Mapping Green Career Pathways:

Job Training Infrastructure and Opportunities in Wisconsin

January 2010

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Affiliations listed for identification purposes only.

Executive Director: Cathy Calfo

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

Lead Authors:
Sarah White, Center on Wisconsin Strategy;
Kate Gordon, Apollo Alliance

Contributors:
Matt Mayrl, Elena Foshay, and
Jessica Halpern-Finnerty, Apollo Alliance;
Jessa Valentine, Laura Dresser, Adrienne Pagac,
and Ayca Zayim, Center on Wisconsin Strategy

Special Thanks To:
Rhandi Berth, Wisconsin Regional Training Partnership; Karen Morgan, Wisconsin Department of Workforce Development; Marge Wood, Sandy Schmit, and Randy Zogbaum, Wisconsin Technical College System

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

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

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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.

Wisconsin exemplifies the need for this transition. Over the past two years Wisconsin has lost more than 66,000 jobs in the manufacturing sector alone, and more than 25% of its manufacturing employment over the past decade.[1] The construction sector has also suffered, losing over 19,000 jobs since December 2007.[2] 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.[3]

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.[4] 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.[5] Wisconsin would feel these benefits directly: over 35,000 jobs would be created in Wisconsin on top of the more than 17,000 green-collar jobs that already exist in the state.[6] With the implementation of policies such as Wisconsin's Renewable Portfolio Standard, the number of jobs created could be even higher.[7]

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.[8] 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.[9]

This paper identifies training opportunities in Wisconsin 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.[10] 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 Wisconsin.

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.[11] Energy efficiency retrofits can require workers from a wide range of trades, including electricians, Heating, Ventilation, and Air Conditioning (HVAC) technicians, roofers, insulation workers, carpenters, plumbers and pipefitters, cement masons, glaziers, construction laborers and managers, auditors, and inspectors. Each of these trades represents a potential career pathway in the construction sector, with opportunities for advanced training, increased responsibility, and higher wages. High-quality training programs for some of these trades already exist, and many are adding new skills and technologies to their curricula to prepare workers for jobs in the efficiency industry.

"New investments and new markets for clean energy technologies could create over 35,000 new jobs in Wisconsin."

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 making up about 12% of the nation's GDP. Not surprisingly, manufacturing plays an even larger role in Wisconsin's economy, employing 16% of the state's workers.[12] 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.[13] REPP also estimates that over 42,000 US firms have the capacity to manufacture wind turbine, solar, and other clean energy components.

Wisconsin, in particular, has the potential to become a key part of the future clean energy supply chain. REPP identified 1,331 firms in Wisconsin 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 new markets for clean energy technologies could help these firms create over 35,000 new jobs in the state, in occupations ranging from production workers to machinists, welders, boilermakers, and technicians, among others.[14]

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

Meanwhile, years of low-road economic development have meant fewer manufacturing jobs as industries move overseas, while the construction sector has seen an overall decline in wage rates consistent with the 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 Wisconsin to take full advantage of this job creation potential, it will need workers whose skills match the needs of the employers and industries of the new energy economy. Amazingly, even during a recession, with high unemployment among skilled laborers, many clean energy industries face a shortage of skilled workers. The National Renewable Energy Lab has identified a shortage of skills and training opportunities as a leading barrier to renewable energy and energy efficiency growth.[15] Workers are in short supply for the many specialized jobs in growing and emerging occupations (e.g. energy auditor, wind turbine technician), 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 Wisconsin's ability to capture economic growth.[16]

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

Photo © Grid Alternatives

DEMAND FOR SKILLED WORKERS IN THE CLEAN ENERGY ECONOMY

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

- In 2007, about 54% of all Wisconsin jobs were estimated as middle-skill, but only 46% of percent of Wisconsin workers had the education and training specific to those positions. Industries from manufacturing to health care struggled to find the skilled workers they needed.[17]
- As "baby boomers" retire, the U.S. will experience a mismatch between supply and demand for educated workers, especially in middle-skill occupations.[18]
- 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.[19]
- 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.[20]
- In a 2007 survey by Wisconsin Manufacturers and Commerce, 58% of chief executives at Wisconsin manufacturing firms reported that they were unable to find workers for skilled production jobs.[21]
- 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.[22] 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.[23]

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.[24] 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.[25]

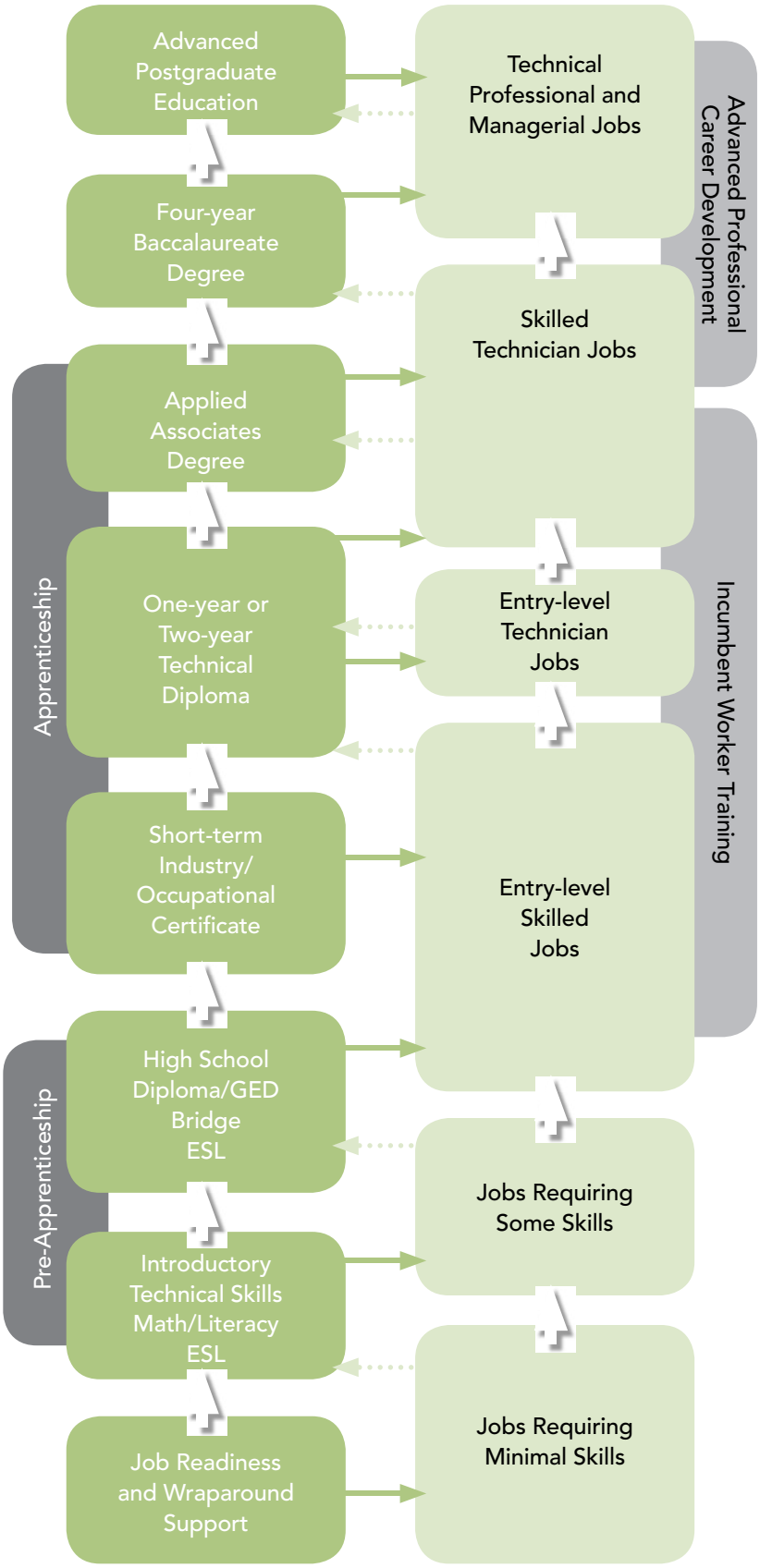
As more than half of green job growth will be among middle-skill jobs in construction and manufacturing, it is important to understand how training is structured in each sector. When looking at workforce development systems, we found that the existing construction and manufacturing training models are quite different. A fairly broad training network exists within the commercial construction sector in Wisconsin, 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. For the most part, the residential construction sector in Wisconsin operates outside of this training and wage system.

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 Wisconsin

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 Wisconsin.

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.[26]

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.[27] Ultimately, the goal is to provide participants with the skills and opportunities they need to obtain stable, high-quality, family-supporting employment, and to ensure access to education and training up through two- or four-year college degrees.

It is important to note that career pathways are not necessarily linear, and do not always represent

a clear progression from one educational institution to another or from one job classification to another. Instead, they are flexible lattices, allowing for lifelong and applied learning of transferable skills that is integrated with different stages of employment. For example, a high school graduate may work while taking classes at night, allowing her to access more advanced positions within her firm where she continues to learn new skills on the job. This may lead her into a formal apprenticeship or certificate program and a succession of higher-paid, higher-quality jobs. Along the way she learns a broad range of skills that can be applied to many different kinds of jobs, further expanding her lifetime career opportunities.

Strong career pathway models must align and integrate all of the different components of the workforce development system so that workers can easily move between employment and training programs of different types, building their skills in some sort of logical progression. Career pathways must be clearly mapped, must be accessible through various entry points at different levels of education and stages of working life, and must have a strong emphasis on portability – teaching skills that can be applied to a range of different jobs, and providing degrees or course credits that are transferable among institutions.[28] 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

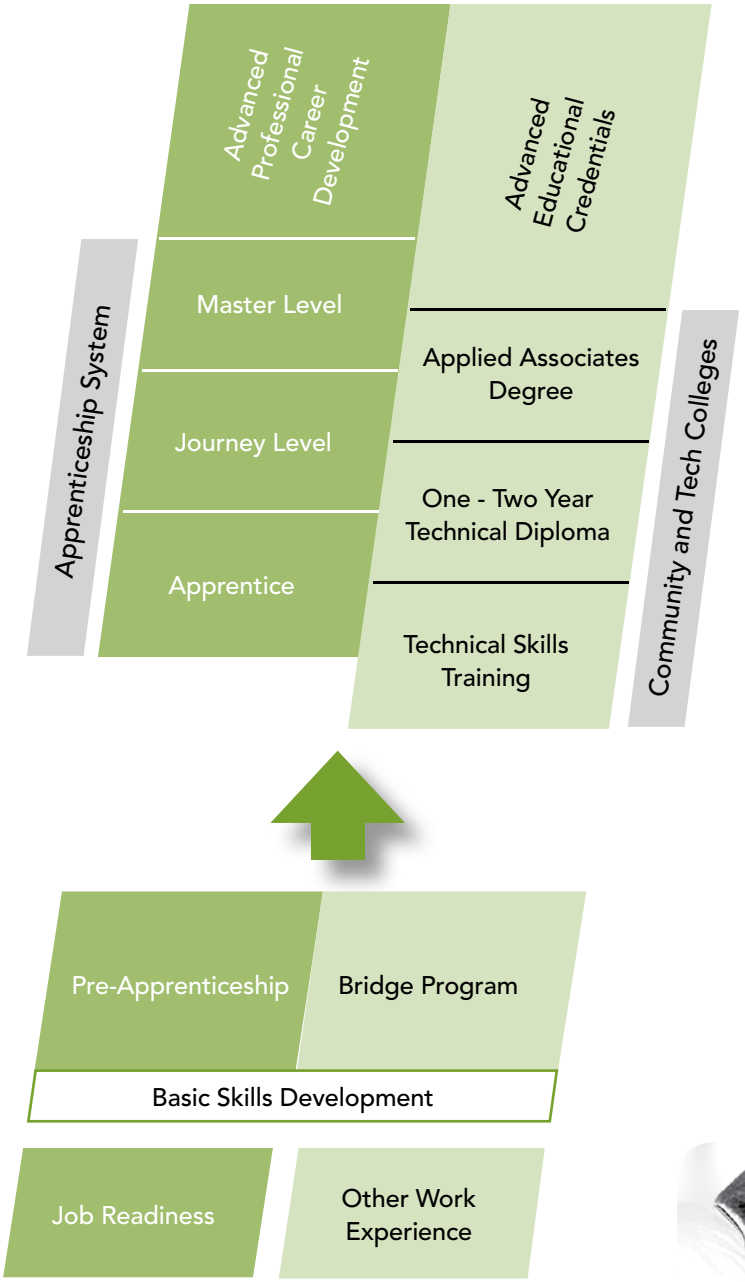
Labor unions are a critical part of a good jobs economy. Unions pave the way to the middle class for millions of American workers, guaranteeing decent wages and benefits like health care and pensions. According to a recent report by the UCLA Institute for Research on Labor and Employment, 11.3% of manufacturing workers and 16.3% of construction workers belong to a union – a total of almost 3 million people.[29] Unfortunately, this represents a decline from just 20 years ago, when almost 30% of workers in these sectors were unionized.[30] 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.[31] 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.[32] Where they exist in sufficient density, unions can drive up wages for all workers in an industry.

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

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

GREEN WORKFORCE DEVELOPMENT INFRASTRUCTURE



Comparing the Workforce Development Infrastructure for Manufacturing and Construction:

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

Photo © Electrical Trades Center of Central Ohio

Existing Workforce Development Assets

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

The elements that contribute to a comprehensive training network include:

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

Photo © WRTP

CASE STUDY: WISCONSIN REGIONAL TRAINING PARTNERSHIP/ BIG STEP

The Wisconsin Regional Training Partnership (WRTP)/BIG STEP is one of the nation's preeminent labor-led sector partnerships. Working with unions, businesses, community groups and the public workforce system, WRTP/BIG STEP has helped thousands of Milwaukee-area workers – often low income or unemployed women and people of color – connect to good jobs and build their skills while also helping dozens of local employers connect to the skills and workers they need.

WRTP/BIG STEP's Center of Excellence offers workers a wide range of support during their preparation for construction and manufacturing careers, including academic assessments and individualized tutoring for apprenticeship exams; pre-employment skills training and certification; and connections to community organizations that can assist with daycare, transportation, GED preparation, job readiness and other services.[35]

In addition to helping candidates move up the pipeline into its apprenticeship-prep program, WRTP/BIG STEP helps participants find jobs – and succeed in them. The Center of Excellence maintains a database of apprenticeship-ready workers, and can certify them for construction projects with local hiring requirements. Once WRTP/BIG STEP participants are placed, the Center of Excellence continues to provide individualized support and evaluation to help apprentices advance in their careers.

This model industry partnership offers a perfect paradigm for green-collar job training. It is no surprise, then, that WRTP/Big Step has answered the weatherization challenge posed by the recent infusion of Recovery Act dollars: how to move towards ensuring both the quality of jobs and the quality of work in the traditionally low-end labor market for residential construction.

Working with Community Action Programs and the Laborers Union, WRTP/BIG STEP plans to bring the coalition's experience and skill to the growing market for energy efficiency retrofitting in Southeastern Wisconsin, and, hopefully, statewide. WRTP/Big Step will apply all of the elements of its successful model to this effort, including:

Initial Assessment and Identifying Community Partners

One key to success, according to Associate Director Rhandi Berth, is savvy skills assessment and strong partnerships: "We are able to quickly assess the needs of the people that come through our door – whether they require essential, basic, or technical industry skills. We work with hundreds of local community organizations that refer those that are work-ready to us and provide support for workers we identify as needing help becoming job-ready."

Employer-Driven Training

WRTP/BIG STEP partners with employers and training providers to offer appropriate curriculum for their students. Their experience in the residential construction sector includes

Operating in Detroit, Michigan, Detroiters Working for Environmental Justice's *Green Jobs Workforce Training Program* is one example of this kind of instruction.[33] 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 teaches 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. The DWEJ curriculum incorporates employer input, and includes modules taught by union apprenticeship and university instructors. Graduates earn industry-recognized certificates and are provided with an introduction to entrepreneurship.

Pre-Apprenticeship Programs:[34] 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.

Photos © WRTP

preparing workers for lead abatement and asbestos removal and WHEDA building projects. By building on that history and coordinating with appropriate agencies and organizations, WRTP will expand its industry-recognized Entry Level Construction Skills (ELCS) credential to include a weatherization component. The ELCS-Weatherization Certificate will assure contractors that graduates have the skills they need to satisfy the high standards of the program.

Leveraged Resources

WRTP/BIG STEP navigates a thicket of public and private funding systems to leverage training dollars from state, federal, and industry sources. WRTP, for example, is an eligible provider for Workforce Investment Act programs; workers can use their Individual Training Account (ITA) vouchers for ELCS training.

Worker Support: Tutoring & Mentoring

WRTP/BIG STEP has developed a model mentorship program to support workers entering the construction industry. It is well known that new workers do better on the job when they have the support of an experienced worker to guide and advise them, but few organizations run successful mentoring programs. WRTP/BIG STEP matches every new worker with a mentor, who is a supportive senior worker and not a supervisor or a trainer who may have conflicted relationships with their mentee. Mentors can spot early signs of trouble, and then WRTP/BIG STEP works to find the appropriate resources to help the mentee succeed – relying on their community partners, union allies, or others, as appropriate.

The WRTP/BIG STEP commitment to helping workers enter into lasting careers led to the development of a successful tutoring program for passing apprenticeship tests. The Center of Excellence helps workers gain the math, science, and other skills they need to enter the Building and Construction Trades. Hundreds of graduates have been placed in apprenticeship programs thanks to flexible tutoring schedules and individually tailored curricula.

Labor Partners

WRTP/BIG STEP has a longstanding relationship with the Laborers Union, Local 113. That union has a residential construction package rate of about $20 per hour, which includes pension and health care benefits. By working with contractors affiliated with the Laborers in residential weatherization, WRTP can offer access to excellent training and support for workers.

Earning an ELCS-Weatherization certificate can be a gateway to a decent job in residential energy efficiency, if the weatherization program is implemented with reasonable labor standards, or the first step on a pathway from residential-sector construction to good jobs on the commercial side, particularly in green building and retrofitting. ■

The Wisconsin Regional Training Partnership WRTP/BIG STEP program in Milwaukee exemplifies a comprehensive pre-apprenticeship program, offering a wide range of support to individuals preparing for entry into the manufacturing and construction trades (see sidebar). The organization has been successful across a range of measures, helping thousands of Milwaukee-area residents – many of them low-income or unemployed women and people of color – improve their skills and connect with employers that can offer good jobs.

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. Carrying this "earn while you learn" model to another level, Wisconsin apprentices earn their wages not just on the job, but in the classroom. 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 (Table 1; see appendix for details). Building and construction trades apprenticeships are accessed and run through trade committees, most of which are organized as a locally-based Joint Apprenticeship Committees (JACs), or Joint Apprenticeship and Training Committees (JATCs). The JACs and JATCs bring together an equal pairing of labor union and employer representatives to develop policies and practices regarding apprenticeship selection and training. Application procedures and requirements vary by committee, but may include an aptitude test, interview, high school transcript, proof of high school graduation or equivalent, birth certificate, valid driver's license, etc. Not all trade committees in the state are joint committees, the most notable being the Associated Building Contractors

Table 1. Union Apprenticeships in the Construction Trades in Wisconsin

Trade	Union Affiliate	Joint Committees and Local
Boilermaker	International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers	Great Lakes Area Boilermakers Joint Apprenticeship Committee Local 107
Bricklayer	International Union of Bricklayers and Allied Craft Workers	Madison, Milwaukee Local 8, Tri-County area Trowel Trades Local 4
	Tile Layers	Milwaukee Local 5
	Tile, Marble, and Terrazo Workers	Milwaukee Local 74
Carpenter: Construction, Floor Covering, Interior Systems, Millwright	United Brotherhoods of Carpenters and Joiners of North America	Central Wisconsin Local 804, Fox Valley/Lakeshore Local 955, Green Bay Local 1146, Wausau Local 1594, Eau Claire Local 1074, Superior Local 361, Madison Local 314, Southeast WI, La Crosse Local 1143, Southern Wisconsin
Cement Mason and Plasterer	Operative Plasterers' And Cement Masons' International Association	WI River Valley Local 599, Northeast WI Local 599, Eau Claire Local 257, Lakeshore Local 599, Madison Local 599, Milwaukee Local 599 area 558, Tri-County Area Trowel Trades Local 845, La Crosse Local 257
Construction Craft Laborer	Laborers' International Union of North America	Fox Valley Local 330, Northwest WI 268, South Central 464, Southeast WI Local 113, Southwest WI Local 140
Construction and Residential Electricians	International Brotherhood of Electrical Workers	WI River Valley Local 159, Northeast WI Local 158, Appleton/Oshkosh Local 577, Eau Claire Local 14, Kenosha Local 127, Kettle Moraine Local 494, Madison Local 159, Milwaukee Local 494, Racine Local 430, South Central WI Local 890, La Crosse Local 14, Southwest WI Local 14
Elevator Constructors	International Union of Elevator Constructors	Elevator Constructors Madison Joint Apprenticeship Program, Local 15
Environmental Systems Technician / HVAC Installation Technician		Rhinelander Area HVAC Joint Apprenticeship Committee
Glazier	International Union of Painters and Allied Trades	Madison Local 914, Southeastern WI District Council 7

(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 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

Trade	Union Affiliate	Joint Committees and Local
Heat and Frost Insulator	International Association of Heat and Frost Insulators and Allied Workers	Northern WI Local 127, Southern WI Local 19
Ironworker	Bridge, Structural, Ornamental and Reinforcing Iron Workers	Ironworkers Local 8, Madison Local 383
Operating Engineer / Heavy Equipment Operator	Wisconsin Operating Engineers	Operating Engineers Local 139
Painter and Decorator	International Union of Painters and Allied Trades	Madison Local 802, Kenosha Local 934, Milwaukee District Council 7, Racine Local 108
Plumber	Plumbers Union	Appleton, Marshfield, Northeast WI, Rhinelander, Stevens Point, Wausau, Wisconsin Rapids, Eau Claire, Kenosha-Racine-Walworth Local 75, Lake To Lake, Madison Local 75, Milwaukee Local 75, Oshkosh, La Crosse
Roofer and Waterproofer	United Union of Roofers, Waterproofers and Allied Workers	Southeast WI Local 65
Sheet Metal Worker	Sheet Metal Workers Local 18	Central WI, Eau Claire-Superior, East Central WI, Madison, Milwaukee, Southeastern WI, La Crosse
Sprinklerfitter	Sprinkler Fitters Union	Milwaukee Local 183
Steamfitter: Construction, Refrigeration / Service	Steamfitters Union	Appleton Local 400, Green Bay Local 400, Tri-City Local 434, Wausau Local 434, Eau Claire Local 434, East Central Local 400, Kenosha/Racine/Walworth Local 118, Madison Local 601, Southeast WI Local 601, La Crosse Local 434, Milwaukee Local 601
Taper and Finisher	International Union of Painters and Allied Trades	Madison Local 802, Kenosha Local 934, Milwaukee Local 1204, Racine Local 108
Terrazzo Worker and Tile Setter	Tile and Terrazzo Workers	Milwaukee Local 5
	Bricklayers and Allied Crafts Local 5	Northeast WI, WI River Valley, Lakeshore, Madison, Tri-County Area Trowel Trades

on residential and commercial solar PV installation.[36] These modules have been integrated into their existing five-year apprenticeship program nationwide, in response to growing demand for renewable energy specialists. Wisconsin is building a promising State Energy Sector Partnership which plans to incorporate green skills, tools and techniques into training for apprentices and journey workers in construction, manufacturing and utility occupations, and to establish three new apprenticeships: Energy Efficiency Auditor, Wastewater Treatment Operator, and Weatherization Installer.

"Bridge" Programs: "Bridge" programs support transitions to postsecondary training for lower-skilled adults. In Wisconsin, 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 college-level credit and/or certificates that can be used for immediate employment or further postsecondary education.

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

One example of a manufacturing skills bridge program in Wisconsin is the Chippewa Valley Technical College Production MIG Welding certificate (see sidebar). 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.

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CASE STUDY: CHIPPEWA VALLEY TECHNICAL COLLEGE WELDING BRIDGE

Before the recent economic downturn, many firms in and around Neillsville, WI were expanding their manufacturing capacities and looking to employ individuals with Metal Inert Gas (MIG) production welding skills. As MIG welding is the most common type of welding utilized in manufacturing and production processes, Chippewa Valley Technical College – which has an outreach/satellite campus in Neillsville – wanted to respond effectively on two separate fronts: meeting employer demand for trained personnel, and providing low-income, low-skill and displaced workers with the training necessary to become viably employed.

Photos © Chippewa Valley Technical College

Previously, training in production MIG welding was only available to students in single-credit night courses or as a component of the full-time Welding Diploma program. Chippewa's Production MIG Welding certificate incorporates basic skills instruction alongside the technical skills of Production MIG Welding, Blueprint Reading and Fabrication, and Math for Welders. In doing so, Chippewa Valley is the first institution in the region to offer certification in a particular welding process in just sixteen weeks using a team-teaching framework. The nine credits earned in the Production MIG Welding certificate directly ladder into the Welding Diploma program at Chippewa Valley, should students want to seek additional training and instruction.

The first Production MIG Welding cohort was piloted at the Neillsville, WI outreach campus in spring 2009. Twelve students were initially enrolled in the program and all successfully completed. According to the results of the pre- and post-course testing, most of the students showed marked improvement in their reading and math computation levels. What's more, there is clear demand for the program – within twenty-four hours of opening registration for fall 2009, the program's twelve openings were full and there was a waitlist.

Chippewa Valley's Production MIG Welding Certificate has benefitted from a high degree of employer involvement in its creation and implementation. Chippewa Valley worked with regional employers and representatives of the welding industry to determine core competencies and design course content. Area employers were also very supportive of the inclusion of an integrated Adult Basic Education component in the program curriculum.

One participating employer went beyond the advisory capacity in the program's development. OEM Fabricators donated materials to outfit the lab for instruction and provided their head welder to the program as a substitute teacher and presenter in the course. OEM's representative conducted mock job interviews with the students to expose them to hiring procedures and practices; his presence in the course gave students the opportunity to see and hear about the ways in which their training had practical applications beyond the classroom. Other employers have indicated to Chippewa that they hope to hire qualified applicants once the economy improves.

Chippewa Valley Technical College is one of many institutions taking a new approach to training in the field of welding. For example, Moraine Park, Milwaukee Area, Waukesha County and Gateway Technical Colleges are collaborating to produce a multi-district welding bridge program, utilizing an integrated ABE/ELL and occupational team-teaching model that terminates in an embedded certificate that would ladder directly into other programs at each participating technical college. And Northeast Wisconsin Technical College (NWTC) has also developed an English Language Learner/Welding certificate program to equip learners with the basic skills they need to secure an entry-level job and pursue additional training and educational opportunities. ■

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. They often work in partnership with 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. Apprentices training in Wisconsin's technical colleges earn 39 credits toward the 60 required for an AAS degree in Technical Studies: Journey Worker.

The tribal community college of the Lac Courte Oreilles Band of Superior Ojibwa near Hayward, Wisconsin has recently joined with the University of Wisconsin and industry partners to expand green building techniques taught through its construction and training program (see sidebar). This effort comes as part of a community-based initiative to build green affordable housing on tribal lands. Community members participate in the planning and design process, and then receive hands-on training in sustainable building techniques.

Beyond innovative individual programs, efforts are underway to "green up" offerings across Wisconsin's technical colleges. Table 2 summarizes programs leading to credentials in renewable energy and energy efficiency as of summer 2009 (See appendix for details). In this rapidly evolving field, new certificates, diplomas and degrees are emerging in every district. What's more, because the "greening" of traditional occupations and industries does not require entirely new programs, the Wisconsin Technical College System has identified, in addition to 25 new "green" programs (planned or operational) and close to 400 existing programs – primarily but not exclusively in construction and manufacturing – that can or will be "greened up."

Photo © Energy Trust of Oregon

Photo © Nature's Path Foods

Table 2.

Examples of Energy Efficiency and Renewable Energy Training at Wisconsin Technical Colleges

Clean Energy Focus	Technical College	Campus	Program	Certificate or Degree
Wind	Lakeshore Technical College	Cleveland	Wind Energy Technology	AAS
Solar	Northeast Wisconsin Technical College	Green Bay	Renewable Energy – Solar	Solar Energy Certificate
Biofuels	Mid-State Technical College	Wisconsin Rapids	Biorefinery Technology	AAS
Biofuels	Northeast Wisconsin Technical College	Green Bay	Biofuels	Biofuels Certificate
Renewable Energy	Madison Area Technical College	Madison	CERET	Certificate in Renewable Energy Technology
Renewable Energy	Mid-State Technical College	Wisconsin Rapids	Renewable Thermal Energy Technician, Renewable Energy Specialist, Renewable Electricity Technician	AAS
Renewable Energy	Wisconsin Indianhead Technical College	Ashland Campus	Renewable Electricity Technician	Renewable Electricity Technical Certificate
Renewable Energy	Fond du Lac Tribal and Community College	Fond du Lac	Clean Energy Technician	Clean Energy Technology Certificate
Energy Efficiency	Fox Valley Technical College	Appleton	Environmental Management Systems for Emerging Technologies	Environmental Management Systems for Emerging Technologies Certificate
Energy Efficiency	Mid-State Technical College	Wisconsin Rapids	Energy Efficiency Technician	AAS
Energy Efficiency	Milwaukee Area Technical College	Oak Creek Campus	Sustainable Operations	Sustainable Operations Advanced Technical Certificate
Energy Efficiency	Northeast Wisconsin Technical College	Green Bay	Sustainable Design	Sustainable Design Certificate

Photo © Grid Alternatives

CASE STUDY: GREEN AFFORDABLE HOUSING IN INDIAN COUNTRY

Green Affordable Housing in Indian Country is a "hands-on" green construction training program involving tribes in the upper Midwest, architects and landscape architects, builders, and contractors, and students and faculty from the Lac Courte Oreilles Ojibwe Community College and the University of Wisconsin-Madison. The project is oriented toward community development on Indian reservations through technology transfer and job skills training in sustainable housing construction techniques based on natural systems, organic materials, local labor, and energy efficiency.

The project began in 2002, when leaders of the Red Cliff Band of Lake Superior Ojibwa invited the UW-Madison Department of Landscape Architecture to participate in a "community planning and design initiative that would address the need for affordable housing while preserving their natural and cultural resources."[39] Faculty and staff from the university proceeded to work with representatives from community planning, housing, social services, and natural resource programs to create an economically, ecologically, and culturally appropriate plan for developing new housing and community facilities on the reservation. The planning process was open to the community at large through a series of public workshops to invite feedback on the different plans under consideration. Following approval of the project by the Tribal Council, construction began in 2005, and by the end of 2008, twenty-four new homes had been built.

The success of the Red Cliff project resulted in requests for similar collaborative efforts in other communities in the region. This led to the creation of the Green Communities and Green Affordable Housing in Indian Country Tech Transfer/Jobs Training Initiative to disseminate the skills and technology training utilized in the Red Cliff development project. Working with the Madison-based nonprofit architectural and planning group Design Coalition and several other organizations, UW Landscape Architecture faculty has facilitated workshops to craft development plans in collaboration with several tribes across the upper Midwest, including the St. Croix Ojibwa, the Lac Courte Oreilles Band of Superior Ojibwa, and the Mole Lake Sokaogon Ojibwa.

Green Affordable Housing in Indian Country training sessions consist of community-based workshops and the development of one or two model projects under the direction of experienced builders and contractors. In this way, program coordinators are "training the trainers" in construction and design techniques, so that there are community residents with the skills and knowledge to implement further development.[39] Furthermore, the projects themselves provide hands-on training for community members without previous experience in general labor and construction. The Lac Courte Oreilles Ojibwa Community College, near Hayward, Wisconsin, has institutionalized this training by joining with the UW, Design Coalition, and Kelly Design Group to expand green building techniques taught at the tribal community college through their Sustainable Living Institute and their Alternative Energy and Construction Technology Programs.

Photos © Green Affordable Housing in Indian Country

The core of the Green Affordable Housing in Indian Country training content involves the "Northern Light Straw-Clay" wall construction techniques developed by Design Coalition, which are specifically tailored to promote energy efficiency and cost effectiveness for houses in the Upper Midwest region. Training also includes information on wood-efficient framing and specialized construction details, the selection and installation of high-efficiency heating, ventilation, and hot water systems, green building materials, sustainable site design and stormwater issues, solar housing design, electrical wiring, and job site efficiency and safety.

In addition to sustainable and low-cost construction, another important component of Green Affordable Housing in Indian Country projects is attention to cultural appropriateness in home design. During some of the initial workshops, it became clear to project coordinators that the standard single-family home was not necessarily the most desirable or efficient model for the tribes. Thus, an emphasis on multi-generational housing design developed into a central aspect of the projects. This type of design typically features a larger kitchen and common space, along with additional bedrooms and bathrooms, to accommodate the needs of extended family living together. Multi-generational housing has the additional benefits of being cheaper and more energy efficient compared to multiple single-family homes, because only one system for heating, cooling, and plumbing is needed, and more space overall is shared.[39] ■

"We suggest what might seem like a simple solution: make connections."

Incumbent Worker Training (on-and off-site): Even when a worker secures a full-time position at a manufacturing firm or on a construction crew, he or she may need further training as processes or technologies change (for instance, as green building practices become more prevalent on construction jobs). Incumbent worker training may be provided by the employer on-site, or offered though apprenticeship training centers or community 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, and are not discussed in the appendix. However, it is worth noting that unionized employers are far more likely to offer continuing training opportunities than are non-union employers.

Incumbent worker training is particularly important for teaching existing workers about new green processes and technologies. The 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.[40] 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.

In Custer, Wisconsin, the nonprofit Midwest Renewable Energy Association trains workers from a variety of occupational and educational backgrounds, certifying solar and wind site assessors, preparing installers for certification by the North American Board of Certified Energy Practitioners, and providing the continuing education required for licensed journey and master level plumbers and electricians.[41]

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.

Wisconsin has a robust apprenticeship system, a superb technical college system, an engaged state workforce system, a host of committed community organizations, and a nationally renowned intermediary model. The state has taken serious and thoughtful steps toward integrating this workforce development infrastructure. But consciously placing the stepping stones of work and learning into a clear, navigable pathway of career advancement is never simple. Challenges abound. While technical colleges have been at the forefront of creating new opportunities in green-collar job training, campuses do not always communicate well; credentials are not always portable or stackable; completion rates for low-skilled workers lag; and degree programs don't always have strong connections to employment. These structural challenges cannot be addressed overnight, and the system is making tremendous strides, particularly in developing bridges and pathways through the state's Shifting Gears initiative.[42] And technical college leaders are increasingly coming together to coordinate green programming. Labor faces similar challenges. 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. There are encouraging signs however, as the Emerald Cities Collaborative begins to build stronger partnerships between labor and community. And while the apprenticeship system is not well connected to the state's workforce system, the WRTP has partnered with the state's

Workforce Development Boards to better integrate the two, and to develop stronger pre-apprenticeship programming in key green sectors.

All of 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 Wisconsin 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, Wisconsin 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. Perhaps most promising, stakeholders from all corners of Wisconsin's workforce system – including labor unions, employers, workforce boards, technical colleges, community organizations, state agencies, technical assistance providers, and labor market intermediaries have joined together in response to clean energy funding opportunities from the Departments of Labor and Energy. But much work still remains to develop a comprehensive, integrated green career pathways model that is both accessible and transparent.

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

1. **Invest in solid, credible data collection and dissemination, so that individual regions and cities can easily access information about existing green-collar jobs as well as growth potential in particular sectors of the green economy.** For example, Washington state created a comprehensive green jobs analysis in 2008, based on the findings of a survey of private-sector employers in the state. The final report identifies the number and type of jobs in the state's emerging green economy, and establishes a baseline measure that can be used to track industry and job growth in Washington's green economy.[43] The state used this report to guide policy decisions in both economic and workforce development, and has taken further steps to develop and report on energy efficiency and renewable energy skills standards.

2. **Break down silos and better integrate environmental, economic, and workforce goals at the federal, state, and local level, so that investments in new training programs are driven by actual job growth.** The state of 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.[44] 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 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.[45]

4. **Condition federal, state, and local training grants and department of development funds on interagency collaboration, and prioritize partnerships between training providers, unions, employers, and Workforce Investment Boards.** In addition to promoting collaboration, training grants should be used to pull together a coherent, coordinated statewide network, while also allowing flexibility to fit local conditions. The Green Jobs Act, passed as part of the 2007 Energy Bill, provides a good example of this kind of language, specifically funding partnerships that include

"the equal participation of industry and labor organizations, and may include workforce investment boards, community-based organizations, qualified service and conservations corps, educational institutions, small businesses, cooperatives, state and local veterans agencies, and veterans service organizations."[46]

5. **Provide funding not just for new training courses and curriculum development, but for the establishment or continuing support of local workforce intermediaries that can and do serve as connectors between the stakeholder groups described above.** One of the most respected national examples of a workforce intermediary is the Wisconsin Regional Training Partnership (WRTP/BIG STEP). WRTP/BIG STEP is a well-established labor-led sector partnership that brings together unions, businesses, community groups, and workforce development agencies to help thousands of workers access high-quality training and employment (see sidebar).[47] 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.

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.[48]

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.[49] 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.[50]

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 Wisconsin. Nevertheless, much work remains to make the existing system one that is both comprehensive and fully integrated. The existing training programs described in this paper represent a starting point for policymakers, green jobs advocates, and workforce development professionals interested in achieving these goals. By building on existing programs, and implementing policies aimed at strengthening, coordinating, and aligning these programs with job growth in the green economy, we can meet the workforce demands of the new energy economy – and we can do so while simultaneously creating navigable career pathways into high-quality, family-supporting jobs that rebuild the middle class.

Photo © LiteControl

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 Wisconsin's apprenticeship and technical college system.

Green-Collar Job Training Through Wisconsin'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." Apprentices earn decent wages while learning transferrable skills in a trade: Wisconsin is the only state that requires employers to pay apprentices an hourly wage not just on the job, but in the classroom.

Apprenticeships in Wisconsin are regulated by the state's Bureau of Apprenticeship Standards (BAS). Application procedures and requirements for both manufacturing and construction trades are subject to BAS approval. Wisconsin apprenticeships involve a contract between the state, the apprentice, and the sponsor (labor-management committees, employers, or employer associations) specifying wage schedules, classroom hours, and length of training.

While ample information about Wisconsin apprenticeships is helpfully gathered on the Department of Workforce Development BAS website, finding a path to a given apprenticeship is not simple. The charts below articulate different access points, standards and requirements by region and trade. It is important to note that, in some cases, applications for apprenticeships are accepted at a different location than where the training takes place.

If the state wins federal support to build its proposed energy sector training partnership, there will be a number of more clearly articulated pathways for green careers within the skilled trades, as well as new energy efficiency apprenticeships (e.g. weatherization and energy auditing). Apprenticeship opportunities will expand in the greening utility sector as well, but these are beyond the scope of this paper.

Apprenticeship Prep or Pre-Apprenticeship

Apprenticeship sets a high bar, particularly for low-income workers with limited education or English, and little or no experience in a trade. Before seeking placement in an apprenticeship, candidates must meet certain requirements (GED, driver's license) and pass a qualifying exam. A program that assists job-seekers in meeting those requirements is known as a "pre-apprenticeship." It is a catch-all term that covers a wide range of unregulated programs and practices, some of which may not be likely or legitimate on-ramps to formal apprenticeships. Many of the apprenticeship experts we spoke to in Wisconsin prefer the term "apprenticeship prep" to describe programs that explicitly prepare people to apply for and enter apprenticeships. These may include hard-skills training or test preparation, basic skills and job readiness, and sometimes social service support such as transportation or child care. There is no standard format or credentialing process: some programs are run by direct training providers, some connect individuals to other organizations, and some do a combination. The best example in the state, if not the country, is the Wisconsin Regional Training Partnership WRTP/BIG STEP program, highlighted above.

Photo © Orientation to Trade and Apprenticeship Program

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Boilermaker**	Boilermakers erect and maintain various types of pressure vessels for institutional and industrial use. Skills include welding, burning, heavy and high rigging, and layout work.	Age 18+; High school diploma or GED; Physical condition to perform the work. Recommended high school courses are general math, geometry, mechanical drawing, and welding.	Four year training program. Applications accepted on an ongoing yearly basis. Classroom work and home studies required, along with on–the-job training.	Great Lakes Area Boilermakers Apprenticeship Program, International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers Local 107	Oak Lawn, IL
Bricklayer	Bricklayers use brick, concrete, and other masonry materials to construct walls, fireplaces, chimneys and other structural elements.	At least 18 years of age or at least 16 years of age with parent/guardian consent; High school diploma or GED; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Three year training program with 4,680 hours on-the-job training and 400 hours paid related instruction. Red Cross First Aid and OSHA Safety Training Courses. Transition-To-Trainer course in the final year.	Madison Area Bricklaying JAC; International Union of Bricklayers and Allied Craft Workers, District Council	Madison
				Milwaukee Area Bricklaying JAC; Bricklayers Local 8, Tile Layers Local 5, Tile, Marble, and Terrazzo Local 74	New Berlin
				Tri-County Area Trowel Trades JAC; International Union of Bricklayers and Allied Craft Workers Local 4	Kenosha
				ABC of Wisconsin*	Madison
Carpenter: Construction, Floor Covering, Interior Systems, Millwright	Carpenters lay out, construct, repair, remodel, renovate or dismantle permanent or temporary structures. Floor layers cut, fit and install hardwood flooring and other types of underlayment. Millwrights study and interpret blueprints; install generators, conveyors, escalators and electric turbines; install and maintain machinery used in manufacturing; and do precision work in nuclear power plants.	At least 17 years of age; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Four year training program with 6,240 hours on-the-job training and 400 hours paid related instruction plus 250 hours unpaid related instruction. Red Cross First Aid and CPR Training courses in the first two years. Transition-To-Trainer course in the final year.	Central WI Area Carpentry JAC; United Brotherhoods of Carpenters and Joiners of North America (Carpenters) Local 804	Wisconsin Rapids
				Fox Valley/Lakeshore Area Carpentry JAC; Carpenters Local 955	Kaukauna
				Green Bay Area Carpentry JAC; Carpenters Local 1146	Kaukauna
				Wausau Area Carpenters JAC; Carpenters Local 1594	Mosinee
				Eau Claire Area Carpentry JAC; Carpenters Local 1074	Eau Claire
				Superior Area Carpentry JAC; Carpenters Local 361	Hermantown
				Madison Area Carpentry JAC; Carpenters Local 314	Madison
				Southeast WI Carpentry JATC; Chicago Regional Council of Carpenters	Northern Region
				La Crosse Area Carpentry JAC; Carpenters Local 1143	La Crosse
				Lakeshore Area Carpentry Advisory Committee*	Cleveland
				ABC of Wisconsin*	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Cement Mason and Plasterer	Cement masons finish the exposed concrete surfaces on many types of construction projects at commercial and industrial, or residential sites. Plasterers apply coats of plaster, cement, and stucco to interior and exterior walls, ceilings and partitions.	At least 18 or at least 16 with parent/guardian consent; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work.	Cement Masons: 3 year training program; 4,000 hours on-the-job training and 400 hours paid related instruction. The apprentice attends night school on his/her own time. Red Cross First Aid, CPR, and the OSHA Certificate courses. Transition-To-Trainer course in the final year. Plasterers: 3 year training program; 4,680 hours on-the-job training and 500 hours paid related instruction. Apprentice shall attend night school on their own time. Red Cross First Aid, CPR, and the OSHA Certificate Courses. Transition-To-Trainer course in the final year.	WI River Valley Area Masonry JAC; Operative Plasterers' and Cement Masons' International Association (Plasterers) Local 599	Wausau
				Northeast WI Area Plasterers Local 599	Green Bay
				Eau Claire Area Masonry JAC; Plasterers Local 257	Eau Claire
				Lakeshore Area Masonry JAC; Plasterers Local 599	Cleveland
				Madison Area Cement Masonry JAC; Plasterers Local 599	Madison
				Milwaukee Area Cement Masonry JAC; Plasterers Local 599 Area 558	Wauwatosa
				Tri-County Area Trowel Trades JAC; Plasterers Local 845	Kenosha
				La Crosse Area Masonry JAC; Plasterers Local 257	La Crosse
				ABC of Wisconsin*	Madison
				Fox Valley Area Laborers JAC; Laborers' International Union of North America (LIUNA) Local 330	De Forest
				Northwest WI Construction Craft Laborers JAC; LIUNA Local 268	De Forest
				South Central Construction Craft Laborers JAC; LIUNA Local 464	De Forest
				Southeast WI Construction Craft Laborers JAC; LIUNA Local 113	De Forest
				Southwest WI Area Construction Craft Laborers JAC; LIUNA Local 140	De Forest
				ABC of Wisconsin*	Madison
Construction Craft Laborer	Construction craft laborers perform a wide range of non-special trade construction work in all areas of construction. Skills include digging, loading, unloading, lifting, carrying, lugging, tending, stockpiling, sweeping and cleaning.	Age 18+; Meet required norms on aptitude test (if required); Reading, writing, comprehension and communication skills; Physical condition to perform the work; Valid driver's license or reliable transportation.	Three year training program with 4,000 hours on-the-job training and 400 hours paid related instruction. Transition-to-Trainer Course during final 1,000 hours.	Fox Valley Area Laborer JAC; Laborers' International Union of North America (LIUNA) Local 330	De Forest
				Northwest WI Construction Craft Laborers JAC; LIUNA Local 268	De Forest
				South Central Construction Craft Laborers JAC; LIUNA Local 464	De Forest
				Southeast WI Construction Craft Laborers JAC; LIUNA Local 113	De Forest
				Southwest WI Area Construction Craft Laborers JAC; LIUNA Local 140	De Forest
				ABC of Wisconsin*	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Construction and Residential Electrician	Electricians assemble, install, and wire electrical systems that operate heating, lighting, power, air conditioning, and refrigeration components; electrical machinery; electronic equipment and controls; and signal and communication systems.	**Construction:** Age 17+; High school diploma or equivalent; Algebra with a passing grade ("C" or higher or equivalent); Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation. **Residential:** Age 18+; High school diploma or equivalent; Physical condition to perform the work; Valid driver's license or reliable transportation.	**Construction:** Four year training program with 8,400 hours on-the-job training and 400 hours paid related instruction, plus hours of unpaid related instruction. Individual program requirements may vary by committee. **Residential:** Four year training program with 5,232 hours on-the-job training and 432 hours paid related instruction; First Aid and CPR course during the first year of the apprenticeship, and continued certification throughout the apprenticeship; Transition-To-Trainer course in the final year.	WI River Valley Area Electrical JAC; International Brotherhood of Electrical Workers (IBEW) Local 159	Madison
				Northeast WI Area JAC; IBEW Local 158	Madison
				Appleton/Oshkosh Area Electrical JAC; IBEW Local 577	Madison
				Eau Claire Area Electrical JAC; IBEW Local 14	Madison
				Kenosha Area Electrical JAC; IBEW Local 127	Madison
				Kettle Moraine Area Electrical JAC; IBEW Local 494	Milwaukee
				Milwaukee Area Electrical JAC; IBEW Local 494	Milwaukee
				Racine Area Electrical JAC; IBEW Local 430	Madison
				South Central WI Area Electrical JAC; IBEW Local 890	Madison
				La Crosse Area Electrical JAC; IBEW Local 14	Madison
				Southwest WI Area Electrical JAC; IBEW Local 14	La Cross
				Madison Area Electrical JAC; IBEW Local 159	Madison
				ABC of Wisconsin*	Madison
Elevator Constructor**	Elevator constructors install, repair, modernize and maintain elevators, escalators, handicap lifts and related machinery.	High school diploma or GED; Physical condition to perform the work, no fear of heights; Prior experience in electrical and mechanical experience is recommended.	Begins with on-the-job training. Courses conducted by the National Elevator Industry Education Program are required for further advancement.	Elevator Constructors Madison Joint Apprenticeship Program; International Union of Elevator Constructors Local 15	Cottage Grove
Environmental Systems Technician/ HVAC Installation Technician	Environmental Systems Technicians (EST) and HVAC Installation Technicians install, service, and repair heating and air conditioning systems in residences and commercial and industrial establishments.	Age 17+; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Five year training program with 9,000 hours on-the-job training and 560 hours paid related instruction with 170 additional hours unpaid instruction; Red Cross First Aid Training course; Transition-To-Trainer course in the final year	Rhinelander Area HVAC JAC	Rhinelander
				ABC of Wisconsin*	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Glazier	Glaziers select, cut, install, replace and remove all types of glass in residential and commercial projects.	Age 17+; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Four year training program with 6,240 hours on-the-job training and 400 hours paid related instruction. Standard first aid course and CPR course during the first 2,000 hours of work, with continued certification throughout apprenticeship. Transition-To-Trainer course in the final year.	Madison Area Glazing JAC; International Union of Painters and Allied Trades Local 914	Sun Prairie
				Southeastern Glazing JAC; Painters and Allied Trades District Council	New Berlin
				ABC of Wisconsin*	Madison
Heat and Frost Insulator	Heat and Frost Insulators install and maintain insulation systems for the conservation of energy and the control of the environment in buildings requiring temperature control, heat transfer, sound barriers, fire protection, fire stopping, and asbestos abatement.	Age 18+; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work.	Four year training program with 6,240 hours on-the-job training and 400 hours paid related instruction. Transition-To-Trainer course in the final year.	Northern WI Area Heat & Frost JAC; International Association of Heat and Frost Insulators and Allied Workers Local 127	Appleton
				Southern WI Heat & Frost Insulators JAC; Heat & Frost Insulators Local 19	Pewaukee
				ABC of Wisconsin*	Madison
Ironworker	Ironworkers erect structural steel, place reinforcing bars in concrete construction, move machinery, rig and erect equipment, install fabricated building components, and fabricate welding.	Age 18+; Birth certificate; high school diploma or GED; transcript of all school records with satisfactory grades in math, science and industrial arts; and military service record, if any; Physical condition to perform the work; Applicants tested for aptitude, manipulative skills, and drug use.	Three year apprenticeship, with at least 6,000 hours of continuous employment in an approved schedule of work experience. First 6 months are probationary period. Hours of labor are the same as established for other skilled workers in the shop. Minimum of 400 hours related instruction.	Ironworkers Joint Apprenticeship Committee; Bridge, Structural, Ornamental and Reinforcing Iron Workers Local 8	Milwaukee
				Madison Ironworkers JAC; Bridge, Structural, Ornamental and Reinforcing Iron Workers Local 383	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Operating Engineer/ Heavy Equipment Operator	Operating Engineers work on heavy equipment at commercial and residential construction projects; at plants that produce rock, sand and gravel; or at the clean-up of hazardous waste sites.	Age 18+; Valid driver's license; High school education or GED; Must pass the General Aptitude Test Battery (GATB) for the Operating Engineers craft; Must attend an orientation at the Coloma Training Center or another approved location; Physical condition to perform the work.	Minimum of 6,000 on-the-job training hours and 400 related Instruction hours. Apprentices start at 70% of journey worker wage including 10% Related Instruction pay. Pay rates increase with completion of each period of training, until Journey worker status.	Operating Engineers Joint Apprenticeship & Training Committee; Wisconsin Operating Engineers Local 139	Coloma
Painter and Decorator	Painters apply paint, stain, varnish and other finishes to buildings and other structures.	Age 17+; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Ability to distinguish colors; Valid driver's license or reliable transportation.	Four year training program with 6,240 hours on-the-job training and 400 hours paid related instruction; Minimum of 80 hours unpaid related instruction; Red Cross First Aid and OSHA Safety Training Courses (included in 80 hours of unpaid instruction); Transition-To-Trainer course in the final year.	Madison Area Painting & Decorating JAC; International Union of Painters and Allied Trades (Painters) Local 802	Sun Prairie
				Kenosha Area Painting & Decorating JAC; Painters Local 934	New Berlin
				Milwaukee Area Painting & Decorating JAC; Painters District Council 7	New Berlin
				Racine Area Painting & Decorating JAC; Painters Local 108	Kenosha
				ABC of Wisconsin*	Madison
Plumber	Plumbers design, install, repair and maintain piping systems in residential, commercial, and industrial buildings and at utility sites.	High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Five year training program with 8,000 hours on-the-job training and 500 hours paid related instruction plus 260 hours of unpaid related instruction; Red Cross First Aid, CPR, and OSHA Safety Training Courses during the first year, with continued First Aid/CPR certification throughout apprenticeship; Transition-To-Trainer course in the final year.	Appleton Area Plumbing JAC	Appleton
				Marshfield Area Plumbing JAC	Marshfield
				Northeast WI Area Plumbing JAC	Green Bay
				Rhinelander Area Plumbing JAC	Rhinelander
				Stevens Point Area Plumbing JAC	Stevens Pt.
				Wausau Area Plumbing JAC	Eau Claire
				Wisconsin Rapids Area Plumbing JAC	Eau Claire
				Eau Claire Area Plumbing JAC	Appleton
				Western WI Area Plumbing JAC	River Falls
				Kenosha-Racine-Walworth Plumbing JAC; Plumbers Union Local 75	Sturtevant
				Lake To Lake Area Plumbing JAC	Cleveland

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Plumber continued				Madison Area Plumbing JAC; Plumbers Union Local 75	Madison
				Milwaukee Area Plumbing JAC; Plumbers Union Local 75	Milwaukee
				Oshkosh Area Plumbing JAC	Oshkosh
				La Crosse Area Plumbing JAC	Eau Claire
				Southwest WI Area Plumbing Advisory Committee*	Platteville
				Fond du Lac Area Plumbing*	Appleton
				Northern WI Plumbing Advisory Committee*	Ashland
				ABC of Wisconsin*	Madison
Roofer and Waterproofer	Roofing and Waterproofing involves installing water-tight roof systems on new or existing roofs. Green roofs require installation of intensive (flowers, shrubs) or extensive (grasses) water-tight roof system before the landscaping is added on top.	Age 18+; High school diploma or equivalent is preferred within first six months, or three years work experience in trade; Physical condition to perform the work; Valid driver's license or reliable transportation; Commercial driver's license may be required.	Four year training program with 6,000 hours on-the-job training and 400 hours paid related instruction. Maximum of 40 hours of unpaid related instruction. Red Cross First Aid and CPR Courses. Transition-To-Trainer course in the final year.	Southeast WI Roofing & Waterproofing JAC; United Union of Roofers, Waterproofers and Allied Workers Local 65	New Berlin
				South Central WI Roofing & Waterproofing*; United Union of Roofers, Waterproofers and Allied Workers Local 65	Indian Head Park, IL
				ABC of Wisconsin*	Madison
Sheet Metal Worker	Sheet metal workers manufacture, assemble, install, and repair systems utilizing sheet metal. Work is often focused on HVAC systems, though project areas may also involve heavy metal work, welding, roofing and siding, and drain-pipe work.	Age 17+; High school diploma or equivalent; Physical condition to perform the work; Meet required norms on aptitude test; Valid driver's license or reliable transportation.	Five year training program with 9,000 hours on-the-job training and 450 hours paid related instruction plus at least 280 hours unpaid instruction; Red Cross First Aid Safety Course; Transition-To-Trainer course in the final year.	Central WI Area Sheet Metal JAC; Sheet Metal Workers Local 18	Wausau
				Eau Claire-Superior Sheet Metal JAC; Sheet Metal Workers Local 18	Eau Claire
				East Central WI Area Sheet Metal JAC; Sheet Metal Workers Local 18	North Fond du Lac
				Madison Area Sheet Metal JAC; Sheet Metal Workers Local 18	Madison
				Milwaukee Area Sheet Metal JAC; Sheet Metal Workers Local 18	Milwaukee
				Southeastern WI Area Sheet Metal JAC; Sheet Metal Workers Local 18	Racine
				La Crosse Area Sheet Metal JAC; Sheet Metal Workers Local 18	La Crosse
				ABC of Wisconsin*	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Sprinklerfitter	Sprinklerfitters install automatic fire sprinkler systems in new and existing buildings in (primarily) commercial construction. Skills include lay out, assembly, installation, and maintenance of pipe systems, pipe supports, and related equipment.	Age 17+; High school diploma or equivalent; Meet required norms on an aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Five year training program with 8,400 hours on-the-job training and 400 hours paid related instruction plus additional unpaid hours of related instruction.	Milwaukee Area Sprinkler Fitting JAC; Sprinkler Fitters Union Local 183	Menomonee Falls
				ABC of Wisconsin*	Madison
Steamfitter: Construction, Refrigeration / Service	Steamfitters lay out, assemble, fabricate, install, troubleshoot, maintain and repair piping systems used in energy production, heating, cooling, food processing, refrigeration and air conditioning, and manufacturing.	Age 18+; High school diploma or equivalent; Meet required norms on aptitude test (if required); Physical condition to perform the work; Valid driver's license or reliable transportation.	Five year training program with 8,000 hours on-the-job training plus 500 hours paid related instruction; Must complete Red Cross First Aid, CPR and OSHA Safety Training Courses; unpaid related instruction determined by the local committee; Transition-To-Trainer course in the final year.	Appleton Area Steamfitting JAC; Steamfitters Local 400	Appleton
				Green Bay Area Steamfitting JAC; Steamfitters Local 400	Appleton
				Tri-City Area Steamfitting JAC; Steamfitters Local 434	Eau Claire
				Wausau Area Steamfitting JAC; Steamfitters Local 434	Eau Claire
				Eau Claire Area Steamfitting JAC; Steamfitters Local 434	Eau Claire
				East Central Steamfitting JAC; Steamfitters Local 400	Appleton
				Kenosha/Racine/Walworth Steamfitting JAC; Steamfitters Local 118	Sturtevant
				Madison Area Steamfitting JAC; Steamfitters Local 601	Milwaukee
				Southeast WI Area Steamfitting JAC; Steamfitters Local 601	Milwaukee
				La Crosse Area Steamfitting JAC; Steamfitters Local 434	Eau Claire
				Milwaukee Area Steamfitter Joint Apprenticeship Training Committee; Steamfitters Local 601	Milwaukee
				ABC of Wisconsin*	Madison

WISCONSIN APPRENTICESHIPS: CONSTRUCTION

Trade	Skills	Requirements	Training Structure	Committee Name and Union Affiliate	Location
Taper and Finisher	Taper and Finishers apply plasterboard or other wallboard to ceilings and interior walls of buildings. They prepare wall surface for painting or papering, and may install exterior insulation finish systems and decorative finishes.	Age 18+; High school diploma or equivalent; Physical condition to perform the work; Valid driver's license or reliable transportation.	Three year training program with 4,280 hours on-the-job training and 400 hours paid related instruction plus 80 hours of unpaid related instruction; Red Cross First Aid and OSHA Safety Training courses (included in 80 hours of unpaid instruction); Transition-To-Trainer course in the final year.	Madison Area Painting & Decorating JAC; International Union of Painters and Allied Trades (Painters) Local 802	Sun Prairie
				Kenosha Area Painting & Decorating JAC; Painters Local 934	New Berlin
				Milwaukee Area Painting & Decorating JAC; Painters Local 1204	New Berlin
				Racine Area Painting & Decorating JAC; Painters Local 108	Kenosha
				ABC of Wisconsin*	Madison
Tile Setter and Terazzo Worker	Tile setters plan, prepare materials, and install tiles in commercial and residential buildings. Terrazzo workers complete the full installation process of terrazzo, from laying the first base of mortar, to mixing the terrazzo, to smoothing and polishing the final product.	High school diploma or equivalent; Valid driver's license or reliable transportation; Physical condition to perform the work.	Three year training program with 4,680 hours on-the-job training and 400 hours paid related instruction; Red Cross First Aid and OSHA Safety Training Courses; Transition-To-Trainer course in the final year.	Northeast WI Area Masonry JAC; Bricklayers and Allied Crafts (Bricklayers) Local 5	Green Bay
				WI River Valley Area Masonry JAC; Bricklayers Local 5	Wausau
				Lakeshore Area Masonry JAC; Bricklayers Local 5	Cleveland
				Madison Area Bricklaying JAC; Bricklayers Local 5	Madison
				Milwaukee Area Tile Setters JAC; Tile and Terrazzo Local 5	New Berlin
				Tri-County Area Trowel Trades JAC; Bricklayers Local 5	Kenosha

Contact info for all committees available at: http://www.dwd.state.wi.us/apprenticeship/construction_trades.htm

*Not a joint committee.

**Certain occupations, such as boilermakers and elevator constructors, are registered nationally with the DOL because their work is categorized as regional. The sprinkler-fitters have one local in Milwaukee, but everywhere else they are part of federally-registered Local 699. These occupations are listed in the materials from the Building and Construction Trades Councils because they do have apprenticeships, but they are not listed in the BAS info.

*** Location of training headquarters may differ from location where applications are accepted, and/or location where training takes place.

WISCONSIN APPRENTICESHIPS: MANUFACTURING

Trade	Skills	Requirements	Training Structure
Electrical and Instrumentation Technician	Electrical and Instrumentation Technicians install, service, troubleshoot, and maintain electrical equipment. They may also service high voltage electrical systems, and ensure that work is in accordance with relevant codes.	Age 18+; Entry requirements vary by employer; High school diploma or equivalent; Physical condition to perform the work.	5 to 6 year training program with 9,392 hours on-the-job training and 1,008 hours paid related instruction; Additional related instruction may be required; Classroom training includes study of electrical codes, electronics, electrical systems, safety, controllers, instrument mechanics and process measurements.
Industrial Maintenance Electrician	No description available.		
Industrial Pipefitter	Pipefitters lay out, assemble, install, and maintain high and low pressure pipe systems.	Entry requirements vary by employer; High school diploma or equivalent; Physical condition to perform the work.	4 year training program with 8,000 hours on-the-job training and 576 hours paid related instruction; Red Cross First Aid, CPR; Transition-To-Trainer courses required.
Injection Molding Machine Setter	No description available.		
Machinist	No description available.		
Maintenance Mechanic	Maintenance mechanics fabricate, install, dismantle, or move machinery and heavy equipment. Skills include pipefitting, boiler making, insulating, welding, machining, carpentry, electrical repairs, new equipment installation, and building/structural repairs.	Age 18+; Entry requirements vary by employer; High school diploma or equivalent; Physical condition to perform the work.	4 year training program with 8,000 hours on-the-job training and 576 hours paid related instruction; Red Cross First Aid, CPR; Transition-To-Trainer courses required.
Metal Fabricator	No description available.		
Mold Maker	Mold makers set up and operate machines to make working models of metal or plastic objects. They lay out, machine, fit, assemble, and finish metal parts.		
Pattern Maker	No description available.		
Tool and Die Maker	Tool and die makers produce and repair tools, dies, and other devices for manufacturing machines. They craft precision tools and machines, produce jigs and fixtures, construct dies, and make metal molds.		

*The Department of Workforce Development website for industrial trades is under construction, so some descriptive information is missing. What is complete is reflected here; please visit the website for updates: http://www.dwd.state.wi.us/apprenticeship/industrial_trades.htm.

Green-Collar Job Training at Wisconsin's Technical Colleges[51]

Wisconsin's technical colleges are renewable energy leaders and will play a central role in training a green-collar workforce. 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. Madison Area Technical College, for example, connects with other technical colleges and the University of Wisconsin through the Consortium for Education in Renewable Energy Technology (CERET). And Lakeshore Technical College, a Midwest leader in wind technician training, is working with other Wisconsin colleges to establish a training pipeline accessible to students around the state without building redundant programs or facilities.

The clean energy field and its training pipelines are evolving rapidly. Heading in to 2009-2010 academic year, at least fourteen technical college programs offered certificates and associate degrees in renewable energy. Others offer either individual courses on clean energy technology or related skill modules within existing curricula, like the electrician training at Western Technical College, which includes a solar skill set. The Wisconsin Technical College System Next Generation Workforce 2009-11 biennial budget initiative proposed seven distinct focus areas for clean energy and green technology program development. And a series of recent clean energy proposals to the Department of Labor and the Department of Energy would build still more.

As of summer 2009, four technical colleges had developed programs leading to a credential in energy efficiency; more are no doubt on the way. But insofar as the bulk of these jobs lie in construction, or are based on traditional occupations in the building trades, a more important role for the Wisconsin Technical College System may be as the provider of classroom instruction for the majority of the state's apprenticeship programs.

Beyond the renewable energy and energy efficiency sectors, programs like the Water Quality Technician diploma at Moraine Park, and the Environmental and Pollution Control AAS at Milwaukee's Mequon campus are clearly part of a green jobs future. So are less obviously green curricula, like automotive tech training at a number of schools, which may include segments on biofuel or hybrid electric vehicles. The Center for Energy Conservation and Advanced Manufacturing (ECAM) at Milwaukee Area Technical College's Oak Creek campus offers HVAC programs leading to either a one-year technical diploma or an associate's degree, as well as shorter term technical diplomas in HVAC, CNC manufacturing, and power engineering programs, all of which will be critical to Wisconsin's clean energy economy.

The chart below lists only programs offering self-identified renewable energy or energy efficiency credentials available as of summer 2009. In many cases green skill sets – where they are different from traditional skill sets – will be integrated into existing manufacturing and construction curricula throughout Wisconsin's technical colleges. To this end, the Wisconsin Technical College System just completed an inventory identifying, in existing or proposed programs, more than two dozen "green" credentials and nearly 400 existing programs that need to be "greened up."

Photo © Orientation to Trade and Apprenticeship Program

Photo © First Solar

WISCONSIN TECHNICAL COLLEGES

Technical College	Program	Requirements	Credits and Length	Certificate or Degree	Program Description
Lakeshore Technical College - Cleveland	Wind Energy Technology	GED/HSED, Accuplacer, Asset, Compass or TABE	67 credits; four semesters	AAS	Students learn to install, test, service and repair wind turbine components; troubleshoot and maintain control and PLC systems; troubleshoot and maintain SCADA systems; wear PPE for climbing and identify safety practices for climbing; and practice safe wind turbine tower climbing skills.
Northeast Wisconsin Technical College - Green Bay	Renewable Energy – Solar	GED/HSED, Accuplacer, Asset, Compass or TABE	14 credits	Solar Energy Certificate	Students learn to discuss and promote the benefits of alternative energy systems; assess, engineer, design, assemble, install and operate photovoltaic energy systems; and collect and distribute data generated by alternative energy systems.
Mid-State Technical College - Wisconsin Rapids	Biorefinery Technology	GED/HSED, Accuplacer	68 credits; four semesters	AAS	Students learn to perform operations and maintenance tasks in the biofuel and biogas production and biorefining industries. Curriculum emphasizes the mechanical processes of biofuel production and biorefining, as well as plant operations, systematic troubleshooting, logical problem-solving and safety. Graduates will be able to maintain a safe work environment; diagnose, service and repair machinery and manufacturing equipment using appropriate tools, materials and methods; plan and execute an effective preventive maintenance program for complex manufacturing processes and machinery; manage production process; maintain product quality program; perform order fulfillment; and continue career development.
Northeast Wisconsin Technical College - Green Bay	Biofuels	GED/HSED, Accuplacer, Asset, Compass or TABE	18 credits	Biofuels Certificate	Students learn to map the process of converting oil crops and animal fat waste into biodiesel, map the process of converting various organic materials into renewable energy, and describe the fundamentals to produce energy from biomass resources.
Madison Area Technical College - Madison	CERET	GED/HSED, Accuplacer	12 credits	Certificate in Renewable Energy Technology	Students learn the theoretical knowledge necessary to begin a career in energy management and renewable energy technology. Students may choose from online and face-to-face courses in several areas of emphasis including transportation, photovoltaics, solar thermal, wind, and biomass.
Mid-State Technical College - Wisconsin Rapids	Renewable Thermal Energy Technician	GED/HSED, Accuplacer	68 credits; four semesters	AAS	Students learn to design, install, operate and maintain solar, geothermal and biomass heating systems for both residential and commercial applications. Technicians will integrate new renewable thermal systems with current existing energy sources, and may be involved in the sale or marketing of solar, geothermal and biomass thermal energy technologies. Graduates will be able to work safely with renewable thermal systems; install solar collectors, geothermal heat pumps, biomass boilers, water heater and storage tanks, piping, pipe insulation and connect system piping, balance of system components, and electrical control systems; perform system inspection and maintenance; select and adapt system design; and conduct a site assessment.

WISCONSIN TECHNICAL COLLEGES

Technical College	Program	Requirements	Credits and Length	Certificate or Degree	Program Description
Mid-State Technical College - Wisconsin Rapids	Renewable Energy Specialist	GED/HSED, Accuplacer	68 credits; four semesters	AAS	Students learn to design and manage an integrated portfolio of renewable and traditional energy producing systems. Upon completion of the program, students are to perform site assessments for solar PV, solar thermal and small wind systems; conduct feasibility studies regarding installation of renewable energy systems; design an integrated portfolio of renewable energy systems; manage renewable energy installation systems; and sell renewable energy systems.
Mid-State Technical College - Wisconsin Rapids	Renewable Electricity Technician	GED/HSED, Accuplacer	68 credits; four semesters	AAS	Students learn to design, install, operate and maintain solar and wind electricity generating systems for both residential and light commercial applications. Technicians will integrate new renewable electricity systems with current existing energy sources, and may be involved in the sale or marketing of solar PV and wind energy technologies. Graduates will be able to work safely with renewable electric systems, install subsystems and components at the site, perform a system checkout and inspection, maintain and troubleshoot a system, select a system design, adapt the mechanical design, adapt the electrical design, conduct a wind site assessment, and conduct a solar photovoltaic site assessment.
Wisconsin Indianhead Technical College - Ashland Campus	Renewable Electricity Technician	ACT/SAT/TABE	9 credits	Renewable Electricity Technical Certificate	Students learn to plan, install and maintain wind and solar (photovoltaic) renewable electrical energy systems. Upon completion of the program, students will be able to evaluate a site's electrical energy needs by creating a load profile; suggest some basic conservation and efficiency strategies that minimize a site's energy demands; write a report assessing a site's suitability for renewable energy systems; specify the design of a renewable energy system based on energy needs and budget; and install, test, and troubleshoot/maintain solar photovoltaic and/or wind energy systems.
Fond du Lac Tribal and Community College - Fond du Lac	Clean Energy Technician	GED/HSED, Accuplacer	22 credits, two semesters	Clean Energy Technology Certificate	Students learn to implement electric-based renewable energy systems in homes and small businesses. The Clean Energy Technician certificate program is a short-term program that combines courses in alternative and renewable energy systems with traditional electricity topic courses.
Fox Valley Technical College - Appleton	Environmental Management Systems for Emerging Technologies	Accuplacer/ACT, Compass, Asset, TABE	15 credits	Environmental Management Systems for Emerging Technologies Certificate	Students learn energy conservation concepts, carbon footprint analysis and reduction, and environmental management systems such as the ISO 14000 series. Upon completion of the program, students will have the skills to create a sustainability plan that incorporates applicable Federal, State, and local regulations to ensure organizational compliance.

WISCONSIN TECHNICAL COLLEGES

Technical College	Program	Requirements	Credits and Length	Certificate or Degree	Program Description
Mid-State Technical College - Wisconsin Rapids	Energy Efficiency Technician	GED/HSED, Accuplacer	68 credits; four semesters	AAS	Students learn to evaluate the energy use patterns for residential and light-commercial buildings and recommend energy efficiency and alternative energy solutions for high energy consuming buildings. Upon completion of the program, students will be able to evaluate the energy use patterns for residential and light commercial buildings, perform building shell analyses, conduct energy audits, recommend energy efficiency solutions, construct energy evaluation technical reports and make presentations for potential project implementation, and install energy efficiency upgrades.
Milwaukee Area Technical College - Oak Creek	Sustainable Operations	Work experience and/or a post secondary degree in a related field	9 credits	Sustainable Operations Advanced Technical Certificate	Students learn energy management systems, sustainable operations management, maintenance management, Six Sigma, Lean, LEED certification, renewable energy and management, and training of building service workers. The certificate is for working professionals and those seeking careers as facility managers, sustainability directors, building superintendents, building managers, maintenance managers, plant managers, sustainable development coordinators and environmental managers.
Northeast Wisconsin Technical College - Green Bay	Sustainable Design	GED/HSED, Accuplacer, Asset, Compass or TABE	12 credits	Sustainable Design Certificate	Students learn to discuss and promote the benefits of energy efficient design and alternative energy systems, identify energy saving and sustainable technologies for the construction industry, design renewable and sustainable energy systems into buildings and landscapes, and identify material resources that promote sustainability.

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