

# **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

A Report to the Chicago Climate Action Plan and  
its Renewable Energy Task Force

Aug 2009

**Chicago Manufacturing Renaissance Council**

3411 W Diversey Ave, Suite 10 Chicago, Illinois 60647 [ChicagoManufacturing.org](http://ChicagoManufacturing.org)

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

### **Introduction**

The national discussion regarding so-called “green jobs” often lacks clarity about the quality and nature of these jobs, in terms of pay, career paths, and demand. Because manufacturing is so critical to our society and because of the promise that many “green” opportunities hold for the industry, manufacturing represents one of the most critical and dynamic elements of the emerging “green economy.” Accordingly, most long-term and well-paying green jobs will likely come from manufacturing.

In this paper, we have looked at some of the key green manufacturing industries with potential to grow in the Chicago region; identified critical occupations related to these industries; and attempted to determine the extent to which the region’s workforce development system can meet increased demand for these critical skilled production positions.

For the purposes of this document, we have defined “green manufacturing jobs” as positions situated in industries that generate green products, such as products that in some way help to combat climate change, clean the environment, mitigate environmental damage, reduce consumption of fossil fuels, etc. We do not define “green manufacturing jobs” in terms of the internal practices of a company or the environmental impact of its processes.

The renewable energy industries that have been widely identified as offering the most growth potential in the near future are wind, solar, geothermal, and biomass.<sup>1</sup> Government and private sources are expected to invest \$450 billion dollars in these industries over the next three years—an investment that could create 1.7 million jobs annually.<sup>2</sup> The renewable energy infrastructure will rest on billions of dollars of high-tech, complex products, such as wind turbine materials. Manufacturers in the Chicagoland area could be well positioned to become leaders in this global market.

### **What kind of jobs are we talking about?**

The most optimistic projections expect literally millions of new green jobs to emerge in renewable energy over the next few years. However, not all of these jobs are equal in their quality, duration, and pay. A report by the Political Economy Research Institute at the University of Massachusetts on Green Jobs<sup>3</sup> predicts potential wages for new jobs in renewable energy, testing for different levels of investment in the industry under various scenarios. The study found that, on average, nearly 50% of jobs created would pay \$12.00 an

---

1 “How to Revitalize America’s Middle Class with the Clean Energy Economy” -- Renewable Energy Policy Project; Green Pathways Out of Poverty: Workforce Development Initiatives—Green For All; “Greening Wisconsin’s Workforce: Training, Recovery, and the Clean Energy Economy” – Center on Wisconsin Strategy

2 How Clean-Energy Policies Can Fight Poverty and Raise Living Standards in the United States, The Political Economy Research Institute. UMASS Amherst. 2009

3 Ibid

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

hour or less, and 74% of all green jobs would pay \$15.00 an hour or less. The top 25% of potential jobs averaged around \$25 per hour.

Because the term “green jobs” encompasses such a wide variety of positions, policymakers must consciously strive to create the most desirable jobs with the greatest social impact.

Careers in advanced, high-tech manufacturing rank among the highest paid in the country, with average yearly wages adding up to \$58,000 per year in 2006, not including benefits.<sup>4</sup> These positions offer exciting career paths and long term employment. Many companies employ candidates without four-year degrees, and although they require extensive training and ongoing education, no other sector in the economy promises such a significant return on investment for public sector dollars. In Illinois, every job in manufacturing creates three more jobs in other sectors, such as retail and distribution. Jobs in other industries like service, construction, and tourism create far fewer. Growth in the manufacturing industry spills over into other sectors.

Public investment in renewable energy is especially attractive because manufacturers in the industry not only participate in the green economy; they lead its transition into the mainstream. Manufacturing helps to build a dynamic economy driven by innovation and long term competitiveness. For manufacturers in Chicago, expansion into wind, solar, and other renewable energies represents the path to global leadership.

### **The Wind Turbine Industry**

For the purposes of this report, we will focus primarily on the wind turbine component market, analyzing it as a case study. The wind turbine supply chain is a complex system composed of several layers. A turbine is the end product, assembled from hundreds of components produced by a number of key suppliers. Generally, these suppliers follow specifications set by the turbine manufacturers, or Original Equipment Manufacturers (OEMs). OEMs typically design and assemble wind turbines.

In 2008, wind energy OEMs invested \$8.5 billion turbine components.<sup>5</sup> Over the coming decades, this amount is project to grow at a double-digit annual rate.<sup>6</sup> The skyrocketing global demand for wind turbine components presents a golden opportunity for American manufacturers. Most of the dominant wind turbine OEMs are based in Europe and Asia. These companies have not yet established a supply chain in the United States, but they are currently searching worldwide for manufacturing facility locations, and they are looking for American based companies to provide them with components. US manufacturers are in a great position to enter this rapidly growing market, which could help our communities grow and attract new business.

---

4 Us Census Bureau County Business Patterns, 2006 Cook and Nine County Chicagoland area.

5 American Wind Energy Association Value Chain Fact Sheet. [http://www.awea.org/pubs/factsheets/metal\\_working.pdf](http://www.awea.org/pubs/factsheets/metal_working.pdf).

6 Ibid.

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

It is difficult to estimate how much investment and job creation the wind turbine industry would generate, but one report singled out Illinois as a potential hotspot. The study found that, if local companies can successfully enter the turbine supply chain, Illinois could gain as many as 57,000 manufacturing jobs and \$2.8 billion in annual investment.<sup>7</sup>

In this report, we will focus on the wind turbine industry example in order to:

- Better understand the workforce needs of this sector
- Determine how we can improve our workforce policies to prepare us for leadership in renewable energy industries
- Explore other factors that could influence our competitiveness vis-à-vis these sectors
- Identify other areas for intervention

### **Workforce**

By and large, green manufacturing jobs are not new jobs. They are the next iteration of existing occupations within traditional manufacturing industries. Rather than completely new occupations, we are seeing the reorientation of existing industries towards new markets. The wind turbine industry is a classic example of this dynamic. Machining of metal parts is a critical process in this industry, as in dozens of other manufacturing industries. However, the wind energy industry requires specialized large-scale machining due to the turbine components' enormous size. But large-scale machining is not a new occupation, and it does not require unique training per se.

The turbine and turbine generator component industries are composed of literally hundreds of different occupations. However, certain key industries are among the most difficult to staff with skilled employees because of they require a relatively large number of skilled workers. Existing demand to fill these positions is among the highest across all manufacturing industries. Nearly 7,000 production positions become available every year in the Chicago region.<sup>8</sup>

Below are 2006 employment figures for the top occupations in the turbine and turbine generator component industries described above. The data include projected employment figures for 2016 and the projected need on an annual basis for new and replacement workers throughout the Chicagoland region.

---

<sup>7</sup> "Wind Turbine Development. Location of Manufacturing Activity" The Renewable Energy Policy Project. 2004.

<sup>8</sup> Illinois Department of Employment Security. Chicago-Joliet-Naperville Occupation Matrix 2007.

# Chicago Manufacturing Renaissance Council

## Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges

Title	Base Year Employment 2006	Projected Employment 2016	Employment Change 2006-2016		Average Annual Job Openings		
			Number	Percent	Growth	Replacements	Total
Team Assemblers	46,597	57,536	10,939	23.48	1,094	969	2,063
Maintenance and repair workers, general	35,502	39,644	4,142	11.7	308	83	391
General and Operations Managers	35,295	36,585	1,290	3.65	129	851	980
Helpers--production workers	19,694	21,839	2,145	10.9	-287	484	197
Production Workers, All Other	19,092	21,410	2,318	12.14	232	395	627
Machinists	17,023	17,439	417	2.5	42	264	306
Electricians	15,185	16,321	1,136	7.48	114	390	504
Inspectors/Testers/Sorters/Weighers	13,471	13,286	-184	-1.36	-18	199	181
Computer Software Engineers	11,350	18,288	6,939	61.13	694	166	860
1st-Line Svrs/Mgrs, Mechs/Installrs	10,274	10,994	720	7.01	72	241	313
Welders, cutters, solderers, and brazers	9,153	9,448	295	3.2	-167	194	27
Computer-controlled machine operators	5,772	5,637	-136	-2.3	-81	69	-12
Industrial machinery mechanics	5,679	6,417	738	13.1	74	95	169
Mechanical Engineers	5,502	5,800	298	5.41	30	119	149
Industrial Engineers	4,655	6,220	1,565	33.62	156	112	268
Sheet Metal Workers	4,351	4,682	331	7.61	33	106	139
Tool and die makers	3,874	3,473	-401	-10.4	-92	52	-40
<b>Total</b>					2,333	4,789	7,122

Source: "Chicago Metro Area Employment Matrix, Employment by Industry, Occupation and Percentage Distribution, 2006 and Projected 2016" by Illinois Department of Employment Security.

Not only do these occupations have high growth rates, they also have high replacement rates. Manufacturers face difficulties filling the increasing number of vacancies left by retiring baby boomers, who are often the most skilled or specialized members in the workforce. This gap illustrates the need for a strong education and training infrastructure that can provide a talent pipeline for high-tech, skilled manufacturing positions.

The data shows five occupations with over 500 projected annual job openings:

- Maintenance and Repair Workers General
- Team Assemblers
- General and Operations Managers
- Other Production Workers
- Electricians
- Computer Software Engineers as areas of need

# Chicago Manufacturing Renaissance Council

## Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges

We also find eight more with least 100 projected annual job openings:

- Helpers--production workers
- Inspectors/Testers/Sorters/Weighers
- Machinists
- 1st-Line Svrs/Mgrs, Mechs/Installrs
- Industrial machinery mechanics
- Mechanical Engineers
- Industrial Engineers
- Sheet Metal Workers

We divided these positions into the **high-level skill, mid-level skill, and low-level skill** categories, and found an increasing need in the high-level skill occupations, which require a bachelor degree or more. These occupations include:

- Industrial Engineers
- Mechanical Engineers
- Computer Software Engineers and
- General and Operations Managers

Mid-level skill occupations do not require a four year degree, but they do require a substantial amount of post secondary training, credentials, and experience. We also find a substantial increase in need for mid-level skill occupations, including:

- Machinists
- Electricians
- Sheet Metal Workers;
- 1st-Line Supervisors, Managers of Mechanics and Installers
- Computer-Controlled Machine Operators
- Industrial Machinery Mechanics

Mid-level skill workers often require specialized training over a series of years. These were also are among those identified in CLCR's 2001 report "Creating a Manufacturing Career Path System in Cook County" as severely underserved occupations areas in terms of their training infrastructure and connection to industry. Manufacturers face an acute shortage of mid-level skill workers, particularly machinists, maintenance and repair workers, and other production employees. These positions are the pillars of a manufacturing business.

Finally we have the low-level skill occupations:

- Team Assemblers
- Welders, Cutters, Solderers, and Brazers
- Helpers--production workers

While low-level skill occupations are less critical to the overall success of these industries, the staggering number of projected job openings in the next decade suggests a shortage of

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

workers with the basic competencies required to obtain basic certifications. Among just these three lower skill occupations, we can identify an annual need for more than 2,200 replacement workers.

The above projections for the next ten years are based on past changes in employment and estimated future replacement. A shortcoming of this approach is its lack of dynamism, and correspondingly, its failure to account for demographic changes such as the widely expected baby boomer mass retirement. Moreover, this approach cannot account for growth from new or emerging markets such as renewable energy.

As our capacity to build turbine components grows, along with the turbine and turbine generator industries, the workforce development system will be faced with growing demand for skilled workers with relevant competencies. Just as critical gaps in the education and training system threatens the long term viability of American manufacturing, they may threaten the emergence of new green industries.

### **Training Infrastructure**

If we take the example of the turbine and turbine generator component industries, we find a lack of alignment, in terms of quality and quantity of graduating students, between the needs of the companies in this sector and the current workforce development system. This disconnect between our training system and the projected demand for skilled labor raises serious doubts about Chicagoland's ability to become a leader in high-tech, green manufacturing. This discrepancy affects advanced manufacturers of all kinds.<sup>9</sup>

In spite of the broad manufacturing base in Chicago, there is no guarantee that regional companies will lead in these emerging sectors. Many other states and metropolitan areas throughout the country are pursuing clear and effective strategies to position themselves as leaders. California, Ohio, Colorado, Iowa, and Michigan are a few of the most prominent examples. In this report, we will look briefly at some critical areas where Chicago maintains a competitive advantage, or where with a concerted and directed effort it could cement a competitive advantage that translates into leadership in one of these growing industries.

### **Turbines and Turbine Generators Industry**

In order to better understand the wind turbine industry and our region's capacity to develop leadership in renewable energy through proactive policies, we will look at some of Chicagoland's overall characteristics.

The turbines and turbine generators industry has a very strong presence in Illinois, and nearly half of Illinois's turbine and turbine generator production capacity is located in the Chicago

---

<sup>9</sup> Creating A Manufacturing Career Path System in Cook County." The Center for Labor and Community Research.

# Chicago Manufacturing Renaissance Council

## Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges

metropolitan area. Wind turbines are a component of this industry, representing approximately 65% of all national turbine production. In 2007, the total sales generated by turbine and turbine generator manufacturers in Illinois amounted to about \$827 million, representing 9% of national output. In comparison, Iowa companies accounted for only 3% of the total, and Indiana and Wisconsin for 2%.<sup>10</sup>

In 2007, Chicago area turbine and turbine generator manufacturing companies employed 662 people directly and generated \$386 million in sales—only \$100 million less than the combined outputs of Iowa, Wisconsin, and Indiana.

Materials and services, labor, and indirect business taxes are the three intertwined cost components that determine the profitability of any industry, per a formula as follows:

$$\text{Output} - (\text{Materials \& Services} + \text{Labor} + \text{Indirect Business Taxes}) = \text{Profit}$$

A higher cost in one component leads to a lower profitability for the industry.

### Costs and Profit Comparison between Chicago and Neighboring States, 2007

	Chicago	Illinois	Iowa	Indiana	Wisconsin	US
<b>Materials &amp; Services</b>	56.8%	57.4%	68.9%	63.5%	59.2%	61.0%
<b>Labor</b>	21.6%	21.3%	15.5%	18.2%	20.4%	19.5%
<b>Profits</b>	21.5%	21.2%	15.5%	18.2%	20.3%	19.4%
<b>Indirect Business Taxes</b>	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%

Source: “Turbine and Turbine Generators Industry”, 2007 Illinois, Iowa, Indiana, Wisconsin and US Industry Input-Out Model compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

The above chart comparing the Chicago area with neighboring states in terms of the cost components of the turbine industry indicates that:

1. The difference in indirect business taxes levied by government in different geographical areas is negligible
2. The major competitive advantage for the Chicago area industry is the lower cost for materials and services
3. Because the materials and services cost in the Chicago area is significantly lower than in other states, the Chicago industry has a relatively high profit despite its relatively high labor cost

---

<sup>10</sup> “Turbine and Turbine Generators Industry”, 2007 Illinois, Iowa, Indiana, Wisconsin and US Industry Input-Out Model compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

While the turbine and turbine generator sector is comprised of a wide variety of manufacturing companies, including wind turbine producers, a critical advantage that Chicago maintains is the concentration of efficient services and materials providers that make business in our region significantly more profitable than in other parts of the state or in neighboring states.

### **Supply Chain of Turbine Industry in Chicago Area**

A utility grade wind turbine has five major components: rotor, nacelle and controls, gearbox and drive train, generator and power electronics, and tower. The manufacturers that have been identified to have the capability to produce or assembly these components are considered as the first tier suppliers to the wind turbine industry. The suppliers that supply materials and parts to these first tier suppliers are the second tier suppliers, and so on, so forth. Like all the industries, the first tier suppliers in the wind turbine manufacturing industry are fairly well established and relatively few in number. Therefore, for the purposes of this report we will focus on the second tier suppliers of wind turbine components.

According to the North American Industry Classification System (NAICS), the most important sectors that supply the wind energy industry are as follows:

<b>NAICS</b>	<b>NAICS Description</b>
333612	Speed changer, industrial
331511	Iron foundries
333613	Power transmission equipment
326199	All other plastics product manufacturing
333611	Turbines, and turbine generators, and turbine generator sets
335312	Motors and generators
332312	Fabricated structural metal
335999	Electronic equipment and components, NEC
334519	Measuring and controlling devices
332991	Ball and roller bearings
334418	Printed circuits and electronics assemblies

### **Regional Absorption Coefficient**

To measure the degree to which local suppliers can satisfy the needs of an industry, economists usually utilize the regional absorption coefficient (RAC), a ratio of local purchases to the industry demands for materials and services. The higher the regional absorption coefficient is, the better the local support to the industry. Based on 2007 regional economic data, Chicago area companies can supply 44% of the Chicago turbines and turbine generators industry's total purchases. In comparison, Iowa's local firms can meet 30% of industry need; Indiana, 34%; and Wisconsin, 38%. In other words, the Chicago metropolitan area has a broader industry base to support the turbine and turbine generators industry. The

# Chicago Manufacturing Renaissance Council

## Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges

relative cost and ease of doing business in Chicagoland is superior to that of neighboring states and the state as a whole, resulting in lower business costs and a significant advantage for companies in the region.

### Regional Absorption Coefficient Comparison between Chicago Area and Neighboring States, 2007

	Chicago	Illinois	Iowa	Indiana	Wisconsin
M & S Purchased	218.8	474.8	152.8	88.7	73.8
Locally Purchased	95.8	206.0	46.1	29.9	27.7
<b>RAC</b>	<b>43.8%</b>	<b>43.4%</b>	<b>30.2%</b>	<b>33.7%</b>	<b>37.5%</b>

Source: “Turbine and Turbine Generators Industry”, 2007 Illinois, Iowa, Indiana, Wisconsin and US Industry Input-Out Model compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

Again we see that the Chicagoland area has real advantages over neighboring regions in terms of cost, localized supply chain, efficiency of services, and ease of transport. However, we must deepen our analysis to the next level and look at the characteristics of individual industries that supply the turbine industry.

### Valve and Fittings Manufacturing

To build turbines, the turbine and turbine generator industry purchases materials and services from 105 other industries. One of the top supply industries is Valve and Fittings Other Than Plumbing Manufacturing, which accounts for 2% of materials and services purchased by the turbine and turbine generators industry.<sup>11</sup>

In 2007, the Chicago valve and fittings companies employed 4,417 people with \$1,317.8 million in sales. However, in spite of such a large concentration, the industry fell short of meeting the Chicago turbine industry’s demand.

---

<sup>11</sup> Source: “Turbine and Turbine Generators Industry”, 2007 US Industry Input-Out Model by Industry compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

**Chicago Manufacturing Renaissance Council**  
**Making Chicago a Leader in Manufacturing for Renewable Energy:**  
**Workforce and Supply Chain Challenges**

**Chicago Valve and Fittings Manufacturers Sales to Turbine Industry, 2007**

	<b>Chicago</b>	<b>Illinois</b>	<b>Iowa</b>	<b>Indiana</b>	<b>Wisconsin</b>	<b>US</b>
In millions of \$						
<b>Turbine ind. purchases from V&amp;F</b>	5.25	11.39	3.66	2.13	1.77	148.89
<b>Local V&amp;F sales to turbine ind.</b>	1.19	2.54	0.85	0.29	0.34	94.59
<b>Local sales as % of total turbine ind. Purchases</b>	22.7%	22.3%	23.2%	13.6%	19.2%	63.5%
<b>Number of employees</b>	4,417	6,417	2,667	982	2,400	81,789
<b>Outputs (millions)</b>	1,317.8	1,889.0	792.3	264.6	702.7	24,708.8
<b>V&amp;F per employee sales to turbine ind</b>	269.41	395.82	318.71	295.32	141.67	1,156.51
<b>Local V&amp;F sales to turbine ind as % of output</b>	0.09%	0.13%	0.11%	0.11%	0.05%	0.38%

Source: "Valve and Fittings Other Than Plumbing Industry", 2007 Illinois, Iowa, Indiana, Wisconsin and US Industry Input-Out Model compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

As the above chart indicates, in 2007, the Chicago turbine industry purchased \$5.25 million in materials and services from the valve and fittings industry. However, the Chicago valve and fittings industry met only 22.7% of this demand, while producing \$269 on a per employee basis and representing less than 0.1% of total industry output. In comparison, the Iowa valve and fittings companies sold \$319 per employee to the Iowa turbine industry on the per employee basis, accounting for 0.11% of total output. This disparity indicates a mismatch between demands and supplies among the Chicago turbine and valve and fittings industries.

Also, available performance data indicates that the Chicago valve and fittings industry lags behind in productivity and profitability, compared to neighboring states. As the following chart shows, the output per compensation dollar is the lowest among the states in question. The profit-to-output ratio is the highest among neighboring states, but still lower than the national average. There appears to be room for improvement in the region's production efficiency.

**Performance of Chicago Valve and Fittings Industry, 2007**

<b>Chicago</b>	<b>Illinois</b>	<b>Iowa</b>	<b>Indiana</b>	<b>Wisconsin</b>	<b>US</b>
----------------	-----------------	-------------	----------------	------------------	-----------

**Chicago Manufacturing Renaissance Council**  
**Making Chicago a Leader in Manufacturing for Renewable Energy:**  
**Workforce and Supply Chain Challenges**

<b>Number of Employees</b>	4,417	6,417	2,667	982	2,400	81,789
<b>Compensation (millions of \$)</b>	284.6	404.7	166.9	46.7	146.1	5,325.8
<b>Output (millions of \$)</b>	1,317.8	1,889.0	792.3	264.6	702.7	24,708.8
<b>Industry Profit (millions of \$)</b>	229.0	323.7	137.0	40.8	119.6	4,346.4
<b>Output per Employee (\$)</b>	298,350	294,381	297,078	269,485	292,780	302,104
<b>Output per Compensation \$</b>	4.63	4.67	4.75	5.67	4.81	4.64
<b>Profit-to-Output Ratio</b>	17.4%	17.1%	17.3%	15.4%	17.0%	17.6%

Source: “Valve and Fittings Other Than Plumbing Industry”, 2007 Illinois, Iowa, Indiana, Wisconsin and US Industry Input-Out Model compiled by IMPLAN, based on data collected by the US Census Bureau, Bureau of Economic Analysis and the Bureau of Labor Statistics.

This data on the Chicago Valve and Fittings Other Than Plumbing Industry is significant for several reasons. We see of number of weakness in this industry and a number of important strengths.

First, we see that this key industry is not serving the turbine industry well. A very small portion of its output is currently meeting that demand. Sales per employee for the turbine industry are low, which reflects the weakness of this sector in terms of its ability to supply turbine manufacturers. The Chicagoland industry is relatively weak compared to neighboring regions in terms of output per compensation dollar, reflecting higher labor costs.

On the other hand, we see that this industry is by far the most profitable among any in the region, both for workers and company owners. It also does a reasonably good job of supplying companies locally. We also can note that productivity is the highest in the region, with Chicago area workers showing the highest output per worker in the group.

Chicago area valve companies are highly profitable, pay workers well, and have productive workforces. This likely reflects the quality of Materials of Services they have available and the skill of their workforce. In this case the competitive advantage of Chicago is clearly workforce and the lower cost of doing business. On the other hand, we have identified that our valve industry does have high labor costs *and* that it is not penetrating a critical market that is increasingly growing and profitable.

This validates our claim about the importance of workforce quality in the competitiveness of companies and demonstrates how critical it is that we have a workforce system that responds to the needs of critical and emerging markets, if we are to have a chance at developing real

# **Chicago Manufacturing Renaissance Council**

## **Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges**

market leadership. It also shows clear areas for policy intervention, helping in this case valve companies to penetrate a new market, by leveraging their strengths relative to the competition.

A similar such analysis throughout the supply chain of the Wind Turbine and Turbine Generators industry would reveal a concise intervention plan for aiding companies and cement Chicago's status as a leader in building the Green Economy.

As a result of our analysis we have so far determined that:

- 1) Clear careers paths don't exist for green manufacturing jobs; career paths exist for certain manufacturing occupations we identified that are critical for advanced manufacturing companies that produce for green industries. For instance, CNC operators or welders.
- 2) The training programs in our region that serve the few, well-defined career paths vary greatly in quality, certification and use of certificates, and do not produce sufficient graduates to meet the need of all industries. Acute shortages of these skilled workers already exist and are expected to worsen in the future.
- 3) We can expect area residents, students, and job seekers to miss out on many opportunities in advanced manufacturing and green manufacturing because of the disjointed nature of our system, the lack of quality programs, and the lack of alignment between programs and industry need.
- 4) Green manufacturing industries will face challenges recruiting and maintaining a skilled workforce in the coming decade, just as many advanced manufacturing companies in Chicagoland already do. This will result in genuine challenges to the growth and vitality of this industry in the region.

### **Conclusions and Recommendations**

The above analysis points to a path to how through focusing on anticipating and meeting the workforce issues of the emerging green manufacturing industries and by analyzing the position of area companies vis-à-vis these markets, the Chicagoland area can be a leader in manufacturing for the Green economy. This type of analysis can then be extended to the remaining sectors that supply the turbine industry *and* to other renewable energy industries or Green industries. An analysis that takes into account the existing infrastructure of Chicago manufacturing in terms of the emerging green industries is critical to understanding how to best position ourselves to enter these markets.

As a follow up to this initial research we recommend that a comprehensive analysis of the strategic sectors that supply to the most critical renewable energy industries identified here: Wind, Solar, Biomass and Geothermal, starting with a sectoral analysis that looks at the

# Chicago Manufacturing Renaissance Council

## Making Chicago a Leader in Manufacturing for Renewable Energy: Workforce and Supply Chain Challenges

current advantages/advantages inherent in the supplier industries and their relative positioning currently. Then this initial step must be followed by a secondary phase that looks at individual companies, identifies their individual characteristics, products, processes, financial viability and targets existing resources and services to help them successfully tackle these new markets.

On the other hand companies (and our analysis has shown in a small way), depend on skilled labor to be profitable and thrive. In part the success of the valve industry is based on that. However, there is a real danger that our workforce development system may not make the adequate changes to meet current projected need, apart from any new need that could arise from emerging industries. There is nothing inevitable about Chicago becoming a leader in these Green industries. The fact that “Green” manufacturing jobs will mostly not be new occupations, *does not mean that we can rely on old systems to fill these jobs with skilled and competent employees*. Only with a strategy that looks at both “creating” demand on one end, and ensuring supply of workers can we truly build leadership in this industry.

A solution that only looks at one side of the equation, for instance the workforce side, risks creating a supply of workers that may not correspond to the demand.

In terms of the workforce question, we have the following recommendations to begin to address the disconnect between the projected future need for manufacturing workers and the capacity and quality of our educational system:

- 1) The Chicago area must develop a career path system, based on the National Association of Manufacturers-Endorsed Skill Standards System, at the secondary and post secondary level. This would go a long way towards creating the necessary career paths for advanced manufacturing industries.
- 2) This system must contain a series of flexible delivery systems, including Community Colleges, community based training centers and Career Academy High Schools, that are closely linked to industry.
- 3) We must develop regional solutions to this workforce problem that are both large in scale and are connected to economic development policy for creating and attracting green business. We cannot become a center for green manufacturing without an ambitious reworking of our educational pipeline.