5
334515	1-10	*
	50-249	2.5
	250-999	1.6
	1000+	1.7
335313	11-49	2.1
	50-249	4
	250-999	6.7
335911	1-10	*
	50-249	2.5
	250-999	6
335999	11.49	2.9
	50-249	5.9
	250-999	2.4

HVAC		
NAICS Code	**Establishment Size**	**Mean**
333412	1-10	*
	50-249	13.5
	250-999	8
333414	11-49	5.1
	50-249	9
	250-999	8.1
333415	1-10	5.2
	11-49	4.2
	50-249	9.1
	250-999	5.6
	1000+	5.1
334512	1-10	*
	11-49	7.3
	50-249	6.6
	250-999	2.6
	1000+	1.3
334519	1-10	*
	50-249	4.6
	250-999	2.4

LIGHTING		
NAICS Code	**Establishment Size**	**Mean**
33511	1-10	*
	11-49	*
	50-249	2.3
	250-999	2.9
33512	11-49	3
	50-249	6.8
	250-999	6.7

335122	1-10	*
	11-49	2.4
	50-249	8.5
	250-999	6.6
335311	1-10	*
	50-249	7.6
	250-999	7.3

WATER CONSERVATION (INDOOR)		
NAICS Code	**Establishment Size**	**Mean**
333319	11-49	6.9
	50-249	6
333911	Total Firms	5.2
334514	50-249	3.8
	250-999	5.2

Source: Bureau of Labor Statistics, Occupational Safety and Health Administration
Data released: October 19, 2005 [1]

Mean Calculated per 100 Workers

** Total number of reported injury cases are < 15*

[1] "Total recordable cases - Injuries and illnesses, 2005" *Bureau of Labor Statistics*, 2005 [government agency]; available from Total recordable cases - Injuries and illnesses, 2005 http://www.bls.gov/iif/oshwc/osh/os/ostb1623.txt

Appendix L

	Consumer, Intermediate, or Producer Good?	Stable vs. Cyclical Markets?	Markets	Basis of Competition	Sources of Competition
BUILDING ENVELOPE					
Insulation	Consumer	Stable	The market for insulation exists across the U.S., but variations in regional demand are most likely dependent on local climates. There has also been a movement to advocate federal government-owned buildings to invest in green insulation because the government is the largest consumer of energy.	Quality and distinctiveness	Nationally: insulation is not widely produced in California Internationally: Canada, New Zealand
Windows	Consumer	Stable	The market is driven by both incentive programs (Energy Star Window Programs) and regional climate.	Quality and distinctiveness	Nationally. Many of the energy efficient window manufacturers are located outside of California.
FINISHES					
Paint	Consumer	Slow but stable	Market is driven by policy. Constant demand comes from public institutions that need to meet specific health requirements (schools, hospitals, public facilities, etc.). There isn't much of a demand from the general public because the average consumer is not well-educated about the product.	Quality and distinctiveness. Equivalent to higher-end paint.	Comes mostly from Mexico
Carpet	Consumer	Stable	Carpet inherently is not a green product because it is made with nylon and latex. Therefore the process of production is what makes carpet greener. Consumers are	Quality and distinctiveness. Carpet that isn't "green" is significantly cheaper and readily available.	Most of the carpet manufactured in the U.S. comes from Georgia

			rarely knowledgeable about the difference, therefore the market is very slim and mostly consists of architects and interior decorators who are actively seeking green products.		
GREEN ENERGY	Consumer	Stable – highly dependent on public incentive programs	Consumers are in areas with the strongest incentive programs: In the U.S: California, New Jersey, and Massachusetts. In Europe: Germany, the UK and France.	Quality and distinctiveness	Regional, National, and International. There is no competitive advantage in terms of location. The only cost advantage is for manufacturers in China who have larger facilities, therefore are able to cut some costs.
HVAC	Consumer	Stable	The market for efficient HVAC system relies on new commercial building construction and retrofitting that aims to be more energy efficient. Two of the five HVAC firms we have identified in LA County are large international firms (Sanyo and Mitsubishi), therefore we believe that the market base is also international.	Quality and distinctiveness	Unknown
LIGHTING	Consumer	Stable	Local markets are the most critical for lighting firms since transportation costs can easily make the cost of doing business outside of the local area less advantageous.	Speed and Distinctiveness. Lighting fixture products are often custom-designed products.	Regional

WATER CONSERVATION	Consumer	Stable	We believe that the market for water conservation also relies on green building initiatives. We have come across several municipalities that drive the market for water conservation with green building incentive programs (i.e. San Francisco and San Diego). They promote water conservation through the usage of gray water landscaping irrigation systems.	Quality and distinctiveness	We are unsure of where most water conservation products are produced since we have only been able to identify a handful of manufacturers.

Appendix M

U.S. Total Exports, Imports and Trade Balance (T Balance), 1998-2003
By 6-Digit NAICS Codes (Figures are in Millions of Dollars)
Source: International Trade Administration

NAICS	PRODUCT		1998	1999	2000	2001	2002	2003	'98 – '03 Change
Finishes									
321219	RECONSTITUTED WOOD	Export	310	338	367	331	329	306	-4
		Import	1,647	2,169	2,056	1,882	2,045	3,105	1,458
		T Balance	-1,337	-1,831	-1,689	-1,551	-1,716	-2,800	-1,462
325510	PAINTS AND COATINGS	Export	1,293	1,398	1,547	1,498	1,491	1,542	248
		Import	480	674	742	732	597	629	149
		T Balance	814	723	806	766	894	913	99
325520	ADHESIVES	Export	632	690	804	765	802	817	185
		Import	208	257	270	255	288	338	130
		T Balance	424	433	533	509	514	480	55
Green Energy									
333611	TURBINES & TURBINE GENERATOR SETS	Export	3,792	3,668	3,607	4,969	4,350	3,715	-77
		Import	1,064	1,584	2,670	4,846	3,830	2,417	1,354
		T Balance	2,729	2,084	937	123	520	1,298	-1,431
334413	SEMICONDUCTORS & RELATED DEVICES	Export	37,235	46,464	59,223	44,202	41,752	45,909	8,674
		Import	33,448	37,684	48,226	30,811	26,520	25,216	-8,231
		T Balance	3,788	8,780	10,997	13,391	15,232	20,692	16,905
325211	PLASTICS MATERIALS & RESINS	Export	10,415	10,570	12,595	12,155	12,483	13,502	3,088
		Import	4,542	4,852	5,784	5,625	5,664	6,580	2,037
		T Balance	5,872	5,717	6,811	6,530	6,819	6,923	1,050
326113	NOT REIN PLASTICS PLATES, SHEETS, ETC (EXC PKG)	Export	2,647	2,580	2,944	2,753	2,722	2,872	226
		Import	1,762	1,837	2,026	1,918	2,035	2,309	546
		T Balance	884	743	918	835	688	564	-321
3272	GLASS & GLASS PRODUCTS	Export	3,374	3,755	5,021	4,678	3,451	3,499	125
		Import	3,859	4,585	5,295	4,615	4,299	4,436	577
		T Balance	-485	-830	-274	63	-848	-937	-452
3314	NONFERROUS (EXC ALUM) & PROCESSING	Export	10,079	9,219	11,111	9,855	7,901	9,309	-770
		Import	14,183	14,348	17,935	15,782	12,715	12,807	-1376
		T Balance	-4,104	-5,129	-6,824	-5,927	-4,814	-3,498	606
332322	SHEET METAL WORKS	Export	66	62	65	63	60	58	-8
		Import	22	27	42	39	40	42	20
		T Balance	44	35	23	24	20	17	-28
334515	ELECTRICITY MEASURING/TESTING INSTRUMENTS	Export	5,428	6,060	8,179	6,479	5,464	5,411	-17
		Import	2,482	2,700	3,684	3,393	2,871	3,194	713
		T Balance	2,946	3,360	4,495	3,085	2,593	2,216	-729
335313	SWITCHGEAR & SWITCHBOARD APPARATUS	Export	1,519	1,559	1,814	1,584	1,496	1,591	71
		Import	1,231	1,451	1,803	1,707	1,649	1,732	501
		T Balance	288	108	11	-123	-153	-141	-429
335911	STORAGE BATTERIES	Export	845	859	932	894	780	722	-123
		Import	1,591	1,818	2,122	1,828	1,623	1,517	-74
		T Balance	-746	-958	-1,190	-935	-843	-795	-49
335931	CURRENT-CARRYING WIRING DEVICES	Export	1,637	2,056	2,440	2,032	1,966	1,976	339
		Import	1,711	1,844	2,072	1,769	1,785	1,887	176
		T Balance	-74	213	368	263	181	89	163
335999	MISC ELECTRICAL EQUIPMENT & COMPONENTS, NESOI	Export	3,629	3,657	4,769	3,938	3,736	3,659	30
		Import	2,754	3,023	3,707	3,428	3,361	3,540	786
		T Balance	875	633	1,062	510	375	118	-756
HVAC									
333411	AIR PURIFICATION EQUIPMENT	Export	244	212	202	205	200	207	-37
		Import	152	168	210	243	264	330	178
		T Balance	92	44	-9	-38	-64	-123	-215
333412	INDUSTRIAL & COMMERCIAL FANS & BLOWERS	Export	298	327	369	343	295	320	21
		Import	491	581	729	628	616	621	129
		T Balance	-193	-254	-361	-286	-321	-301	-108
333414	HEATING EQUIPMENT (EXC WARM AIR FURNACES)	Export	347	281	272	302	305	274	-73
		Import	300	393	460	465	486	561	260
		T Balance	47	-112	-188	-163	-181	-287	-334
333415	AC/WARM AIR HTG &	Export	4,757	4,700	4,852	4,642	4,433	4,275	-482

	COMMERCIAL REFRIG EQUIP	Import	1,955	2,286	2,662	2,705	3,186	3,787	1,833
		T Balance	2,802	2,414	2,189	1,938	1,247	488	-2,315
334512	AUTOMATIC ENVIRONMENTAL CONTROLS	Export	308	341	340	278	275	264	-44
		Import	509	571	623	649	718	733	224
		Balance	-201	-230	-282	-371	-443	-470	-269
334519	OTHER MEASURING & CONTROLLING DEVICES	Export	2,302	2,087	2,075	2,289	2,091	2,218	-84
		Import	906	949	863	952	1,126	1,173	267
		T Balance	1,397	1,138	1,212	1,338	965	1,045	-352
Lighting									
335110	ELECTRIC LAMP BULBS & PARTS	Export	837	836	868	776	747	718	-119
		Import	1,153	1,267	1,391	1,614	1,476	1,515	362
		Balance	-316	-431	-522	-838	-729	-797	-481
335311	POWER/DISTRIBUTION/SPECIALTY TRANSFORMERS	Export	615	566	545	543	499	500	-115
		Import	1,034	1,284	1,556	1,691	1,669	1,488	455
		T Balance	-419	-419	-718	-1,011	-1,169	-989	-570
Water Conservation (Indoor/Outdoor)									
333319	OTH COMMERCIAL/SERVICE INDUSTRY MACHINERY	Export	347	324	343	363	352	309	-37
		Import	215	234	248	239	249	297	81
		T Balance	131	90	95	124	103	13	-118
333911	PUMPS & PUMPING EQUIPMENT	Export	1,551	1,543	1,724	1,775	1,694	1,676	125
		Import	1,025	1,059	1,169	1,159	1,236	1,422	397
		T Balance	526	485	555	616	459	254	-272
334514	TOTAL FLUID METERS & COUNTING DEVICES	Export	255	264	282	295	360	358	102
		Import	204	219	243	274	279	313	109
		T Balance	51	44	39	22	80	45	-7

Appendix N

Ownership profiles/ Other Business Interests

Methodology:
The following sources were used to gather ownership profile and business interest information for some of our green building manufacturing companies: Hoover's Company records (A Dun and Bradstreet Company), the US Business Directory by infoUSA.com, Netvention Company Profiles by Netvention, Inc., company websites and SEC filings for Public companies. Because our list of companies was long and there was little information available for small privately owned companies, we concentrated our efforts on finding information for a few of the firms that were publicly owned.

BUILDING ENVELOPE

International Aluminum Corporation (parent company of International Window Corporation)

1. Firm-related unique information
International Aluminum Corporation (IAL) makes aluminum and vinyl building products for commercial and residential customers who want to build, remodel, or improve their homes or businesses. Through its International Window Corporation (IWC) subsidiary it makes Super Energy Efficient Windows and Wood Framed Windows.

Founded in 1957, International Aluminum Corporation blossomed into a multifaceted corporation of building products. Initially started as an aluminum window manufacturing company, International Aluminum gradually expanded to the current day number of 14 operating subsidiaries, which have over 1,700 employees and 23 facilities throughout North America.

NAICS CODES:
332321 - Metal Window and Door Manufacturing
332322 - Sheet Metal Work Manufacturing
332999 - All Other Miscellaneous Fabricated Metal Product Manufacturing
444190 - Other Building Material Dealers

2. Owners, background
Publicly owned and trades on the NYSE exchange under the ticker: IAL
Current Shares Outstanding: 4,300,000

Number of Shareholders: 280

3. Board membership

Board	Audit	Comp.	Nom.
John P. Cunningham	-	-	Member
Alexander L. Dean	Member	Chair	Member
Joel F. McIntyre	Member	Member	Chair
Norma A. Provencio	Chair	Member	-
Ronald L. Rudy	-	-	-
David C. Treinen	-	-	-
Cornelius C. Vanderstar (Chair)	-	-	-

4. Managers, background

OFFICERS (2006):

Name	Title	Cash Compensation	Total Compensation
Mitchell K. Fogelman	Senior Vice President, Finance and Secretary	$230,000	$334,477
Ronald L. Rudy	President and Chief Executive Officer	$285,000	$414,872
William G. Gainer	Senior Vice President, Operations	$185,000	$259,621

5. Investment in other companies, holding companies
SUBSIDIARIES**:**

- General Window Corporation
- International Extrusion Corporation
- International Extrusion Corporation-Texas
- International Window Corporation
- International Window-Arizona, Inc.
- Raco Interior Products, Inc.
- United States Aluminum Corporation
- United States Aluminum Corporation-Carolina
- United States Aluminum Corporation-Illinois
- United States Aluminum Corporation-Texas
- United States Aluminum Of Canada-British Columbia Ltd.
- United States Aluminum Of Canada-Ontario Ltd.

6. Business plan

International Aluminum Corporation's success has been attained through an aggressive yet controlled approach towards business. Identifying market trends and changes has provided customers with quality products and service. Constant development of products through a fully staffed engineering department has maintained the International Aluminum companies as market leaders. The growth and experience of the International Aluminum companies continues to provide success to existing customers.

Sources:

Hoover's Inc. – Hoover's Company Records - In-depth Records,
The McGraw-Hill Companies, Inc. – Standard & Poor's Corporate Descriptions plus News,
CoreData, Inc. – U.S. Executive Compensation Database
http://www.intlalum.com/index.htm

GREEN ENERGY

Capstone Turbine Corp.

1. Firm-related unique information

The company makes the Capstone MicroTurbine, a power generating system that produces environmentally friendly electricity and heat. Capstone Turbine Corp. develops, manufactures, markets and services microturbine technology solutions for use in stationary distributed power generation applications, including cogeneration (combined heat and power (CHP) and combined cooling, heat and power (CCHP)), resource recovery and secure power. The products include major design features such as patented air-bearing technology, digital power electronics and advanced combustion technology.

NAICS CODES:
333611 - Turbine and Turbine Generator Set Units Manufacturing
33591 - Battery Manufacturing
335911 - Storage Battery Manufacturing
335999 - All Other Miscellaneous Electrical Equipment and Component Manufacturing
336322 - Other Motor Vehicle Electrical and Electronic Equipment Manufacturing

2. Owners, background

Publicly owned and trades on the NASDAQ exchange under the ticker: CPST.
Current Shares Outstanding: 103,000,000.
Rho Capital Partners owns nearly 6% of Capstone Turbine.

3. Board membership

Board	Audit	Comp.	Nom.
Richard K. Atkinson	-	-	Member
Richard M. Donnelly	Member	-	Chair
John V. Jaggers	-	Chair	Member
Noam Lotan	Member	Member	-
Eliot G. Protsch (Chair)	-	-	-
Dennis Schiffel	Chair	-	-
Gary D. Simon	-	Member	-
John R. Tucker	-	-	-
Darrell J. Wilk	-	-	-

4. Managers, background

OFFICERS (2006):

Name	Title	Cash Compensation	Total Compensation
Karen Clark	Former Senior Vice President and Chief Financial Officer	$107,830	$295,330
Walter J. McBride	Executive Vice President and Chief Financial Officer	$180,632	$1,222,284
John Tucker	President and Chief Executive Officer	$400,400	$400,400
John Fink III	Executive Vice President of Business Development and Chief Marketing Officer	$205,000	$327,062
Michael Redmond	Senior Vice President of Quality	$205,000	$305,000
Leigh L. Estus	Senior Vice President Operations	$74,374	$624,374

Walter “Chuck” McBride
Executive Vice-President and Chief Financial Officer
Mr. McBride joined Capstone Turbine Corporation in July 2005, as Executive Vice-President & Chief Financial Officer. Prior to Capstone, Mr. McBride most recently served as Executive Vice-President & CFO from 2000 to 2005 of First Consulting Group Inc. (Nasdaq: FCGI), an information technology services company. Prior to FCG, Mr. McBride served as the CFO at Emulex (NYSE: ELX), Kistler Aerospace, Unplugged Communication and CalComp. Mr. McBride graduated from Ohio State University with a bachelor’s degree in accounting/finance with honors. He earned a master’s degree in computer systems management from the Rochester Institute of Technology. He is a member of Financial Executives International.

John Fink , III
Executive Vice President, Business Development and Chief Marketing Officer
Mr. Fink was named Executive Vice President, Business Development and Chief Marketing Officer in April 2006. Mr. Fink joined the Capstone Leadership in 2003 as Sr. Vice-President and has held positions in Sales and Service, and Operations. His professional career in leadership of sales and service functions spans executive level positions with several industry leading companies, Westinghouse Electric, AEG-Westinghouse Transportation, ABB-Daimler Benz Transportation, DaimlerChrysler Rail Systems and York International. He has a broad range of experience including new product development, outsourcing and licensing. He was responsible for international marketing, sales and project management while living in Berlin , Germany . Other experience includes worldwide parts distribution, service and repair operations. Mr. Fink received his B.S. in Marketing from the University of South Carolina .

Leigh L. Estus
Senior Vice President of Operations
Mr. Estus joined Capstone Turbine Corporation on November 7, 2005. Prior to Capstone, Mr. Estus most recently served as Director of Operations at the communications & countermeasures systems division of EDO Corporation (NYSE:EDO). Prior to his employment with EDO, Mr. Estus spent more than 16 years with BAE Systems, where he held the positions of Vice President of Operations and Director of Support Solutions. Prior to BAE Systems, Mr. Estus was employed by Whittaker Electronics Systems and Hughes Aircraft Company. He is a Six Sigma Champion and member of the American Management Association and Manufacturers' Alliance for Productivity and Innovation.

5. Investment in other companies, holding companies
SUBSIDIARIES: Capstone Turbine International Inc, 100%

6. Business plan
As part of a strategic realignment, Capstone is working to reduce production costs and increase operating efficiency. The company has announced plans to provide direct sales and service, rather than relying exclusively on third-party distributors and authorized service agents.

Sources:
Hoover's Inc. – Hoover's Company Records - In-depth Records,
The McGraw-Hill Companies, Inc. – Standard & Poor's Corporate Descriptions plus News,
CoreData, Inc. – U.S. Executive Compensation Database
http://www.capstoneturbine.com/index.asp

Appendix O

Industry Periodicals

California Builder (http://www.californiabuildermagazine.com/internal.asp?pid=2)

ecoLogical Home Idea (http://www.ecologicalhomeideas.com/magazine/index.cfm)

Eco-Structure (http://www.eco-structure.com/)

Environmental Design & Construction (http://www.edcmag.com/)

Green Building Product Dealer

Natural Home (http://www.naturalhomeandgarden.com/)

Plenty Magazine (http://www.plentymag.com/)

Solar Today (http://www.solartoday.org)

Sustainable Industries Journal (http://www.sijournal.com/)

Appendix P

Interview Questions

Function

- What exactly does the product do?
- How is it integrated into the building construction? Is it a component which is part of a broader system? Energy? HVAC? Ventilation? Pluming? Framing? Etc.
- What are its green benefits? More efficient? Less toxic? Made from recycled material? Certified materials made through environmentally responsible methods?
- How does it compare to its non-green alternatives? Life span? Price? Difficulty/complexity to setup and use?
- Is it a high end product? Is it a necessary or luxury item for buildings?
- What is the size of the product? Are there different sizes or categories?

Production Method

- How is it produced? What does the manufacturing or supply chain look like? From where do your materials come?
- Does it require a large manufacturing plant with a large foot print and storage space? Is it manufactured in one place and stored in another?
- How many employees does it take to make this product?
- How long does it take to produce the product?
- What kind of machinery is used in the manufacturing process?
- Does it require the handling of hazardous substances?
- Does the production process require physical strength or dexterity?

Labor Force

- How many workers do you employ? Do you anticipate growth?
- Can you please describe the composition of your workforce? Age range? Gender? Education?
- Where do most of your employees reside? Are they local or do they commute from a distance?
- What is the employee turnover rate?

- Do employees need to drive to places for delivery, installation, pick-up? Do they need a driver's license?

- What type of skills do your employees need? Special skills? Technical skills? Computer skills? Electrical skills? Safety skills?

- What type of skills do entry-level employees need?

- Are there opportunities for advancement?

- Does the firm offer a job training program?

Market

- Is the demand for your product steady? Increasing?

- Have you observed an increasing demand for locally manufactured products in recent years as the green building industry has become more popular? What are the trends is Los Angeles?

- Who orders your product? What regions demand it – local, regional, international?

- What types of green products are in high demand? Has there been a decrease in demand for certain products?

- Does a certain region have a stronghold on producing this product?

- What current policies have directly impacted your company and/or industry?

Business

- Why is the business located in Los Angeles? Owner preference? Program/Tax incentives? High demand for the product locally? Adequate labor supply?

- How old is the company? Has it merged?

- Who are the competitors? Are there similar products?

- What contractors do you work with? Who are some of the major building contractors in Los Angeles that have a reputation for green building?

Others

- Can you refer us to any other resources?

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Bureau of Labor Statistics, Occupational Outlook Handbook 2006-07 Edition. http://www.bls.gov/oco/

Bureau of Labor Statistics, Quarterly Census of Employment and Wages. http://data.bls.gov/PDQ/outside.jsp?survey=en

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Green Building Resource Center. http://www.globalgreen.org/gbrc/services.htm

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