

Planning For the Next Generation: Community College Connections to Future Energy Workforce

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ABSTRACT

The efficient use of energy in today's sophisticated manufacturing/industrial processes is technically challenging and requires a higher level of skills and training than ever before. The growing use of alternative energy in manufacturing increases the educational requirements of the workforce. Community colleges should adopt changes in their energy management curriculum to meet the need for an educated and trained workforce in the energy management and alternative energy sectors for manufacturing.

Thirty-seven community colleges have been identified as offering energy management programs by the Energy Efficiency and Renewable Energy (EERE) section of the U.S. Department of Energy. The vast majority of these programs provide instruction in energy management and renewable energy only related to the residential and commercial sectors. Yet almost 31% of the nation's energy output is used by industries, while just 19% of energy is used in the commercial sector with 22% consumed in the residential sector. The manufacturing/industrial segment is a significant untapped opportunity for energy management programs.

Community colleges should provide a point where higher education and the real world intersect. They must provide students with hands-on experience as well as relevant knowledge. Community colleges must align their curriculum to the knowledge and skills needed by energy technicians in industry. This requires industry participation in educational advisory boards and partnerships with companies to assist in providing real world learning environments through internships. Collaboration between industry and community colleges could result in a new vocationalism yielding a skilled workforce for the next generation.

The Need for Higher Level of Skills and Training

The efficient use of energy in today's sophisticated manufacturing/industrial processes is technically challenging and requires a higher level of skills and training than ever before. The growing use of alternative energy in manufacturing increases the educational requirements of its workforce.

The ACEEE Energy Efficiency Workforce webpage states "Workforce has emerged as a vital issue in the successful implementation of energy efficiency measures throughout all sectors. It is a critical issue for implementation of energy efficiency in manufacturing, as well as expansion of production and productivity improvements more broadly. In addition, a well-trained workforce is important in designing and operating commercial and institutional buildings, which have increasingly sophisticated controls." However, roughly 12 million Americans are unable to find work, with more than 40 percent of that number unemployed for six months or more. At the same time, current estimates put the number of job vacancies in this country at 3 million per month. (ACEEE 2013)

Former President Bill Clinton at the 2012 Democratic National Convention proposed the most popular explanation for this apparent paradox. He called it "skills mismatch" or, what

happens when people in the labor pool lack the skills to do what the market demands. Skills mismatch is a symptom of structural employment. This is where the jobs lost in one sector of the economy, such as construction and real estate; disappear for good, while at the same time other sectors, such as health-care, energy management and education, increase so rapidly, that the pool of qualified labor cannot keep pace. The unemployment rate during the Great Recession was affected by approximately 30% due to skills mismatch. (Carnevale and Smith 2013)

Using this analysis, a current reasonable estimate would assume that 2 million jobs go unfilled today because of gaps in skills, training, and education. About 1.5 million or approximately 69 percent of those vacancies consist of what are referred to as middle-skill jobs that require education and training beyond a high school diploma but less than a bachelor's degree. (Carnevale and Smith 2013)

In the next ten years almost one-third of all job openings will require a postsecondary vocational certificate, industry-based certification, some college credits, or an associate degree. These middle-skill jobs, or "middle jobs", have long been eclipsed by more prominent, theoretically better-paying career choices marketed to students who graduate from four-year colleges and universities. This perception does not reflect actuality. (Carnevale and Smith 2013)

In April 2012 the Associated Press reported that 53% of America's recent college graduates were either unemployed or under-employed. These graduates typically held bachelor degrees in the arts or humanities. In many instances graduates with technical degrees are more valuable than those with liberal arts degrees because they have the skills and hands-on training. (Weissmann 2012)

Despite these opportunities, the United States continues to under-produce skilled workers with a post-secondary education. A 2011 report issued by the Georgetown University Center on Education and the Workforce in Washington, D.C. estimates that the accumulated short-fall of these post-secondary educated Americans has risen each year since 1980 and should approach 20 million by 2020. (Carnevale and Smith 2013)

Supervisors and managers within technical fields, including energy managers, are often in top manufacturing positions, suggesting the need for even more specialized training at the line worker level. Operational procedures and details are often the primary focus of these mid-level managers. With the return of jobs post-recession, the growth rate of mid-level management positions will exceed that of top-level positions. As baby boomers retire, industries that rely on post-secondary educated workers will need more of better-educated mid-level managers. (Carnevale and Smith 2013)

There is little debate among educators that middle-skill job training represents an ample opportunity for their campuses and, more importantly, for their students. The harder question is how to pay for it. (Carnevale and Smith 2013)

Three years ago, when President Obama pledged \$12 billion as part of his now defunct American Graduation Initiative (AGI) to help community colleges bolster partnerships with businesses and to train workers in high-demand industries, enthusiasm on community college campuses for middle-skill job training and other economic necessities ran high. But, when deep budget reductions essentially eliminated AGI, slashing the president's initial pledge to \$2 billion for a U.S. Department of Labor job-training grant effort, stakeholders were forced to adjust expectations. If there was a silver lining, it was this: The attention generated by the president's proposal established community colleges as a major player in the nation's economic recovery. (Carnevale, Smith 2013)

The Role of Community Colleges

For decades the backbone of the community college mandate has been to provide what middle-skill workers are finding they so desperately need now. Community colleges provide retraining for the long-term unemployed, match new graduates' skill sets to job opportunities through internships and mentoring, serve regional geographic localities, and provide job training for nontraditional students. (Carnevale 2013)

“Community colleges are the institutions that stand closest to the crossroads of higher education and the real world, where Americans need to apply a mix of technical knowledge, business acumen, and creativity to add value in firms whose imperative is to compete on innovation.” (Soares 2010) Community colleges, through their dual educational and workforce development missions, possess the opportunity for room to grow, in addition to opportunities to “flex their muscles” as they already stand “head and shoulders above the rest in the movement toward truly comprehensive postsecondary institutions”. (Carnevale 2013)

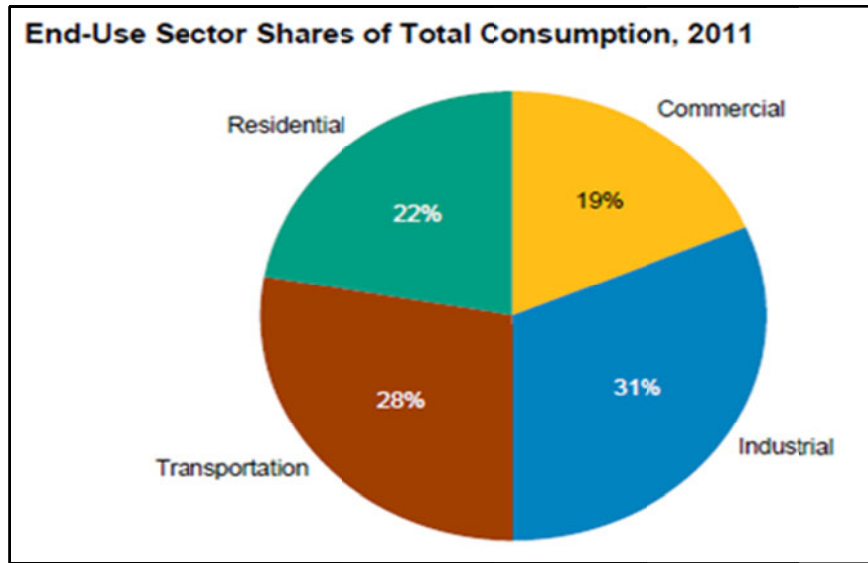
Throughout most of its history, the United States has been predominantly skilled at educating and training professionals through baccalaureate and post-baccalaureate educational programs of study. The U.S. actually ranks second internationally in its share of workers with a bachelor degree. However, at the same time, before the growth of the community colleges, U.S. post-secondary institutions have been second-rate in preparing students for middle-skill jobs. Current international rankings place the United States 16th in its share of workers with sub-baccalaureate degrees. With the inclusion of postsecondary certificates, this ranking would increase to 11th among industrialized nations. (Carnevale 2013)

Education is the crucial element in occupational development and advancement in addition to workplace productivity and efficiency. With this realization, it then becomes necessary for the formation and development of local, high-quality learning opportunities that are available for traditional-age college students and working adults. The hallmark of community colleges is the ability to provide access to these opportunities at a relatively lower cost at the local and regional level. Expansion and enhancements to infrastructure are costly; however, they are an investment in higher education. These investments in community colleges yield a wide range of economic and social returns that significantly offset the initial costs to students and the public. Community colleges, through low tuition costs, provide broad access to students who would otherwise forgo higher education. These students emerge with no to low student debt responsibilities. (Mullin 2011)

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The manufacturing/ industrial segment is a significant untapped opportunity for partnerships with community colleges. Community colleges should adopt changes in their energy management curriculum to meet the need for an educated and trained workforce in the energy management and alternative energy sectors for manufacturing.

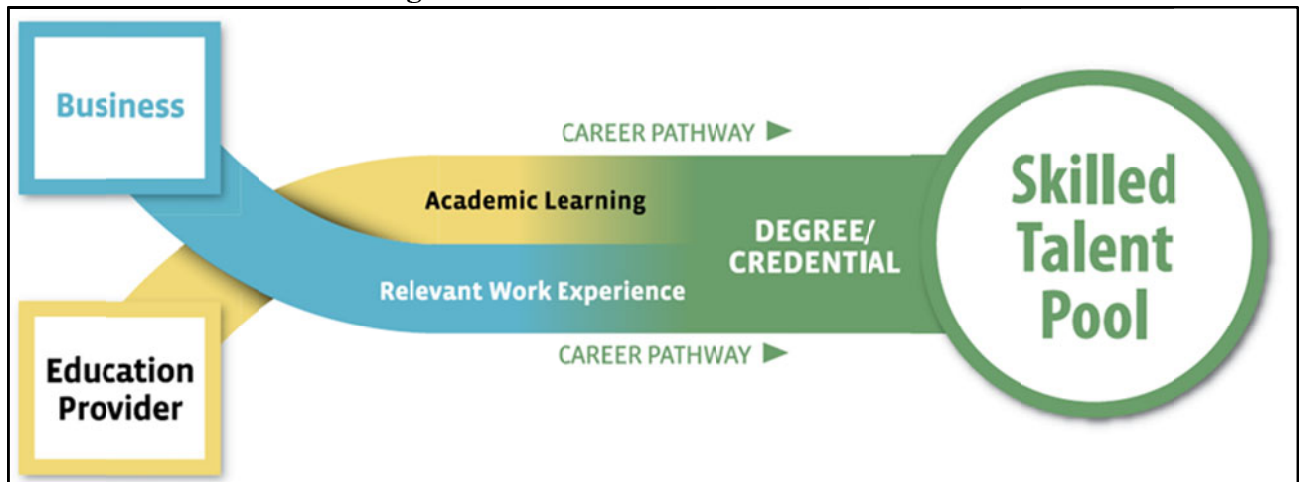
Figure 1. Energy Consumption by Sector



Source: U.S. Energy Information Administration

In order to meet these new curriculum requirements, a new model of education and work needs to be developed. This paradigm will give students formal postsecondary qualifications to get through the door to jobs that pay, as well as provide access to advanced technology and valuable work experience. (Figure 2.) Community colleges will also continue to assist workers who desire to upgrade their skills as they progress through their careers. (Carnevale 2013)

Figure 2. A Model for Education and Business



Source: Corporate Voices for Working Families 2012 (Used with permission)

Proudly diverse and stubbornly democratic, community colleges are the solid pillars of public higher education in America. These two-year colleges expeditiously prepare students for careers with a reasonable average tuition of \$2,963 per year. Many students seeking a degree at a four-year institution often use community colleges as a springboard. A recent study by the American Association of Community Colleges disclosed that state and local governments get an estimated 16% return on investment for every \$1 they spend on community colleges. In addition,

the study revealed evidence of benefits to society of having a better-educated, higher-earning workforce. (Bumphus 2012)

During the Great Recession from 2007 to 2011, enrollment at the nation's more than 1,100 community colleges jumped almost 22%. These colleges were the institutions of choice for almost half of U.S. undergraduates and provided an affordable lifeline to learning during these difficult economic years. However now, the increase in demand has collided with dwindling resources. Higher education appropriations per students have decreased in 43 states since the 2006 fiscal year. This is particularly significant for community colleges, as state support and local taxes represent more than one-half of these institutions' revenues. (Bumphus 2012)

A glaring example of this is found in California where 112 community colleges serving nearly three million students had their budgets cut by 12% since 2009. This resulted in a decrease in enrollment of more than 485,000 students due to severe budget cuts for the three academic years 2008-2009 to 2011-12. (CCCCO 2013)

Industry: Community College Partnerships

Community colleges need to operate more resourcefully. Boutique programs with limited demand or practicality are no longer financially feasible. It is essential that the coursework offered is fully transferable to four-year institutions and more closely aligns with workplace demands. However, in the current period of government budget cuts, there is the question of resources. There is the need and the opportunity for the private sector to step up. Some corporations such as Siemens, Verizon, UPS, and Goldman Sachs are already partnering with community colleges to assist in bridging the skills gap; however, more partnerships need to be developed in both scale and scope. (Bumphus 2012)

Community college-industry partnerships have the potential to become an institution transforming catalyst in the community college system and be viewed as a piece of a larger "new vocationalism" puzzle. These partnerships can lead a transformation in higher education and must not be viewed principally as an extension of the vocational training role of the community college, previously considered as one of the historical missions of the organization. (Soares 2010)

Partnerships require careful development, care and nurturing. They require mutual benefit, commitment to the goals and objectives of the partnership, and commitment to desired and stated outcomes. Each partner can bring different resources to the table, but the perceived value must be the same. The method of integrating two fundamentally different organizational cultures can seem formidable at times, but the challenges are not impossible when the organizations share a similar vision and values.

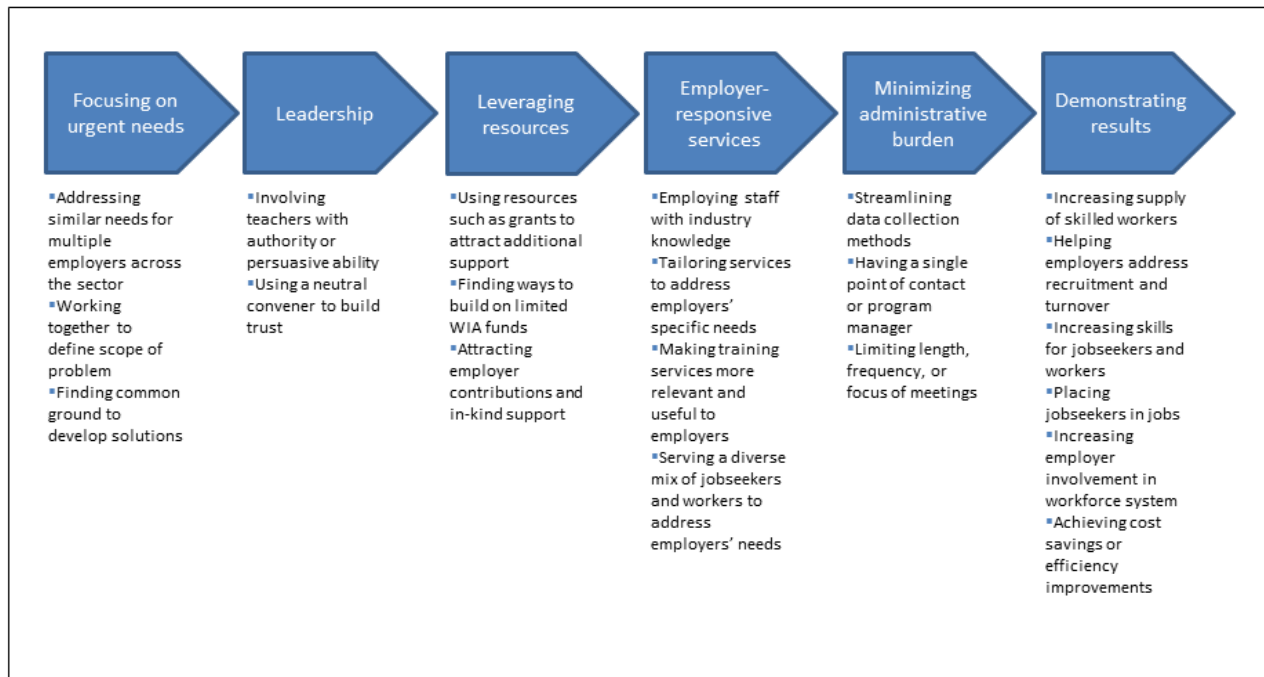
To advance a partnership, participants must meet regularly to discuss their relationship and make adjustments where necessary. It is not about trust as much as it is about clarity of roles, goals, and outcomes that makes development and attention to the partnership agreement so important. (Gnage 2012)

The formation and management of partnerships is not an easy accomplishment. Community colleges are primarily focused on delivering education. They need to change their approach and begin viewing these partnerships as a product that must be developed, marketed, and sold to potential private-sector partners. "At the same time, both the public and private sectors must overcome the challenges created by an inherent conflict between their respective objectives: the public sector wants to minimize total or overall economic costs and ensure the

delivery of high-quality service, while the private sector aims to maximize returns.” (Airoldi et al. 2013)

It is essential to remember that successful co-operation between institutions of higher education and industry takes place person to person, not institution to institution. (Figure 3.) Industry representatives and educators must find ways to achieve mutual understanding where their capabilities and approaches are concerned. (Airoldi et al. 2013)

Figure 3. Why Training Partnership Succeed



Adapted from: GAO, 2012. "Innovative Collaborations between Workforce Boards and Employers Helped Meet Local Needs". *Report to Congressional Committees* (January 2012): 10.

Approximately 5.7 million manufacturing jobs were lost in the last decade and with those jobs the need for skilled workers. Currently the trend is changing as shown by the decisions of Apple Inc., General Electric Co, Caterpillar and others to increase U.S. production that will result in the need for re-trained workers. America's prosperity depends on educating and training a highly skilled workforce and even policymakers agree on the need for most Americans to obtain a postsecondary education credential of some type. It is encouraging that community college enrollments have risen dramatically over the last few years; however, public support for these institutions has declined. Consistent and increased investments in community colleges are desperately needed to meet the demands of the economy and the needs of students. Both students and society will reap significant returns through these investments. (Mullin 2011)

It is understood that many of the benefits of investing in higher education apply to all other sectors of higher education; however, the return on public investment in community colleges is heightened because of their local focus. Students who attend community colleges are more likely to live and work in their communities after graduation. These colleges additionally provide non-educational services that support their students and the communities they serve. Community colleges also provide these benefits to their communities with an unquestionably

proportionally smaller percentage of public resources than other public institutions. (Mullin 2011)

The workforce system needs to transition into a hybrid model that combines the educational rigor of higher education with the labor-market focus of workforce training. A hybrid model would emphasize education and training programs with both an academic component and an applied learning component leading to an associate's degree, technical certificate, or credential. The Center for American Progress highlighted a few of these models in its issue brief for the White House Summit on Community College in October 2010.²⁶ The most promising hybrid models are listed below:

- **Sector partnerships.** These programs are collaborations between training providers—typically community colleges, technical colleges, labor-management agreements, or other training providers—and a group of businesses in the same industry or service sector. The programs combine public and private resources to create alternative education and training models intended to build a skilled workforce for a particular industry.
- **Registered apprenticeships.** These programs are long-term, formal training contracts between an employee and employer. During the course of a registered apprenticeship, apprentices are employees enrolled in a structured training program that alternates between on the job training, classroom training, and hands-on work experience.
- **“Learn and earn” training models.** This is a broad category consisting of programs that recognize the need for participants to earn an income while increasing their skills. Examples include on-the-job training, paid internships, and work-study programs, among others. Registered apprenticeship is also a “learn and earn” model. Programs can be work-place based with a training component such as on-the-job training or classroom-based with a workplace component such as paid internships and work-study.
- **Career pathways.** These programs offer clear sequences of coursework to move from lower skill levels all the way to associate's degrees or other professional credentials with multiple entry and exit points along the way.
- **Contextualized instruction.** These programs combine adult basic education with occupational training so students learn literacy and workplace skills at the same time. (Steigleder, Soares 2012)

The common element of Learn and Earn partnerships is that they are established to meet bottom-line business strategies. Most employers invest in such efforts for one central reason: to strengthen their talent pipeline of current and future workers. Other motivations (see Figure 4.) may include the need: to replace a retiring workforce; to stabilize the workforce by reducing employee turnover and increasing retention; to increase diversity among their employees; to improve job performance and customer satisfaction; and to meet industry demands. (CVWF 2012)

Figure 4. Creating a Skilled Workforce





Source: Corporate Voices for Working Families 2012 (Used with permission)

An example of a successful community college/industry partnership is Bison Gear & Engineering Corp that developed partnerships with local community colleges to deliver customized training that leads to an industry-recognized credential. To determine the program’s ROI, company managers tracked two key performance measures—productivity and the “Bison Pride” rating, which is a compilation of three metrics for great customer performance: on-time shipment rate; how often the company says yes to customers’ requested delivery date; and in-field warranty return rate to assess product reliability. Through its Learn and Earn partnerships, Bison Gear was able to measure and track a 23 percent gain in performance measures and a 31 percent gain in productivity. (CVWF 2012)

Another example (see Figure 5) is Pacific Gas and Electric Company (PG&E) that faced a growing challenge within its workforce. Most job applicants lacked the skills needed to meet the demands of the industry’s new green-energy technologies, while rapid retirements were depleting the ranks of experienced employees. In response, PG&E, a California energy company, established its PowerPathway™ program, joining with higher education, the public workforce system, and partners in labor and industry to build a strong and diverse pool of new, skilled workers. (CVWF 2012)

Figure 5. Partnership Examples

 <p>Pacific Gas and Electricity Company <i>PowerPathway™</i></p> <p>Business Imperative: Build a talent pipeline of workers with green job knowledge and skills. Gain support in building a strong regional pool of workers.</p> <p>Best Practices Implemented:</p> <ul style="list-style-type: none"> • Customizes workforce training with higher education partners • Cultivates career pathways • Fosters public and private partnership with workforce investment boards and higher education <p>Outcomes:</p> <ul style="list-style-type: none"> • Over 3:1 ROI due to accelerated time to productivity • Increased rate of hiring satisfaction • 60 percent average diversity of applicant pool • Created pool of skilled workers in region 	<p>Bison Gear & Engineering</p>  <p>Bison Gear and Engineering Corporation <i>Manufacturing Skills Standard Council: Certified Production Technician</i></p> <p>Business Imperative: Demand for employees with highly technical and customized skills</p> <p>Best Practices Implemented:</p> <ul style="list-style-type: none"> • Partnership with community college to deliver customized training to gain credential <p>Outcomes:</p> <ul style="list-style-type: none"> • 23 percent gain in performance measures • 31 percent gain in productivity • Employee skills development • 64 employees continuing education • Develop manufacturing technician career and education pathway
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Source: Corporate Voices for Working Families 2012

Conclusion

There are significant growth opportunities for industry through energy efficiency which results in global competitive advantages. The energy efficiency industry is in dire need of workforce development. Employers in today’s job market are not finding enough sufficiently skilled job applicants. The expected growth of the industry will only increase the severity of the problem in the short term. Energy Management programs offered at community colleges are not keeping pace with the growth and needs of the industry/manufacturing sector. Curriculum changes need to be made at the higher education levels, as well as providing hands on work-based learning in specialized energy areas for the trades.

The greatest challenge to employers is the lack of direct energy efficiency experience that potential workers possess. The increased availability and utilization of community college/industry partnerships will provide the solution to developing the skill sets needed by the energy efficiency industry. Job creation in the energy efficiency industry potentially appears to be significant and is possibly the leading sector for job growth in the clean energy field. Opportunities for talented, trained and creative thinkers abound in the energy management profession. (NEEC 2008)

Community colleges should be one of the points where higher education and the real world intersect. They must provide students with hands-on experience as well as relevant knowledge. Community colleges must align their curriculum to the knowledge and skills needed by energy technicians in industry. This requires industry participation in educational advisory boards and partnerships with companies to assist in providing real world learning environments through internships. Partnerships between industry and community colleges could result in a new vocationalism yielding a skilled workforce for the next generation. Sector-specific workforce and education programs that link the training of participants to the needs of employers are key factors to the new community college mandate. (Carnevale and Smith 2013)

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