Mapping Green Career Pathways:

Job Training Infrastructure and Opportunities in Ohio

January 2010

POLICY MATTERS OHIO

Mapping Green Career Pathways:

Job Training Infrastructure and Opportunities in Ohio

We gratefully acknowledge the support of the Joyce Foundation in the production of this report.

Lead Authors:
Piet van Lier and Amanda Woodrum,
Policy Matters Ohio;
Kate Gordon, Apollo Alliance

Contributors:
Matt Mayrl, Elena Foshay, and
Jessica Halpern-Finnerty, Apollo Alliance;
Joshua Marcin, Zachary Walker and Mirela Turc,
Policy Matters Ohio

Special Thanks To:
Courtney DeOreo, Jon Honeck,
Wendy Patton, Susan Helper,
and Community Research Partners

Any errors or omissions in the report are the sole responsibility of the authors.

Apollo Alliance
330 Townsend St., Suite 205
San Francisco, CA 94107
415-371-1700

TABLE OF CONTENTS

APPENDIX

Cover photo credits: Clockwise from top: Apollo Alliance; Simonton Windows, Grid Alternatives, Gamesa

INTRODUCTION

The current economic and energy crises place us at a crossroads. One path leads backward toward the kind of carbon-intensive, high-waste, low-road economic development strategies we have been following for decades. The other leads into a new clean energy future, where acting sustainably requires not only choosing lower-carbon, more environmentally friendly energy and fuel, but also choosing to pursue sustainable economic growth strategies that produce high-quality, family-supporting jobs and long-term prosperity. The Apollo Alliance and its partners believe the choice is clear: the old way did not work, and we must move in a new direction that is better for our workers, better for our communities, and better for our environment.

Photo © Electrical Trades Center of Central Ohio

Ohio exemplifies the need for this transition. Over the past decade Ohio has lost some 404,000 jobs in the manufacturing sector alone.[1] The construction sector has also suffered, losing over 31,000 jobs just in the past year. On top of these losses, workers and their families have borne the consequences of the state's fossil fuel dependency through price volatility in gasoline and home heating fuel. In 2008, record high energy costs led many low- and middle-income families to fall behind in bill payments; these families also reported that they spent less on critical goods like groceries and medicine because of their heating costs.[2]

"Transitioning away from fossil fuels and toward a clean energy economy has the potential to create millions of green-collar jobs – defined as high-quality, career-track jobs that contribute significantly to enhancing or preserving the environment"

Transitioning away from fossil fuels and toward a clean energy economy has the potential to create millions of green-collar jobs – defined as high-quality, career-track jobs that contribute significantly to enhancing or preserving the environment – while freeing workers and their families from the costs of fossil fuel dependency.[3] A recent analysis shows that a major, national investment in clean energy similar to the comprehensive climate and energy legislation being debated in Congress would generate a net increase of roughly 1.7 million jobs in the U.S.[4] Ohio would feel these benefits directly: over 67,000 jobs would be created in Ohio alone, on top of the more than 60,000 specialized workers already supporting the state's advanced energy industry.[5] With the implementation of policies such as Ohio's Alternative Energy Portfolio Standard, the number of jobs created could be even higher. [6]

Green-collar jobs potentially or currently exist in every single sector of the economy, and range from entry-level to advanced-skill. Most, however, will be "middle-skill" jobs in construction and manufacturing – jobs that require more than a high-school degree but less than a four-year college education.[7] Fully 55% of all new jobs in the emerging renewable energy and efficiency industries are projected to be in the manufacturing and construction sectors, industry areas that have long been the ticket into the middle class for the 68% of working Americans without four-year college degrees.[8]

This paper identifies training opportunities in Ohio that prepare workers for green-collar jobs in the construction and manufacturing sectors, and that represent key elements of an integrated green workforce-development system.[9] It highlights existing programs that are beginning to tie these elements together, and provides policy recommendations on how to begin the challenging, but critical, work of building and strengthening green career pathways. The appendix offers a detailed description of our investigation and conclusions that emerged during the research process, as well as specific information about technical college and apprenticeship programs that are, or could be, integrated into green career pathways in Ohio.

Green Careers in Construction and Manufacturing

The construction and manufacturing sectors hold particular promise for workers seeking green-collar training and job opportunities. Investment in energy efficiency will generate large-scale demand for trained construction workers; as an example, the 2009 American Recovery and Reinvestment Act alone has the potential to create almost 180,000 jobs in energy efficiency over the next few years.[10] Energy efficiency retrofits can require workers from a wide range of trades, including electricians, Heating, Ventilation, and Air Conditioning (HVAC) technicians, roofers, insulation workers, carpenters, plumbers and pipefitters, cement masons, glaziers, construction laborers and managers, auditors, and inspectors. Each of these trades represents a potential career pathway in the construction sector, with opportunities for advanced training, increased responsibility, and higher wages. High-quality training programs for some of these trades already exist, and many are adding new skills and technologies to their curricula to prepare workers for jobs in the efficiency industry.

"New investments and new markets for clean energy technology could create over 51,000 new jobs in Ohio"

Manufacturing will also play a critical role in the emerging green economy, in Ohio and elsewhere. Despite a decline of almost two million jobs nationally over the past two years, manufacturing still represents nearly 8% of national employment making up about 12% of the nation's GDP. Not surprisingly, manufacturing plays an even larger role in Ohio's economy, employing 12% of the state's workers employed in the sector.[11] Although only a small portion of clean energy products and components are currently made in the U.S., investment in renewable energy and energy efficiency has the potential to generate significant new demand for American-made products and components. The Renewable Energy Policy Project (REPP) estimates that a national renewable energy standard of 25% by 2025, combined with other policies, would create 850,000 jobs if all clean energy parts and components were made in the United States.[12] REPP also estimates that over 42,000 U.S. firms have the capacity to manufacture wind turbine, solar, and other clean energy components.

Ohio, in particular, has the potential to become a key part of the future clean energy supply chain. Environment Ohio has identified more than 440 businesses and research institutions already working in the solar, wind, biomass, geothermal and fuel cell industries, and REPP has identified a total of 2,465 firms in Ohio that are primed to produce component parts for

Photo © Electrical Trades Center of Central Ohio

wind turbines, solar panels, biomass co-firing systems, and the other renewable energy technologies that will power the clean energy economy.[13] New investments and new markets for clean energy technologies could help these firms create over 51,000 new jobs in the state, in occupations ranging from production workers to machinists, welders, boilermakers, and technicians, among others.[14]

Unfortunately, the nation's workforce development system is not fully prepared to support the growth of middle skill jobs in the clean energy economy. Policy makers have been guided by the assumption that jobs in our economy are concentrated at the top, among highly-paid, high-skill workers, and at the bottom, among a large number of workers that are low-paid and low-skill. As a result, training and education has focused on high-skill jobs requiring a college education as the only pathway to success.

Meanwhile, years of low-road economic development have meant fewer manufacturing jobs as industries move overseas, while the construction sector has seen an overall decline in wage rates consistent with the overall decline in unionization. As a result, jobs that used to be tickets into the middle class are now too often either located in other countries, or paid at rates barely above minimum wage. Done right, clean energy economic growth could reverse this trend.

The demand for clean energy workers is real, and will only grow as federal, regional, and state climate and energy policies move forward. However, for Ohio to take full advantage of this job creation potential, it will need workers whose skills match the needs of the employers and industries of the new energy economy. Amazingly, even during a recession, with high unemployment among skilled laborers, many clean energy industries face a shortage of skilled workers. The National Renewable Energy Lab has identified a shortage of skills and training opportunities as a leading barrier to renewable energy and energy efficiency growth.[15] Workers

are in short supply for the many specialized jobs (e.g. energy auditor, wind turbine technician) in growing and emerging occupations, as well as in existing professions (e.g. machinist, welder) that will require additional training as their industries become "greener." These factors, in combination with an older workforce nearing retirement, may result in an unmet demand for skilled workers, which in turn could inhibit Ohio's ability to capture economic growth.[16]

Matching the skills of American workers with new opportunities in the clean energy economy will require strong worker training programs at all levels. Fortunately, because many of the jobs created by investments in clean energy are in occupations that already exist, the training systems needed to prepare workers for these jobs are also largely in place. It is a common misperception that we need to create a new workforce development infrastructure to provide green-collar job training. In fact, many of the elements needed to build strong, integrated green career pathways exist in Ohio today.

Photo © Grid Alternatives

DEMAND FOR SKILLED WORKERS IN THE CLEAN ENERGY ECONOMY

Investment in renewable energy and energy efficiency is on the rise, creating new jobs and transitioning existing jobs to become more "green." However, as the clean energy economy grows and expands employers in many sectors are experiencing a shortage of trained workers to fill green-collar jobs. This is true not only in Ohio, but across the nation:

- As "baby boomers" retire, the U.S. will experience a mismatch between supply and demand for educated workers, especially in middle-skill occupations.[17]
- According to the Bureau of Labor Statistics, about 45% of all job openings in the next ten years will be in middle-skilled occupations, particularly in the skilled construction, transportation, and installation/maintenance/repair sectors. At the same time, the Bureau of Labor Statistics projects that by 2020 the U.S. will see slower growth in the number of workers with "some college," the education level that produces the most middle-skill workers.[18]
- In a recent industry survey, 72% of energy professionals indicated that there will be a shortage of qualified workers in the renewable energy and energy efficiency fields in the next five years.[19] An example is in the wind industry, where wind turbine factories with qualified machinists and welders capable of churning out high-quality gear boxes are in short supply. As a result, gear-box manufacturers have been unable to keep up with demand. Bottlenecks have occurred, raising the price of wind turbines, delaying wind turbine projects.[20]
- Many workers lack the basic skills necessary to access middle-skill jobs. A total of 57% of working adults (88 million people) have low literacy, limited English proficiency, or lack an educational credential past high school.[21] A 2009 White House survey of employers found that most job applicants who had recently graduated from high school lacked the basic skills of reading, math, and especially writing. These skills are essential for accessing jobs in the new energy economy.[22]

Without an adequate supply of skilled workers, the clean energy economy will be unable to reach its full potential. As we see an increase in opportunities for large-scale growth in various clean energy sectors, we must also increase training programs' ability to respond by providing relevant skills to both new and incumbent workers, across a broad range of occupations. These programs must be accessible to workers at a variety of skill levels, including those in entry-level positions seeking opportunities for career advancement. Training for green-collar jobs must be incorporated into existing programs, creating new career tracks within traditional occupations. Furthermore, inclusive regional workforce networks must be created or strengthened to ensure that training is demand-driven and appropriate for local needs. ■

CAREER PATHWAYS AND GREEN-COLLAR JOBS

Photo © Oakland Green Jobs Corps

Green-collar jobs exist throughout the economy, mostly within existing sectors and occupations which are experiencing increased demand in response to clean energy policies and investments. In many cases, the skills required for these jobs are no different than those already being applied within traditional occupations. For example, a machinist working at a gear manufacturing firm might shift from making auto parts to making parts for wind turbines on the same machine.

In other cases, existing occupations are becoming greener as workers adapt or enhance their skill set to include new low-carbon or efficient processes and technologies. The Department of Labor has identified 124 such occupations in which workers are "greening" their skills to meet the demand for efficiency and clean energy, such as building and construction inspectors, heating and air conditioning installers and mechanics, roofers, plumbers, and sheet metal workers.[23] A smaller number of green-collar jobs are in comparatively new sectors and occupations, like renewable energy or biofuels; however, even these jobs often use some combination of existing and new skills. A solar panel installer, for example, needs the skills of a roofer, an electrician, and a renewable energy specialist.[24]

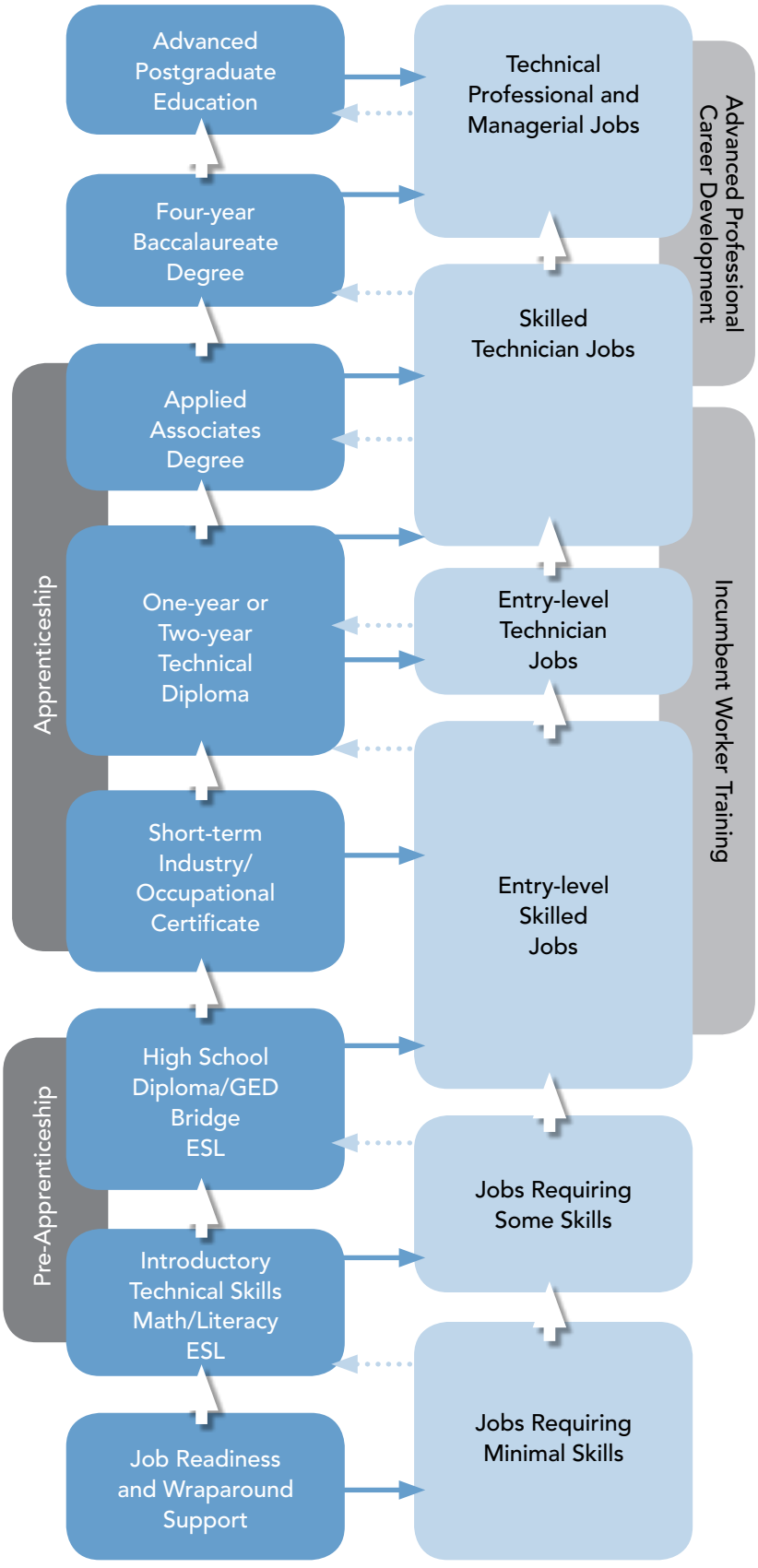
As more than half of green job growth will be among middle-skill jobs in construction and manufacturing, it is important to understand how training is structured in each sector. When looking at workforce development systems, we found that the existing construction and manufacturing training models are quite different. In construction, a fairly broad training network exists, based around a centrally-organized system of apprenticeships in the building trades (e.g. plumbing, electrical, sheet metal). Apprenticeships are offered through a partnership with employers, with the understanding that the training provider offers a consistent and high-quality pipeline for well-trained workers. In general, pay increases as workers move up through the program, but a worker will not secure a well-paid, full-time position until his or her apprenticeship is completed. Apprenticeships are sometimes connected, often informally, to job readiness or pre-apprenticeship programs, which offer training in basic skills and assistance in preparing for entrance tests.

In manufacturing, the training system is organized differently. Fewer workers enter or advance in the manufacturing workforce through formal apprenticeship programs. In general, job seekers with basic workplace and educational skills can secure a place in a firm at a low level, and then continue learning new skills on the shop floor. Where formal apprenticeships or community and technical college training programs exist, they are typically tied to specific employers or particular skill sets. There are simply not as many skilled trades jobs in the manufacturing sector, and even in those occupations in which an apprenticeship system may be appropriate, other forms of incumbent worker training offer a more common path to advancement.

In both sectors, it is difficult for job seekers to access the skilled trade training system without a high school education or equivalent, and the basic educational foundation – including math and communication skills – necessary to learn and perform the technical aspects of these jobs.

Photo © IceStone, LLC

GREEN CAREER PATHWAYS



Adapted from Wisconsin Regional Industry Skills Education (RISE) Career Pathways Diagram

Building Green Career Pathways in Ohio

Just as many of the skills associated with green-collar jobs are not new, neither are the workforce strategies to prepare workers to fill them. In many cases, training already exists and can be enhanced to incorporate new skills and become more accessible. We do not need to reinvent the wheel; we only need to apply important lessons learned from the workforce development world to make sure the system runs as smoothly as possible. In this section, we provide a brief description of the career pathways model of workforce development and then explain how it applies to the construction and manufacturing sectors in Ohio.

At its core, workforce development should be demand driven, starting with actual and available jobs. As with any training program, training programs for green-collar jobs should be responsive to the particular economic growth potential, employer needs, and workforce realities in a given region. Employers and industry leaders must be at the table from the beginning, to help design training programs and pathways that truly reflect the skills necessary for new jobs in emerging and expanding occupations. Over the past decade, employers, state agencies, and labor unions have built industry partnerships in a number of sectors, including construction, manufacturing, and health care; these are ideal models for the kind of employer engagement necessary to guide an effective training system.[25]

The best work being done in the workforce development arena recognizes the importance of developing "career pathways" in particular industries to help job seekers move from entry-level work into higher-paid, more specialized positions. These models take as their guiding principle that every step along the pathway should be designed to prepare students for the next level of both employment and training.[26] Ultimately, the goal is to provide participants with the skills and opportunities they need to obtain stable, high-quality, family-supporting employment, and to ensure access to education and training up through two- or four-year college degrees.

It is important to note that career pathways are not necessarily linear, and do not always represent a clear progression from one educational institution to another or from one job classification to another. Instead, they are flexible lattices, allowing for lifelong and applied learning of transferable skills that is integrated with different stages of employment. For example, a high school graduate may work while taking classes at night, allowing her to access more advanced positions within her firm where she continues to learn new skills on the job. This may lead her into a formal apprenticeship or certificate program and a succession of higher-paid, higher-quality jobs. Along the way she learns a broad range of skills that can be applied to many different kinds of jobs, further expanding her lifetime career opportunities.

Strong career pathway models must align and integrate all of the different components of the workforce development system so that workers can easily move between employment and training programs of different types, building their skills in some sort of logical progression. Career pathways must be clearly mapped, must be accessible through various entry points at different levels of education and stages of working life, and must have a strong emphasis on portability – teaching skills that can be applied to a range of different jobs, and providing degrees or course credits that are transferable among institutions.[27] Finally, career pathways ought to connect with K-12 education, include access to on-the-job training, and offer direct links to actual employers and work opportunities.

BENEFITS OF UNIONS

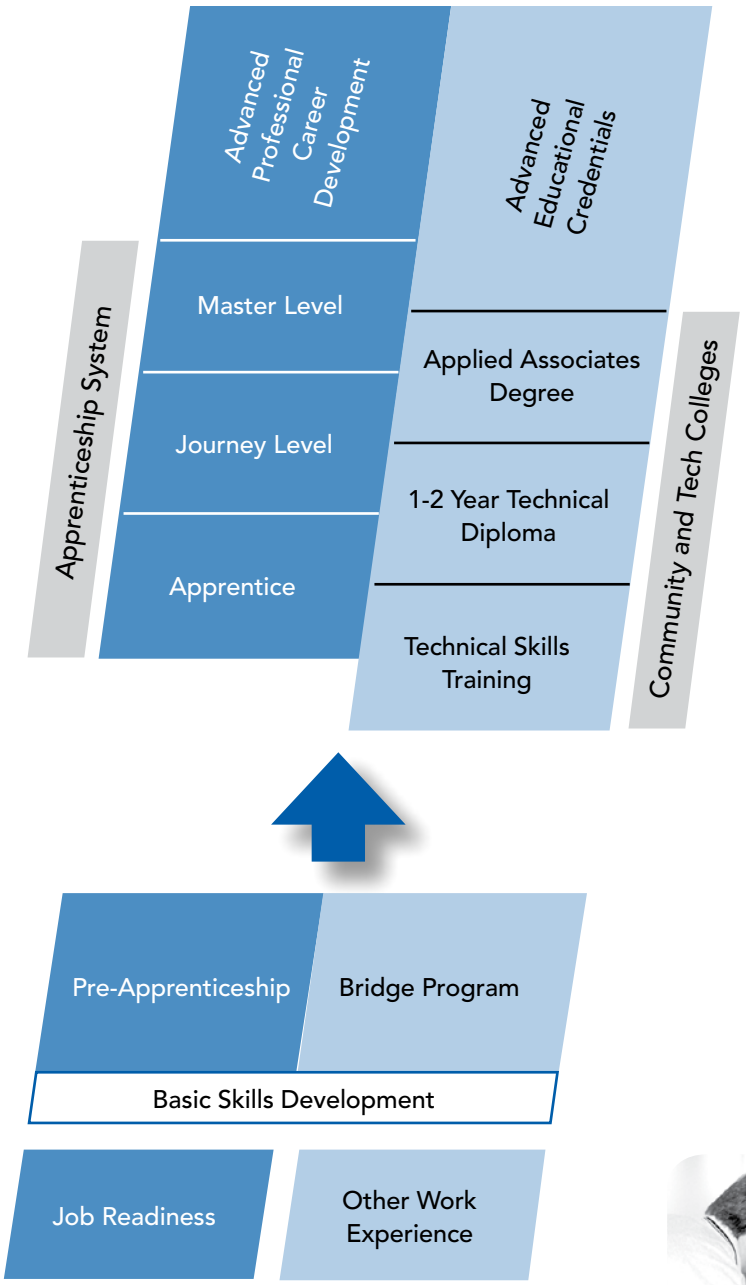
Labor unions are a critical part of a good jobs economy. Unions pave the way to the middle class for millions of American workers, guaranteeing decent wages and benefits like health care and pensions. According to a recent report by the UCLA Institute for Research on Labor and Employment, 11.3% of manufacturing workers and 16.3% of construction workers belong to a union – a total of almost 3 million people.[28] Unfortunately, this represents a decline from just 20 years ago, when almost 30% of workers in these sectors were unionized.[29] Despite this decline, labor unions can and should play a critical role in the clean energy economy by providing high-quality training and by ensuring that green-collar jobs are good jobs.

A union connection provides many benefits for workers. First and foremost, union workers earn significantly more – $2.26 per hour more, on average – than their non-union counterparts, and union employers are more likely to provide benefits like health insurance and pensions.[30] For traditionally disadvantaged workers, the impact is deeply felt – for African-American workers, unionization raises wages by an average of 12%; for Latino workers it raises wages by more than 17%; and both women and younger workers are at least 20% more likely to have health insurance and a pension if they belong to a union.[31] Where they exist in sufficient density, unions can drive up wages for all workers in an industry.

A key benefit of unionization is access to high quality job training, through apprenticeships and "journey-level" programs. Training is shaped by both employers and workers, is skills-oriented and practical, and includes hundreds of hours of on-the-job experience. Additionally, participants earn wages and benefits throughout training, increasing as technical expertise improves. Finally, the number of apprentices a union accepts in a given year is directly linked to the availability of jobs for union workers, making trainees much more likely to find employment after graduation. ■

"A key benefit of unionization is access to high-quality job training, through apprenticeships and 'journey-level' programs."

GREEN WORKFORCE DEVELOPMENT INFRASTRUCTURE



Comparing the Workforce Development Infrastructure for Manufacturing and Construction:

- Along any career pathway there are multiple entry points.
- Throughout their careers, most people shift in and out of work and training, building skills and progressing toward higher-skill, higher-paid positions.
- There are fewer apprenticeship programs in manufacturing than in construction.
- It is less common to enter the manufacturing sector through formal apprenticeships or training programs than is the case in the construction sector.
- Ongoing training in manufacturing is largely organized through employers.
- In addition to formal training, most workers build skills through on-the-job training and experience.

Photo © Electrical Trades Center of Central Ohio

Existing Workforce Development Assets

A comprehensive workforce development system is made up of many different types of organizations and programs. People enter the system at different points and receive services through specific, targeted programs, or through programs that address several aspects of skill building. Because a worker's accumulation of skills is most often not a linear, step-by-step process, the distinctions between categories or types of training programs are often blurry or overlapping. It is difficult to definitively categorize these components because in a well-integrated system they are not always distinct. Nevertheless, there are identifiable elements of a successful workforce development system, even though they are rarely encompassed by a single organization.

The elements that contribute to a comprehensive training network include:

Job Readiness Programs: These programs are usually run by community-based organizations or government agencies. They are sometimes open to the public, and sometimes focused on a specific population, such as youth (18-21 year olds) or ex-offenders re-entering the labor market. The main goal of these programs is to teach the "soft skills" necessary to function effectively in any workplace – skills such as problem solving, teamwork, professional communication, and punctuality. Job readiness programs usually can feed into career pathways in any sector because their content is intended to be broadly applicable. However, given that soft skills are difficult to acquire without on-the-job application, job readiness programs may attempt to teach these skills to students already engaged in some type of work, internship, or pre-apprenticeship placement which can simultaneously offer more specialized or technical skills training.

Modeled after the Green Jobs Corps in Oakland, California, the Pathways out of Poverty through Green, Sustainable Jobs program at Cuyahoga Community College combines soft skill training, such as anger management and communication, with occupation-specific training and support services. The program, which began in the spring of 2009, is based on a curriculum model developed by Professor Raquel Pinderhughes of San Francisco State University. It is intended to create a career path for people with significant barriers to employment, with focused outreach to ex-offenders. The Cleveland-based program, while promising, had a difficult start, struggling in its first months with lower-than-expected funding as well as staffing and program changes and continued to evolve as this report was written. As of August 2009, the program had placed 11 of the 29 participants who had successfully completed the first-cohort training in green-collar jobs; staff continued to work with other participants and planned a second cohort to begin in October.[32]

Pre-Apprenticeship Programs:[33] Pre-apprenticeships are far more prevalent in the construction trades than in manufacturing, and are often taught at technical colleges or through high school career technical education classes (Table 1; for more details see appendix). In some cases, pre-apprenticeship programs are combined with secondary education, through high school Career Technical Education programs or community-based youth programs that combine GED classes with job readiness.

Though the term "pre-apprenticeship" implies that these programs are designed to prepare students for specific apprenticeships, that is not always the case. All too often, programs calling themselves "pre-apprenticeships" teach curriculum that is not aligned with, or linked to, any apprenticeship. The best pre-apprenticeship programs teach specific skills required for entry into apprenticeships, making it much more likely that graduates will continue on to a registered apprenticeship program.

An example of an existing pre-apprenticeship program in Ohio is the Cleveland-based Union Construction Industry Partnership Apprenticeship Skill Achievement Program (UCIP-ASAP), which is offered to minority and disadvantaged men and women. The five-day-a-week, 320-hour program offers pre-apprenticeship training in math, blueprint reading, construction safety, trade orientation, welding, nutrition, resume writing, interviewing and trade selection. The program's eight-week courses enroll up to 20 participants, with the goal of training 60 people each year; of 260 graduates, UCIP-ASAP has placed 165 into apprenticeship programs, including Cleveland IBEW, Operating Engineers Local No. 18, and Sheet Metal Workers JATC 33.[34]

Ohio is currently working to create a system of credentialed pre-apprenticeship programs. To jump-start this effort, the Ohio Department of Job and Family Services released in June a request for proposals for its "Constructing Futures Initiative" (see appendix). The goal is to provide pre-apprenticeship training for Ohioans underrepresented in the building trades, specifically minorities, women, veterans, dislocated workers and ex-offenders. The initiative is to be funded with $4 million from ARRA in fiscal year 2010, matched by sponsoring organizations. Entities receiving money must have letters of support from registered apprenticeship programs, proving their commitment to collaboration.[35]

Hard Hatted Women (HHW), another Cleveland job readiness and pre-apprenticeship program, works to prepare women for employment in non-traditional careers in the building trades, and connect them with job opportunities and mentors. Through its statewide Women in Roadways Construction Consortium, HHW partners with the Ohio Department of Transportation to help recruit women into registered

Table 1. Summary of Pre-Apprenticeship Programs in Ohio

Program	Description	Target Groups
Blueprint for Success	Nine-month on-the-job construction training program. Provides financial, job search, and child care assistance for participants.	Cincinnati residents aged 18 to 24 that are unemployed, underemployed, ex-offenders, or high school dropouts.
Hard-Hatted Women	Orientation to non-traditional careers, basic skills and pre-apprenticeship in construction.	Working poor women or those transitioning from welfare to work in the Cleveland area.
Helmets to Hardhats	Connects former military personnel to employers and apprenticeships in the building and construction trades.	Former military personnel.
Orientation to Trade and Apprenticeship Programs (OTAP) at Columbus State Community College Center for Workforce Development	Ten-week job training and placement program for apprenticeships in skilled trades, including drafting, welding, carpentry and plumbing.	Low-income, unemployed, or displaced adults. Separate introductory program for youth aged 16 to 18.
Pathways Out of Poverty Through Green, Sustainable Jobs at Cuyahoga Community College	Provides academic and technical training, paid internships, support services, and placement.	Including, but not limited to, ex-felons, single women with children and/or dependent on public assistance, at-risk youth.
Union Construction Industry Partnership - Apprenticeship Skill Achievement Partnership (UCIP-ASAP)	Eight-week program including classroom instruction and hands-on training. Offers direct entry into paid, union apprenticeship programs for qualified graduates.	Cleveland residents who have been historically under-represented in the construction trades.

apprenticeship programs or into pre-apprenticeship and other vocational training programs. Of the approximately 300 women that HHW serves every year, around 35 enter apprenticeships or other training in non-traditional careers.

Apprenticeship Programs: Apprenticeships combine structured on-the-job training with related classroom instruction, carrying participants through a clearly articulated sequence of steps to career advancement. One key feature of these programs is that apprentices are paid during the course of training, which may last several years. As students progress through the program, they gain new skills and therefore command higher pay. Apprenticeships in Ohio often offer course credit at community and technical colleges, or at other higher education institutions (Table 2; for more details see appendix). For example, the International Brotherhood of Electrical Workers (IBEW) Electrical Trades Center of Central Ohio invites faculty from Columbus State Community College to come and teach some classes at the center. This allows apprentices to earn an associate degree without setting foot on a college campus. Apprentices can also take courses onsite or online from Franklin University and earn a bachelor's degree in applied management.

Apprenticeships are organized differently in the construction and manufacturing sectors. Building and construction trades apprenticeships are accessed and run through trade committees, most of which are organized as a locally-based Joint Apprenticeship Committees (JACs), or Joint Apprenticeship and Training Committees (JATCs). The JACs and JATCs bring together an equal pairing of labor union and employer representatives to develop policies and practices regarding apprenticeship selection and training. Application procedures and requirements vary by committee, but may include an aptitude test, interview, high school transcript, proof of high school graduation or equivalent, birth certificate, valid driver's license, etc. Not all trade committees in the state are joint committees, the most notable being the Associated Building Contractors (ABC). These committees typically consist only of employer representation.

Apprentices have two ways to find apprenticeship placements in the building and construction trades: the rank order list and the letter of introduction. In the first, the trade committee lists candidates in order of their scores on written and oral examinations. When employers request an apprentice, the committee refers the next person on the list. Employers can request the apprentices who will help them meet hiring goals for women or minorities, or wait until a particular individual reaches the top of the list, but otherwise cannot hand-select apprentices. The second placement strategy is the letter of introduction, where people who apply for an apprenticeship and meet basic qualifications are given a letter from the sponsoring committee stating that they are eligible to be hired as apprentices. It is then the responsibility of the individual to

CASE STUDY:
ORIENTATION TO TRADE AND APPRENTICESHIP PROGRAM

Photo © Simonton Windows

The Orientation to Trade and Apprenticeship Program (OTAP) at Columbus State Community College runs 10-week trainings to prepare participants for jobs and apprenticeships.[36] Last year, the college incorporated a 42-hour green training element into the OTAP curriculum. In addition to basic academics, including five hours of technical math a week, OTAP provides classes like resume writing, blueprint reading, work ethics and safety. Hands-on training includes framing, drywall, plumbing, electricity, welding and a range of construction trades. In response to growing demand for construction workers trained for green-collar jobs, the program recently added two weeks of classroom training in skills such as weatherization.

Photo © OTAP

OTAP began as a program to train women for non-traditional jobs, but responded to demand among men in the area, especially foreign-born residents and men of color. Today the majority of students are between 22 and 35 years old and roughly 75 percent are men. Applicants to OTAP must be 18 years or older and have a high school diploma or GED, though exceptions are made for participants if they are willing to simultaneously take academic classes. Background checks, drug tests (at the beginning and randomly during the program), math and language assessments, and completion of 7th grade are required. All applicants are interviewed as well. For youth age 16 to 18, OTAP offers a free introduction to the construction trades. The program meets two nights a week for eight weeks, and provides rewards such as a tool box and work boots for perfect attendance.

Upon successful completion of the program, OTAP graduates receive job placement assistance from an OTAP staff member who works directly with unions and non-union contractors. Of the 180 people enrolled between June 2008 and April 2009, 143 completed the program and 106 of those were placed. During that period, 27 were placed in construction jobs and 23 in union apprenticeships. As a program at Columbus State, OTAP also places graduates in higher education.

Though OTAP has experienced some important successes, the program continues to face challenges. Clearly there is room for improvement in the program's job placement numbers, but this speaks to the need for better integration of pre-apprenticeship and bridge programs with apprenticeships and technical colleges. It is clear that those managing pre-apprenticeship programs like OTAP ought to have a consistent line of communication with directors of union apprenticeship programs, so that classroom learning covers material that is needed to pass entrance exams. Funding is also an issue – as of August 2009, the program had been operating at reduced capacity for several months due to inadequate financial support. But the program continues to operate within existing resources, and hopes to access additional funding in the future. ■

Photo © OTAP

find an employer to sponsor their apprenticeship, although the committee can often provide a list of participating employers.

In manufacturing, apprenticeship is a far less common entry point and pathway to career advancement than in construction. Applicants apply directly to a company that runs an apprenticeship program, and requirements for completion are determined by the employer or, in some cases, by a Joint Apprenticeship Committee. Most employers require a high school diploma or equivalent, math and reading skills, and some also test applicants in trade-specific knowledge or aptitude. Although these apprenticeships are sometimes listed with local job centers, technical colleges, or in public ads, companies often limit apprenticeship opportunities to incumbent workers.

Many apprenticeship programs have already begun to strategically "green" their curricula by incorporating additional skills and certifications into the training they offer. The International Brotherhood of Electrical Workers has also developed a series of training modules on residential and commercial solar PV installation.[37] These modules have been integrated into their existing five-year apprenticeship program nationwide, in response to growing demand for renewable energy specialists.

Table 2. Summary of Ohio Apprenticeships in Construction and Manufacturing Trades

Trade	Location	Program
Boilermaker	Cleveland	Great Lakes Area Boilermakers Apprenticeship Program Local Lodge 774
	South Piketon	Cincinnati Boilermakers JATC
Bricklayer	Cleveland, Canton, Akron, Youngstown, East Liverpool/ Steubenville, Mentor, Mansfield, Warren, Fremont, Hudson	Northern Ohio Administrative District Council Regional Training Center for Bricklayers & Allied Craftworkers
Bricklayer, Cement Mason, Composition Roofer, Laborer, Plasterer, Tile, Marble & Terrazzo, Reinforced Concrete and Iron Worker	Cincinnati	Cincinnati Plasterers, Bricklayers, Construction Craft Laborers, Composition Roofers, Reinforced Concrete Iron Workers and the Tile, Marble and Terrazzo JATC
Bricklayer, Cement Mason, Glazier, Insulator, Roofer and Waterproofer	Toledo	Northwest Ohio Construction Education Center
Carpenter, Millwright/Piledriver, Floorlayer	Rossford	Northwest Ohio Carpenters JATC
	Columbus	South Central Ohio District Council of Carpenters JATC
	Monroe	Southwest Ohio Carpenters JATC
Carpenter, Floor Covering, Millwright/ Piledriver, Cabinetmaker/Millwork: Residential & Commercial	Richfield	Northeast Ohio Carpenters Joint Apprenticeship Program
Construction Laborer	Toledo	Laborers Local 500
Electrical Construction	Mentor	IBEW Local 673 Joint Apprenticeship and Training for Electrical Construction
	Mansfield	Mansfield Area Electrical JATC
	Warren	Warren Electrical JATC
Electrical Construction and Telecommunications Technician	Lorain	Lorain IBEW JATC
	Cleveland	Cleveland IBEW/NECA Electrical JATC
	Cincinnati	Cincinnati IBEW/NECA Electrical Training Center
Electrician	Akron	Akron Area Electrical JATC
	Youngstown	Mahoning-Trumbull Electrical JATC
Electrician: Inside Wireman and Installer-Technician	Columbus	Columbus IBEW Electrical Trades Center of Central Ohio
	Dayton	Dayton IBEW/NECA Electrical JATC
	Rossford	Toledo Electrical JATC

Table 2. Summary of Ohio Apprenticeships in Construction and Manufacturing Trades *continued*

Trade	Location	Program
Electrician: Outside Electrical Construction	Medway	American Line Builders Joint Apprenticeship & Training Program (ALBAT)
Glazier and Painter	Columbus	Columbus Painting and Decorating Joint Apprenticeship Committee, Glaziers Local 372 and Painters Local 1275
	Cincinnati	I.U.P.A.T. Glaziers Local 387
Heat and Frost Insulator and Asbestos Worker, Ironworker	Cincinnati	Joint Apprenticeship and Training Program, Asbestos Workers Local 8; Ironworkers JATC
Ironworker	Columbus	International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers, Local 172 Columbus
Millwright	Parkersburg	JATC Millwright Local 1755
	Monroe	Southwest Ohio Millwrights JATC
Operating Engineer	Columbus	Operating Engineers JATC includes four regions in Richfield, Cygnet, Logan and Miamisburg as well as the central office in Columbus
Painter and Drywaller	Cincinnati	Painters and Allied Trades District Council 12
Pipefitter	Cleveland	Pipefitters Local 120 of the United Association and Mechanical Contractors Association of Cleveland
Plumber	Cleveland	Cleveland Plumbers Local 55 JATC
Plumber and Pipefitter	Columbus	Columbus Plumbers and Pipefitters Local 189 (Sauner Mechanical Contracting)
	Dayton	United Association Plumbers, Pipefitters & Service Technicians Local 162 Apprenticeship and Training Center
	Norwalk	Plumbers and Steamfitters Local 42 JATC - Norwalk
Plumber, Pipefitter, and HVAC	Northwood	Plumbers and Steamfitters Local 50: Piping Industry Training Center
Plumber, Pipefitter, and Mechanical Equipment Servicemen	Cincinnati	UA Plumbers JATC Local 392 Training Center
Reinforced Concrete Worker	Cincinnati	Cincinnati Reinforced Concrete Workers Joint Apprenticeship Committee Local 372
Roofer	Columbus	Columbus United Union of Roofers, Waterproofers, and Allied Workers Local 86
	Cincinnati	Composition Roofers JATC Local 42
Roofer, Reinforced Concrete, Iron Worker	Massillon	Canton IBEW/NECA Electrical Apprenticeship and Training Committee
Sheet Metal Worker	Parma, Massillon, Parma, Rossford, Vermilion and Youngstown	Sheet Metal Workers' Local 33 JATC
Sprinkler Fitter	Cincinnati	Sheet Metal Workers' Local 25 JATC
	Cincinnati and other locations throughout the state	Local 669 Sprinkler Fitters Apprenticeship Ohio Outreach Organizations
Telecommunications Technician	Rossford	Telecommunications Technician Local 8

"Bridge" Programs: "Bridge" programs support transitions to postsecondary training for lower-skilled adults. In Ohio, there are many types of bridge programs, but in a career pathways context they refer to the integration of Adult Basic and Literacy Education (ABLE), English Language Learner (ELL), and/or Developmental instruction with college-level occupational or academic training. Bridge programs employ contextualized instructional strategies, reflect active cooperation between postsecondary and basic education divisions, and result in college-level credit and/or certificates that can be used for immediate employment or further postsecondary education.

"Community colleges have been at the leading edge of the effort to redesign existing job training to be more responsive to the needs of employers."

One example of a manufacturing skills bridge program is the Chippewa Valley Technical College Production MIG Welding certificate in Wisconsin. The 16-week program provides basic and technical skills instruction in welding and related processes, and is targeted toward low-skill and displaced workers in the region. Credits earned from the certificate are transferable to the Welding Diploma program, effectively creating a bridge for workers looking to upgrade their skills. Employers have been highly involved in the development of the program to ensure that the training meets their needs.

Community and Technical College Courses and Programs: The Midwest's extensive community and technical college systems offer a wide variety of individual courses and multi-course degree programs, with entry points for high school graduates at different levels, from basic "bridge" classes to pre-requisites for four-year degree programs. But the greatest strength of community and technical colleges is their certificate, one- and two-year degree programs in a variety of trades and technical professions. Such programs exist for both manufacturing and construction. In the case of manufacturing, they are often linked to the training needs of specific employers, which may pose a challenge as workers try to transfer these skills to new jobs or to apprenticeship programs.

These colleges have been at the leading edge of the effort to redesign existing job training to be more responsive to the needs of employers, including those in emerging green industries like renewable energy and efficiency (See Table 3; for more details see appendix). They often work in partnership with the other training providers, including labor unions and employers, offering everything from classroom space and faculty expertise to combined curriculum development.

In some cases, they offer college credit for a portion of apprenticeship classroom hours, which may be applied toward an associate degree.

In Northwest Ohio, Fremont-based Terra Community College is partnering with area firms and the four-county WSOS Community Action Commission (named for the four counties in its primary service area --Wood, Seneca, Ottawa, and Sandusky) to offer a wind energy certificate starting in the fall of 2009. The certificate, which requires about 20 credit hours over two semesters, includes electrical work, fundamentals of wind energy and safety. It is also stackable to the college's two-year electricity degree.[38]

Other programs of note include Cincinnati State Technical and Community College, which has retooled existing technical degrees with new areas such as solar thermal and photovoltaic installation, and Hocking College in Athens County, which has established associate degree programs in alternative energy, hybrid vehicles and fuel cells.[39] The school's Energy Institute, in nearby Hocking County, opened in 2009 and includes a hands-on working lab for training on vehicular transportation technologies and equipment for learning HVAC, solar, wind and geothermal systems.[40]

Photo © Chippewa Valley Technical College

CASE STUDY: WEST CENTRAL OHIO MANUFACTURING CONSORTIUM

The West Central Ohio Manufacturing Consortium, started in 2005 with seed money from the Cincinnati-based KnowledgeWorks Foundation, promotes advanced manufacturing in the region and collaborates with Lima-based Rhodes State College to create a pool of prepared and qualified workers.[41]

Students who successfully complete one or more levels of the Manufacturing Career Pathways program, operated by Rhodes State and the Consortium, are given referrals to the consortium's 25 dues-paying member firms, which have access to the students' resumes, academic records and credentials.

The Manufacturing Career Pathways program trains at three levels:

- Basic – Training consists of a 40-hour course that introduces students to manufacturing and focuses on computer, communication, math, safety and other workplace skills.
- Intermediate – Training builds on basic skills with a focus on process control, math and measurement, and computers. Students can earn this certificate in nine courses (three quarters minimum) at Rhodes State or over a 15-month period at area education centers.
- Advanced – Training focuses on advanced manufacturing skills such as computer numerical controlled (CNC) machining, mechanical, electrical and others. Students who complete this course of study receive an associate degree from Rhodes State; credits can be transferred to Ohio Northern University at Ada.

About three-quarters of the 200 students who completed the basic pathway as of summer 2008 had been placed in a job and about 50 of those got jobs in consortium firms. Of some 50 students who completed the advanced degree, half of the 40 placed in jobs were hired by consortium firms. New pathways are still being developed at the advanced level. Even though much of this training isn't green specific, the manufacturing focus can lead to good jobs in the new energy economy.

The consortium's community partners include Adult Basic Literacy Education, area career centers, school systems and community centers, Wright State University and Defiance College. Courses in the basic and intermediate levels are regularly taught in centers around the region, and can be paid for with Workforce Investment Act funds. ■

Photos © West Central Ohio Manufacturing Consortium

Table 3. Ohio Community and Technical Colleges offering Green-Specific Training

College	Location	Green-Specific programs
Cincinnati State Technical and Community College	Cincinnati	Certificates and associate degrees in renewable energy and energy efficiency.
Columbus State Community College	Columbus	Green construction certificate and training in fuel-cells and alternative fuels.
Cuyahoga County Community College	Cleveland	Certificates and degrees in solar, deconstruction, automotive, and wind.
Edison Community College	Piqua	Renewable energy major to be added in 2011, offering an associate degree.
Hocking College	Nelsonville	Associate in Applied Science Degree in Alternative Energy and Fuel Cells.
Lorain Community College	Elyria	Associate degrees and certificates available in wind energy major.
North Central State College	Mansfield	Green engineering program is under development.
Northwest State Community College	Archbold	Associate Degree in Alternative Energy System Design, Associate Degree in Alternative Energy System Installation and Repair, and an introduction to alternative energy course.
Owens Community College	Findlay	Photovoltaic and green building.
Sinclair Community College	Dayton	Three-course sequence in advanced energy includes alternative and renewable energy, fuel cells, and energy auditing for commercial and residential buildings.
Stark State College of Technology	North Canton	Mechanical engineering.
Terra Community College	Fremont	Certificate in wind energy.

Incumbent Worker Training (on-and off-site): Even when a worker secures a full-time position at a manufacturing firm or on a construction crew, he or she may need further training as processes or technologies change (for instance, as green building practices become more prevalent on construction jobs). Incumbent worker training may be provided by the employer on-site, or offered though apprenticeship training centers or community/technical colleges. Although some of this training offers credentials that can be used to demonstrate acquired skills to other potential employers, many times incumbent worker training goes formally unrecognized, putting these workers at a distinct disadvantage because they cannot demonstrate advanced skills to new employers. As such, these training opportunities are difficult to quantify, and are not discussed in the appendix. However, it is worth noting that unionized employers are far more likely to offer continuing training opportunities than are non-union employers.

Incumbent worker training is particularly important for teaching existing workers about new green processes and technologies. The Ohio Workforce Guarantee, funded by the state's Department of Development, supports incumbent worker training. Courses which result in a portable certificate can be reimbursed at 100%, rather than the standard 75% reimbursement rate. If the employer partners with a joint vocational center or a community college for the training, courses can also be funded at 100% of cost.[42]

Creating a Comprehensive, Integrated System

As described above, there are a variety of education and workforce programs in the state already that are either clearly relevant to, or specifically defining themselves as a part of, occupations in the emerging green economy. But how to turn these building blocks into an actual career pathway for a job seeker looking for an alternative to low-paid service sector work, or a laid-off worker looking to gain new skills in a growing green industry?

In general, we suggest what might seem like a simple solution: make connections. Community-based organizations need to form relationships with pre-apprenticeship programs. Pre-apprenticeships must be formally linked to apprenticeships. Community and technical colleges must work with all other training programs to fill in gaps, offer partnerships, and help to market career pathways to prospective students. And all parts of the model must stay in close contact with the actual employers, who will dictate what training is most relevant to actually finding a job. The role of the state should be to target funding toward support for broad partnerships,

ensuring that training remains affordable and accessible, and providing "wrap-around" services that support workers involved in any area of the training system.

Creating a more unified system in Ohio will not be easy. Even though many of the building blocks already exist in this state, there are many challenges. While community and technical colleges have been at the forefront of creating new opportunities in green job training, tuition rates in Ohio are among the highest in the nation, completion rates in these programs are less than 60%, and degree programs don't always have strong connections to employment.[43] In addition, schools in the K-12 system are not adequately preparing many students for entry into community college or apprenticeship programs. At the same time, while unions have a long history of providing quality training in the trades and direct entry into family-supporting jobs, they still struggle to make membership more accessible and diverse. And finally, Workforce Investment Boards, despite controlling funding which could be used to further system integration, often remain disconnected from each other and from other potential partners.

For these reasons, all the pieces of this puzzle, from K-12 and post-secondary education institutions, to apprenticeships and incumbent worker training programs, must find new ways to work together. By combining what we know about best practices in workforce development, with newly-emerging data about clean energy job opportunities, we can create a more fully-integrated system that will enable Ohio to take advantage of the transition to a greener economic growth model. This level of integration and communication will also help ensure that the new green economy is open to everyone, not just to those who already have the necessary skills.

POLICY RECOMMENDATIONS

Though strengthening the state's workforce development system will be challenging, Ohio is not starting from scratch. For years, the state's community/technical colleges and apprenticeship programs have been training job seekers and workers in the critical skills needed to build the green economy. More recently, these programs have begun to incorporate training modules aimed at preparing students for particular tasks unique to emerging green industries. But work still remains to develop a comprehensive, integrated green career pathways model that is both accessible and transparent.

This is a critical time for decision makers in the energy and workforce development fields. Congress is considering comprehensive climate legislation that would drive investment into the clean energy economy, and will soon turn its attention to reauthorization of the Workforce Investment Act. State and local governments, as well, are currently deciding how best to use existing training funds to train for green-collar jobs in their own regions. We offer the following recommendations to support the development of green career pathways:

1. **Invest in solid, credible data collection and dissemination, so that individual regions and cities can easily access information about existing green-collar jobs as well as growth potential in particular sectors of the green economy.** For example, Washington state created a comprehensive green-collar jobs analysis in 2008, based on the findings of a survey of private-sector employers in the state. The final report identifies the number and type of jobs in the state's emerging green economy, and establishes a baseline measure that can be used to track industry and job growth in Washington's green economy.[44] The state is now using this report to guide policy decisions in both economic and workforce development.

2. **Break down silos and better integrate environmental, economic, and workforce goals at the federal, state, and local level, so that investments in new training programs are driven by actual job growth.** The Ohio Skills Bank was designed to help training institutions meet targeted regional economic needs and promote the principles of demand-driven, sector strategy workforce planning across the state. Though funding for the program was stripped in the 2010-11 biennial budget, in some regions the Skills Bank continues to work to align education programs, short-term training, and workforce services based on the needs of employers.[45] And regardless of particular agency constellations, one way to breach silos and create a more comprehensive training system is to drive workforce development through jobs rather than institutions.

3. **Award public grants and contracts for green projects in ways that create linkages to training opportunities, such as awarding contracts based on the "best value" to the community rather than to the lowest cost bidder.** Contracts should emphasize high-road principles such as a commitment to local hiring from apprenticeship and other training programs and to providing family-supporting wages for workers. A 2006 ordinance in the city of Madison, Wisconsin places a specific emphasis on workforce development by requiring that all contractors with the city be qualified to participate in state-approved apprenticeship programs. Additionally, the ordinance requires that contractors report on their performance history, affirmative action plan, and substance abuse policy as part of the Request for Proposals (RFP) process.[46]

4. **Condition federal, state, and local training grants and department of development funds on interagency collaboration, and prioritize partnerships between training**

providers, unions, employers, and Workforce Investment Boards. In addition to promoting collaboration, training grants should be used to pull together a coherent, coordinated statewide network, while also allowing flexibility to fit local conditions. The Green Jobs Act, passed as part of the 2007 Energy Bill, provides a good example of this kind of language, specifically funding partnerships that include "the equal participation of industry and labor organizations, and may include workforce investment boards, community-based organizations, qualified service and conservations corps, educational institutions, small businesses, cooperatives, state and local veterans agencies, and veterans service organizations."[47] As a result of ARRA funding for the Green Jobs Act, most states are in some stage of developing such partnerships.

5. **Provide funding not just for new training courses and curriculum development, but for the establishment or continuing support of local workforce intermediaries that can and do serve as connectors between the stakeholder groups described above.** One of the most respected national examples of a workforce intermediary is the Wisconsin Regional Training Partnership (WRTP/BIG STEP). WRTP/BIG STEP is a well-established labor-led sector partnership that brings together unions, businesses, community groups, and workforce development agencies to help thousands of workers access high-quality training and employment.[48] Community and technical colleges, Workforce Investment Boards, and non-profit organizations can also play this role.

6. **Invest in policies and programs to fill in gaps between existing training programs, rather than investing in new and sometimes unnecessary programs.** Examples of these gap-filling programs include high-school career technical education; basic literacy, math, and job readiness training through Adult Basic Education; pre-apprenticeship or bridge programs for youth and adult job seekers; expanded employer-based on-the-job training fund accessible to both small businesses and large employers; and initiatives that integrate curriculum design to improve articulation between programs.

7. **Address barriers to access and retention in the construction and manufacturing trades by providing incentives for training, hiring, and mentoring often-excluded job seekers,** including people of color and female job seekers; workers displaced by the transition to the new energy economy (e.g. workers from carbon-intensive and mining industries); formerly incarcerated individuals; and returning veterans. Ohio has a number of innovative programs targeting training and employment support toward disadvantaged populations. For example, Hire Vets First, run through the state Department of Labor, helps veterans translate skills and experience gained during military service into occupations experiencing job growth. The program also builds relationships with employers in order to link veterans with available job opportunities.[49]

8. **Invest in career pathways models that emphasize flexibility, so that workers can easily move in and out of classroom-based training and employment.** As an important first step, the federal Department of Labor recently updated the regulations governing certified apprenticeships to allow for the development of portable interim credentials.[50] Additionally, the Building and Construction Trades Department of the AFL-CIO has developed a "multi-craft core curriculum" that provides structured training in basic skills that are transferrable among all participating trades.[51]

CONCLUSION

Green-collar jobs are not just on the horizon; they exist today, appearing in many sectors of the economy and demanding a workforce with the right set of skills to fill them. As the pace of public and private investment in clean energy quickens, the number of green-collar jobs in the economy will continue to multiply.

This job growth holds the potential to rebuild the middle class and put millions of unemployed Americans back to work. But we won't be able to achieve these goals unless our workforce development system is strengthened to create better and greener pathways that lead workers toward new and expanding opportunities. Other countries that have spent the past few years significantly beefing up their own clean energy investments and workforce training programs may be in a much better position than we are to take advantage of global green-collar job growth.

Fortunately, we are not starting from scratch. Many of the pieces needed for an effective training infrastructure already are operating in Ohio. Nevertheless, much work remains to make the existing system one that is both comprehensive and fully integrated. The existing training programs described in this paper represent a starting point for policymakers, green jobs advocates, and workforce development professionals interested in achieving these goals. By building on existing programs, and implementing policies aimed at strengthening, coordinating, and aligning these programs with job growth in the green economy, we can meet the workforce demands of the new energy economy – and we can do so while simultaneously creating navigable career pathways into high-quality, family-supporting jobs that rebuild the middle class.

APPENDIX

The purpose of this research is to develop a better understanding of the existing workforce development system and to identify the places where it could be put to greater use for green-collar jobs training. The model of green career pathways used in this paper was first outlined in the *Green-Collar Jobs for America's Cities* and *Greener Pathways* reports. We applied the model to the existing workforce development systems in Michigan, Ohio, and Wisconsin to highlight the areas where green-collar jobs training is already occurring and has the potential for expansion, and to identify the ways in which the system could be improved to offer more effective and navigable pathways.

The conclusions and policy recommendations in each report reflect a collaborative effort between the Apollo Alliance and its partners in each state. These three states were chosen because they face a common set of challenges due to the decline of Midwest manufacturing and job losses in construction, but also share similar strengths in terms of their pre-existing industrial base and job-training infrastructure. The following sections describe, in further detail, our investigation and findings of green-collar job training within Ohio's apprenticeship and community college system.

Green-Collar Jobs Training Through Ohio's Pre-Apprenticeship Programs

Pre-apprenticeship programs can be an important step in the apprenticeship career pathway. These programs can prepare individuals with the skills needed to be hired and succeed as an apprentice, or to enter a community college training program. Ideally, such training aims to place individuals with union apprenticeships and lead to jobs that pay family-supporting wages and provide benefits.

Pre-apprenticeship programs in Ohio are often run by community-based organizations, in partnership with labor unions and/or community colleges, and target specific populations. While training usually includes hard or technical skills, it also typically includes job readiness skills such as resume writing and communication, and fundamentals like math, reading, and English language. Programs usually also offer support services like help accessing transportation or child care, or case management and mentoring, to help ensure that participants succeed.

Based on our research, we found that the most effective pre-apprenticeship programs share some common characteristics: 1) Provide direct entry into an apprenticeship program or have strong relationships that facilitate placement; 2) Involve community groups, education institutions, unions, employers, and partners from the workforce investment system; and, 3) Ensure access for under-represented populations, including people of color, women, and low-income workers, providing wrap-around support services as needed.

Ohio is in the process of creating a statewide network of quality pre-apprenticeships that build on existing programs, while encouraging programmatic improvements. It will include a system for attaining pre-apprenticeship credentials, and incentives to encourage the development of comprehensive programs that meet the needs of participants, cover relevant curricula, and coordinate with registered apprenticeship programs. The task of creating this network is a monumental one, and progress has been made with the help of the Ohio State Apprenticeship Council and the Board of Regents. Pre-apprenticeship credential rule proposals are currently available for public comment, and the Constructing Futures Initiative, which uses federal stimulus funds to encourage the development of pre-apprenticeship programs in the building trades, is awaiting applications following a Request For Proposals.[52]

The table below outlines several community-based pre-apprenticeship programs in Ohio. This listing is not intended to be comprehensive; rather, it is intended to provide a sample of programs available in Ohio. This table does not include programs at the high-school level, which can teach skills that provide an entrée into apprenticeships.

Photo © B'More Green

OHIO PRE-APPRENTICESHIP PROGRAMS

Program	Location and Contact	Entry Requirements	Description	Target Population	Enrollment and Placement
Blueprint for Success	1740 Langdon Farm Road Cincinnati (513) 569-4510 x1435	Valid state ID, library card, and interview.	Nine-month construction training program. Provides financial, job search, and child care assistance. Partnership of the City and Cincinnati-Hamilton County Community Action Agency.	Cincinnati residents aged 18 to 24 that are unemployed, underemployed, ex-offenders, or high school dropouts.	
Hard-Hatted Women	4220 Prospect Ave, Cleveland (216) 861-6500	Tradeswomen TOOLS: none Pre-apprenticeship training: High school diploma or GED, driver's license, reliable transportation, physically fit for work in trades, math at 7th-grade level, reading at 8th-grade level, and interview.	Tradeswomen TOOLS (Training, Outreach, Opportunity, Leadership and Support) includes monthly orientations to nontraditional careers, industry-specific presentations, assessments, career pathway development, supportive services, mock interview/soft skills, math and physical fitness, job postings and referrals. Pre-Apprenticeship training teaches math and measurement, blueprint reading, study skills, tool recognition, tool use and safety, material handling, physical conditioning.	Working poor women or those making the transition from welfare to work. Most participants live in Cleveland or inner-ring suburbs and typically range from their mid-20s to mid-40s. Two-thirds are single parents and a majority are living below the poverty line.	Pre-apprenticeship training program graduated 516 women since 1992, with an average placement rate of 70 percent, and starting wages of $13 to $18/hour. Graduates work as salt miners, highway maintenance workers, city utility workers, operating engineers, carpenters, ironworkers, landscapers and in other fields.
Helmets to Hardhats	National program (866) 741-6210	Age 18 or older with honorable discharge and high school diploma. Applicants must take aptitude test and create a profile.	Referral service connecting former military personnel to employers and apprenticeships in the building and construction trades.	Former military personnel.	No tracking after referrals.

OHIO PRE-APPRENTICESHIP PROGRAMS

Program	Location and Contact	Entry Requirements	Description	Target Population	Enrollment and Placement
Orientation to Trade and Apprenticeship Programs (OTAP) at Columbus State Community College Center for Workforce Development	550 East Spring Street Columbus (614) 287-5905	Age 18 or older, driver's license, high school diploma or GED strongly preferred, drug test, math and language assessment, interviews, background check, and 7th-grade math and reading levels.	Ten-week job training and placement program preparing participants for apprenticeships in skilled trades, including drafting, welding, carpentry and plumbing. Skills taught include: blueprint reading, basic mathematics, test-taking skills, thermodynamics, stress management, weatherization, wind and solar.	Low-income, unemployed, or displaced adults, including women, racial/ethnic minorities and foreign-born workers. Separate introductory program for youth aged 16 to 18.	June 2008 through April 2009: 180 enrolled and 143 completed program with OSHA certification. 106 of those have been placed in jobs, apprenticeships or higher education. Most placed as apprentices in one of the 11 member unions of the Central Ohio Training Consortium or with member contractors of the non-union Associated Builders and Contractors.
Pathways Out of Poverty Through Green, Sustainable Jobs at Cuyahoga Community College	4400 Richmond Road Warrensville Heights (216) 987-2867	Cuyahoga County resident; high school diploma or GED may be required, depending on cohort.	A program of the Green Academy and Center for Sustainability designed to train and place individuals with significant barriers to employment. Provides academic and technical training, paid internships and support services.	Including, but not limited to, ex-felons, single women with children and/or dependent on public assistance, and at-risk youth.	First cohort of 30-plus began in April 2009, and was geared toward weatherization crew jobs.
Union Construction Industry Partnership - Apprenticeship Skill Achievement Partnership (UCIP-ASAP)	3515 Prospect Cleveland (216) 432-7033	Cuyahoga County resident, high school diploma or GED, age 18 or older, entrance exam, interview, and drug screening.	Eight-week program includes classroom instruction and hands-on training. Graduates receive direct entry into paid, union apprenticeship programs for which they qualify and in which opportunities exist.	Residents of Cleveland, especially those who have been historically under-represented in the construction trades, such as African-Americans, women and low-income residents.	Enrolls up to 20 participants per session. Of the 260 who have completed the program, 165 have been placed in paid union apprenticeships in the construction trades.

Green-Collar Jobs Training Through Ohio's Apprenticeship System

Apprenticeship programs are a critical component of any workforce training infrastructure, whether or not the jobs come with a green collar. In Ohio, the State Apprenticeship Council, part of the Ohio Department of Job and Family Services, is the official regulatory agency of apprenticeship programs in the state. According to its website, OSAC registers and monitors apprenticeship programs to ensure quality and safety. It conducts audits and site visits to review program compliance with state and federal code, equal opportunity pledges, safety, supervision, wages, etc. OSAC requires that each program include a minimum of 2,000 hours per year of structured on-the-job training and 144 hours per year of classroom instruction. To be registered, a sponsor of an apprenticeship program has to have a written set of standards that outlines what apprentices will learn on the job and what they will learn through classroom or technical instruction.

Apprenticeships in the building and construction trades are often organized through partnerships between unions and employers called Joint Apprenticeship and Training Centers or Committees. The International Brotherhood of Electrical Workers (IBEW), for example, partners with National Electrical Contractors Association (NECA) to run apprenticeship programs nationally and in Ohio. Unions also offer additional quality guarantees and regulate affiliated training centers.

Our research indicates that many of the "green skills" that are important in the new energy economy have been taught for many years in Ohio apprenticeship programs. In some cases, traditional skills are the same ones needed for green-collar jobs. Much of the training for Operating Engineers, for example, is the same whether workers are moving earth on a brownfield site or on one without an industrial past. But the same heavy equipment operators do need safety training to move hazardous materials, training they've been getting since the 1970s, according to a representative of Ohio's Local 18 apprenticeship and training program. Apprentices in programs run by the IBEW and NECA have been learning new skills relating to solar photovoltaic technology as part of the program's national curriculum.

The following table provides descriptions and contact information for a sample of union apprenticeship programs in the building and construction trades in Ohio, and includes information on green-specific training where it was available. A full listing of Ohio apprenticeships in all areas – union, non-union, building and construction, and manufacturing – can be accessed through the OSAC site or at http://oa.doleta.gov/bat.cfm. Information for this chart was gathered from the OSAC website, from individual websites and through interviews. Where no information was available, spaces were left blank.

Photo © Marin City Community Development Corporation

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Boilermaker	Great Lakes Area Boilermakers Apprenticeship Program Local Lodge #774 1435 East 13th Street Cleveland (216) 241-2085	Birth certificate and high school diploma or GED. Applicants with proof of welding certification or welding training qualifications have priority selection.		
	Cincinnati Boilermakers JATC 561 U.S. 23 South Piketon (740) 289-4255	18 years or older, high school diploma or GED, good physical condition, and tube or pipe certification.	70 percent of journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.
Bricklayer	Northern Ohio Administrative District Council Regional Training Center for Bricklayers & Allied Craftworkers 5171 Hudson Drive Hudson (includes locals in Cleveland, Canton, Akron, Youngstown, East Liverpool/ Steubenville, Mentor, Mansfield, Warren, Fremont) (330) 463-5501 or (800) 442-0479			
Bricklayer, Cement Mason, Composition Roofer, Laborer, Plasterer, Tile / Marble / Terrazzo, Reinforced Concrete and Iron Worker	Cincinnati Plasterers, Bricklayers, Construction Craft Laborers, Composition Roofers, Reinforced Concrete Iron Workers and the Tile, Marble and Terrazzo JATC Allied Construction Industries Cincinnati (513) 221-8020	18 years or older, high school diploma or GED (10th grade for roofers), valid driver's license, ability to perform tasks of the trade, and reliable transportation. Some programs require a drug test and 1 year work experience.	45 to 60 percent journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.
Bricklayer, Cement Mason, Glazier, Insulator, Roofer and Waterproofer	Northwest Ohio Construction Education Center 4535 Hill Avenue Toledo (419) 531-5911	Driver's license, interview, drug test, and aptitude test. Prior work experience and demonstration of physical fitness may be required, depending on the program.	40 to 70 percent of journey-level wage; starting wage ranges from $14.80-$19.54/hour.	Partners with Owens Community College. Number of credit hours transferable varies by program.
Carpenter, Millwright/ Piledriver, Floorlayer	Northwest Ohio Carpenters JATC 9270 Bass Pro Blvd Rossford (419) 872-4651	17.5 years or older, driver's license, interview, and aptitude test.	Start at 45 percent of journey-level wage.	Partners with Owens Community College. Credits earned are transferable for two-year associate degree.
	South Central Ohio District Council of Carpenters JATC 1394 Courtright Road Columbus (614) 236-4205 or (877) 726-5282	17 years or older, high school diploma, GED or 1500 hours documented work in the trade, math test, and drug test.	Start at 60 percent of journey-level wage.	Partners with Cuyahoga Community College.
	Southwest Ohio Carpenters JATC 361 Breaden Drive Monroe (513) 539-7870 or (877) 638-8544	17 years or older, high school diploma, GED or 1500 hours documented work in the trade, math test, and drug test.	Start at 60 percent of journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Carpenter, Floor Coverer, Millwright/Pile Driver, Cabinetmaker / Millworker: Residential & Commercial	Northeast Ohio Carpenters Joint Apprenticeship Program 4100 Maple Drive Richfield (330) 659-9495 or (800) 601-1800	17 years or older (parent signature required if under 18), $42 fee for drug test, in-person visit to one of four regional offices, pursuit of a position with a signatory contractor, completed "intent to hire" letter, and purchase of tools required by contractor.	Start at 40 percent of journey-level wage with increases every six months.	Partners with Cuyahoga Community College to offer an Associate of Applied Science Degree in Applied Industrial Technology.
Construction Laborer	Laborers Local 500 2270 Ashland Avenue Toledo (419) 243-3279	Valid ID and proof of physical fitness.		Partners with area community colleges to offer college credit for some courses.
Construction Electrician	IBEW Local No. 673 Joint Apprenticeship and Training for Electrical Construction 8376 Munson Road Mentor (440) 255-3028	17 years old at the time of application, 18 at time of indenture, $25 application fee, high school diploma or GED or two year associate degree, high school algebra, high school transcript, and valid driver's license. Must pass aptitude test with a score of 5 or higher.		
	Mansfield Area Electrical JATC 67 S. Walnut Street Mansfield (419) 526-4688	17 years or older, high school diploma or GED, high school transcript, proof of completion of Algebra I or equivalent, valid driver's license, $25 application fee, and drug test.	Start at $10.26/hour.	Program partners with North Central State College to offer college credit for some courses.
	Warren Electrical JATC 4550 Research Pkwy Warren (330) 394-3690	$20 fee, driver's license, interview, physical exam, drug test, and reading, writing and math aptitude test. 80 percent pass rate on aptitude tests, with retakes available after six months.		Solar panels and a wind turbine are being installed at the training center to generate on-site energy and offer hands-on coursework.
Construction Electrician and Telecommunications Technician	Lorain IBEW 105 Cooper Foster Park Road W. Lorain (440) 233-7156 or (513) 281-6924	$25 fee, resident of Lorain, Erie or Huron counties, one year high school algebra or one post high school algebra course successfully completed, and interview as-needed to gauge reliability, interest, attitude, judgment, cooperativeness and other personal traits.	40 to 55 percent of journey-level wage.	55 to 60 credits can be applied at Owens Community College, and partners with area vocational schools like Lorain County Joint Vocational School for pre-apprenticeship connections. Program curriculum covers developments in solar and wind technology.

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Construction Electrician and Telecommunications Technician (continued)	Cleveland IBEW/NECA Electrical JATC 1590 East 23rd Street Cleveland (216) 573-0400	$40 fee, driver's license, one year of algebra coursework, interview, drug test, and aptitude test.	Start at $11.82/hour with 5 percent wage increases every six months. Journey-level wage of $33.78/hour.	31 credit hours can be applied toward associate degree at Cuyahoga Community College. Partners with Hard-Hatted Women, UCIP-ASAP, and Helmets to Hardhats. Offers courses on solar photovoltaic technology, training for net metering installation, and installation process for DC to AC power inverters.
	Cincinnati IBEW/NECA Electrical Training Center 5179 Fishwick Drive Cincinnati (513) 281-6924	17 years or older, $10 fee, driver's license or state-issued ID, successful completion of algebra course for telecommunications applicants, interview, math/algebra and reading aptitude test with pass rate of approximately 60 percent; retakes available after 6 months.	Apprentices begin at $16.64/hour with wage increases every 1,000 hours until reaching the journey-level wage of $39.01/hour. Hourly wage for telecommunication begins at $15.17/hour, and increases every 800 hours. Journey-level wage of $26.59/hour.	59 credit hours can be applied at Cincinnati State Technical and Community College. 7 additional courses are required for an associate degree. Training for wind and solar installation makes use of the recently purchased 1200 watt solar-energy system.
Electrician	Akron Area Electrical JATC 2650 S. Main St. Suite 100 Akron (330) 644-4286	17 years old at time of application, 18 at time of indenture, high school diploma, GED or two year associate degree, official high school transcript, ability to pass electrical trades aptitude test, scoring at least 4 out of 9, ability to pass physical and drug screen tests.	40 percent journey-level wage. Journey-level salary is $57,000 per year plus benefits.	College credit is available for related classroom training.
	Mahoning-Trumbull Electrical JATC 8166 Market St. Suite L Youngstown (330) 965-0578	17 years old at time of application, 18 at time of indenture, high school diploma, GED or 2 year associate degree, official high school transcript, ability to pass physical and drug screen tests, completion of 1 year of high school algebra, $25 application fee; valid drivers license, and interview.		

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Electrician: Inside Wireman and Installer-Technician	Columbus IBEW Electrical Trades Center of Central Ohio 23 West 2nd Avenue Columbus (614) 294-4786	Birth certificate, panel interview, and entrance exam that tests for 11th-grade reading comprehension and math (geometry, algebra, basic trigonometry).	$17.09 to $28.73/hour (between 40 and 80 percent of journey-level wage).	Student Partner Program starts high school students in pre-apprenticeship training during summer after junior year. Roughly 40 percent of current apprentices came through this program. Credits earned in apprenticeship can be applied toward an associate degree from Columbus State or a B.S. in Applied Management from Franklin University.
	Dayton IBEW/NECA Electrical JATC 6550 Poe Avenue Dayton (937) 264-2052	$20 fee, one year of high school algebra, interview, physical exam, drug test, and aptitude test.	Start at $11.38/hour. Wages increase annually until reaching the journey-level wage of $28.45/hour.	45 credit hours can be applied toward an Associate Degree in Technical Studies at Sinclair Community College. May also apply credits toward a four-year degree. Program is adding additional training on solar technology.
	Toledo Electrical JATC 807 Lime City Road Rossford (419) 666-8088	$20 fee, birth certificate, one credit of algebra coursework, interview, physical exam, drug test, and 18 years old at time of indenture.	Start at 30 percent of journey-level wage.	Partners with community colleges, vocational and public schools. School-to-work program allows workers move from pre-apprenticeship to residential training to journeyworker status.
Electrician: Outside Electrical Construction	American Line Builders Joint Apprenticeship & Training Program (ALBAT) 1900 Lake Road Medway (937) 849-4177 or (800) 223-9339	$25 fee, driver's license, work history, and interview to earn position on stand-by list.		Program offers credit toward an associate degree.
Glazier and Painter	Columbus Painting and Decorating Joint Apprenticeship Committee 1104 Cleveland Ave. Columbus (614) 294-5302	18 years or older, high school diploma or GED, picture ID, and physical ability to perform the work.		
	I.U.P.A.T. Glaziers Local 387 200 Kovach Dr. Cincinnati (531) 221-7990	18 years old, high school diploma or GED, valid driver's license and transportation, physical ability to perform the work of the trade.	Glaziers start at 50 percent of journey-level wage with pay increases every 6 months. Painters start at 60 percent of journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Heat and Frost Insulator and Asbestos Worker; Ironworker	Joint Apprenticeship and Training Program, Asbestos Workers Local 8; Ironworkers JATC 4850 Madison Rd. Cincinnati (513) 221-5969 or (513) 561-3590	18 years old, high school diploma or GED, valid driver's license, and reliable transportation. Some programs require passing a drug test.	Insulator and asbestos workers earn 70 percent of journey-level wage. Ironworkers earn 60 percent of journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.
Ironworker	International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers, Local 172 Columbus 2867 S. High St. Columbus (614) 497-0550	18 years or older high school diploma or GED, valid driver's license, and drug test.		
Millwright	JATC Millwright Local 1755 4600 Camden Ave. Parkersburg, WV (304) 422-1593	18 years or older, high school diploma or GED, proof of residency in jurisdictional counties (Washington and Athens in Ohio), physical ability to perform work, written qualifying and aptitude test, interview, and drug test.		
	Southwest Ohio Millwrights JATC 361 Breaden Dr. Monroe (513) 539-7849 or (877) 638-8544	17 years or older, valid driver's license, high school diploma or GED, physical ability to do construction work, suitable transportation, and drug test.	Start at 60 percent of journey-level wage.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.
Operating Engineer	Operating Engineers JATC (includes Richfield, Cygnet, Logan and Miamisburg and central office in Columbus) 1184 Dublin Rd. Columbus (614) 487-6531 or (888) 488-9997	$10 fee, driver's license, interview, drug test, Commercial Driver's License exam, PSI Visual Pursuit test, Ramsay Speed of Marking Test, Bennett Mechanical Comprehension Test, and Minnesota Paper Form Board Test.	Start at 50 percent of journey-level wage. Increases 10 percent annually.	18 credits can be applied to enrollment at Cuyahoga Community College, Columbus State or Owens Community Colleges. Operating engineers work on both typical and green job sites, but the skills needed in each case are equivalent.
Painter and Drywaller	Painters and Allied Trades District Council no. 12 1216 East McMillan St. R. 108 Cincinnati (513) 221-7990	18 years or older and high school diploma or GED.		
Pipefitter	Pipefitters Local 120 of the United Association and Mechanical Contractors Association of Cleveland 6305 Halle Dr. Cleveland (216) 524-8334	18 years or older, high school diploma or GED, and $20 application fee.		

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Plumber	Cleveland Plumbers Local 55 JATC 980 Keynote Circle Cleveland (216) 459-2900	18 years or older, high school diploma or GED, driver's license or valid ID, proof of citizenship or legal alien status, $20 application fee, and $35 testing fee.		
Plumber and Pipefitter	Columbus Plumbers and Pipefitters Local 189 (Sauner Mechanical Contracting) 1801 Lone Eagle St. Columbus (614) 853-2500			
	United Association Plumbers, Pipefitters & Service Technicians Local 162 Apprenticeship and Training Center 1220 E. Second St. Dayton (937) 223-8534	High school diploma with a 2.00 cumulative GPA or better, two years of math with a C average, one year of science with a C average, or GED score of 500 or better; copy of birth certificate; driver's license; ACT Work Keys and Pre-Employment Test, and fee of $49.		
	Plumbers and Steamfitters Local 42 JATC Norwalk 187 Woodlawn Ave. Norwalk (419) 668-7305	$35 fee, birth certificate, proof of citizenship, interview, dexterity test, and differential aptitude test. Suggested preparation includes algebra/math, plumbing and welding coursework.	Start at $11.00/hour, or 40 percent of journey-level wage. 5 percent increases every six months until journey-level wage of $27.50/hour.	Offers clean room training on creating clean environments for project installation.
Plumber, Pipefitter, and HVAC	Plumbers and Steamfitters Local Union No. 50: Piping Industry Training Center 7560 Caple Blvd. Northwood (419) 666-7482	$10 fee, birth certificate, Social Security card, driver's license or picture ID, interview, and mechanical aptitude test.		
Plumber, Pipefitter, and Mechanical Equipment Service	UA Plumbers JATC Local 392 Training Center 1300 Century Circle North Cincinnati (513) 671-5282	$30 fee, driver's license (no more than four points on record over past three years), 2.0 high school GPA or GED score above 450, completion of two years of math and one year of science coursework, birth certificate, interview, drug test, and aptitude test. Previous job training can offset a failure to meet grade or GED score requirements.	40 to 50 percent of journey-level wage.	Credits can be applied toward an associate degree at Owens Community College.
Reinforced Concrete Worker	Cincinnati Reinforced Concrete Workers Joint Apprenticeship Committee Local 372 1010 Yale Ave. Cincinnati (513) 221-8020	18 years or older, high school diploma or GED, valid driver's license, work experience, drug test, interview, and exam.		

OHIO APPRENTICESHIP PROGRAMS

Trade	Location and Contact	Requirements	Wage	Career Pathways and Green Training
Roofer	Columbus United Union of Roofers, Waterproofers, and Allied Workers Local 86 37 1/2 West 2nd Ave. Columbus (614) 299-6404	18 years or older, high school diploma or willingness to obtain a GED, physically ability to do the work, and reliable transportation.		
	Composition Roofers JATC, Local 42 Cincinnati 1010 Yale Ave. Cincinnati (513) 221-8020	18 years or older, valid driver's license, completion of 10th grade, diploma or GED, test, and interview.		
Roofer, Reinforced Concrete, Iron Worker	Canton IBEW/NECA Electrical Apprenticeship and Training Committee 2333 Nave St. SE Massillon (330) 830-6446	Valid driver's license, three letters of recommendation, interview, math test, physical examination, and drug test.	Start at $10.58/hour.	31 credit hours can be applied at Cuyahoga Community College. Curriculum includes classes on installation of wind connections; solar, fuel cell and smart grid technology; and training to install solar panels, inverter boxes and fuel cells.
Sheet Metal Worker	Sheet Metal Workers' Local Union No.33 JATC 12525 Corporate Dr. Parma (800) 527-3834 or (216) 267-0151	$10 to $15 fee, driver's license, interview, and high school diploma or GED. Entrance exam covers math, reading, and hand-eye coordination, and is offered monthly.	Pay depends on region and ranges from a taxable pay of $23.94/hour in Vermillion to $32.51/hour in Cleveland.	40 to 45 credits can be applied toward an associate degree at Owens Community College. Green jobs training includes HVAC and other testing to ensure that equipment is operating efficiently, as well as the use of certified green materials, including water-based solvents for sealing compounds.
	Sheet Metal Workers' Local No.25 Cincinnati JATC 1579 Summit Rd. Room 114 Cincinnati (513) 821-8120	18 years old at time of interview, high school diploma or equivalent, physical ability to perform the work of the trade, valid driver's license, and drug test.	42.5 percent of journey-level wage, on average. Apprentices earn $11.31 to $19.95/hour. Journeypersons make $26.50/hour.	Partners with Owens Community College, Cincinnati State Technical and Community College, and Gateway Technical College.
Sprinkler Fitter	Local 669 Sprinkler Fitters Apprenticeship Ohio Outreach Organizations 7050 Oakland Mills Rd. Suite 100 Columbia, MD (410) 312-5202 or (800) 638-0592	18 years old, high school diploma or GED, physical ability to perform work of the trade, interview, and birth certificate.	Start at 50 percent of journey-level wage, on average. Increases to a journey-level wage of $31.85/hour.	Stipulates a minimum of 12 correspondence lessons per quarter with Washentaw College and 8 mandatory classes per year.
Telecommunications Technician	Telecommunications Technician Local 8 803 Lime City Rd. Rossford (419) 666-8088			

Green-Collar Jobs Training at Ohio's Community and Technical Colleges

The following table provides descriptions and contact information for all 23 of the community and technical colleges in the University System of Ohio. Based on the analysis conducted for this report, about half of the colleges have jumped into some aspect of green jobs training, mostly in renewable energy.

Information for this table was gathered from websites or through interviews. Where no information was available, spaces were left blank. While every effort was made to bring together all relevant information, this table should not be viewed as a comprehensive document. For example, many colleges offer credits transferable to four-year colleges and universities, run apprenticeship programs and accept credits from apprenticeship programs or other education institutions; not all of these connections are listed here.

Offerings range from short introductory workshops such as those offered in photovoltaics and green building at Owens Community College in Findlay to certificates and associate degrees in renewable energy at several schools around the state.

Of note are the many existing courses and programs at all 23 colleges in traditional building and construction trades areas as well as in manufacturing. While these programs may not be identified as "green" by the colleges, they teach skills that can be applied in green-collar jobs.

A complete catalog of green training at Ohio's community colleges has been developed by the Board of Regents, and can be found at (http://www.uso.edu/opportunities/sustainability/green-pathways/documents/GreenPathwaysCatalog.pdf).

Photo © Energy Trust of Oregon

Photo © Nature's Path Foods

OHIO COMMUNITY AND TECHNICAL COLLEGES

College	Location	Green-Specific Programs and Skills	Related Programs	Requirements	Career Pathways
Belmont Technical College	120 Fox-Shannon Place Clairsville		HVAC technology, tooling and machining, welding, and industrial electronics.	Placement exam.	
Central Ohio Technical College	1179 University Drive Newark		Advanced manufacturing technology and electrical trades technology.	$20.00 application fee and high school diploma or GED.	
Cincinnati State Technical and Community College	3520 Central Parkway Cincinnati	Certificates and associate degrees in renewable energy and energy efficiency; Training in solar, geothermal, wind, and fuel cell energy. Teaches installation and service of energy efficient technologies.	Electronics engineering technology, power systems engineering technology, sustainable design and construction, and environmental safety and security.	$10 application fee, high school diploma or GED, high school transcript or copy of GED, and placement exam.	Partnerships with Duke Energy, Mazak Corporation, Melink Corporation, Procter & Gamble, R.A. Jones & Company, Rite Track Equipment Services
Clark State Community College	570 East Leffel Lane Springfield		CAD, industrial technology, manufacturing engineering technology, and mechanical engineering technology.	High school transcripts and placement exam.	
Columbus State Community College	550 East Spring Street Columbus	Classes offered in hybrid technologies and alternative fuel systems (propane, natural gas, and E85). Certificate available in green building. Courses in solar, wind, and energy-efficient HVAC are under development.	Carpentry, electrical trades, HVAC technology, plumbing, welding, construction trades, current trends in engine performance, facilities maintenance, electro-mechanical engineering technology, electronic engineering, environmental science, and safety and health technology.	Placement exam.	Connected to OTAP, a 10-week program to prepare individuals for apprenticeships and trades, which includes green curriculum.
Cuyahoga County Community College	2900 Community College Avenue Cleveland	Green Academy and Center for Sustainability offer certificates and degrees in solar, deconstruction, automotive, and wind. Training in solar photovoltaic and solar thermal installation, deconstruction and materials reuse, hazardous material abatement, healthcare and institutional facilities maintenance, millwrighting, ironworking, manufacturing technology, hybrid vehicles, clean room technology, wind turbines (manufacturing technology), energy auditing, energy efficient rehab, green bidding specs, and the LEED application process.	Bricklaying, hazardous material abatement, construction, carpentry, millwrighting, operating engineering, automotive technology, CAD, computer-integrated manufacturing, electrical/electronic engineering, environmental health & safety technology, integrated systems engineering technology, manufacturing/industrial engineering technology, and precision machining technology.	High school diploma or GED if under 25, and placement exam.	Offers connections to BA, BS, MA, and MS degrees with various university and college partners in Ohio and Pennsylvania. Partners with Pathways Out of Poverty Through Green, Sustainable Jobs (in solar installation, wind, deconstruction, weatherization). Corporate training also available.

OHIO COMMUNITY AND TECHNICAL COLLEGES

College	Location	Green-Specific Programs and Skills	Related Programs	Requirements	Career Pathways
Edison Community College	1973 Edison Drive Piqua	Associate Degree in Renewable Energy will be added in 2011. Renewable energy major will focus on wind, solar, biomass, and water energy. Alternative energy class is offered every semester and in the summers.	Electronics, control systems, industrial systems, manufacturing systems, mechanical design, welding technologies, mechanical engineering, CAD, and manufacturing systems.	$20.00 application fee, high school transcript or GED, and placement exam.	
Hocking College	3301 Hocking Parkway Nelsonville	Associate in Applied Science Degree in Alternative Energy and Fuel Cells, offered through the Energy Institute. Covers green building design aspects and offers hands-on learning labs for students studying in the college's energy programs (such as alternative energy, fuel cells, vehicular hybrids, wind, and solar).	Construction management and drafting and design.	$20.00 application fee and high school transcript.	
James A. Rhodes State College	4240 Campus Drive Lima	Civil design technology, design engineering technology, electronic engineering technology, industrial engineering technology, manufacturing engineering technology, and mechanical engineering technology.		$25.00 application fee, high school diploma or GED, and placement exam.	40 to 50 students are enrolled at Rhodes State in connection with West Central Ohio Manufacturing Consortium (www.wcomfg.com).
Jefferson Community College	4000 Sunset Boulevard Steubenville	Advanced welding, building/construction trades technology, drafting/design, electrical, electro-mechanical engineering, electronics, industrial/manufacturing trades technology, and maintenance trades technology.		High school diploma or GED and placement exam.	
Lakeland Community College	7700 Clocktower Drive Kirtland	Electrical engineering technology, mechanical engineering technology, and electrical construction technologies. Electrical engineering programs stress AC/DC conversions, a skill important to wiring solar energy.		$15.00 application fee, high school diploma or GED, and placement exam.	
Lorain Community College	1005 N. Abbe Road Elyria	Associate degrees and certificates available in the wind energy major. Program focuses on siting, installing, and maintaining wind power systems (modeled after a program at Iowa Lakes Community College).	Automation engineering technologies, electronic engineering technology, facilities electronic engineering technology, manufacturing engineering technologies, CAD, and welding technology.	Placement exam.	
Marion Technical College	1467 Mt. Vernon Avenue Marion	Mechanical engineering, industrial maintenance, industrial electrical maintenance, electro-mechanical technology, and electric power utilities.		$20.00 application fee, high school diploma or GED, and placement exam.	

OHIO COMMUNITY AND TECHNICAL COLLEGES

College	Location	Green-Specific Programs and Skills	Related Programs	Requirements	Career Pathways
North Central State College	2441 Kenwood Circle Mansfield	Green engineering program is under development. School works with private industry to see what skills are most needed in developing curriculum.	Tool and die operation, mechanical engineering technology, electronic engineering technology, and engineering design.	High school transcript or GED and placement exam.	
Northwest State Community College	22600 State Route 34 Archbold	Associate Degree in Alternative Energy System Design, Associate Degree in Alternative Energy System Installation and Repair, and an introduction to alternative energy course. Introductory course teaches units of energy, how it is measured, and current usage patterns. Also covers alternative energy sources including solar, wind, biomass, hydrogen, and fuel cells.	Industrial electrical trades, industrial maintenance, millwright technology, machining technology, HVAC technology, CAD, maintenance technology, and mechanical engineering.	$20.00 application fee, high school transcript or GED, and placement exam.	Students from Bluffton College and Defiance College can enroll in Introduction to Alternative Energy as an elective.
Owens Community College	3200 Bright Road Findlay	Five-day Photovoltaic Training Program qualifies students to test for the North American Board of Certified Energy Practitioner (NABCEP) PV Entry Level Certificate of Knowledge program. With additional work experience students qualify to take the national certification test as a PV system installer. Four-day series in green building covers green building, wind turbines and solar energy, geothermal energy, and local resources.	Automotive technology, diesel technology, building maintenance, electrical trades, mechanical trades, electronics, HVAC technology, pipefitting, and plumbing.	High school transcript or GED and placement exam.	
Rio Grande Community College	218 N. College Avenue Rio Grande	CAD technology, industrial technology, manufacturing, power plant technology, electronic technology, industrial automation, plant maintenance, technical studies, and welding.	High school transcript or GED and official results from ACT.		
Sinclair Community College	444 West Third Street Dayton	Three-course sequence in advanced energy includes alternative and renewable energy, fuel cells, and energy auditing for commercial and residential buildings.	Automotive technology, aviation, architectural technology, civil engineering, construction management, automation and control technologies, environmental engineering, mechanical engineering, HVAC technology, sheet metal work, plumbing, and pipefitting.	$20.00 application fee and high school transcripts or GED.	
Southern State Community College	100 Hobart Drive Hillsboro		CAD, drafting design, electrical technology and electronics, and electronic information systems.	High school transcript or GED and placement exam.	

OHIO COMMUNITY AND TECHNICAL COLLEGES

College	Location	Green-Specific Programs and Skills	Related Programs	Requirements	Career Pathways
Stark State College of Technology	6200 Frank Avenue NW North Canton	Mechanical engineering training covers fuel cells and alternative energies (wind, solar).	CNC technical certificate, civil engineering technology, design engineering technology, electrical power utility technology, electrical maintenance technology, automation and robotics certificate, environmental health and safety technology, HVAC, and mechanical engineering technology.	Copy of any available transcripts and placement exam.	
Terra Community College	2830 Napoleon Road Fremont	Certificate in wind energy is stackable with Terra's electricity degrees. Credits earned can also be transferred to Bachelor's Degree programs at Bowling Green State University. Wind energy certificate includes training on wind energy, safety class, and AC/DC conversion.	Architecture and construction, electrical engineering, electrical power and controls, HVAC technology, manufacturing technology, mechanical engineering technology, automotive power technologies, robotics/integrated manufacturing, and welding technology.	Copy of any available transcripts.	Collaboration with WSOS Community Action Commission (www.wsos.org), which provides job and school readiness services and training. Local contractors and technicians are course instructors.
Washington State Community College	710 Colegate Drive Marietta	Automotive service, automotive/diesel truck systems, diesel truck systems, electrical engineering technology, electrical engineering electronics, and electrical engineering instrumentation and control; industrial technology: chemical operations; design drafting; heating, air, and refrigeration; power plant operation; and mechanical engineering technology.		Copy of high school transcripts or GED and placement exam.	
Zane State College	1555 Newark Road Zanesville		Architectural drafting, mechanical design, computerized machine tool systems, and electrical/electronics engineering technology.	$25 application fee and placement exam.	

References

1. *Economy at a Glance: Ohio* (Bureau of Labor Statistics, May 2009).

2. National Energy Assistance Directors' Association. 2008 Energy Costs Survey (Energy Programs Consortium, June 6, 2008).

3. Apollo Alliance, Green for All, Center on Wisconsin Strategy, and Center for American Progress. *Green-Collar Jobs in America's Cities* (2008).

4. Pollin, R.; Heintz, J. and Garrett-Peltier, H. *The Economic Benefits of Investing in Clean Energy* (June 2009).

5. *Ohio Advanced Energy* (Ohio Department of Development, February 2009).

6. The Ohio Alternative Energy Portfolio Standard sets a goal of 25% renewable energy generation by 2025. For more information, visit: http://www.legislature.state.oh.us/bills.cfm?ID=127_SB_221.

7. White, S. and Walsh, J. *Greener Pathways* (COWS, 2008).

8. American Community Survey, 2005-2007 data; Bivens, J.; Irons, J. and Pollack, E. Green *Investments and the Labor Market* (Economic Policy Institute, April 2009).

9. Though this paper focuses exclusively on training for green-collar jobs in the manufacturing and construction trades, we recognize that a similar training infrastructure exists for other trades, such as those in the utilities sector, that are transitioning to the clean energy economy.

10. Pollin, R.; Heintz, J.; and Garrett-Peltier, H. *Economic Benefits of Investing in Clean Energy* (PERI, June 2009).

11. *Industries at a Glance: Manufacturing.* (Bureau of Labor Statistics, 2009); *Agenda for Shared Prosperity* (Economic Policy Institute, 2009).

12. *Building a Clean Energy Assembly Line* (Renewable Energy Policy Project and Blue Green Alliance, November 2009).

13. Kruse, W. and Gomberg, A. *Growing Ohio's Green Energy Economy* (March 2009); *Building a Clean Energy Assembly Line* (Renewable Energy Policy Project and Blue Green Alliance, November 2009).

14. *Ibid.* For more information on job creation potential in the manufacturing of specific carbon-reducing technologies (such as LED lighting and high-performance windows), see *Manufacturing Climate Solutions*, by Center on Globalization, Governance, & Competitiveness (Duke University, 2008).

15. R Margolis and J. Zuboy, *Nontechnical Barriers to Solar Energy Use: Review of Recent Literature* (National Renewable Energy Lab, 2006).

16. Helper, S. *Renewing U.S. Manufacturing: Promoting a High-Road Strategy* (EPI Briefing Paper #212, February 2008).

17. Holzer, Harry J. and Lerman, Robert I. *America's Forgotten Middle-Skill Jobs: Education and Training Requirements in the Next Decade and Beyond* (Skills2Compete, November 2007).

18. Holzer, Harry J, and Lerman, Robert I. *The Future of Middle-Skill Jobs* (Brookings, February 2009).

19. *Green Jobs: Survey of the Energy Industry* (The Association of Energy Engineers, 2009).

20. Svenvold, M. "For wind power, its all about nuts, bolts, bearings, gearboxes – and jobs," *Daily Finance* (August 24, 2009).

21. *Toward Ensuring America's Workers and Industries the Skills to Compete* (Workforce Alliance, 2009).

22. *Preparing the Workers of Today for the Jobs of Tomorrow* (White House Council of Economic Advisors, July 2009).

23. Dierdorff, E. et al. *Greening the World of Work: Implications for O*NET-SOC and New and Emerging Occupations* (Department of Labor Employment and Training Administration, February 2009).

24. Dierdorff, E. et al. *Greening the World of Work: Implications for O*NET-SOC and New and Emerging Occupations* (Department of Labor Employment and Training Administration, February 2009).

25. Dresser, L. *The Wisconsin Regional Training Partnership: Developing a Highly Qualified Workforce for the Milwaukee Metropolitan Area* (COWS, February 2003); Giloth, B. *Workforce Intermediaries: Partnerships for the Future* (Economic Development Quarterly 17:3, 2003); *Building Skills, Increasing Economic Vitality: A Handbook of Innovative State Policies* (Jobs for the Future, January 2005).

26. Ganzglass, E. and Strawn, J. *Using Increased Funding under the Workforce Investment Act to Create Multiple Pathways to Postsecondary Credentials and Middle Class Employment* (CLASP, April 2009).

27. *Toward Ensuring America's Workers and Industries the Skills to Compete* (Workforce Alliance, 2009).

28. Appelbaum, L. and Zipperer, B. *State of the Unions 2009: A Profile of Union Membership in Los Angeles, California, and the Nation* (UCLA IRLE, September 2009).

29. Hirsch, B. and MacPherson, D. Unionstats.com data (2009).

30. Madland, D. and Walter, K. *Unions are Good for the American Economy* (Center for American Progress, 2009).

31. Schmitt, J. *Unions and Upward Mobility for African-American Workers* (Center for Economic and Policy Research, March 2008); Schmitt, J. *Unions and Upward Mobility for Latino Workers* (Center for Economic and Policy Research, September 2008); *Unions and Upward Mobility for Young Workers* (Center for Economic and Policy Research, October 2008); Schmitt, J. *Unions and Upward Mobility for Women Workers* (Center for Economic and Policy Research, December 2008).

32. Interviews with Courtney DeOreo, John Gajewski and Leo Russo, Cuyahoga Community College.

33. It is worth noting another way that the term "pre-apprenticeship program" may be used. Companies that hire inexperienced workers before taking them on as apprentices often describe this procedure as a "pre-apprenticeship program." In reality, however, there is no guarantee that the worker will ever be hired as an apprentice, and so "pre-apprenticeship" is more accurately characterized in this case as an apprentice vetting procedure – one that could be used to justify lower wages.

34. Interviews with Cindy Marizette, executive director of UCIP-ASAP, March 18 and May 26, 2009. More information about UCIP-ASAP can be found at www.ucipconstruction.com/asap.htm.

35. *Constructing Futures Initiative* (Ohio Department of Job and Family Services, n.d.).

36. More information about OTAP can be found at: http://www.cscc.edu/OTAP/adults.html.

37. "IBEW Green-Job Training Facilities Around the Country Open Their Doors to the Public," *www.IBEW.org* (June 8, 2009).

38. Interviews with Bruce Myer, Terra Community College (www.terra.edu/) and Kerrie Carte, WSOS Community Action Commission (www.wsos.org/).

39. Interview with Larry Feist, Cincinnati State Technical and Community College (www.cincinnatistate.edu/).

40. Interview with JerroldHutton, Hocking College (www.hocking.edu/).

41. More about the *West Central Ohio Manufacturing Consortium* can be found at: www.wcomfg.com. More about *KnowledgeWorks Foundation Career Pathways* can be found at: http://www.kwfdn.org/adult_learning/career_pathways/work/.

42. Interview with Jay Bahr, Ohio Department of Development.

43. Ohio Board of Regents, 2009.

44. *2008 Washington State Green Economy Jobs* (Washington State Employment Security Department, Labor Market and Economic Analysis, January 2009).

45. Ohio Board of Regents, *Ohio Skills Bank.* (University System of Ohio).

46. "Best Value Contracting: A Raincoat for the Perfect Storm," *City of Madison news release* (December 4, 2006).

47. *Energy Independence and Security Act of 2007*, Pub. Law No. 110-140, Sec. 1001-1002, 121 Stat. 1749.

48. Dresser, L. *The Wisconsin Regional Training Partnership: Developing a Highly Qualified Workforce for the Milwaukee Metropolitan Area* (COWS, February 2003).

49. More information can be found at: http://hirevetsfirst.dol.gov/.

50. *Apprenticeship Programs, Labor standards for Registration, Amendment of Regulations* (Federal Register 73:210, October 2008).

51. Building Trades Multi-Craft Core Curriculum (BCTD, 2007). http://www.efficiencycities.us/062309/BCTD%20TriFold_v6.pdf.

52. More information about the Constructing Futures Initiative can be found at: jfs.ohio.gov/releases/ConstructingFuturesInitiative.pdf.

www.apolloalliance.org

POLICY
MATTERS
OHIO

www.policymattersohio.org

Printed on recycled paper with soy-based ink