JOB GROWTH PROJECTIONS AND ANALYSIS IN CHICAGO'S EMERGING GREEN INDUSTRIES: RESULTS AND METHODOLOGY

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CHICAGO
WORKFORCE
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INTRODUCTION

For the past several years, there has been much discussion on the growth of green jobs, especially as a route out of the country's current economic downturn. This report aims to provide an analysis of the number and types of jobs that the new green economy could bring to Chicago and what our city can do to prepare our workforce development system for these new opportunities.

Chicago is a national environmental leader among cities and has long aimed to be the greenest city in the nation. In September 2008, the City released the Chicago Climate Action Plan (CCAP), which outlines a bold path to reduce Chicago's greenhouse gas emissions and prepare the city for the inevitable effects of climate change. Chicago Green Jobs for All (GJFA) is an initiative of the City of Chicago and the Chicago Workforce Investment Council (CWIC).[1] GJFA works to ensure that Chicago residents are prepared for the jobs that are either created by, or transformed through, the Chicago Climate Action Plan (CCAP), that the job opportunities created by the CCAP are available to all Chicagoans, and that communities in need are connected to job training opportunities. GJFA is led by a steering committee comprised of City of Chicago staff and partners and is managed by CWIC.

Initially, GJFA's work was informed by analysis of the impact on labor demand expected from a full implementation of the CCAP.[2] In light of the economic downturn, GJFA determined that further analysis was needed to inform a modified strategy designed to make workforce development and training more responsive to the industries directly affected by the CCAP.

This paper summarizes the key data underpinning GJFA's recommendations for a strong, efficient and accessible workforce training infrastructure that can respond as "green" industries expand and skill requirements change.

DEFINING GREEN JOBS

Chicago Green Jobs for All focuses on green jobs that are transformed or created by the CCAP. We analyzed four of the strategies in the CCAP: building retrofits for energy efficiency, renewable energy, waste reduction, and climate change adaptation.[3] The methodology in this paper was also greatly informed by the classifications of green jobs used by the Department of Labor, which states that the greening of occupations refers to the extent to which green economy activities and technologies have three impacts:

- **Increase the demand for existing occupations (referred to henceforth as "increased demand");**
- **Shape the work and worker requirements needed for occupational performance ("enhanced skills"); or**
- **Generate unique work and worker requirements ("new and emerging occupations").[4]**

RESEARCH QUESTIONS

GJFA undertook a workforce analysis to understand the demand for, and supply of, a trained workforce in industries related to CCAP strategies through 2015. Specifically, the research sought to answer the following questions:

What are the expected sizes of the relevant industries in Chicago through 2015?

- What drives demand in these markets?
- What public subsidies might affect market growth, and in turn, labor demand?
- What legislation will affect their growth?

How many jobs will be created?

- How many can be filled by the existing workforce and how many could be open to unemployed workers?

Who will be employed in those jobs?

- What are the skills necessary to fill these new, green jobs?
- What are the opportunities for Chicagoans with barriers to employment?
- How many jobs are union and non-union? If union, which unions?

For the jobs that are created, does Chicago have training programs in place to train a sufficient workforce?

APPROACH

The purpose of this analysis is to assist Chicago's workforce development system with planning and investments in training and job preparation. Previous studies have made projections about industries that will grow and the jobs that will follow, but they are typically not at the level of detail needed to inform local workforce investments. These other studies have derived growth levels, and the number of jobs subsequently created, by assuming achievement of larger goals, such as a certain reduction in greenhouse gas emissions.[5] In contrast, the GJFA approach:

- Begins with the current size of the market and the number of people currently employed;
- Applies growth rates based on market information to make an estimate of the number of new jobs;
- Provides detail on what the skills and requirements are for those occupations;
- Estimates job creation over a five year period by skill type and industry; and
- Factors in existing workforce capacity, the supply of unemployed, skilled workers and the capacity of training programs.

GJFA developed a model for each CCAP strategy to estimate the number and types of jobs created for each industry in each year from 2010 through 2015 (see the detailed methodology section for a more in depth explanation of the model). These models were developed to provide local decision makers with the information needed to develop and implement targeted workforce development strategies for particular industries and job types. **It is important to remember that the figures in this report are best interpreted as estimates rather than as exact predictions.**

To ensure that our analysis supports on-the-ground, immediate planning efforts, GJFA interviewed local government staff, industry associations, businesses, and training organizations and conducted a thorough literature review to determine local estimates of the supply and demand for labor for each CCAP strategy. When local information was not available through interviews or secondary sources, Chicago figures were estimated using national data.

SCOPE

As explained above, four of the strategies in the CCAP were analyzed: building retrofits for energy efficiency, renewable energy, waste reduction, and climate change adaptation. Since these strategies span a variety of sectors or industries, the methodology was individually customized for each sector based on the available data and unique characteristics of each. Installation, operations, and maintenance jobs were researched for every sector. Within some sectors, manufacturing jobs were studied as well (see Figure 1 for an illustration of the scope of this research). The steering committee, co-chaired by the Chicago Department of Environment and the Chicago Workforce Investment Council, selected these sectors because they correspond with the carbon emission reduction strategies outlined in the Chicago Climate Action Plan (CCAP).

In total, fifteen industries in the four areas of potential job growth were studied in depth. In the following sections, each CCAP strategy analyzed will be reviewed in depth, including industries impacted and types of jobs created.

Figure 1
Areas of potential job growth and examples of occupations. (researched areas are shaded)

CCAP STRATEGY	DIRECT JOBS			INDIRECT JOBS	INDUCED JOBS
	New and Emerging Skill Sets	**Enhanced Skills**	**Increased Demand for Existing Skill Sets**		
Energy efficient buildings	Energy Auditors	Construction Managers	Laborers	Product Designers	Retailer, wholesaler, and other jobs created by wages spent from direct jobs
Clean and renewable energy sources	Solar PV Installers	Geothermal Heat Pumps Mechanists	Laborers	Welders	
Reduced waste and industrial pollution	Materials Re-Use Workers	Hazardous Materials Handlers	Construction Equipment Operators	Material Scientists	
Adaptation	N/A	Landscaping & Urban Gardening Specialists	Landscapers	Environmental Scientists	
Improved transpor-tation options	Covered by other workforce development initiatives, such as Chicago LEADS				

RESULTS

Summary of Estimates

Between 2010 and 2015, we estimate that a cumulative total of nearly 3,000 new direct jobs could be created in energy efficient buildings, waste reduction and climate change adaptation.[6] Again, these numbers are best interpreted as estimates and not as exact predictions. Figure 2 illustrates the projected job growth for each industry in each year.

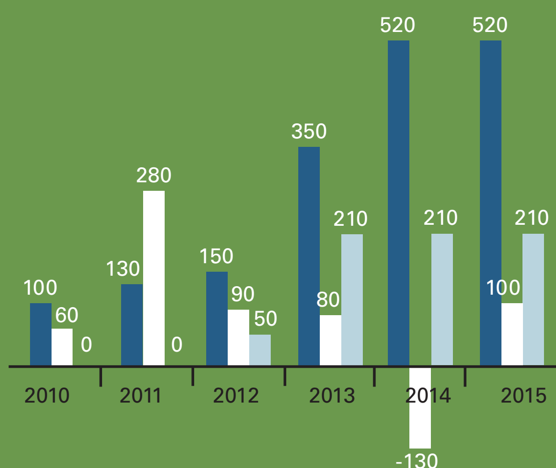


Figure 2
New, direct jobs created each year by CCAP strategy.[7, 8]

SECTOR	CUMULATIVE NEW JOBS FROM 2010–2015
Retrofits for Energy Efficiency Aggressive Case	1,770
Waste Reduction	480
Adaptation	680
TOTAL	**2,930**

BUILDING RETROFITS FOR ENERGY EFFICIENCY[9]

Scope

Building retrofits for energy efficiency ("retrofits") aim to reduce the greenhouse gas emissions generated by the operation of buildings.[10] The CCAP's goal is to reduce energy consumption and emissions by an average of 30 percent in over 9,000 commercial and industrial buildings and about 400,000 residential units. Retrofits include actions such as improving insulation, sealing leaking windows, and replacing incandescent light bulbs with compact fluorescent bulbs. GJFA set out to understand the demand for workers to complete retrofits and the supply of trained workers who could fill any new jobs in order to better understand whether additional workers would need to be trained.

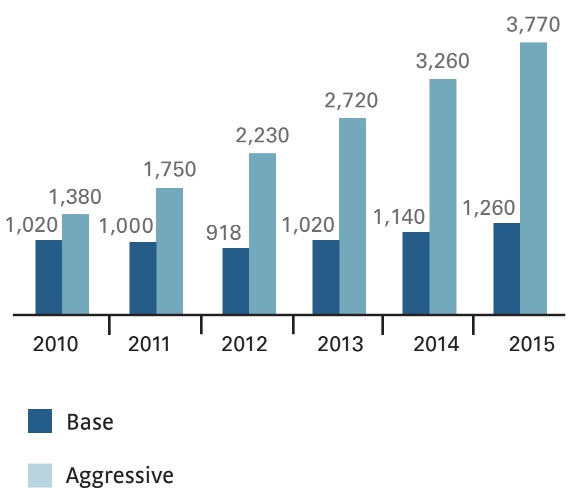
Retrofit work differs by building type, so our analysis split the building stock into six segments: industrial, small commercial, large commercial, institutional, subsidized residential (where "subsidized" means that the retrofit is at least partially paid for with public funds) and non-subsidized residential. The market for retrofits, and the jobs created by it, will depend on normal growth in the existing market plus any additional funding that directly supports retrofitting buildings or creates incentives for owners to do so. Thus, to estimate the demand for a trained workforce to retrofit buildings, GJFA analyzed all of the funding for building retrofits in

Chicago, including public programs such as the Illinois Weatherization Assistance Program, as well as financing and other strategies aimed at spurring the private, unsubsidized retrofit market.

As part of this analysis, two scenarios were created:

- A base case which assumes that there would be no additional public funding for subsidized retrofits beyond what was committed at the time of our study and a modest, 0.2% increase of the total market retrofitted each year.
- An aggressive scenario that assumes that an additional 1% of the potential residential market is retrofitted each year and that an additional 0.5% of the potential commercial and industrial market is retrofitted each year. This latter estimate of growth relies on the assumption of new funding sources, including those that are targeted towards increasing the number of unsubsidized retrofits through marketing, financing and other strategies.

Figure 3
Total jobs to complete retrofits



Findings

If Chicago's retrofit market grows in line with the aggressive case scenario, GJFA estimates that 3,700 people will be employed in retrofit jobs in 2015. Figure 3 shows the total number of people that will be employed in the industry through 2015 under each scenario (base and aggressive).[11] This figure includes not only new job creation (as in figure 2) but also workers that are already fully employed in retrofits.

In order to understand whether we have enough workers to meet demand in each scenario, GJFA estimated the existing supply of a trained workforce in Chicago to complete the retrofits.

The team found, through extensive employer interviews and data analysis, that:

- Currently employed workers may be able to do additional work (about 15% of the current retrofit workforce)
- About 20% of the experienced construction workforce in Chicago is currently unemployed

The interviews also revealed that, for entry-level retrofit jobs, employers seek workers who have general construction experience. Therefore, the 20% of construction workers that are unemployed could potentially fill many of the retrofit jobs. If 15% of the growth in the retrofit market is absorbed by the existing workforce, and there are experienced construction workers to fill much of the remaining growth, then jobs for new entrants are fairly limited. For example, in 2013, of the 360 estimated new jobs, about 60% of the jobs could be filled by the unemployed, experienced workforce, assuming that there is little reduction in the unemployment rate for construction workers over the next few years.

What this analysis indicates is that there is some need to update the skills of the unemployed, experienced construction workforce in techniques and technologies specific to retrofits and that there will be modest job opportunities for new workers with training in this market. Figure 4 below illustrates these estimates, assuming significant growth in the retrofit market, under the aggressive case scenario.

Figure 4
Number of New Jobs for New Entrants and Skilled, but Unemployed Workers – Aggressive Scenario

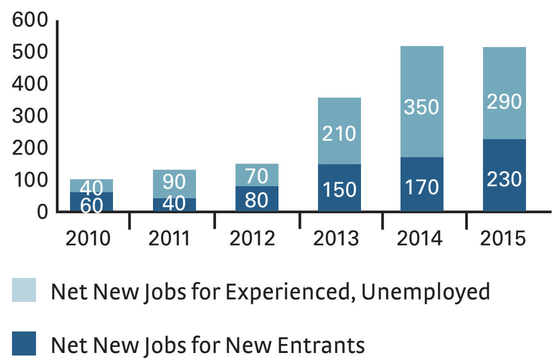
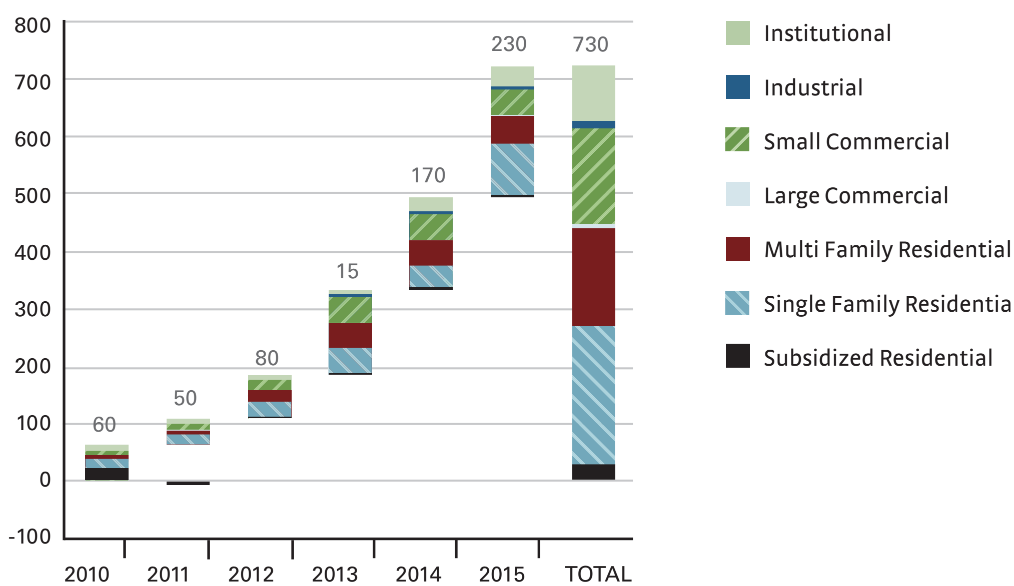


Figure 5 shows the distribution of jobs across different segments of the retrofit industry. Net job growth under the aggressive scenario depends on growth in the unsubsidized retrofit market, so that is where most opportunities for new entrants would be expected. Additionally, entry-level jobs in this segment require less skill than more complex commercial or industrial buildings.

It is important to note that while this analysis does not promise thousands of new jobs for new entrants to the field, labor markets are fluid. These estimates assume that the number of unemployed, experienced construction workers in the market will decline very slightly over the next five years, which is a conservative assumption, since we are currently at a comparatively high unemployment rate and many construction workers are nearing retirement age.

GJFA analyzed existing training programs in Chicago in order to understand the capacity to train as the labor force changes over time. In 2010 and 2011, Chicago will train several hundred workers in basic construction skills. Many of these trainees will also receive special energy efficiency installer training. In addition, thanks to funding provided by the American Recovery and Reinvestment Act, Chicago will have training programs to train sufficient numbers of workers for key positions, such as crew chiefs, for retrofit work as well as energy efficiency auditors. Chicago also has the ability to ramp up quickly should the demand for more workers emerge.

Figure 5
New Entrant Retrofit Jobs by Market Segment (Aggressive Case)



Recommendations

GJFA developed a list of strategic practices that could be utilized by the workforce development system. We use this framework to make recommendations about potential actions to achieve the project's goals for each CCAP strategy. Below are the recommendations for ensuring a trained retrofit workforce and connecting disadvantaged jobseekers to retrofit training and jobs.

STRATEGIC PRACTICES AVAILABLE TO THE WORKFORCE DEVELOPMENT SYSTEM	RECOMMENDATIONS
1 Understand which green industries and jobs are growing.	Continue to monitor growth in building retrofits industry.
2 Advocate for investment in and policies to remove barriers to the expansion of key green industries.	Monitor and support federal and state climate legislation and new programs that have the potential to increase the demand for retrofits, such as "Cash for Caulkers."
3 Share information about job types, skill requirements and career pathways.	Share research findings with job developers throughout the workforce development system.
4 Direct state, local, federal, private education and training funding differently.	Monitor public investments to ensure that 1) Chicago is not overtraining new entrants for jobs that may be filled by experienced workers and 2) funds are being used to appropriately fill the gaps in services, develop new service strategies, ensure access for disadvantaged populations, develop new curricula, and improve program quality.
5 Change content of education and training programs.	For entry-level jobs, 1) invest in training programs that teach basic construction skills and work-readiness 2) explore the role of paid work experience and/or internships in these programs during this time of high unemployment.
6 Influence contract terms.	Identify opportunities to create incentives or mandates for contractors to hire local residents and those with relevant certifications.
7 Support certification standards.	Continue to monitor industry developments to identify those certifications most valuable to employers, such as Building Performance Institute certifications and Weatherization Assistance Program competency standards.[12]
8 Build relationships with businesses and program managers in these sectors.	Work with and support the retrofit ramp-up project with the Chicago Metropolitan Agency for Planning.

WASTE REDUCTION

Scope

GJFA researched and analyzed eight waste reduction industries: residential and commercial recycling; composting; construction and demolition recycling; deconstruction; electronic waste recycling; green alley and road installation; refrigerant retirement; and urban agriculture. This list was developed initially by researching many industries included in the CCAP waste reduction strategy. These industries were analyzed to determine which industries warranted further study by choosing only those that are green, growing and job creating.[13] Figure 6 includes the industries initially researched and the results of the preliminary research. The shaded industries are those that were investigated further.

Figure 6
Waste reduction industries (shaded industries researched in greater depth)[14]

INDUSTRY	GREEN	GROWING	JOB CREATING
Cisterns and rain barrels	Yes	Yes	No
Composting	Yes	Yes	Yes
Construction and demolition recycling	Yes	Yes	Yes
Deconstruction and materials re-use	Yes	Yes	Yes
Electronic waste	Yes	Yes	Yes
Environmental remediation	No	No	-
Green alley and road installation	Yes	Yes	Yes
Industrial synergies	Yes	No	-
Landfill operations	No	-	-
Medical waste	No	-	-
Niche recycling	Yes	No	-
Nuclear waste	No	-	-
Permeable pavement	Yes	Yes	No
Refrigerant leak detection and repair	Yes	No	-
Refrigerant retirement	Yes	Yes	Yes
Residential and commercial recycling	Yes	Yes	Yes
Urban agriculture	Yes	Yes	Yes
Waste collection and processing	No	-	-
Waste-to-energy	Yes	-	-

Findings

For most of the industries reviewed, there will be modest job opportunities for new entrants within the next five years. Many new jobs will be filled by unemployed, experienced workers and training program graduates. Figure 7 shows waste reduction jobs by industry. As with retrofits and renewable energy, GJFA analyzed ratios of jobs to investment for each industry. Each industry had to be estimated independently, through industry research, interviews and analysis. For example, GJFA estimates that 8.5 jobs are created for every 10,000 tons of commercial and residential recycling.

A Neighborhood Stabilization Program grant to manually deconstruct 400 houses over three years will provide a temporary increase in deconstruction jobs, creating 231 jobs in its first year. As a result, the job growth for deconstruction is negative after the grant expires, leading to an overall decrease in jobs in 2014.

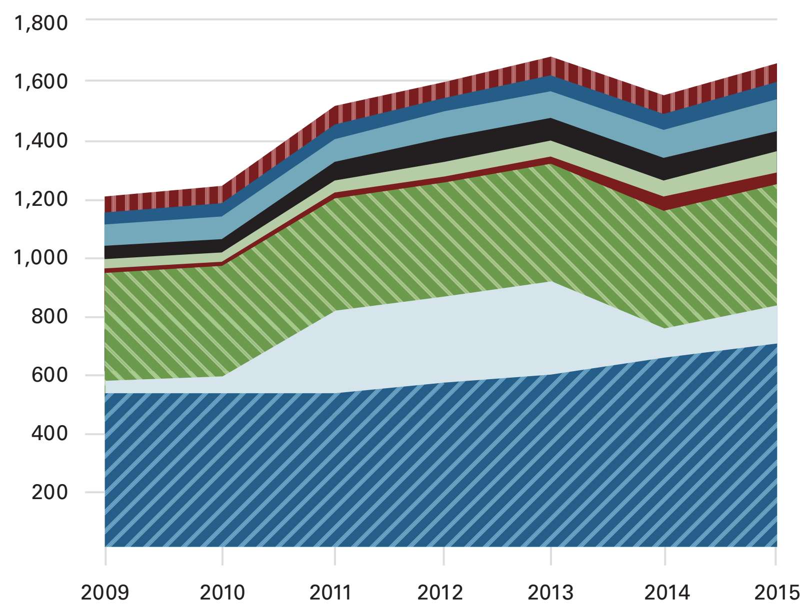
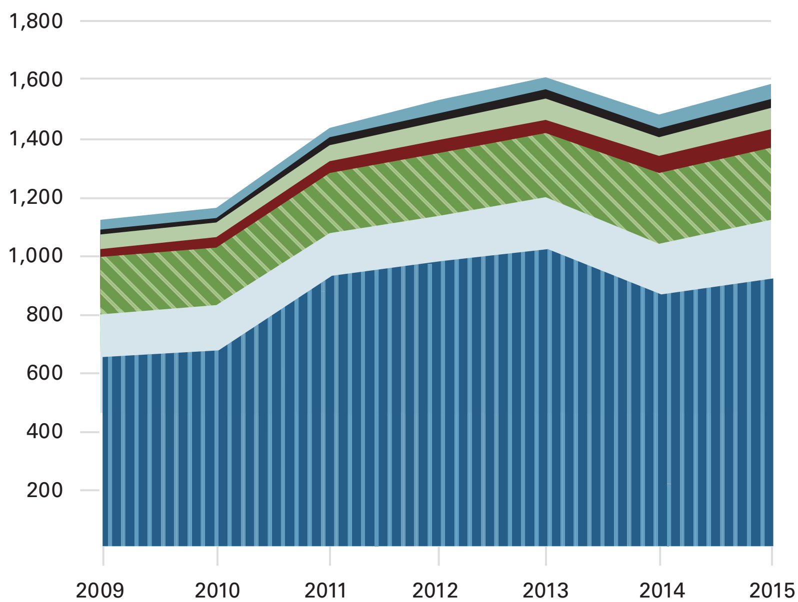


Figure 7
Waste reduction jobs by industry

KEY	INDUSTRY	CUMULATIVE NEW JOBS FROM 2010–2015
	Green Alleys & Roads	12
	Electronic Waste	14
	Deconstruction (Hybrid)	33
	Urban Agriculture	35
	Refrigerant Management	40
	Composting	45
	Commercial and Residential Recycling	47
	Deconstruction (Manual)	84
	Construction and Demolition Recycling	178
	Total	**488**

Figure 8 illustrates that Chicago has a deep bench of experienced, unemployed workers that could fill many of these jobs, potentially making the need for new, trained workers small. However, it is important to remember that labor markets are fluid, and the actions of current workers (retirement, change in career, etc.) may have a significant effect on the need for new workers. In addition, many of these industries are relatively open to workers with barriers to employment, such as criminal records.

Figure 8
Waste Reduction Jobs by Type[15, 16]



KEY	INDUSTRY	CUMULATIVE NEW JOBS FROM 2010–2015	BENCHED LABOR IN CHICAGO
	Hazardous Materials Workers	11	1,572
	Agricultural Managers & Training Coordinators	14	1,203
	Retail Staff	20	17,398
	Refrigerant Workers	40	504
	Commercially Licensed Drivers	50	7,696
	Machine Operator	50	555
	General Laborer	280	7,362
	Total	**488**	

Recommendations

STRATEGIC PRACTICES AVAILABLE TO THE WORKFORCE DEVELOPMENT SYSTEM	RECOMMENDATIONS
1 Understand which green industries and jobs are growing.	• Due to the ongoing developments around city recycling, continue to monitor the program for changes. • Continue to follow development of urban agriculture market and its ability to create jobs.
2 Advocate for investment in and policies to remove barriers to the expansion of key green industries.	• Advocate for overcoming barriers for deconstruction (faster permitting, inspection processes, etc.) to help the deconstruction market grow.
3 Share information about job types, skill requirements and career pathways.	• Share research findings with job developers throughout the workforce development system.
4 Influence contract terms.	• Ensure that the City's computers are recycled by an organization that hires Chicagoans with barriers to employment. • Work with the City to explore whether new recycling policies could stipulate hiring requirements. • Advocate for hiring requirements for local residents into construction and demolition ordinance amendments.
5 Build relationships with businesses and program managers in these sectors.	• Work with Chicago Compost, Allied Waste, and others whom Chicago Department of Environment may permit in the future to staff new composting facilities. • Identify ways to collaborate with the Delta Institute on the Neighborhood Stabilization Program (NSP) deconstruction grant.

ADAPTATION

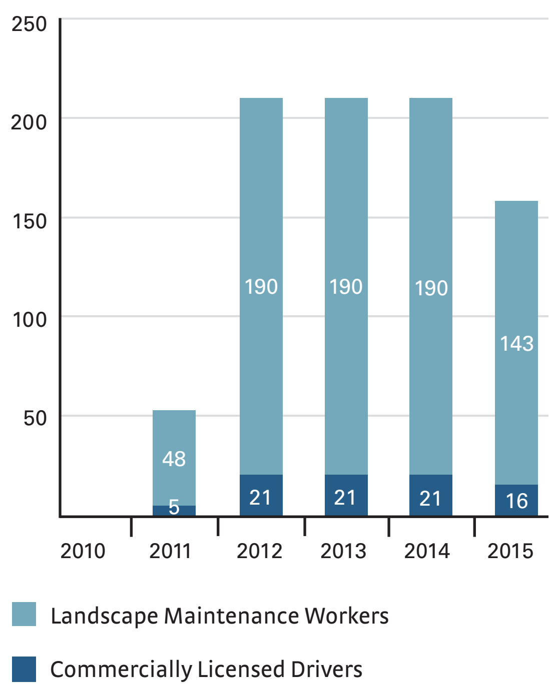
Scope

The CCAP's climate change adaptation strategy is composed of actions the City of Chicago, its residents, and businesses will take to adapt to environmental changes that are already happening and prepare for changes that lie ahead. As with the waste reduction strategy, GJFA selected industries for study based on whether they were green, growing, and job creating. Adaptation is the area of the CCAP with the fewest immediate job impacts. Figure 9 lists the industries that were proposed for study. Landscaping was the only industry that merited further research. However, available job opportunities in the landscaping sector will be contingent upon a shift in the H-2b migrant worker visa policy.[17] If the number of foreign worker visas is limited, then hundreds of new landscaping jobs in the Chicago area could open as the real estate market stabilizes.

Figure 9
Adaptation industries (shaded industry researched in greater depth)

INDUSTRY	GREEN	GROWING	JOB CREATING
Air conditioning installers	Yes	No	-
Catch basins	Yes	No	-
Flood relief operations	Yes	No	-
Landscaping	Yes	Yes	Yes
Sewer pipe replacement	Yes	No	-
Tree planting	Yes	No	-

Figure 10
Total New Jobs for Landscaping



Findings

As seen in other industries, currently there is enough experienced, unemployed labor to supply business needs in the landscaping industry. However, as the economy improves, this benched labor could be absorbed. And, if the number of foreign worker visas is limited, employers in the landscaping industry may be in need of new employees. In Figure 10, we assume that the visas will be limited. We also found through interviews with employers that the landscaping sector is relatively open to hiring workers with barriers to employment.

Recommendations

STRATEGIC PRACTICES AVAILABLE TO THE WORKFORCE DEVELOPMENT SYSTEM	RECOMMENDATIONS
1 Understand which green industries and jobs are growing.	• Due to the large number of migrant workers in the landscaping industry, monitor federal changes to the H-2b migrant worker cap. • Monitor market recovery of landscape industry.
2 Share information about job types, skill requirements and career pathways.	• Share research findings with job developers throughout the workforce development system.
3 Change content of education and training programs.	• Deepen and broaden relationships with Chicago area landscaping contractors through employers' advisory council, to determine any curriculum modifications, such as increasing the breadth and depth of exposure to landscaping equipment during Greencorps and other landscape training programs. • Consider developing a landscaping competency standards "report card" for Greencorps graduates. • Continue building internship program to allow each Greencorps or other landscape maintenance program graduate an experience in the field.
4 Build relationships with businesses and program managers in these sectors.	• Consider modeling landscaping curriculum on the skills required to pass the Certified Landscape Technician test.

RENEWABLE ENERGY

Scope

GJFA analyzed six renewable energy industries: geothermal, solar photovoltaic (PV), solar thermal, concentrated solar power (CSP), wind, combined heat and power (CHP), and smart grid. First GJFA mapped out the Chicago market and, second, investigated in greater depth industries that are growing in Chicago. The technologies in Figure 11 were investigated for their likelihood to grow between 2010 and 2015, and how that growth would affect the number of jobs in manufacturing, installation/construction, and operations and maintenance (O&M).

Findings

GJFA did not make estimates of the number of jobs in renewable energy that will be created in Chicago for several reasons. GJFA would need to rely on assumptions about undecided future changes in US federal policy, uncertain international demand projections that are impacted by the current recession, and assumptions about future natural gas prices. In addition, GJFA was unable to estimate the current amount of megawatt installation and production of renewable energy in Chicago. Because the new and fast-growing renewable energy industries are still consolidating their supply chains, precise information on their locations and volumes do not yet exist, making it difficult to estimate Chicago's current or potential share of manufacturing.

Instead, GJFA proposes a method that **could be** used to estimate job growth, based on a calculation of installed or manufactured megawatts of each type of renewable energy (see Figure 12) **if we knew** the current amount of renewable energy installed or manufactured in Chicago. For example, we estimate that for every megawatt of solar photovoltaic energy manufactured or installed, approximately seventeen manufacturing jobs are created, eight installation jobs are created and less than one operations and maintenance job is created. However, because we do not know how many megawatts are currently installed in Chicago, nor how many are being manufactured, and

Figure 11
Renewable energy technologies (shaded technologies researched in greater depth)

TECHNOLOGY	RESULTS
Biomass	Unlikely to grow
Carbon Capture and Storage	Unlikely to grow
Coal Gasification	Unlikely to grow
Combined Heat and Power	Jobs in manufacturing, installation/construction, and operations and maintenance
Concentrated Solar Power	Jobs in manufacturing, installation/construction, and operations and maintenance
Geothermal	Jobs in installation/construction, and operations and maintenance
Hydropower	Unlikely to grow
Landfill Gas	Unlikely to grow
Smart Grid	Jobs in installation/construction, and operations and maintenance
Solar Photovoltaic	Jobs in manufacturing, installation/construction, and operations and maintenance
Solar Thermal	Jobs in manufacturing
Transmission Build-Out	Unlikely to grow
Wind	Jobs in manufacturing

cannot estimate the growth of that market with any degree of confidence, we cannot say how many jobs in these industries there are going to be.

Figure 12 provides our best estimates of the number of jobs created per megawatt of renewable energy in manufacturing, installation, operations and maintenance. These estimates were created through analysis of a variety of sources, as well as from interviews with local renewable energy businesses.[18]

Additionally, through interviews and other research, GJFA was also able to determine the types of jobs that are created with renewable energy investment. As the market develops, these two pieces of information – jobs per megawatt and job types – will help us to estimate the number of jobs of various types.

In manufacturing, there is evidence of a skills mismatch between those who have been laid off and the needs of employers who are hiring. Over the past decade, Chicago has invested significantly in addressing the persistent high-skilled manufacturing worker deficit and this effort will help to prepare for potential job growth in wind and other renewable energy component manufacturing. As the renewable energy market grows and manufacturing jobs are transformed, we need adaptive training programs and individuals who a have a higher level of skill. Chicago is working, through organizations like the Chicago Manufacturing Renaissance Council and World Business Chicago, to increase the city's share of renewable energy systems components manufacturing, especially in wind.

Although difficult to estimate, there does not currently appear to be high-demand for renewable energy installation, operations or maintenance workers in Chicago. GJFA partners will continue to monitor growth in this market so that future workforce initiatives can respond to changing demand.

Figure 12
Rough Estimate of Jobs per Megawatt of Renewable Energy

INDUSTRY	MANUFACTURING	INSTALLATION	O&M
Solar Photovoltaic	16.83	7.86	0.40
Concentrated Solar Power	4.79	5.94	0.60
Wind	3.91	2.91	0.25
Combined Heat and Power	2.87	2.87	0.50
Distributed Solar Thermal	16.83	5.70	0.20
Utility Scale Geothermal	5.01	4.17	1.71
Small Hydropower	6.25	6.25	5.04
Landfill Gas	2.86	2.86	1.14
Biomass	2.11	2.64	0.89
Carbon Capture and Storage	10.24	10.24	0.31

Recommendations

STRATEGIC PRACTICES AVAILABLE TO THE WORKFORCE DEVELOPMENT SYSTEM	RECOMMENDATIONS
1 Understand which green industries and jobs are growing.	• Build relationships with existing component manufacturers in the Chicago area, particularly those working closely with economic development leaders. • Explore whether there is a need for a more in-depth analysis to understand the transformation in occupational mix, skill requirements, and educational pathways that may be developing within the manufacturing sector.
2 Advocate for investment in and policies to remove barriers to the expansion of key green industries.	• Work with economic developers in Chicago to create packages for manufacturers which include workforce development incentives (i.e. customized training).
3 Share information about job types, skill requirements and career pathways.	• Provide information on new, growing career pathways for installers of solar PV, solar thermal, geothermal, and CHP installers to job developers throughout the workforce development system.
4 Change content of education and training programs.	• Because some manufacturing employers value experience above certifications, support training programs incorporating internships, wage subsidies and on-the-job training for advanced manufacturing.
5 Support certification standards.	• Further investigate standardized certifications for installer jobs like solar PV and solar thermal and decide how best to promote equal access to installation career pathways.

NEXT STEPS

This research will be used to inform investments in workforce development services over the next several years. GJFA will continue to monitor all of these industries and will explore how existing training and job preparation programs—including those funded by the public workforce system, community based organizations, Chicago's building trades, the City Colleges of Chicago and employers—can be leveraged to ensure a trained workforce as these green industries grow. In addition to the recommendations made in earlier sections of this report, some specific next steps include:

- The Chicago Metropolitan Agency for Planning (CMAP) was recently awarded $25 million in Energy Efficiency Conservation Block Grant funding for the Chicago Region Retrofit Ramp-up, the region's retrofit ramp-up strategy. CWIC is working closely with CMAP to align investments in retrofit training, including $3 million in State Energy Sector Partnership funding. As part of this work, CMAP will provide seed funding for a comprehensive workforce development strategy that supports growth of the retrofit market.
- At this time, GJFA will not change course to focus on preparing people for renewable energy jobs. Although difficult to estimate, there does not currently appear to be high-demand for renewable energy installation, operations or maintenance workers in Chicago. GJFA partners will continue to monitor growth in this market so that future workforce initiatives can respond to changing demand. In manufacturing, there is evidence that a skills mismatch exists between those who have been laid off and the needs of employers who are hiring. Over the past decade, Chicago has invested significantly in addressing the persistent high-skilled manufacturing worker deficit, and continuing this effort will help to prepare for potential job growth in wind and other renewable energy component manufacturing.
- The City of Chicago has already invested over $4.5 million in a deconstruction job training and work experience program, deconstructing city-owned properties. To our knowledge, it is the largest deconstruction program in the nation and is making significant strides toward building the deconstruction market in Chicago. GJFA will work with the City and its partners to continue to support this market's growth.

METHODOLOGY

The methodology to complete this analysis for Chicago can be replicated in other locations. Our research approach distinguishes itself from other green job projections in that it does not rely on estimates of national funding and investment. Rather, our approach incorporates local demand and supply insights to inform development of, and investment in, workforce development programs.

GJFA found it useful to assemble a team with a variety of skills, including quantitative modeling, data collection and analysis, interviewing, knowledge of local workforce development efforts, and familiarity with local government sustainability initiatives and goals. The following guide outlines Chicago's approach to completing a local green jobs growth projection and analysis.

AUDIENCE

GJFA considered the end-users' needs for sound labor market information to shape the scope of the research and the insights that would be most useful to them. In Chicago, the steering committee included representatives from the local workforce investment board staff and the City of Chicago's Department of Family and Support Services and Department of Environment, which implement workforce development programs and sustainability initiatives, respectively. These organizations will use this research to inform planning and investment decisions for job training and other programs.

SCOPE

GJFA determined our geographic scope to be Chicago, since the stakeholders are responsible for programs and investments within the city limits. Of course, other researchers might find that a county, regional or state boundary is more appropriate for their purposes.

GJFA clearly defined our scope from the outset, knowing that some modifications would be necessary as new information was gathered. GJFA chose to align our research around the City of Chicago's environmental strategy, the Chicago Climate Action Plan (CCAP). As a result, the research team structured the sectors and industries studied around those prioritized in the Plan. This made it easier to connect with key experts in the City that were assigned specific areas of the Plan; this alignment also helped to ensure that the research could be easily incorporated into future projects.

Each industry selected for initial review was then put through the following series of filters to determine if it would produce green jobs:

Is it green? While some industries such as renewable energy generation may be inherently green, others may include both green and non-green components. For instance, waste reduction includes nuclear waste disposal, a practice that is not typically considered to be green. This highlights the subjectivity involved in defining whether an industry is green; although there is no perfect way of defining these industries, we found it helpful to rely on national research to limit our scope.

Is it growing within the geographic scope? If an industry is not growing, it will not be a source of net new jobs. Therefore, there is no need to research it further.

Does growth create jobs? If an industry is growing, that does not necessarily mean that it will create jobs. For example, if a city is expanding green transportation options by replacing traditional buses with hybrid buses manufactured in another state, there will not be growth in jobs because the required amount of drivers will be the same. However, while the growth of these industries may not create new jobs, there may be a need for incumbent worker training.

The fourth consideration in limiting GJFA's scope was the time horizon for workforce development programming. GJFA's steering committee determined that a reasonable planning period for workforce development programming is five years.

Finally, other factors, such as availability of experts and information, also influenced scope. GJFA was fortunate to have extensive support from the Joyce Foundation and the resources of the Civic Consulting Alliance and other partners to complete this project. In addition, GJFA was able to leverage the connections of the steering committee to obtain information fairly quickly.

While proactive efforts were made to establish the scope from the outset, the scope naturally continued to evolve as the research was underway. If new insights led to new scope limitations, GJFA recorded the insights that excluded industries from future research; the project stakeholders were often equally interested in learning why certain industries were not projected to yield job growth as they were in those that were growing.

RESEARCH QUESTIONS

The major research questions fell into two categories: labor demand and labor supply. Labor demand questions helped GJFA determine what type and how many jobs would be created by each industry within the geographic scope and within the established time horizon. Labor supply questions helped us to estimate how many experienced, unemployed and employed but underutilized workers would be available to complete the work. Using this data GJFA was able to estimate the number of jobs that might be available for new entrants to the market.

GJFA also considered other factors that can influence the ability of new, inexperienced entrants to access jobs. These include requirements for training, certification, and prior experience, employer receptiveness to jobseekers with barriers to employment, and the opportunity to enter unionized building trades.

GJFA developed a literature review and interview list concurrently with scope development. A sample interview guide is included in Appendix A. Local government agencies that have experience within each green industry can be helpful as first interviews. For example, GJFA began with interviews of key staff at the Chicago Department of the Environment who are responsible for implementing programs as part of the Chicago Climate Action Plan. The interviews provided answers to key research questions and provided inputs for the model.

MODEL

GJFA developed quantitative models to create locally-driven projections of the number of green jobs that will be created in the next five years in each of the industries studied. Each model was set up in a slightly different format depending on the type of data available. For example, for the waste reduction strategy, GJFA looked at multiple industries with different drivers; each industry has a separate calculation worksheet that is then aggregated into a summary output worksheet. For the retrofit industry, each of the multiple building types was split into separate worksheets (see Appendix B for a sample model page). Regardless of the exact structure of the model, the aggregate summary worksheets each include:

- Total jobs by industry by year
- New jobs by industry by year
- Total jobs by type by year
- New jobs by type by year

Where there is considerable uncertainty or the possibility of a “game-changing” development, an aggressive scenario could be contrasted with a “business-as-usual” scenario, also called the “base case.” It is important to clearly indicate assumptions and sources within the model itself. After completing all industries or segments of the model, GJFA checked each calculation and result to ensure that it passed a “common sense” test.

SHARING FINDINGS

GJFA scheduled frequent steering committee meetings to gain input from project stakeholders on refining the scope of the project and on initial results of the analysis. GJFA gained input on initial drafts as necessary to ensure that recommendations were relevant and actionable. GJFA was also able to compare across areas and highlight the highest-impact recommendations for the steering committee.

APPENDICES

APPENDIX A – SAMPLE INDUSTRY INTERVIEW QUESTIONS
APPENDIX B – SAMPLE MODEL PAGES

APPENDIX A - SAMPLE INDUSTRY INTERVIEW QUESTIONS

Note: The following interview questions can be tailored for the industry or for the goals of the research project. Interview questions should directly lead to inputs for the model.

1. Company and personal history

a. Describe the work of your company and your role within the company.
   i. Which segment(s) of the industry do you work within?
   ii. How large is your firm (e.g. number of employees)?
b. Who do you see as your main competitors?

2. Market Growth

a. What are the current, likely, and hopeful growth rates in your industry?
b. How do you see the industry developing in Chicago over the next 5 years?
   i. What factors could influence its direction?
c. How do you see federal/state/local governments influencing the market?
d. What can be done to encourage and expand this market?

3. Employees

a. Do you see a gap in the supply of skilled employees that you can hire?
b. Do you have slack labor? In other words, if demand for your services suddenly doubled, would you have to hire new people? Or could you increase the hours of those already on your payroll?
c. Do you hire workers from the building trades? Are you a "union shop"?
   i. Out of your competition, how many companies are staffed by union workers?
d. If you did have to hire new people, would it be difficult to find qualified labor? Where would you look?

4. Types of jobs

a. What different types of jobs are there at your company?
b. How many workers / man hours of each type of worker do you need?
   i. Does this mix of work vary based on the project?

5. For each type of job

a. Job Description
   i. What are the responsibilities of this job on a typical project?
   ii. What specific skills does this entail?
b. Training Requirements
   i. What type of training do you traditionally expect your entry levelworkers to have?
   ii. Are there any minimum requirements at your firm regarding education and experience?
   iii. What additional skills or certifications are required?
   iv. Would you consider hiring someone who did not have the training background you traditionally hire?
   v. Do you screen for criminal backgrounds? How important is this screen?
c. Points of Entry
   i. Where do you recruit workers from?
   ii. Can or do you train existing workers to do this work?
   iii. Where do you hire your employees from?
      1. Regional
      2. Programs: College, training /certification
d. Career Pathways
   i. What is the career path in your firm/occupation?
   ii. How does one start, and how does one move up?

6. Other people to talk to or sources to follow up on?

APPENDIX B - SAMPLE MODEL PAGES

Note: The steps below outline the basic approach to developing a model for a particular industry. Residential recycling is used as an example here, and the numbers are not actual figures.

1. **Gather basic data inputs from interviews, literature review, etc. The data available will often dictate how the model will take shape.**

Rate at which residential recycling is growing each year (source: local authorities)	8%
Current estimated recycling rate (source: university waste diversion study)	25%
Current tons of disposal going to landfills (source: university waste diversion study)	2,875,000
Number of jobs created per 10,000 tons of new recycling (source: EPA Recycling Economic Impact study)	8.5

2. **Perform calculations with the available information**

Current number of tons recycled	958,333
Current number of people employed - base year	815

3. **Determine the types of jobs within the industry and the proportions of each**

JOB RATIOS (SOURCE: INTERVIEWS WITH INDUSTRY)	
Driver	40%
General labor	30%
Machinery Operator	20%
Manager	10%

4. **Estimate total job growth from the base year until the end of the time horizon**

	BASE YEAR	BASE YEAR + 1	BASE YEAR + 2	BASE YEAR + 3	BASE YEAR + 4	BASE YEAR + 5	NEW JOBS
Driver	326	352	380	410	443	479	**153**
General labor	244	264	285	308	332	359	**115**
Machinery Operator	163	176	190	205	222	239	**76**
Manager	81	88	95	103	111	120	**38**
Yearly totals	**815**	**880**	**950**	**1,026**	**1,108**	**1,197**	**382**

5. **Estimate new job growth from the base year until the end of the time horizon**

	BASE YEAR + 1	BASE YEAR + 2	BASE YEAR + 3	BASE YEAR + 4	BASE YEAR + 5	NEW JOBS
Driver	26	28	30	33	35	**153**
General labor	20	21	23	25	27	**115**
Machinery Operator	13	14	15	16	18	**76**
Manager	7	7	8	8	9	**38**
Yearly totals	**65**	**70**	**76**	**82**	**89**	**382**

6. **Contrast new job growth with experienced unemployed and underutilized to determine net new jobs for new entrants.**

We used two strategies for estimating new job growth given experienced unemployed and underutilized labor:

A. Through interviews, determine how much underutilized and experienced unemployed labor there is on average for each job type and industry. Then, once the number of jobs that will be created each year is determined, subtract the experienced unemployed and underutilized labor from this total to determine opportunities for new entrants. To determine if any need exists for additional training programs, subtract the number of new graduates from programs related to each job type and industry to determine opportunities for new, untrained entrants.
B. If this level of detail is not available, estimate the amount of experienced unemployed labor by job type within the geographic area. EMSI provides the unemployment level by industry and the number of employed by job type for different geographic regions. From this information, estimate the number of unemployed. Contrast the total new jobs created with the total experienced unemployed labor. If experienced unemployed labor is many times greater than new jobs created, it may be reasonable to assume that benched labor will be able to absorb any new jobs created.

ENDNOTES

[1]GJFA was originally staffed for the Chicago Mayor's office by the Chicago Jobs Council. It is now housed at CWIC.

[2]Much of the research in this paper was informed by that initial analysis. See "Potential Workforce Impacts of the Chicago Climate Action Plan: Quantitative and Qualitative Assessments," published in January 2009 by the Center for Urban Economic Development at the University of Illinois at Chicago available at http://www.chicagoclimateaction.org/filebin/pdf/CUED_CCAPJobs_Final.pdf

[3]The Chicago Climate Action Plan (www.chicagoclimateaction.org) includes five strategies; the transportation strategy was not covered in this work because the transportation sector has been researched through other local workforce initiatives such as Chicago LEADS.

[4]See "Greening of the World of Work: Implications for O*NET®-SOC and New and Emerging Occupations," published in February 2009 by North Carolina State University for the Department of Labor available at http://www.onetcenter.org/dl_files/Green.pdf.

[5]These studies had other purposes than planning for workforce development programming. One example of a high-level green jobs study that assumes the achievement of significant investment in green infrastructure is "Green Economic Recovery Program Impact on Illinois" by the Center for American Progress and the Political Economy Research Institute at the University of Massachusetts, Amherst available at http://www.peri.umass.edu/fileadmin/pdf/other_publication_types/green_economics/illinois.pdf

[6]Renewable Energy job numbers estimates are not provided in this paper because of a lack of confidence in estimates of market growth. Please see the Renewable Energy Results section for more information.

[7]In 2014, the waste reduction industry is projected to lose jobs due to the ending of a manual deconstruction program. For the retrofits analysis, the "aggressive case" scenario, described below, is illustrated in this figure.

[8]This chart includes jobs filled by "slack labor" which are workers that are currently employed but not fully utilized.

[9]Bain & Company was responsible for the building retrofits research and analysis and is the original author of the figures and figures presented in this section.

[10]The "Energy Efficient Buildings" CCAP strategy includes actions beyond retrofitting buildings. The GJFA focused on retrofits for this analysis because previous research in "Potential Workforce Impacts of the Chicago Climate Action Plan: Quantitative and Qualitative Assessments," published in January 2009 by the Center for Urban Economic Development at the University of Illinois at Chicago, identified retrofits as having the most significant job creating potential in the strategy.

[11]These estimates were informed by a methodology developed by The Center on Wisconsin Strategy (COWS), along with the Powell Center for Building and the Environment at the University of Florida. The COWS methodology uses job multipliers that are based on the demand created by energy efficiency building retrofit programs for single- and multifamily residential and commercial buildings. Bain supplemented this information with interviews with local contractors to provide a more complete picture of the skilled workforce that the Chicago retrofit industry will need as it grows. See the Methodology section of this paper for more information.

[12]Building Performance Institute certifications can be found at www.bpi.org and competency standards for the federal Weatherization Assistance Program can be found at www.waptac.org.

[13]See the methodology section for definitions of green, growing, and job creating.

[14]Since the industries associated with waste reduction are extremely diverse, each industry was researched individually and the model for job projections was created based on the information available for each industry.

[15]Included in this figure are only job types that have more than ten new jobs. Job types that did not create more than ten jobs are pavers, concrete installers, chemical engineer, operations manager, and computer technicians.

[16]No precise measurements of benched labor by job type for the Chicago region were available. To compute this figure, the number of people employed in Chicago by job title and the unemployment rate for each industry was obtained from Economic Modeling Specialists Inc. From this data, the estimated number of unemployed for each job title was extrapolated.

[17]The H-2B Work Visa for Skilled and Unskilled Workers allows foreign nationals to come to the United States temporarily, where there is shortage of labor. The visa classification permits foreigners to enter the United States for temporary/one-time engagements. Terms such as seasonal business, one-time requirement, and peak load define the nature of the engagements that qualify for an H-2B Work Visa. An H-2B visa relates to a specific job from a particular employer. The following conditions must be met when applying for an H-2B Work Visa: the nature of the employer's requirement is significant; the applicant should have a valid job offer in the US; the applicant must prove their intention to return to their home country at the end of their assignment; and, the duration of the assignment must not be more than a year in length. https://usaimmigrationsupport.com/us-visas/h2b-work-visa.html

[18]Sources include European Photovoltaic Industry Association, the Electric Power Research Institute, the Renewable Energy Policy Project, the Western Governors Association, the National Renewable Energy Laboratory and team analysis.

CHICAGO WORKFORCE INVESTMENT COUNCIL

The Chicago Workforce Investment Council (CWIC) is an independent nonprofit organization that works to ensure that Chicago has a skilled and educated workforce to keep our businesses, economy, communities, and families thriving. CWIC accomplishes this by monitoring over $350 million of annual public investments in education and workforce training, and coordinating resources across the City to ensure these investments support the overall health of our economy. CWIC works in partnership with business, philanthropic, community-based and government leaders to develop strategies grounded in data and best practices. CWIC's Board of Directors is chaired by Mayor Richard M. Daley and comprised of Chicago business and civic leaders. For more information please visit www.cwic.org. CWIC is the program manager of Chicago Green Jobs for All.

CHICAGO JOBS COUNCIL

Chicago Jobs Council (CJC) is a city-wide coalition of community-based training organizations, advocacy groups, businesses and individuals working toward ensuring access to employment and career advancement opportunities for people living in poverty. Since 1981, CJC's membership has grown to include over 100 organizations and individuals. Through collaboration, advocacy, applied research, and capacity building, CJC works with its members to influence the development and reform of public policies and programs designed to move people into the workforce. For more information please visit www.cjc.net. CJC is a member of the Chicago Green Jobs for All steering committee and managed funds to support this research.

CHICAGO CLIMATE ACTION PLAN

The Chicago Climate Action Plan is a comprehensive and detailed roadmap to help lower greenhouse gas emissions and address climate change. The plan builds on the many efforts the City and its partners have already implemented to make Chicago the most environmentally friendly city in the nation. It is a dynamic plan that will require Chicago's residents, business owners and institutions to work together to achieve significant emissions reductions. The City of Chicago is committed to fostering partnerships to carry out each action recommended in the Plan. Addressing the climate change challenge together, Chicago will continue to lead the world in designing a path to a more secure future. Visit www.chicagoclimateaction.org to learn more about the Plan.

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For more information contact:

Meghann Moses
Chicago Workforce Investment Council
60 W. Randolph Street, Suite 200
Chicago, Illinois 60601
(312) 762-9211
mmoses@cwic.org

Jennifer Keeling
Chicago Jobs Council
29 E. Madison St., Suite 1700
Chicago, Illinois 60602
(312) 252-0466
jennifer@cjc.net

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