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Which Green Jobs Look Promising for Rural Illinois?

Newton, a town of 16,000 people in central Iowa, seems an unlikely symbol of the green economy. For the entire 20th century, Newton was a center of traditional manufacturing as the site of a large Maytag plant that manufactured washers and dryers. Newton was also home to Maytag's corporate headquarters. Unfortunately, in 2006, Maytag was acquired by Whirlpool, which soon closed the plant and office headquarters, causing the loss of 1,900 jobs.

The massive job losses forced Newton to seek new strategies for economic recovery. Leaders from a seven-county region in central Iowa developed a regional strategic plan, which included a focus on alternative energy. Within a year, TPI Composites announced that it was locating a major wind turbine production facility in Newton. The factory, which is located at the site of the former Maytag factory, will employ 500 workers at peak production. Trinity Structural Towers Inc., which produces massive steel towers for the windmills, also started a factory in Newton that will bring an additional 140 jobs. In total, alternative energy and high-tech companies created 1,200 well-paying jobs by fall 2008 (Economic Modeling Specialists, Inc. 2009a).

On Earth Day 2009, President Barack Obama visited the wind turbine plant in Newton to tout the federal government's support for green industry. While the nation watched Newton, many were asking questions. Does Newton represent the future economy of the Midwest? Can the green economy power an economic revival for small towns in the Midwest, including Illinois communities?

The Obama Administration clearly believes in the future of the green economy. The administration launched a \$100 billion initiative to promote green industries in the U.S. economy and to provide sustainable growth. The key idea is the gradual transition of the U.S. to a low-carbon economy by investing in green sectors of the economy focused on clean energy production. One estimate is that this large federal investment in green jobs could potentially create two million jobs of which 935,000 would be direct green jobs and the remainder would be created by the multiplied effect of additional supplier and consumer spending (Pollin, Garrett-Peltier, Heintz, & Scharber 2008).

The prospect of clean, well-paying jobs spurred by green development is attractive to many small Illinois towns. It is important for local leaders to understand this emerging sector of economic opportunity and implement policies that promote green jobs. Unfortunately, since the green movement is a new approach, there is a lot of misunderstanding and confusion about exactly what constitutes a "green industry" or "green job." In this report, we provide a description of green industries and identify which are most promising for rural Illinois. We will discuss some key green jobs and the workforce skills that are necessary for those jobs. Obviously, we can't cover all green industries and all green jobs. However, after you read this report, you should have a better understanding of which green jobs are most promising for small Illinois communities.

In Part 1, we describe six green industries and representative jobs associated with each industry. Many green jobs are in the fields of construction and engineering. Part 2 of this report discusses three industries that we believe are especially promising in rural Illinois: (1) Building Retrofitting, (2) Wind Energy, and (3) Advanced Biofuels. In Part 3, we examine current employment in engineering

and construction in rural Illinois and describe the necessary training for related green positions. Finally, we conclude that rural Illinois is well-positioned to capture many green jobs, particularly in the construction and agricultural sectors. We close with recommendations that rural regions improve “mid-level” training for green jobs and the promotion of green entrepreneurship.

Part 1. What Is a Green Job?

We begin with this seemingly simple question. However, it is not easy to answer because of the current way that occupational data is maintained. The U.S. Department of Labor defines occupations by broad groupings of workers (e.g., retail salespersons) who perform specific work activities (O*Net Online 2009). The problem is that a given occupation, say welder, may contain both green and non-green jobs. For example, a welder in a wind turbine factory would probably be considered a green worker, whereas a welder in an automobile plant would not be. Such distinctions become tricky. For example, does a welder working in a hybrid car factory have a green job?

hybrid vehicle lowers greenhouse emissions compared to a traditional car.

We will follow others in defining *green jobs* not by the specific tasks associated with the occupation but by the specific outcome of the work effort. In other words, green jobs are those associated with green products or services that utilize resources more efficiently, provide renewable sources of energy, lower greenhouse gas emissions, or otherwise minimize environmental impact (Centers of Excellence 2009). By this definition, a welder in a hybrid car factory would be considered a green worker since a

Six different industries can be defined that meet the aims of carbon reduction, energy efficiency, and minimal environmental impact (Pollin et al. 2008): (1) Building Retrofitting, (2) Mass Transit and Freight Rail, (3) “Smart” Electrical Grid Transmissions Systems, (4) Wind Power, (5) Solar Power, and (6) Advanced Biofuels. Representative jobs that are found in each industry are listed in Table 1.

Some green jobs are in specialized areas such as solar panel installation and environmental engineering. But, as Table 1 indicates, the overwhelming majority of jobs are in occupations that many people already work in today. Increasing the energy efficiency of buildings requires construction managers, roofers, and heating/air conditioning installers. Manufacturing wind turbines requires machinists, sheet metal workers, and truck drivers. Producing new crops for biofuels requires farmers, truck drivers, and farm product suppliers. In addition, all these industries require support activities performed by lawyers, accountants, office

Table 1. Green Industries and Representative Jobs

Green Industries	Representative Jobs
Building Retrofitting	Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers
Mass Transit/Freight Rail	Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Bus Drivers, Dispatchers, Locomotive Engineers, Railroad Conductors
Smart Grid	Computer Software Engineers, Electrical Engineers, Electrical Equipment Assemblers, Electrical Equipment Technicians, Machinists, Team Assemblers, Construction Laborers, Operating Engineers, Electrical Power Line Installers and Repairers
Wind Power	Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors
Solar Power	Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers
Advanced Biofuels	Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agricultural Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors

Source: Pollin et. al. 2008

clerks, and salespeople. Because these support jobs are not directly involved in green production, they are not listed in Table 1.

Van Jones (2009), author of *Green Collar Economy*, agrees that most green jobs will seem familiar. In an interview, he commented,

Sometimes people think we're talking about some exotic occupation from Mars that nobody's ever heard of. That we're talking about George Jetson or Buck Rogers when we're talking about green jobs. We're not talking about solar ray-guns; we're talking about caulking guns as one of the major tools we're going to need to be smarter with energy. Those are jobs our existing work force, with a little training, can start doing right away.

Part 2. Which Green Industries Fit Best in Rural Illinois?

Of the industries listed in Table 1, three seem particularly well-suited to rural Illinois: (1) Building Retrofitting, (2) Wind Power, and (3) Advanced Biofuels. We select these industries because rural Illinois has the basic locational characteristics that are required for businesses to succeed in these industries. Specifically, rural Illinois has a skilled and dedicated workforce for the Building Retrofitting industry, sites with sufficient wind speed and wind power for the Wind Energy industry, and fertile and abundant agricultural land for growing biomass for the Advanced Biofuels industry.

Building Retrofitting

Most existing buildings can gain significant energy savings by retrofitting with the latest products, technologies, and systems. Building retrofitting relies on existing technologies such as high-performance windows, geothermal heating and cooling systems, efficient heating, ventilation and air conditioning systems, and photovoltaic-powered energy.

Building retrofitting has a large potential market, particularly in the U.S. commercial building sector. The U.S. commercial sector has 70 billion square feet of space and a large opportunity for energy savings, reduction of carbon, and increased property values. Although currently a relatively small market, it is forecast that comprehensive efficiency retrofits will more than triple to \$6.6 billion annually by 2013. The total potential for major green renovations in the commercial building sector is approximately \$400 billion (Pike Research 2009).

The *Green Practices Study*, a recent survey of managers of commercial buildings, reported that 92% of managers are making their facilities more sustainable. Furthermore, evidence indicates that improving the sustainability of the building also leads to higher rent premiums. Higher rents and property values are also driving the market for retrofitting (Global Facilities Management Association 2008).

Since many small Illinois towns have energy-inefficient commercial buildings and an aging housing stock, there are many opportunities for retrofitting. This industry may be a fertile one for entrepreneurs starting new businesses or expanding an existing construction company. Furthermore, rural Illinois has a relatively high proportion of contractors and construction workers who would only need minimal training in green products and techniques in order to be productive in this industry. The construction sector is especially hurting in the recession, so retrofitting may provide jobs for construction workers now out of work.

Example of a Green Job. In the Building Retrofitting industry, the position of construction manager is critical. This position oversees the construction process, coordinates the workers, prepares budgets, and manages the construction schedule. The position usually requires a college degree. Construction managers must know green technologies like HVAC installation and water-saving methods and must know the markets and prices related to green building materials (Centers of Excellence 2009).

Wind Energy

Wind Energy is a rapidly growing industry. According to the American Wind Energy Association (AWEA) (2009), wind-generating capacity grew by 50% in 2008 in the U.S. surpassing all previous records by installing 8,545 megawatts (MW) of new generating capacity, capable of powering over two million households. The additional capacity accounts for about 42% of the entire new power-producing capacity added nationally in 2008. The U.S. Department of Energy estimates that wind energy could generate 20% of the nation's electricity by 2030.

In Illinois, wind power capacity rose from 50 MW in 2003 to over 1,000 MW in 2009. A key policy driver in Illinois is the passage of the Illinois Power Agency Act in 2007 (Loomis and Hinman 2009). It stipulates that at least 25% of all energy will be from renewable sources by 2025, of

which 75% must come from wind. As of March 31, 2009, Illinois ranked 10th in the U.S. in existing wind-powered generating capacity and ranked 16th in the U.S. in potential capacity (AWEA 2009). Illinois had 17 wind projects online, accounting for 1,118.76 MW of wind-generating capacity.

Wind speed is an important consideration in developing a wind farm. Illinois has Class 3 wind power, with several pockets of Class 4 winds throughout the state. There are other states that have more powerful winds; however, technological improvements in wind blades have allowed turbines to capture winds at greater heights where the wind speed is stronger. Furthermore, Illinois has an important competitive advantage in that its transmissions systems are less constrained than in many other states. This alleviates a major cost: transmitting the electricity from the wind farm to the load center (Loomis and Hinman 2009).

Example of a Green Job. The Wind Energy industry is currently experiencing shortages of trained wind turbine technicians. Wind turbine technicians are responsible for assembling, maintaining, and repairing wind turbines. According to the U.S. Department of Labor, there are approximately 25,000 wind turbines in the U.S., but only 15 colleges and universities are preparing wind energy specialists (Gillam 2008). Wind turbine technicians need strong mechanical skills, similar to those of auto repair technicians, with good basic math and communication skills. And these technicians cannot be afraid of heights as they must scale tall wind towers.

Advanced Biofuels

Advanced biofuels, also called second-generation biofuels, use technologies that enable biofuels to be produced from biomass. *Biomass* is commonly used to refer to non-food parts of crops such as stems, leaves, and husk and to crops that are not used for foods such as switch grass, jatropha, and miscanthus. The advantage of advanced biofuels is that they offer a sustainable, affordable, and environmentally friendly method of generating energy without threatening food supplies and biodiversity.

The 2007 federal energy bill mandated that refiners begin using biofuels made from corn cobs, wheat straw, grasses, and other sources of plant cellulose by 2010, with the target increasing to 22 billion gallons by 2022. There is an effort in Congress to expand the mandate to include fuels made from algae and microorganisms, sometimes called third-generation biofuels. This mandate is a powerful investment

incentive for research into advanced biofuels (White and Walsh 2008).

Illinois has an important research center on advanced biofuels, the Center for Advanced BioEnergy Research (www.bioenergy.uiuc.edu). The Center is conducting research and commercialization of a new biobased economy that relies on corn stover (the residue parts of the corn plant after harvesting) and dedicated energy crops such as miscanthus and switchgrass. A large share of the nation's biomass is located in crop residues from the Midwest.

The future of this industry depends on technological innovation and commercialization of new technologies. Illinois may emerge as a leader in the Advanced Biofuels industry, especially if corn stover or dedicated energy crops become a preferred feedstock for the industry. The high productivity of Illinois' soils and farmers is a competitive advantage. Furthermore, river and rail transportation is an advantage in Illinois, particularly for reaching lucrative markets in the northeastern U.S. urban corridor (Brown, Orwig, Nemeth, and Rocha 2007).

If new crops are produced in Illinois for the Advanced Biofuels industry, the production may boost both the number of farm jobs and the incomes realized by farmers. For example, planting switchgrass on land that is not suitable for corn would provide an additional income source. Alternatively, using non-food parts of the corn plant would also enable farmers to generate additional income from their land. Furthermore, agricultural-related jobs held by truck drivers, elevator operators, and farm product suppliers would increase. Biofuels processing plants would have an incentive to locate near the feedstock, thereby reducing transportation costs. This may result in new biofuels processing plants locating in rural regions.

Example of a Green Job. In addition to new farming opportunities, there are specialty jobs within the Advanced Biofuels industry. High demand is expected for biofuels production technicians. Although the precise nature of the job depends on emerging technologies, it will involve managing the production and processing of biofuels. This includes operating the chemical processing equipment, calculating the refined feedstock mixes, and inspecting and monitoring the plant and equipment. These positions will require skills in math, chemistry, and data management, along with the knowledge of biomass processing technologies and logistics (O*NET Online 2009).

Part 3. Engineering and Construction Jobs

Many green jobs will be in engineering and construction (Table 1), but these jobs, for the most part, will not be vastly changed from what they are today. Workers may need to adapt and learn new green skills. For example, construction workers may need to learn how to install green roofs or other green products, but their carpentry skills would still be very relevant.

Understanding how engineering and construction are currently faring in rural Illinois is useful for understanding the potential for green jobs. Are there sufficient numbers of engineers and construction workers? What is the average pay for those positions? What training is required? This analysis will give us a sense of how prepared rural Illinois is to capture additional green jobs in these sectors.

In rural Illinois (defined as the state's nonmetropolitan counties), engineering employment has experienced a 2% loss from 2008 to 2009, although this is not surprising in light of the recession (Table 2). Unfortunately, rural Illinois has relatively few engineers compared to the nation as a

whole. In total, 0.30% of rural Illinois employment is in engineering compared to 1.01% in the nation. This indicates that rural Illinois does not currently have the concentration of engineers to facilitate expansion of green jobs. Either migration of engineers into small Illinois towns or recruiting graduating engineers who want to live in rural areas will be required to expand this occupation.

Although most engineering positions require a bachelor's degree, there are engineering technician positions that require only an associate's degree. Salaries are attractive, with engineers earning \$60,000 to \$80,000 annually and annual salaries for the technician positions in the \$40,000 to \$50,000 range.

Jobs in the construction sector in rural Illinois grew by 3% from 2008 to 2009 despite the recession (Table 3). This contrasts with a decline nationally over that time period. Furthermore, rural Illinois employs a considerably larger fraction of its labor force in construction than in engineering, (3.1% of total jobs), which is comparable to the

Table 2. Engineering Employment in Rural Illinois

Occupation Name	2008 Jobs	2009 Jobs	2008-2009 % Change	Percentage of Jobs Relative to Total Jobs in Rural Illinois 2008	Percent of Jobs Relative to Total Jobs in Nation 2008	Current Median Hourly Earnings in Rural Illinois	Current National Median Hourly Earnings	Education Level
Computer software engineer, applications	401	404	1%	0.05%	0.31%	\$25.19	\$39.03	Bachelor's degree
Computer software engineer, systems software	416	406	(2%)	0.05%	0.24%	\$27.01	\$41.67	Bachelor's degree
Chemical engineer	108	102	(6%)	0.01%	0.02%	\$33.25	\$40.30	Bachelor's degree
Civil engineer	599	603	1%	0.07%	0.18%	\$19.90	\$32.99	Bachelor's degree
Electrical engineer	344	330	(4%)	0.04%	0.09%	\$35.58	\$38.60	Bachelor's degree
Environmental engineer	82	82	0%	0.01%	0.03%	\$28.84	\$34.87	Bachelor's degree
Civil engineering technician	201	199	(1%)	0.02%	0.05%	\$20.17	\$21.23	Associate's degree
Electrical and electronic engineering technician	316	297	(6%)	0.04%	0.09%	\$23.01	\$25.35	Associate's degree
Environmental engineering technician	108	109	1%	0.01%	0.01%	\$18.00	\$19.70	Associate's degree
Total Engineering Employment	2,575	2,532	-2%	0.30%	1.01%	\$25.06	\$36.14	

Source: Economic Modeling Specialists Inc. (2009b) data

national share. Although most construction projects will take place in urban areas, there will be many opportunities in downstate communities as well, especially in the Building Retrofitting industry as companies and households seek to reduce their energy bills.

The earnings for the construction sector are fairly strong, ranging from \$25,000 to \$50,000 for a full-time worker (Table 3). The addition of green projects may enable seasonally employed construction workers to find year-round work. With the exception of the position of construction manager, college degrees are not required for these positions. Instead, most employees learn through on-the-job training from a contractor.

Some employees have the opportunity for formal apprenticeship programs which offer two to four years of classroom and on-the-job training. Associate degree programs in construction trades are offered at many community colleges.

The presence of many construction tradesmen and workers in rural Illinois suggests that green jobs in this sector could be supported by a sizeable pool of workers. Furthermore, because of the history of farming and manufacturing in rural communities, many residents have strong carpentry and mechanical skills. Many persons are skilled at working with their hands. This is a good potential workforce for green construction jobs.

Table 3. Construction Employment in Rural Illinois

Occupation Name	2008 Jobs	2009 Jobs	2008-2009 % Change	Percentage of Jobs Relative to Total Jobs in Rural Illinois 2008	Percent of Jobs Relative to Total Jobs in Nation 2008	Current Median Hourly Earnings in Rural Illinois	Current National Median Hourly Earnings	Education Level
Construction manager	3,086	3,167	3%	0.361%	0.43%	\$11.65	\$20.19	Bachelor's degree
Carpenter	7,840	8,089	3%	0.917%	0.92%	\$13.26	\$16.68	Long-term on-the-job training
Construction laborer	6,845	6,926	1%	0.801%	0.83%	\$13.56	\$13.71	Moderate-term on-the-job training
Operating engineer and other construction equipment operators	1,961	1,976	1%	0.229%	0.24%	\$23.05	\$18.41	Moderate-term on-the-job training
Electrician	3,038	3,115	3%	0.355%	0.43%	\$23.72	\$20.74	Long-term on-the-job training
Painter, construction and maintenance	2,119	2,201	4%	0.248%	0.31%	\$11.38	\$14.62	Moderate-term on-the-job training
Roofer	751	812	8%	0.088%	0.10%	\$11.97	\$15.14	Moderate-term on-the-job training
Helper, construction trades, all other	225	231	3%	0.026%	0.02%	\$14.03	\$12.13	Short-term on-the-job training
Construction and building inspector	355	361	2%	0.042%	0.07%	\$19.32	\$22.23	Work experience in a related field
Total Construction Employment	26,220	26,878	3%	3.1%	3.3%	\$14.97	\$16.91	

Source: Economic Modeling Specialists Inc. (2009b) data

Conclusions

This report provides an overview of promising green jobs in rural Illinois. Building Retrofitting, Wind Energy, and Advanced Biofuels are industries with high potential in rural Illinois. From a workforce standpoint, rural Illinois is well-positioned to capture many green jobs, especially in construction and agriculture. Many rural residents are skilled and experienced in these sectors.

Green jobs span a variety of skills and educational backgrounds. However, many jobs that will be in demand are “mid-skilled” jobs that require education past high school but not

a college degree. Most green jobs, as we see in engineering and construction, will be modifications to existing jobs, likely requiring learning new skills and methods. Community colleges and universities in rural regions can change training programs in such fields as construction and engineering to incorporate green technologies and techniques.

Furthermore, the greening of the economy will provide entrepreneurs with opportunities to launch new enterprises. For example, within the Building Retrofitting industry, there will be many opportunities for companies capable of auditing

energy efficiency of buildings and designing and installing new green products to reduce energy consumption. Previous issues of the *Rural Research Report* (e.g., Chojnowski 2006) have described how communities can effectively support entrepreneurs. Communities may want to improve their support of entrepreneurs and identify resources that can directly assist green entrepreneurs. This community support could pay extra dividends in the green economy.

Additionally, from a long-term standpoint, the greening of the economy may benefit small towns. An important reason that young people don't return to their hometowns is lack of job opportunities. By expanding rural employment in construction and agriculture, among other fields, the green economy may enable more young people to remain or return to their rural communities.

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