

# Mapping Green Career Pathways: Job Training Infrastructure and Opportunities in Michigan



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## 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.

Michigan exemplifies the need for this transition. Over the past decade Michigan has lost nearly 460,000 jobs in the manufacturing sector alone, many of them sent overseas.<sup>1</sup> 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.<sup>2</sup>

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.<sup>3</sup> 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.<sup>4</sup> Michigan would feel these benefits directly: over 54,000 new jobs would be created in Michigan alone, on top of the more than 96,000 green-collar jobs that already exist in the state.<sup>5</sup> With the implementation of policies such as Michigan's Integrated Renewable Portfolio Standard the number of jobs created could be even higher.<sup>6</sup>

*“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”*



Photo © Electrical Trades Center of Central Ohio

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.<sup>7</sup> 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.<sup>8</sup>

This paper identifies training opportunities in Michigan 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.<sup>9</sup> 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 Michigan.

## 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.<sup>10</sup> 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

*“New investments and new markets for clean energy technologies could create over 34,000 new jobs in Michigan.”*

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.

Manufacturing will also play a critical role in the emerging green economy. Despite a decline of almost two million jobs over the past two years, manufacturing still represents nearly 8% of national employment and about 12% of the nation's GDP. Not surprisingly, manufacturing plays an even larger role in Michigan's economy, employing 12% of the state's workers.<sup>11</sup> 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.<sup>12</sup> REPP also estimates that over 42,000 U.S. firms have the capacity to manufacture wind turbine, solar, and other clean energy components.

Michigan, in particular, has the potential to become a key part of the future clean energy supply chain – REPP identified 2,050 firms in Michigan that are primed to produce component parts for wind turbines, solar panels, biomass co-firing systems, and the other renewable energy technologies that will power the clean energy economy. New investments and



Photo © Grid Alternatives

new markets for clean energy technologies could help these firms create over 34,000 new jobs in the state, in occupations ranging from production workers to machinists, welders, boilermakers, and technicians, among others.<sup>13</sup> A 2009 report produced by the state's labor market bureau revealed that, among a subset of green-related firms, employment grew by 7.7%, while the state's overall economy experienced a 5.4% decline in employment over the 2005-2008 period. According to the report, of that subset, firms in the renewable energy sector grew at a substantial rate of 30% – suggesting that this currently small area of the economy in Michigan is the fastest-growing.<sup>14</sup>

Unfortunately, the nation's workforce development system is not fully prepared to support the growth of middle skill jobs in the clean energy economy. Policymakers 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 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 Michigan 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, economy 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.<sup>15</sup> 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 Michigan’s ability to capture economic growth.<sup>16</sup>

In Michigan, the situation is compounded by the fact that so many workers lack even basic skills. A recent report to the Governor argues that a large portion of working age Michigan residents do not possess the basic skills to be effective workers in any kind of economy, green or not.<sup>17</sup> According to the report, 1.7 million Michigan workers – fully one in

three working-age Michigan adults – lack the basic skills or credentials to attain a family-sustaining job and contribute to the state’s economy. Additionally, at least 60% of students entering community colleges require remedial classes before they can engage in post-secondary education. At the same time, Michigan, like many states, has decreased funding for adult basic education classes over the last two decades, leaving a chaotic and underfunded system that cannot meet the demands of a growing and diversifying economy.

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 Michigan today.

## 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 Michigan, 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.<sup>18</sup>
- 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 construction, transportation, and installation/maintenance/repair fields. 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.<sup>19</sup>
- 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.<sup>20</sup> 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.<sup>21</sup>

- 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.<sup>22</sup> 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.<sup>23</sup>

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.<sup>24</sup> 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.<sup>25</sup>

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

an entry-level position in a firm, 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 could be appropriate, other forms of incumbent worker training offer a more common path to advancement.

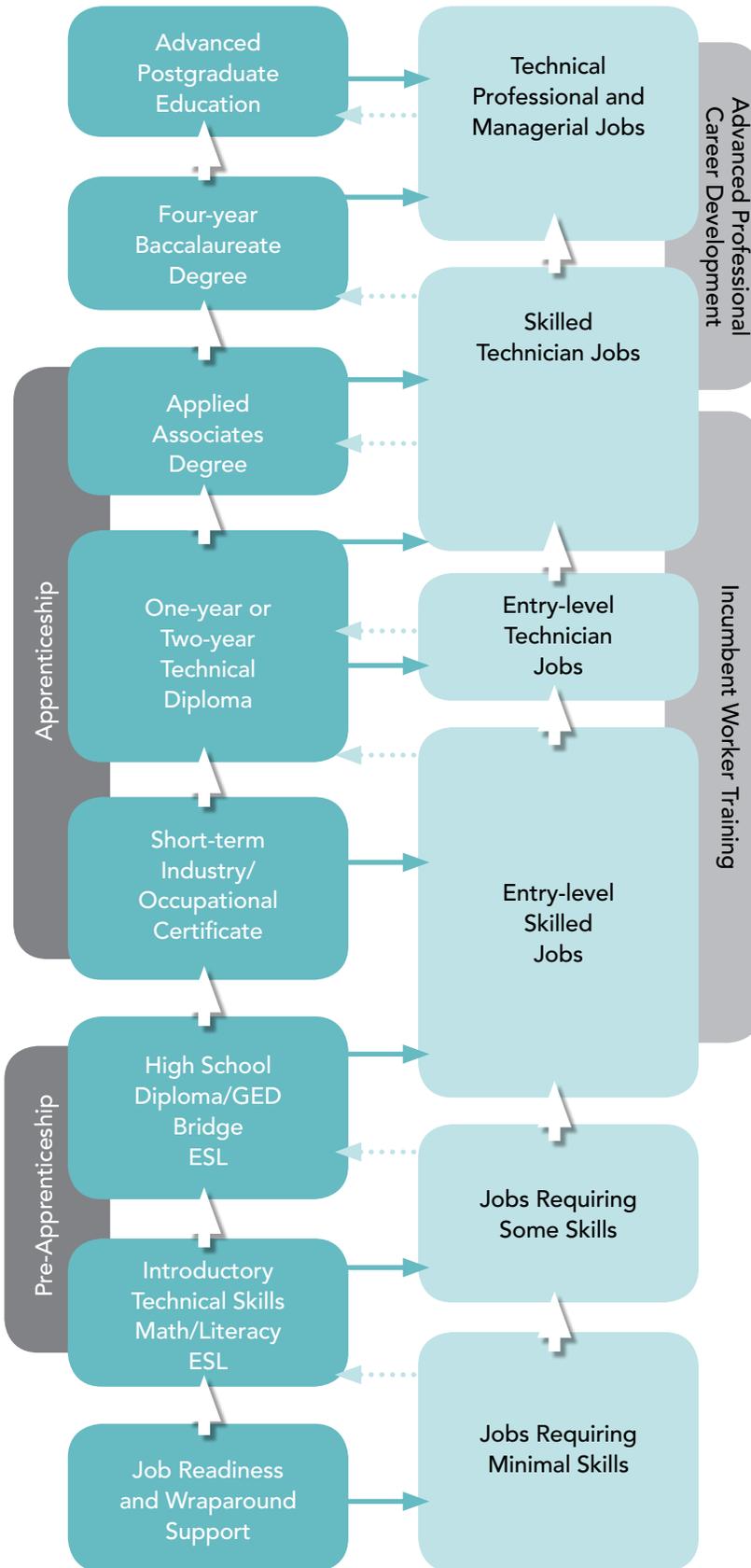
In both sectors, it is difficult for job seekers to access the skilled trade training system without a high school education or equivalent, and the basic educational foundation – including math and communication skills – necessary to learn and perform the technical aspects of these jobs.



Photo © IceStone, LLC



## GREEN CAREER PATHWAYS



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

## Building Green Career Pathways in Michigan

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 Michigan.

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.<sup>26</sup>

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.<sup>27</sup> 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 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 that meets their individual needs. 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.<sup>28</sup> 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

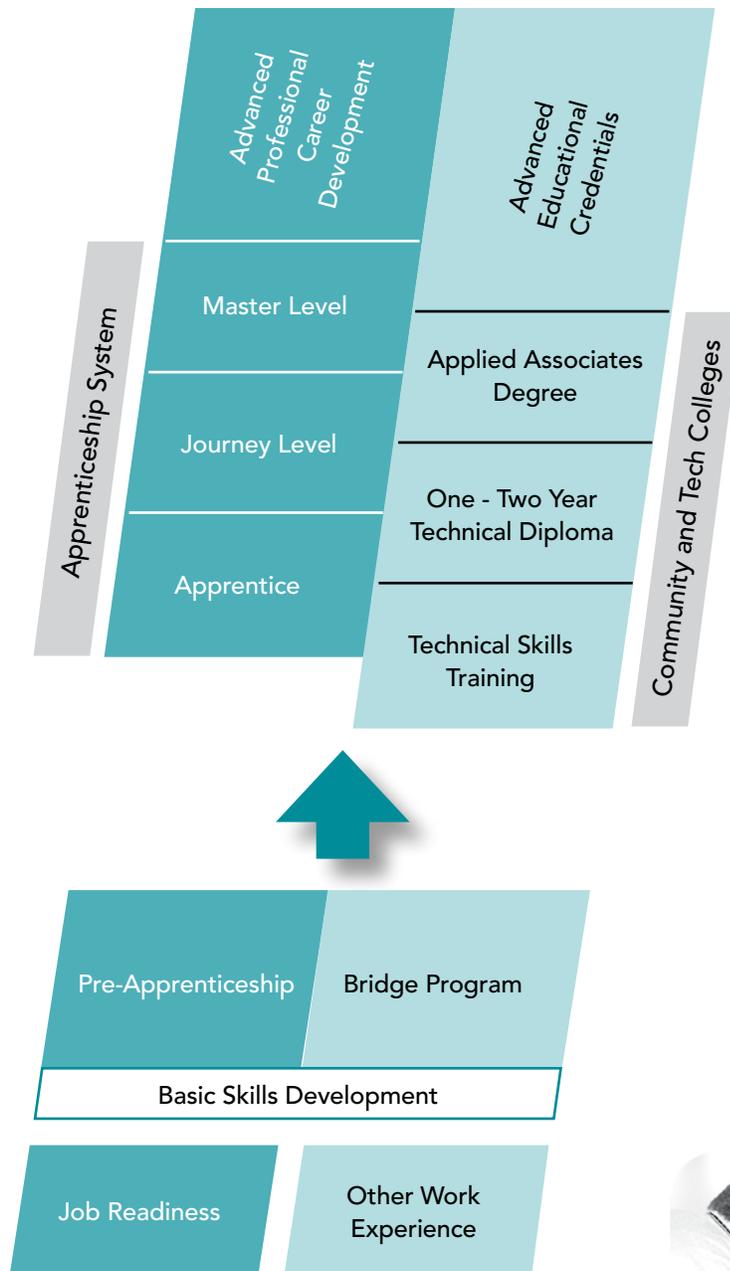
Labor unions are a critical part of a good jobs economy. Unions pave the way to the middle class for millions of American workers, guaranteeing decent wages and benefits like health care and pensions. According to a recent report by the UCLA Institute for Research on Labor and Employment, 11.3% of manufacturing workers and 16.3% of construction workers belong to a union – a total of almost 3 million people.<sup>29</sup> Unfortunately, this represents a decline from just 20 years ago, when almost 30% of workers in these sectors were unionized.<sup>30</sup> 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.<sup>31</sup> 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.<sup>32</sup> 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" neces-

sary 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 type of work, internship, or pre-apprenticeship placement which can simultaneously offer more specialized or technical skills training.

Operating in Detroit, Detroiters Working for Environmental Justice's *Green Jobs Workforce Training Program* is one example of this kind of instruction (see sidebar).<sup>33</sup> The first half of the 16-week program is dedicated to workforce readiness skills, such as study skills, computer basics, and physical fitness. The second half of the program helps students apply those soft skills as they learn the specific construction skills necessary for weatherization work, such as lead and asbestos abatement training. Though entry into the program does not require a GED or clean criminal background, it does require a certain minimum reading and math skill level.

### CASE STUDY: DETROITERS WORKING FOR ENVIRONMENTAL JUSTICE

DWEJ, Detroiters Working for Environmental Justice, a nonprofit based in Detroit, Michigan, has been working in the environmental and social justice space since its founding in 1994. In 2007, DWEJ launched its Green Jobs Workforce Training Program, creating a skilled workforce that will help Detroit become more attractive to a brand new sector of industry, according to DWEJ Green Jobs director Roshani Dantas. The program, which originated with the Environmental Protection Agency-funded brown-field cleanup training that DWEJ has offered since 1995, is considered a model for combining soft and hard skills training.

The Green Jobs Workforce Training Program is part of DWEJ's overall *Build Up Detroit* effort, which focuses on economic sustainability through creating and training for green-collar jobs, social sustainability through civic engagement and education, and environmentally sustainable development – the "triple bottom line."

"Our goal is not just to get them a job, but also make them complete advocates in the community," Dantas says

of program participants. In 2008 – its inaugural year – the DWEJ Green Jobs program received over 300 applications for 25 available

spots in the 13-week class. In 2009 the program expanded to 16 weeks and will run three cohorts of 25 people each. The program stands out for targeting underemployed and unemployed Detroit residents. A high school diploma or GED is not required, nor does DWEJ preclude residents with criminal backgrounds from participating. About two-thirds of applicants do not meet the program's reading level entry requirements, and receive referrals for additional support from other DWEJ and community programs.

The first half of the program is dedicated to work readiness and life skills training, and emphasizes what Dantas calls "popular education," a way of teaching in the classroom that is very context based and hands-on. The second



Photo © Detroiters Working for Environmental Justice

**Pre-Apprenticeship Programs:**<sup>34</sup> 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. 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.

The Lansing Area Manufacturing Project (LAMP) offers an example of a pre-apprenticeship program in Michigan. LAMP is an educational partnership sponsored by the United Auto Workers, General Motors, and the Ingham Intermediate School District, aiming to help high school seniors gain skills and explore careers in manufacturing. The integrated curriculum combines classroom instruction with work-based learning

to provide students with job readiness training and basic manufacturing skills. While the work is unpaid, community college credit is available.<sup>35</sup>

In Detroit, Goodwill runs a program called *Flip the Script*, which targets men aged 18 to 30 interested in entering the construction trades (see sidebar). While much of the program focuses on workforce readiness activities, three weeks of the program are specifically construction skills-related. At the close of the program, many graduates take apprenticeship entrance tests for various building trades, with high pass rates.

In September of 2009, Michigan’s Governor announced the launch of the new Energy Conservation Apprenticeship Readiness (ECAR) Program. The state’s Department of Energy, Labor and Economic Growth (DELEG) worked with key partners and stakeholders in Michigan to create a Green Sector Skills Alliance that collaborated with several unions to develop the state-of-the-art ECAR Program. The program is specifically targeted to increase entry by women, minorities and economically disadvantaged individuals into apprenticeships in renewable energy and energy efficiency sectors. Participants complete an intensive nine-week program comprised of 270 hours of training in 19 curriculum components including applied math, essential

half focuses on various aspects of the “green” economy, with technical training and a mix of classroom and on-the-job experiences. The modules in this part of the program are taught by a number of training provider partners, including the United Auto Workers and the ERB Center at the University of Michigan, and run simultaneously in various tracks. Students who complete the program receive a DWEJ certificate and may choose to test for a number of industry-recognized certifications, including BPI Building Analyst, asbestos and lead abatement, confined space entry, and OSHA 10 workplace certification. The program also includes an entrepreneurship element focused on sustainable business plans.

Employer input is integral to the program. The program’s advisory board consists of many employers who hire graduates and who also provide instructional support, in-kind contributions and on-the-job experiences for students. The program also includes a job developer who works with employers for placement of graduates and provides retention support to those graduates. In 2008, job placement for DWEJ graduates was 100%.

Student support is key to the program’s success. Dantas says that the small class size is designed to give students a generous amount of attention and access to a broad spectrum of tools. The 25 applicants who make it through the application

and interview process to participate in the program receive a scholarship which may include bus passes or parking vouchers, and catered breakfast and lunch daily. “We want to remove any barriers that would get in the way of learning in the classroom,” Dantas says. ■



Photo © Detroiters Working for Environmental Justice

employment skills, and principles of green construction, and earn multiple certifications including a National Career Readiness Certificate. Assessment, training, placement assistance, and follow-up and retention services will be coordinated through the state's one-stop system.<sup>36</sup> Notably, unions worked together with stakeholders to develop curriculum content that would support entry into a number of apprenticeship programs in a range of trades, rather than creating a pre-apprenticeship program that fed into only one trade. At the close of the program, participants are more qualified to apply for a variety of formal apprenticeships in the renewable and energy efficiency sectors than they would have been without taking part in ECAR.

**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 are organized differently in the construction and manufacturing sectors. Building and construction trade 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 that 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

## CASE STUDY: GOODWILL INDUSTRIES OF DETROIT

Long known for its workforce readiness programs, Goodwill Industries of Detroit started its Flip the Script program in 2003, targeting minority men aged 18 to 30 who reside in the City of Detroit and Wayne County for careers in the building and construction trades industry.

The program is an intensive curriculum centered on gender and culture-specific training and/

or retraining in the critical areas of mathematics, reading enrichment, positive relationship development, fatherhood, workplace ethics and "the other 16 hours outside of work" that are important to becoming economically self-sufficient and a positive head of household.

Started in 2003 with a grant from the Thompson McCulley Foundation, the program currently has over 500 graduates. In 2008, the program moved to a larger facility in Detroit which allows it to serve 180 men at a time. It contains six modules covering 15 skills in construction, but director Keith Bennett expects to add modules in deconstruction, as well as wind and solar installation when curriculum becomes available. Since math is so fundamental to success in the construction industry, the program specifically focuses on improving participants' math levels. Participants often improve by two grade levels from entry to completion. Though only the latter three weeks focus on industry-specific training, over 75% of participants have passed apprenticeship application tests in the building trades, and the Goodwill graduate certificate is recognized by trade and industry partners.

Employers and trade unions are highly engaged in the program's advisory board, and Goodwill's jobs developer conducts on-site visits with employers to gain further feedback and suggestions on curriculum. Close dialogue with employers and the trades has made clear that employers don't want Flip the Script to replicate what is covered in apprenticeship programs; instead they want just enough information covered so that participants can make a good transition from Flip the Script to a formal apprenticeship program.

In 2009, the program will have three cohorts of about 60 participants each. Many are ex-offenders, and a GED or high school diploma is not required to apply for the program. Participants can avail themselves of Goodwill's many support services, including help with cleaning up driver's license records, assistance in paying for public transportation, and tuition subsidies for continuing education at local community colleges. ■



Photo © Goodwill Industries of Detroit

apprentices. It is then the responsibility of the individual to 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 (IBEW), for example, has developed a series of training modules on residential and commercial solar PV installation.<sup>37</sup> These modules have been integrated into their existing five-year apprenticeship program nationwide, in response to growing demand for renewable energy specialists.

Michigan is seeking to increase the number of registered apprenticeships through the state’s No Worker Left Behind program (See Table 1; for more details, see appendix). In August of 2009 the state began offering new funds, provided under the American Recovery and Reinvestment Act (ARRA), to offset some of the cost of wages or “technical-related instruction” provided through apprenticeships. Participating

**Table 1. Summary of Selected Michigan Apprenticeship Programs**

Program	Location	Trades
Southwestern Michigan Community College Apprenticeship Program	Niles	Auto Mechanic; CADDs; Die Cast; Electronics Technician; Millwright; Machine Repairer; Machine Building; Toolmaker; and Welder
Michigan State University Electrical Technology Apprenticeship Program	East Lansing	Electrician; Emphasis on Residential, Agricultural, Commercial, and Industrial Wiring
University of Michigan Skilled Trades Union Apprenticeship Program	Ann Arbor	Multiple trades
National Electrical Contractors Association / IBEW Local 252 Ann Arbor Electrical Apprenticeship Training Center	Chelsea	Inside Wireman; Residential Wireman; Voice, Data, Video
Detroit Electrical JATC Electrical Industry Training Center, IBEW Local 58	Warren	Construction and Telecommunications
International Association of Heat and Frost Insulators and Asbestos Workers, Asbestos Abatement Workers Local 207	Taylor	Asbestos Worker Initial and Refresher; Asbestos Supervisor Initial and Refresher; Lead Worker Initial; Lead Supervisor Initial; Hazmat Initial; OSHA Safety Training; Mold, Asbestos & Lead Awareness
Detroit Carpentry Joint Apprenticeship & Training Committee, Detroit Carpenters Apprenticeship School	Ferndale	Carpentry
UA Local 636 Pipefitting Industry Training Center	Troy	Pipe Fitting
United Brotherhood of Carpenters and Joiners of America, Michigan Carpenter & Millwright Apprenticeship Programs	Fennville, Mason, Saginaw, Grayling, Marquette, Warren and Detroit	Carpentry
Bay Area Association of Michigan Plumbing and Mechanical Contractors Local 85, Apprenticeship Contractor Training Program	Saginaw	Plumbing and pipefitting
Sheet Metal Workers Local 80 Training Center	Warren	Sheet Metal
Michigan Laborers Training and Apprenticeship Institute	Perry	Commercial Construction; Highway Construction; Underground Construction; and Environmental Remediation
UA Local 190 Joint Apprenticeship Training Program	Ann Arbor	Plumbing; Pipe Fitting; HVACR; Gas Distribution

employers, sponsors, or Joint Apprenticeship Training Committees (JATCs) can receive up to \$1,000 per new apprentice registered.

**“Bridge” Programs:** “Bridge” programs support transitions to postsecondary training for lower-skilled adults. In Michigan, there are many types of bridge programs, but in a career pathways context they refer to the integration of Adult Basic Education (ABE), 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



*“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.”*

college-level credit and/or certificates that can be used for immediate employment or further postsecondary education.

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 2; 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.

Montcalm Community College, for example, responded to United Solar Ovonic’s need for skilled workers at its new plant in Greenville, Michigan by custom-designing a training curriculum to prepare workers to manufacture the company’s products (see sidebar). Similarly, in collaboration with a variety of partners, Delta College redesigned its Chemical Process Technician degree program to meet the needs of local employers, including a solar panel manufacturer (see sidebar).



Photo © Goodwill Industries of Detroit

Table 2. Summary of Renewable Energy Training at Michigan Community Colleges

College	Location	Program Name	Credential
Bay de Noc Community College	Escanaba	Water Resource Management	Certificate, AAS
Delta College	University Center	Chemical Process Operator	Job training, Certificate, AAS
		Wind Technician Training Program	AAS
Grand Rapids Community College	NE Grand Rapids	Construction Trades Program	Non-credit Certificate, can apply for articulation
		Construction Remodeling	Non-credit Certificate
		Residential Construction	Non-credit Certificate
Henry Ford Community College	Dearborn	Energy Technology	Certificate, AAS
Jackson Community College	Jackson	Climate Control Technology	AAS
Kalamazoo Valley Community College	Kalamazoo	Wind Energy Technology	Certificate
		Wind Turbine Technician Academy	Non-credit, BZEE Wind Turbine Technician credential
Lansing Community College	Lansing	Alternative Energy Technology	AAS
		Automotive Technology	Certificate, AAS
		Alternative Fuels	Certificate
		Customer Energy Specialist	Certificate, AAS
		Energy Management Technician	AAS
		HVAC/R-Energy Management Engineering Technology	AAS
		Heating and Air Conditioning/Building Maintenance	Certificate, AAS
		Stationary Energy Technology	Certificate
Macomb Community College	Warren	Automotive Technology	Certificate, AAS
Montcalm Community College	Sidney	Integrated Manufacturing Technology	Certificate, AAS
Northwestern Community College	Traverse City	Michigan Energy Demonstration Center	Continuing educational certificates
		Michigan Energy Demonstration Center Residential Energy Assessment Program	Continuing educational certificate
		Customer Energy Specialist	Certificate
Oakland Community College	Bloomfield Hills	Environmental Systems Technology	Certificate, AAS
St. Clair County Community College	Port Huron	Alternative Energy Technology	Certificate

## CASE STUDY: MONTCALM COMMUNITY COLLEGE

When United Solar Ovonic (UNI-SOLAR) of Auburn Hills was looking to open a new facility to expand its production capacity of thin film solar products, an available skilled workforce was a critical consideration in its site selection process. When the company centered its search on Greenville, Montcalm Community College (MCC) stepped up to ensure UNI-SOLAR would have the resources to meet its training needs.

Between 2004 and 2006, the Greenville region lost more than 4,000 manufacturing jobs. With unemployment at 15.3% in July 2006, the region had a surplus of workers with experience in manufacturing, but who needed training to transfer their skills to production of UNI-SOLAR's thin film solar products.

Within days of their initial meeting in January 2006, the college began revising a curriculum that UNI-SOLAR had received from a college in South Carolina. That curriculum had originally been developed for the Intel Corporation, but MCC made adaptations to respond to the specific needs of UNI-SOLAR. To inform the revised curriculum, the college coordinated WorkKeys testing and job profiling of technicians at the company's Auburn Hills facility.

The WorkKeys Assessment System is a comprehensive tool for quantitatively assessing the common skills required of individuals in actual jobs. The in-depth job profile of the Auburn Hills workers created a detailed task list and allowed the college to ensure that the curriculum would cover all the critical skills that UNI-SOLAR sought in its new Greenville workers. This meant developing an emphasis on industrial technology (particularly vacuum forming, pneumatics and hydraulics), troubleshooting, problem solving, and communications.

In May 2006, the college curriculum committee approved a new Integrated Manufacturing Technology (IMT) certificate, and the first class of 45 students began training in June. By combining the certificate classes with general education courses, students could also qualify for an associate degree.

At the time of the program launch, UNI-SOLAR required its new hires to have completed the certificate program. However, business development at the Greenville plant soon outpaced the capacity of the program, and the company began hiring students before they had even finished. Eventually, UNI-SOLAR changed its hiring practice to no longer require program completion, and student demand has dropped off. However, the time and effort spent in developing the program was not wasted – Montcalm now offers much of the program's technical curriculum through on-the-job training of UNI-SOLAR employees.

Now that UNI-SOLAR has settled into Greenville, it is encouraging its employees to seek the well-rounded education, including problem-solving and critical thinking skills, that comes with an associate degree. The company believes that this will improve the quality of their workers and allow them to more easily advance within the company. To accomplish this, Montcalm Community College is retooling the delivery of the IMT program in order to meet the needs of the company's employees, who work 12-hour rotating shifts that are incompatible with traditional education schedules. Classes will be converted to modularized e-learning courses that will be delivered in an open lab format with instructors available, allowing students more control of their schedules and the opportunity to learn at their own pace. ■



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## CASE STUDY: DELTA COLLEGE

In turbulent economic times, the mid-Michigan region is riding the wave of green-collar jobs as a way to revitalize its economy. The region's industries are leading the way, with a trio of inter-related businesses – Dow Chemical, Dow Corning and Hemlock Semiconductor – all expanding into the field of solar photovoltaics.

A properly skilled workforce is key to this expansion and the future prosperity of area companies. One occupation – Chemical Process Technologists – is both fundamental to the work and in particularly high demand, with more than 100 openings per year currently. This demand is being met through an innovative partnership between the three aforementioned employers, Delta College, and MichiganWorks!, the local workforce development agency.

Delta College has had a chemical process technology program since the mid-1990s, but enrollment was low and the program was primarily a feeder for students transferring to the Chemical Engineering program at Michigan Technological University. The college revised and updated the program in 2007, just as local demand began to increase. Meanwhile, Dow Chemical found itself facing a shortage of chemical process technologists, so it launched an in-house training program to provide specific technical skills to new employees. However, Dow Chemical quickly concluded that it was not cost-effective to offer the program in-house, especially given demand for similar training from its regional partners and suppliers, Dow Corning and Hemlock Semiconductor.

At this point, Michigan Works! stepped in to broker a partnership between the employers and the college. In consultation with the companies, Delta College developed a 3-tiered training program to address workforce demand. The first two tiers are made up of a 2-year, 65-70 credit hour associate degree in Chemical Process Technology, and a 31 credit hour certificate program. The certificate program includes most, but not all, of the technical skills from the associate degree program, qualifying graduates to find local employment. But many of the region's employers value the critical thinking skills and well-rounded education that come



with the associate's degree. As the companies embrace new fields such as photovoltaics, they need a much more advanced skill set from their technical employees, who must independently be able to analyze and solve problems.



Photos © Delta College

The certificate and degree programs fill much of the region's demand, but not all of it. Half of the 163 students currently enrolled in both programs attend part-time, and thus take longer to finish their degrees. To address this gap, the college offers a 16-week, 480-hour "Fast Start" program based on the on-site training that Dow Chemical offered in 2007. In order to qualify, applicants must already have an associate degree in another field or documented technical training from a technical school or the military. In addition, they must have some work experience and score at least a level 5 on the first three WorkKeys. The stringent entry requirements help ensure that workers are ready to go as soon as they graduate.

One of the chief advantages of this program is its flexibility, which allows the college to quickly ramp up or down in response to fluctuations in employer demand. This ensures that the region is not flooded with workers who are unable to find jobs. Post-graduation job placement rates are near 90%, and wages, which start at \$13-\$20 per hour, generally increase to \$15-\$23 per hour within 6 months, depending on the company.

The educator-employer partnership didn't end with the development of the curriculum. The college and companies continue to work in tandem to make decisions about when FastStart programs should be offered and how the program should evolve. MichiganWorks! also remains involved, referring dislocated workers to the program and providing funding for many of them through the state's No Worker Left Behind program, which offers up to two years of free tuition to unemployed or dislocated workers and those earning less than \$40,000 per year. Before each FastStart session, the employers, college and MichiganWorks! collaborate to provide an orientation in which program applicants can hear directly from employers about the job and work environment. Applicants also receive information on various grant and tuition programs and other services offered by the college and MichiganWorks! ■

**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 through apprenticeship training centers or community and 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 can not demonstrate advanced skills to new employers. As such, these training opportunities are difficult to quantify, 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.

The United Auto Workers (UAW) and Ford run an integrated training program for Ford-UAW employees looking to enhance their skills and advance in their careers. Through the Skills Enhancement Program, Ford-UAW provides tutoring and instruction for workers to take the Apprentice Eligibility Test, which is administered at each plant location. Qualified workers then participate in the Future Apprenticeship Orientation to help decide which trade to specialize in and receive basic apprenticeship skills training through the Core Skills Training Program. Paid classroom and on-the-job training follow, leading the employee to Journeyman status in their chosen trade.<sup>38</sup>

Incumbent worker training is particularly important for teaching existing workers about new green processes and technologies. The United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry (UA) and the Mechanical Service Contractors of America (MSCA), for example, offer a Green Awareness Training and Certification Program, developed in partnership with Ferris State University in Michigan. The certification is designed to teach journeymen plumbers and pipe fitters about emerging green technologies, especially new products and installation techniques that improve energy efficiency and water conservation. This training is complemented by the Heating, Ventilation and Air Conditioning (HVAC) Mobile Green Classroom, a new educational tool sponsored by UA and three contractors associations.<sup>39</sup> The HVAC Mobile Green Classroom is a trailer that travels around the country to union halls and events, containing simulators that demonstrate how to install technologies like solar heating systems, geothermal heat pumps, and grey water toilet flushing systems.<sup>40</sup>

## 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 Michigan 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-collar job training, completion rates in these programs are low, degree programs often lack strong connections to employment, and the costs and time associated with participation often prevent those who would benefit most from taking part. 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 Michigan 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, Michigan 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.** Michigan conducted an industry- and occupation-specific analysis in 2009, based on a detailed definition of green-collar jobs.<sup>41</sup> The study used quantitative, qualitative, and analytical research to identify green-related industries and occupations in the state and assess job trends among green-related firms. 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.** Michigan recently integrated its economic, energy and workforce development structures to create the Department of Energy, Labor, and Economic Growth (DELEG). This represents an innovative effort to combine under one authority efforts to develop the state's economic base, with an emphasis on the renewable energy and energy efficiency sectors; create jobs in a number of high-growth sectors; and coordinate

training partnerships that link training opportunities to jobs in these sectors.<sup>42</sup> 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.<sup>43</sup>
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, specifically funds 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."<sup>44</sup> Michigan's No Worker Left Behind program, which offers up to two years of free tuition to unemployed or dislocated workers and those earning less than \$40,000 per year, is an example of this approach. To date, the program has put 100,000 workers into training across the state. Governor Granholm's Green Jobs Initiative, part of No Worker Left Behind, supports workforce development in the state's green economy by funding worker training, industry partnerships focused on workforce skills, and community college capacity.
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.** Both the Michigan

Regional Skills Alliances (MIRSAs) and Governor Granholm's Green Jobs Initiative support the creation of industry and training partnerships in the state's green economy.<sup>45</sup> 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 funds accessible to both small businesses and large employers; and initiatives that integrate curriculum design to improve articulation between programs. Under the auspices of Governor Granholm's Green Jobs Initiative, a cohort of automotive employers, community colleges, and other stakeholders identified a need for engineers with specific technical skills related to building hybrid cars, such as vehicle propulsion. The group formed the Michigan Academy for Green Mobility, which will offer accelerated graduate classes for auto engineers on advanced hybrid and battery technology.<sup>46</sup>
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. Michigan's ECAR program, a pre-apprenticeship that specifically targets under-represented populations and women, is an example of this approach.
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.<sup>47</sup> 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.<sup>48</sup>

## 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 Michigan. 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 policy-makers, 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.



Photo © Grid Alternatives

## 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 Michigan's apprenticeship and community college system.

### Green-Collar Job Training Through Michigan's Apprenticeship System

Every apprenticeship starts with a job. By combining structured on-the-job training with related classroom instruction, and carrying participants through a clearly articulated sequence of steps to career advancement, apprenticeships are the original "career pathways." Most importantly, apprentices earn decent wages while learning transferrable skills in a trade.

In Michigan, apprenticeships are organized differently in the construction and manufacturing sectors, and are sponsored by employers, employer associations, or jointly by management and labor, with standards set and monitored by the Bureau of Apprenticeship Training (BAT). Building and construction trades apprenticeships are accessed and run through trade committees, most of which are organized as 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 management representatives to develop policies and practices regarding apprenticeship selection and training (and journeyman upgrading in the case of the JATCs). Application procedures and requirements are subject to BAT approval and vary by committee. Requirements may include

an aptitude test, interview, high-school transcript, proof of graduation or equivalent, birth certificate, and valid driver's license.

The table on the following pages highlights a representative sample of Michigan programs. A more comprehensive list of union-led apprenticeships in construction can be found at the Michigan Construction Careers website (<http://miconstructioncareers.org/>). The Michigan Apprenticeship Steering Committee, Inc. (MASCI) website (<http://www.aboutmasci.org>) includes a variety of resources to help those interested in pursuing apprenticeship to navigate the frequently complicated system.



Photo © Marin City Community Development Corporation

## MICHIGAN APPRENTICESHIP PROGRAMS

Program	Location and Contact	Trades	Description	Requirements
Southwestern Michigan College Apprenticeship Program	M-TECSM @ SMC 33890 U.S. Highway 12 Niles (269) 687-5644	Auto Mechanic; CADD; Die Cast; Electronics Technician; Millwright; Machine Repairer; Machine Builder; Toolmaker; and Welder	Community college-based apprenticeship program. Coordinator of Work-Based Learning at Southwestern Michigan College (SMC) develops a schedule of related trade instruction (RTI) based on the needs of the employer. Upon completion of on-the-job training and RTI, apprentices receive a certificate of completion, and are just a few classes shy of earning an AAS degree. SMC also offers a degree completion program for skilled trade journeypersons. For the journey status, students receive 32 credits which may be applied to an AAS degree.	
Michigan State University Electrical Technology Apprenticeship Programs	Michigan State University East Lansing (517) 353-4896	Electrician with an emphasis on residential, agricultural, commercial, and industrial wiring	Community college-based apprenticeship program. Combines 15 months of classroom, lab, and on-the-job training. Students learn the latest National Electrical Code, electrical fundamentals, various electrical installations, and various electrical operations in housing, agriculture and industry. Graduates can become a licensed journey-level electrician through the State of Michigan.	
University of Michigan Skilled Trades Union	7920 Jackson Road Ann Arbor (734) 424-0253	Multiple trades	AFL-CIO affiliate representing 30 trade classifications, with membership approaching 500 skilled-trades men and women. Currently has 15 apprentices enrolled in training programs in 11 different trades.	
National Electrical Contractors Association / IBEW Local 252, Ann Arbor Electrical Apprenticeship Training Center	13400 Luick Drive Chelsea (734) 475-1180	Inside Wireman; Residential Wireman; Voice, Data, Video	Joint labor-management training program. Program lasts 5 years for Inside Wireman and 3 years for Residential Wireman and Voice/Data/Video. Program includes classroom and hands-on instruction. Curriculum covers every area of wiring and electricity, from simple installations to digital controllers, and from fiber optics to advanced communication systems.	
Detroit Electrical JATC Electrical Industry Training Center, IBEW Local 58	2277 E 11 Mile Rd Suite 1 Warren (586) 751-6600	Construction and Telecommunications Technician	Joint labor-management training program. Program lasts 5 years for construction and 3 years for telecommunications. Training includes specialized modules on photovoltaics and distributed energy. Both require the apprentice to attend a full day of classes at the Training Center one day every other week. Apprentices are employed by a signatory contractor doing electrical construction work, and are paid a percentage of the journeyperson wage rate with periodic wage increases as they meet the program requirements.	High school diploma or GED, one year of high school or post high school algebra (no GED math scores will be accepted), and legal right to work in the United States.

## MICHIGAN APPRENTICESHIP PROGRAMS

Program	Location and Contact	Trades	Description	Requirements
International Association of Heat and Frost Insulators and Asbestos Workers, Asbestos Abatement Workers Local 207	26465 Northline Road Taylor (734) 947-1745	Asbestos Worker Initial and Refresher; Asbestos Supervisor Initial and Refresher; Lead Worker Initial; Lead Supervisor Initial; Hazmat Initial; OSHA Safety Training; and Mold, Asbestos & Lead Awareness	Joint labor-management training program. Program certificate is currently accepted in 22 states. Classes are scheduled regularly throughout Local 207's territory for the membership at no cost, and members are reimbursed for their state license.	Pre-employment and annual drug tests are required.
Detroit Carpentry Joint Apprenticeship & Training Committee, Detroit Carpenters Apprenticeship School	1401 Farrow Ferndale (248) 541 - 2740	Carpenter	Comprehensive apprenticeship for skilled carpenters. Four-year course of practical on-the-job training, supplemented by attendance once every two weeks at the Detroit Carpentry Apprenticeship School. Credits earned are transferable to most universities offering construction management degrees. Program offers a variety of skill advancement classes in the evening available to union journeypersons to keep pace with new developments in tools, materials, and technical information. Pay starts at 44 percent of the journeyman's wage when training begins and periodically raises, ending at 85 percent. Apprentices receive vacation, holiday, pension, and insurance benefits.	Birth certificate, high school diploma or GED, social security card, and driver's license or Michigan identification. Upon placement with an employer, applicants must pass a drug test. Applicants are responsible for finding their own jobs with a contributing contractor who will act as a sponsor.
UA Local 636 Pipefitting Industry Training Center	636 Executive Drive Troy (248) 585-0636	Pipefitter	No longer accepting apprenticeship applicants due to economic instability in the region. Apprenticeship program is five years, with classroom instruction for eight hours once every two weeks, 26 weeks per year.	18 years or older, completed application, valid driver's license, high school diploma or GED, and \$20.00 cash, money order, cashier's check or certified check made out to I.E.T.F. as an application-processing fee.
United Brotherhood of Carpenters and Joiners of America, Michigan Carpenter & Millwright Apprenticeship Programs	Fennville, Mason, Saginaw, Grayling, Marquette, Warren and Detroit.	Carpenter	Consists of a four-year course of practical on-the-job training, supplemented by periodic attendance at a Michigan Carpenters Training Facility. Classes are held on a bi-weekly basis; apprentices attend school one day every other week instead of going to the job site. A total of 672 school hours, 5,200 - 8,000 work hours, and successful completion of 12 units of instruction are required for graduation from the program. Pay starts at 50 percent of the journeyman's wage when training begins and periodically raises, ending at 95%.	High school diploma or GED, birth certificate, driver's license or Michigan identification, social security card, math proficiency test, letter of intent to hire from a union contractor, and ability to pass a drug test.
Bay Area Association of Michigan Plumbing and Mechanical Contractors Local 85, Apprenticeship Contractor Training Program	6705 Weiss Saginaw (989) 792-0212	Pipefitter	5-year apprenticeship program teaches plumbing, pipefitting, welding, isometric drawing, template layout, blueprint reading and math. Apprentices study computer assisted drawing, plus the latest in safety techniques.	

## MICHIGAN APPRENTICESHIP PROGRAMS

Program	Location and Contact	Trades	Description	Requirements
Sheet Metal Workers Local 80 Training Center	32700 Dequindre Road Warren (586) 979-5190	Sheet Metal Worker	Apprenticeship testing currently suspended due to economic instability.	Entrance exam, high school diploma or GED, picture I.D. (preferably a valid drivers license), and \$40 cash non-refundable testing fee. Applicant receives a time to report for the entrance exam and information on how to prepare for the test.
Michigan Laborers Training and Apprenticeship Institute	11155 South Beardslee Road Perry (517) 625-4919	Construction Craft Workers: Commercial Construction; Highway Construction; Underground Construction; and Environmental Remediation	Non-profit training facility jointly administered by management and union labor offers incumbent worker training in new or upgraded skills through classes at MLTAI, and apprenticeships for new workers. Apprentices complete 4000 hours of diversified work, and 400 hours of related classroom and hands-on training to reach journey status. Pay starts at 75% of the journey person's wage when training begins and periodically raises, ending at 95%.	18 years or older, may be required to pass a drug test, must be physically able to perform the work of the trade, and must have reliable transportation.
UA Local 190 Joint Training Program, Plumbers / Pipe Fitters / HVACR Technicians / Gas Distribution	7920 Jackson Road Ann Arbor (734) 677-5367	Plumber, Pipe Fitter; HVACR Technician; Gas Distribution Technician	Joint training program with Washtenaw Community College (WCC). Completion of a 5-year apprenticeship qualifies for credit with WCC toward certain associate degree programs. On-the-job work includes plumbing and pipefitting activities in all types of new construction and remodeling, including water supply, fixtures, boilers, etc. Classroom instruction covers Plumbing Codes, Heating, Air Conditioning, Refrigeration, Hydronic Heating, Rigging, and Basic Pneumatics.	High school diploma or GED, 18 years or older, basic math and reading skills testing, valid driver's license, and ability to pass a drug test.

## Green-Collar Job Training at Michigan's Community Colleges

Michigan's community colleges have quickly adapted to the needs of the green workforce and energy economy, and have moved to offer a wide variety of applicable education and training programs. Over the last decade, many campuses have developed hands-on training and demonstration capacity by installing wind turbines and solar panels, while others have promoted online learning communities to share capital, students, and ideas. In classes devoted to green automotive technology, auto manufacturers have partnered with community colleges to provide students with hybrid vehicles on which to practice.

The chart below lists only programs that are specifically identified and promoted by their institutions as being related to the green economy, such as energy technology and efficiency programs, and manufacturing programs for production of solar photovoltaics. But green skill sets – where they are different from traditional skill sets – are integrated into existing manufacturing and construction curricula throughout Michigan's community colleges. The state of Michigan maintains a broad listing of many more programs that, while not being specifically billed as "green," also may provide pathways to green-collar jobs. This listing is available at [www.michigan.gov/greenjobs](http://www.michigan.gov/greenjobs).

While this list focuses specifically on community colleges with green training programs, there are other entities such as trade associations, four-year institutions, and technical schools that also offer this type of instruction. Programs listed here may be credit or non-credit, lead to a certificate or degree in skills that are specifically "green" and are more than one day or weekend of classes. The field of training for green-collar jobs continues to evolve rapidly, and it is likely that new programs have been introduced since this scan was conducted. Several programs were in the "proposed" stage at the time of this review.



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Photo © Nature's Path Foods

College	Location and Contact	Program	Green Sector	Credential	Program Description
Bay du Noc Community College	2001 North Lincoln Road Escanaba (906) 786-5802	Water Resource Management	Water	AAS in Environmental Management and Water Management Certificate in Water Technology	Offers on-the-job training to prepare students for careers in industrial or municipal water and wastewater operations and management, environmental consulting, engineering, contracts operations, state agencies, chemical or equipment sales, instructor and operator training, hazardous waste treatment specialists, state/federal regulatory agency technicians, environmental research, hydrogeology, and many others.  Prepares students for careers as chemical process operators in the solar industry.  Certificate available through 480-hour FastStart program for students who meet certain criteria (previous associate degree, experience, skills testing) but need to acquire specific technical skills to work in this occupation.
Delta College	1961 Delta Road University Center (989) 686-9000	Chemical Process Operator	Solar	Job training, certificate, AAS	Associate degree program for wind technicians.
Grand Rapids Community College	143 Bostwick Avenue NE Grand Rapids (616) 234-4722	Construction Trades Program	Construction	Non-credit certificate: Students can apply for articulation	Non-credit construction training program aimed at incumbent workers. Most courses follow a traditional classroom approach in a standard college semester. Specialties offered in electrical, plumbing, sheet metal, sprinkler fitting, and construction management. This program is a prerequisite for advanced Residential Construction and Residential Remodeling classes, both of which include instruction in LEED standards.  Training takes place at construction site, where students remodel an existing home. Students learn entire process of residential remodeling including blue print reading, site layout, concrete, carpentry, door/window installation, roofing, siding, wiring, plumbing and interior finishing. Graduates are qualified for employment in the residential construction industry. This course utilizes the NCCER Level I Carpentry National Curriculum and LEED for Homes remodeling techniques.
Henry Ford Community College	5101 Evergreen Road Dearborn (800) 585-4322	Residential Construction	Construction	Non-credit certificate	Training takes place at construction site, where students build new LEED certified homes via Habitat for Humanity. Students learn the entire process of residential new construction. Graduates will be qualified for employment in the residential construction industry.  Variety of programs designed to introduce students to Renewable/Alternative Energies and expose them to jobs related to energy efficient power generation, heating and cooling, alternative automotive propulsion, green construction and energy-related savings through better usage and design. These are general education programs which focus on exposure to renewable/alternative energies, not engineering programs.

## MICHIGAN COMMUNITY COLLEGES

College	Location and Contact	Program	Green Sector	Credential	Program Description
Jackson Community College	2111 Emmons Road Jackson (517) 787-0800	Climate Control Technology	Solar, geothermal	AAS	Teaches skills required for heating, air conditioning and refrigeration occupations. Training areas include application techniques for basic and advanced air conditioning, heat pumps, fossil fuels, solar energy and refrigeration.
Kalamazoo Valley Community College	Texas Township Campus 6767 West O Avenue Kalamazoo (269) 488-4400	Wind Energy Technology	Wind	Certificate	Certificate program designed to help meet the growing demand for skilled technicians who can install, maintain, and service modern wind turbines.
	Arcadia Commons Campus 202 N. Rose Street Kalamazoo (269) 373-7800	Wind Turbine Technician Academy	Wind	Non-credit, BZEE Wind Turbine Technician credential	26-week program ending in a multi-craft credential in construction, operation, and maintenance of utility-sized wind turbines. Based on the industry-based competency standards of the Bildungszentrum für Erneuerbare Energien (BZEE) - Renewable Energy Education Centre in Husum, Germany. The BZEE has been training Wind Turbine Technicians in the United States to offer students an opportunity to earn the BZEE Wind Turbine Technician credential.
Lansing Community College	Room 221 Gannon Building Lansing (800) 644-4522	Alternative Energy Technology	Cross-sector	AAS	Program training Professional Energy Specialists to be involved in the inventory, evaluation, planning, design, installation, and maintenance of a wide variety of energy producing systems. Integrates current energy courses with newly developing alternative energy distribution systems. The energy specialist needs a working knowledge of "green" building concepts and energy efficient design principles. Certificates in geothermal, solar, energy efficiency and wind are under development.
		Automotive Technology	Automotive service	Certificate, AAS	Programs offering a variety of certificate and associate degree programs designed to provide students with the latest in practical, hands-on coursework based on current industry standards. Students in the program learn on-the-job, repairing cars and trucks. Students in the program work on hybrid vehicles and have built an internal combustion engine powered by a fuel cell.
		Alternative Fuels	Automotive service	Certificate	Certificate program incumbent workers in the automotive repair industry. Students are trained specifically in the area of alternative fuels and are prepared to take the State of Michigan Mechanics Certification Test to become automotive technicians through the Secretary of State. The Automotive Technology Program is a National Automotive Technicians Education Foundation (NATEF) Certified Training Program, evaluated by the National Institute for Automotive Service Excellence (ASE) and a member of the National Alternative Fuels Training Consortium (NAFTC).

College	Location and Contact	Program	Green Sector	Credential	Program Description
Lansing Community College (continued)	Room 221 Gannon Building Lansing (800) 644-4522	Customer Energy Specialist	Cross-sector	Certificate, AAS	Cross-sector training program designed to give students the technical knowledge and customer relations skills to determine customer energy needs in the negotiation, design, installation, and application of utility facilities. Students learn how to negotiate barriers in order to supply energy from the road or nearest energy supply center to the outside of a building under construction. Customer energy specialists are employed by utility companies, governmental agencies, heating and cooling contractors, the construction industry, and engineering and architectural firms.
		Energy Management Technician	HVAC	AAS	Training for technicians working on systems that control temperature, humidity, and air quality of enclosed spaces. Technicians evaluate, recommend, install, service, and maintain the various types of equipment used to control human comfort in residential, commercial, industrial and institutional environments. They are also involved in the planning, design, installation and maintenance of a wide variety of energy producing systems, such as solar, wind or fuel cells. Technicians gain a working knowledge of "green" building concepts and energy efficient design principles.
		HVAC/R-Energy Management Engineering Technology	Energy Efficiency	AAS	AAS program teaching current methods of identifying and performing efficiency evaluations on different types of heating, ventilation and air conditioning systems found in commercial and industrial buildings and methods of adjusting and balancing equipment for maximum performance. Curriculum also teaches problem-solving related to designing, retrofitting, testing and balancing. Graduates will be able to seek employment in manufacturing, contracting, building operations, and in the engineering of commercial, institutional and industrial building systems.
		Heating and Air Conditioning/ Building Maintenance	HVAC	Certificate, AAS	Two-year AAS program focused on designing, installing, maintaining and servicing temperature control systems. A certificate of achievement is also offered which can be applied toward an associate degree in the same program. Students receive hands-on training in campus labs equipped to establish a working knowledge of the latest in heating, air conditioning and refrigeration systems, mechanical code, direct digital controls, sheet metal fabrication and other skills needed to compete in the industry. Students also learn energy management and alternative methods for heating and cooling buildings and residences.
		Stationary Energy Technology	HVAC	Certificate	Certificate program intended for entry-level technicians as well as professionals involved in the heating, ventilation and air conditioning field to add a specialization in energy to their credentials. Stationary energy technicians are involved in various aspects of the inventory, evaluation, planning, design, installation, and maintenance of a wide variety of energy producing systems. They deal with the integration of current energy sources along with newly developing energy distribution systems. Technicians gain a working knowledge of "green" building concepts and energy efficient design principles.

## MICHIGAN COMMUNITY COLLEGES

College	Location and Contact	Program	Green Sector	Credential	Program Description
Macomb Community College	14500 E. 12 Mile Road Warren (866) 622-6621	Automotive Technology	Automotive Service	Certificate, AAS	Programs designed to prepare students for entry-level positions in the automotive industry. Students learn how to properly diagnose, repair, and maintain the parts and systems comprising the modern automobile. Hybrid vehicle technology has been integrated into curriculum, and a skills certificate in hybrid technology is available.
Montcalm Community College	2800 College Drive Sidney (989) 328-2111 (877) 328-2111	Integrated Manufacturing Technology	Solar	Certificate, AAS	Prepares students for advanced manufacturing positions. Program include classroom and hands-on training, and may be transferable to a four-year university. Program was originally developed to meet the needs of United Solar Ovonics.
Northwestern Community College	Aero Park Campus; 2600 Aero Park Drive Traverse City 1701 E. Front Street Traverse City (231) 995-1169 (800) 748-0566	Michigan Energy Demonstration Center  Michigan Energy Demonstration Center Residential Energy Assessment Program	Cross-sector  Energy Efficiency	Continuing educational certificates  Continuing educational certificate	One of eight state-supported Michigan Energy Demonstration Centers. Training includes a grid-tied solar array, geo-thermal installation, solar thermal system, portable solar lab, small wind turbine, and a building sciences lab. A larger wind turbine is located at the University Center.  Certificate program offering two new courses designed to provide training in energy efficiency and building science technology for those working in energy and construction related fields. Nationally recognized certification can be attained through the Building Performance Institute (BPI) by successfully completing written and field exams. BPI certifications are available for Building Analyst and Envelope Professional.
Oakland Community College	2480 Opdyke Road Bloomfield Hills (248) 341-2000	Customer Energy Specialist  Environmental Systems Technology	Cross-sector  HVAC	Certificate  Certificate, AAS	Certificate sponsored by Consumers Energy. Students may apply for an internship with Consumers Energy. For more information on the Customer Energy Specialist certificate, please call (231) 995-1159.  Program has four options to meet students' needs, including a customized option for students with previous experience in the area. Training areas include: Heating, cooling and refrigeration technology, facilities management, green building, renewable energies, and energy management. Graduates are prepared to take the AEE Certified Energy Manager exam.
St. Clair County Community College	323 Erie Street Port Huron (810) 989-5500	Alternative Energy Technology	Cross-sector	Certificate	Cross-sector program providing a working knowledge of alternative energy power generation and delivery systems. Graduates may design, build, and maintain energy systems such as, but not limited to, wind energy, passive solar energy, and photovoltaic power. Currently, only a certificate is offered, but an associate degree is under development.

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