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Opportunities to Expand Building Efficiency Programming at Community Colleges

Noah Sandoval, Sletsy Dlamini, and Allison Moe

National Laboratory of the Rockies

The National Laboratory of the Rockies is a national laboratory of the U.S. Department of Energy, Office of Critical Minerals and Energy Innovation, operated under Contract No. DE-AC36-08GO28308.

Technical Report
NLR/TP-5500-94704
April 2026

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List of Acronyms

ACCS	Alabama Community College System
AEITCN	Alabama Energy Infrastructure Training Center and Network
BAS	Building Automation Systems
BEST	Building Efficiency for a Sustainable Tomorrow
BLS	U.S. Bureau of Labor Statistics
BPI	Building Performance Institute
BTO	Building Technologies Office
CTE	Career and Technical Education
DOE	U.S. Department of Energy
ESA	Energy Smart Academy
FMT	Facilities Maintenance Technician
HLC	Higher Learning Commission
HVAC	heating, ventilation, and air conditioning
HVACR	heating, ventilation, air conditioning, and refrigeration
LEED	Leadership in Energy and Environmental Design
MATC	Milwaukee Area Technical College
NCES	National Center for Educational Statistics
NLR	National Laboratory of the Rockies
OSHA	Occupational Safety and Health Administration
RESNET	Residential Energy Services Network
SEED	Sustainability Education and Economic Development
USEER	U.S. Energy and Employment Report
USGBC	U.S. Green Buildings Council

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Introduction

According to the most recent U.S. Energy and Employment Report (USEER), more than 2.3 million workers in the United States are involved in activities that reduce energy usage in buildings (U.S. Department of Energy [DOE] 2025). This workforce supports energy efficiency from the design of buildings and their systems through the manufacturing and trade of components and supplies involved in these systems to the installation, repair, and maintenance of these systems.¹ Throughout this report, we refer to this segment of the workforce as the building efficiency workforce.

As described in the next section, less than 10% of the workers in key building efficiency occupations have a bachelor's or higher degree, compared to ~40% of the general workforce (U.S. Bureau of Labor Statistics, n.d.). Thus, the community college system is a key stakeholder in training and educating a large portion of the building efficiency workforce. Despite this, the literature review conducted by the National Laboratory of the Rockies (NLR) for this report found almost no research focused on better understanding and supporting the role of community colleges as they train this workforce at scale. In this report, we refer to community colleges and the community college system, which we define as institutions that offer credit and non-credit courses, where students can earn diplomas, certificates, associate's degrees, and other formal recognition for their studies. In addition, some of these institutions may offer bachelor's degrees or transfer credit toward bachelor's degrees. Other terms for the institutions encompassed in this definition include 2-year schools and technical colleges.

Given the Building Technologies Office's (BTO's) goal to reduce energy costs, expand consumer choice, and accelerate the adoption of high-performance and efficient building technologies at scale,² this report seeks to understand how and to what extent building efficiency and advanced building technology concepts are being addressed in community colleges as well as potential pathways for schools to consider to better prepare students to enter the building efficiency industry. This report is organized in three sections. The first section presents information from a literature review and data analysis to provide background on the building efficiency workforce, the types of building efficiency training and education available from community colleges, and the barriers and challenges that exist in the workforce. The second section offers a series of case studies that illustrate the various ways that building efficiency content can be addressed at community colleges. The final section provides an overview of the opportunities available to community colleges as well as considerations for schools that want to increase building efficiency programming.

¹ According to the 2025 U.S. Energy and Employment Report (USEER), the energy efficiency workforce in the United States includes all workers that spend 50% or more of their time in the “manufacturing, wholesale trade, installation, and repair and maintenance of products designed to improve energy performance. Furthermore, the sector includes design and contracting services focused on enhancing building efficiency through measures such as insulation, windows, and air sealing improvements, lighting upgrades and design, installation of energy-efficient certified products, and other strategies to increase energy efficiency in both residential and commercial buildings” (U.S. Department of Energy 2025).

² <https://www.energy.gov/eere/buildings/building-technologies-office>

Background and Context

Defining the Building Efficiency Workforce

The building efficiency workforce comprises workers from several industries, sectors, and occupations, and, according to the Building Performance Association, these jobs are found in 99% of U.S. counties and have continued to grow in number over the last several years (Building Performance Association, 2024). Figure 1, from the 2025 USEER publication, outlines the distribution of building efficiency workers in various technology groups associated with energy efficiency. These data indicate that because no one area of building efficiency dominates the workforce, efforts to support this workforce must work across occupations and technologies. Figure 2 highlights the fact that close to half of these jobs (i.e., Production and Manufacturing and Installation and Repair positions) are critical to the actual delivery and deployment of these products into the national building stock. A full list of industries and occupations included in the USEER analysis is provided in Appendix A.

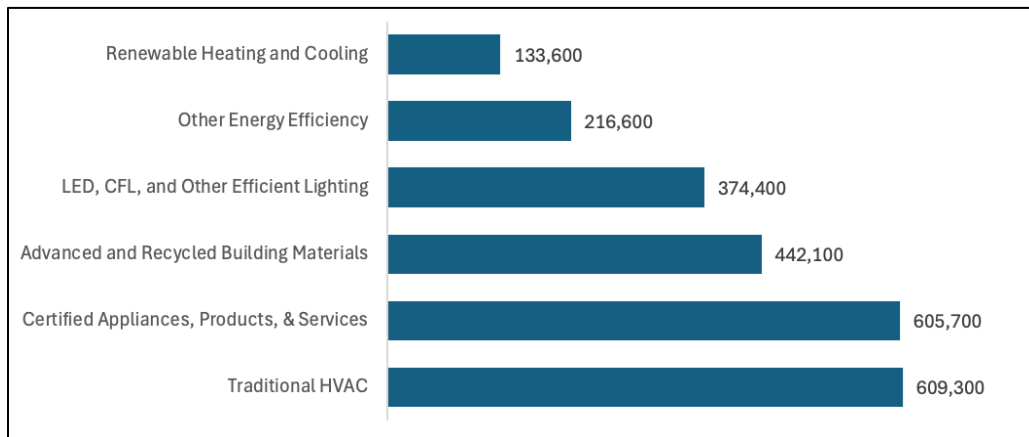


Figure 1. Energy efficiency employment by subsector group, 2021–2023 (2025 United States Energy & Employment Report, n.d.)

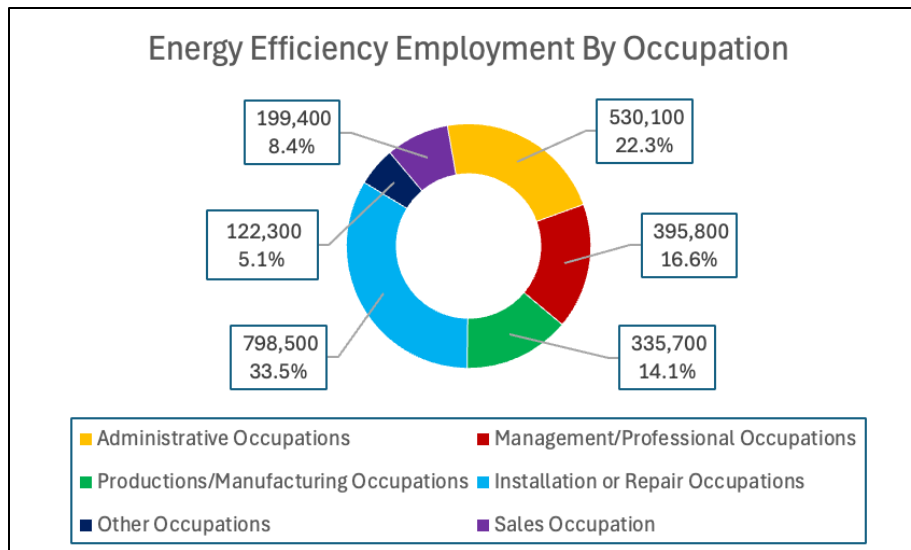


Figure 2. Energy efficiency employment by occupation (2025 United States Energy & Employment Report, n.d.)

The 2025 USEER report also provides employer feedback on hiring challenges and projections for future workforce needs. Approximately 80% of employers surveyed reported at least some difficulty finding workers, with the construction sector having the highest level of difficulty. Moreover, all industries cited lack of experience, training, or technical skills as the primary reason for that difficulty.

Barriers To Expanding the Building Efficiency Workforce

Employers and workforce stakeholders face several barriers in trying to grow a building efficiency workforce with adequate size and skill to meet the evolving needs of the industry. Similar to the construction industry overall, the building efficiency industry has an issue with an aging workforce. Sometimes described as the “silver tsunami,” workers are retiring at a greater rate than those who are entering the workforce to replace them (Greenberg et al., 2024; Pearson et al., 2024). This is in part because of negative perceptions of construction trade careers as well as building efficiency careers (Greenberg et al., 2024; Pearson et al., 2024); Srivastava et al. 2025; Truitt et al. 2022). For building efficiency jobs in particular, there is a lack of understanding and awareness of what the jobs are, what the career pathways are, and how to access jobs, training, or professional development to advance along this pathway (Capps et al., 2022; Guo et al., 2024). Pay can also be a factor, especially depending on the type of building efficiency job (Capps et al., 2022; Pearson et al., 2024). According to the BLS, occupations related to building envelope work such as insulators, carpenters, and residential remodelers pay less than occupations related to building systems such as heating, ventilation, and air conditioning (HVAC) mechanics, plumbers, and electricians (U.S. Bureau of Labor Statistics, n.d.). In addition, the BLS reported that residential workers (e.g., HVAC contractors) make less than commercial workers in the same industry (U.S. Bureau of Labor Statistics, n.d.).

A barrier that appeared repeatedly in both the literature review and the case studies conducted for this report was a skills gap in the building efficiency workforce: Employers need workers to have the building science technical knowledge that would typically be received at a 4-year institution,

but they also need workers with hands-on, real-world experience that a student receives in a community college setting. The 2025 American Council for an Energy-Efficient Economy report *Building a Workforce for Energy-Efficient Homes* notes a lack of standardized technical curricula across various training providers as an element related to this barrier (Srivastava et al., 2025). There is also a lack of standardization of recognized certifications and contractor licensing requirements. These can vary regionally but can also depend on specific residential energy efficiency programs, e.g., unique requirements for the Weatherization Assistance Program versus local jurisdictions or individual utility programs (Srivastava et al., 2025). Although the commercial building efficiency sector appears to be more unified in its training and certification/licensing requirements, there is a gap in technical skill sets for more “high-tech” occupations such as digital building diagnostics, energy modeling, and cybersecurity related to building automation systems (Pearson et al. 2024; Srivastava et al. 2020).

Although some of these challenges are because of broad economic conditions outside the sphere of influence of most workforce training providers, community colleges are well situated to help fill some of these gaps—in part because of the unique structure of these institutions, their ability to offer a variety of programming types, and their relative nimbleness in being able to develop and adapt programs to meet both longstanding and evolving needs in their communities. These unique qualities are described in more detail in the following sections.

The Current Role of Community Colleges in Building Efficiency Training and Education

Using BLS data for the eight occupations most aligned with building efficiency work,³ approximately 90% of workers in those occupations in the United States have less than a bachelor’s degree, compared to about 60% of the U.S. workforce overall (Figure 3). Of these workers who do not have a bachelor’s degree, almost a third have an associate’s degree or some college; even more of these workers participated in registered apprenticeship programs, many of which are associated with a community college (U.S. Bureau of Labor Statistics, n.d.). These statistics indicate the community college system is responsible for training and educating a significant portion of the building efficiency workforce.

³ High-priority building efficiency occupations used for this analysis are heating, ventilation, air conditioning, and refrigeration (HVACR) mechanics; plumbers, pipefitters, and steamfitters; electricians; insulation workers (floor, ceiling, and wall); insulation workers (mechanical); glaziers; construction and building inspectors; and construction laborers.

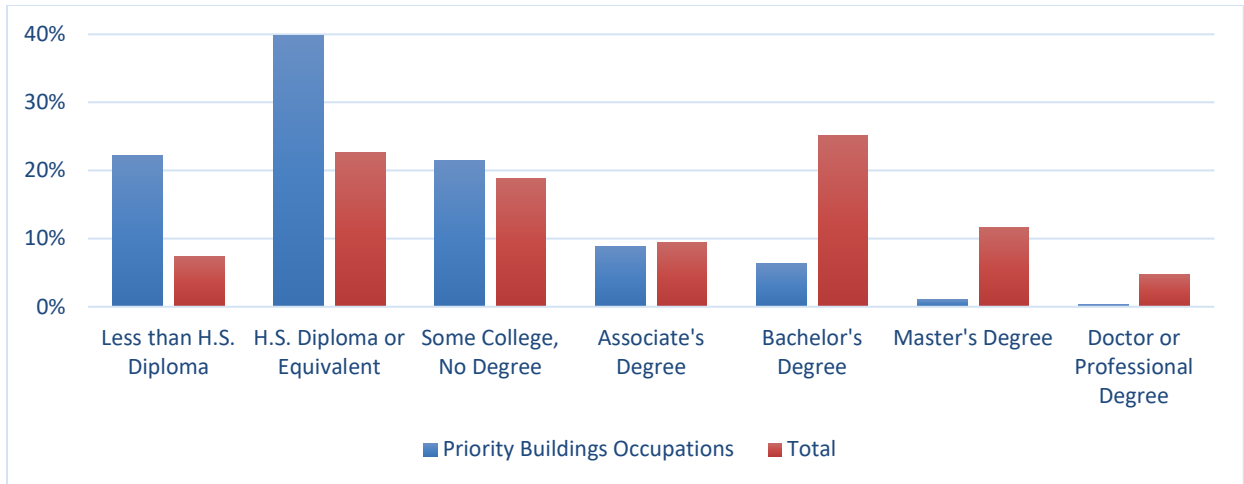


Figure 3. Educational attainment by occupational category (U.S. Bureau of Labor Statistics, n.d.)

Data from multiple sources confirm the critical role community colleges play in building efficiency training and education. The Community College Research Center estimates there are more than 1,000 “community colleges” and “technical schools” serving approximately 10 million students across the United States (Community College Research Center, 2025). In 2023, data from the National Center for Educational Statistics (NCES) showed that more than half (57%) of community colleges offered degree or certificate programs in the priority building and construction occupations (National Center for Educational Statistics n.d.). Figure 4 outlines the percentage of community colleges in the state that offer building efficiency programs. In almost all states, students have access to at least one community college that has a building efficiency program; more than 90% of community colleges in 10 states (Utah, Nevada, Delaware, Wisconsin, Mississippi, Georgia, Indiana, Kentucky, Maine, and South Carolina) offer these types of programs to prospective students. See Appendix B for map data by state.

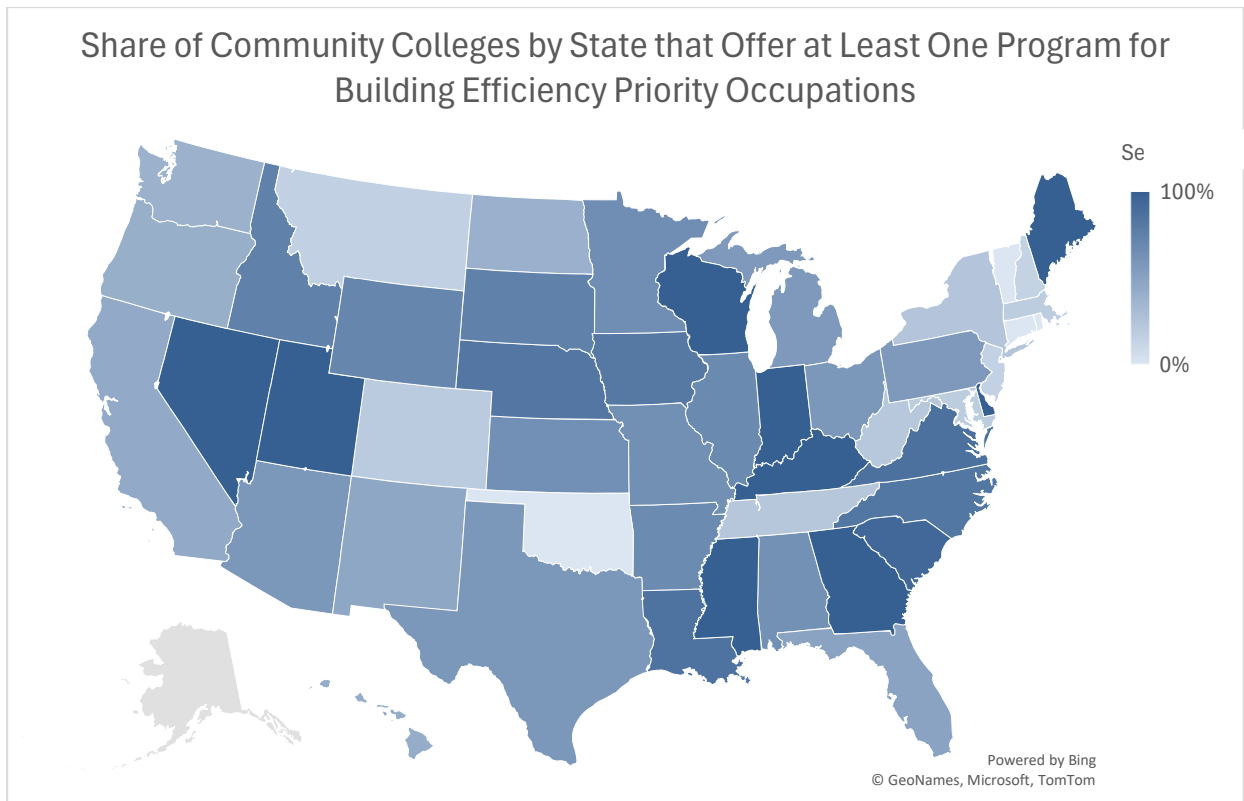


Figure 4. Share of community colleges by state that offer at least one program for building efficiency priority occupations (NRL interpretation of NCES data, 2023)

Despite the fact that a portion of the building efficiency workforce is educated and trained in the community college system, much of the energy efficiency and “green building” education, training, and certification programs have so far been focused on students pursuing bachelor’s and advanced degrees (Cole, 2019). According to a 2024 internal congressional report by the DOE Office of Energy Jobs, only 1% of DOE workforce funding from fiscal year 2011–2022 went to students at 2-year educational institutions, compared to 80% that went to undergraduate and graduate students (U.S. Department of Energy, 2024a). Although the U.S. Green Building Council (USGBC) and DOE have attempted to broaden their reach by offering programs for high school students, these are and have typically been design and engineering focused. Therefore, these programs are more likely to serve students intending to pursue 4-year degrees.

The remainder of this report details the attributes of the community college system in meeting the needs of the building efficiency workforce. This includes meeting the growing demand for training in these fields as well as filling the skill gap identified previously. Community colleges can do this in part because they operate differently from high schools, 4-year schools, or even industry-led technical schools; differences include the diversity of their student bodies, how they are funded, and their locally responsive nature.

The Value of Community Colleges in Building Efficiency Training and Education

The community college system plays a vital role in both providing a steppingstone into the 4-year university system and responding to local workforce demand (Drury, 2003). Community colleges are located in urban, suburban, and rural areas and offer affordable and accessible education and training opportunities for students of all ages, circumstances, educational backgrounds, and experience levels (Community College Research Center, 2025). There are three unique high-level strengths of community colleges that can be valuable to expanding and supporting the building efficiency workforce in the United States: industry partnerships and collaboration, regional workforce alignment, and expanding access and addressing barriers to entry. These aspects of community colleges position them to address several training and education barriers described previously and help scale the adoption of high-performance building technologies in the United States.

Industry Partnerships and Collaboration

Community colleges have an established track record in forming strategic partnerships with key local industry partners. Partners can include unions, utilities, workforce development boards, community-based organizations, government agencies, and local businesses or business associations. These collaborations have been shown to be successful in rural, suburban, and urban areas (Atwell et al., 2022). These partners can directly impact workforce development through collaboration with community colleges to create regionally tailored, industry-driven training models that combine classroom instruction with practical, hands-on learning that aligns training with employer needs (Bozell and Liston, 2010; Brown, 2018). In addition, community colleges engage with employers by providing the education required for registered apprenticeships, training students to meet local labor market demands while students earn paychecks—resulting in a strong alignment between workforce education programs and in-demand jobs (Atwell et al., 2022). Programs such as California’s PowerPathway™, developed by PG&E in partnership with higher education, the public workforce system, and labor and industry partners, further demonstrate the success of such collaborations. This initiative integrated green-energy training into existing community college programs, creating a diverse pipeline of skilled workers, addressing industry needs for deploying new technologies, and increasing employer hiring satisfaction (Mecham, 2013). Partners can also support community colleges in a less direct manner by sitting on program advisory committees, also referred to as advisory boards. Advisory committees, which are often required for most vocational programs, bring together key local stakeholders to regularly review program courses, course objectives, and content to ensure it is aligned with industry need.

Regional Workforce Alignment

The geographic diversity of community colleges enables them to address labor shortages in specific industries while adapting to the unique demands of local economies. Community colleges can leverage local labor market data gleaned from their partnerships to create programs tailored to workforce and economic opportunities in their regions (Feldbaum, 2009). This is particularly important for the energy and construction industries, where various states are pursuing a unique mix of strategies and technologies based on their local context—including climate, building codes, and existing building stock. In addition, research indicates the strongest partnerships arise in response to specific regional workforce needs, leading to the creation of

adaptive training models (Brown, 2018). Community colleges can use their local partnerships and understanding of local markets to craft their programs to best serve the needs of students (Mecham, 2013). One example of this regional workforce alignment is the Illinois Green Economy Network, a consortium of 39 community colleges formed to establish solar installation training programs. These programs engaged more than 40 businesses and trained more than 400 students, demonstrating the potential for scalable, impactful energy workforce initiatives (Davis and Raney, 2022). Following implementation, this initiative identified programs embedded within existing majors, industry-recognized credentials, and hands-on instruction as necessary factors for success in the region.

Expanding Access and Providing Optionality

Because of their location within communities and their relatively low cost compared to other higher education institutions, community colleges provide accessible education to a wide range of students (Mecham, 2013). This enables them to serve a broad array of populations, including nontraditional students and workers seeking retraining, increasing the pool of trained workers. This could include adjusting outreach strategies based on where prospective students live and offering night and weekend classes, shorter semesters, credit for prior learning, or hybrid programming to make training and education more accessible to adult learners (Brock and Cormier, 2021). This accessibility is reflected in the various ways that students and workers can obtain training and education through the community college system.

Community colleges also provide a wide range of options in the education and training students can pursue. Figure 5 shows the many types of building efficiency programs offered at community colleges differentiated by six program attributes. Not all program types are offered at all community colleges (e.g., bachelor's degree); some programs are partnerships with other institutions (e.g., high school career and technical education [CTE]), and most schools offer some combination of them. As is illustrated more in the following sections, the variety of offerings outlined previously helps schools meet a diverse range of students where they are, allows students to pursue education and training that meets their needs, and provides clear pathways to continue and build upon that education as they advance through their careers and/or as their life situations change.

Building Efficiency Program at Community Colleges							
	Bachelor's	Associate's	Applied Associate's	Short-Term Credential	Skills Training	Registered Apprenticeship	High School CTE
Accreditation Type	Accredited College and Programs	Accredited College and Programs*	Accredited College and Programs*	Accredited College	Industry Accreditation*	Various: Federal and State	Based on college partner
Credit vs. Non-credit	Credit-based (~120 credits)	Credit-based (~60 credits)	Credit-based (~48 credits)	Both (Various)	Not credit-based (Days to Months)	Both (Years)	Credit-based (Various)
Funding Sources	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Student Fees and Corporate Sponsors	Various (Federal, state, employer)	Federal/State DOE
Time to Create New Course	Years	Years	Years	Months to Years	Months	Months to Years	Months to Years
Degree Pathway	Transfer	Transfer or Workforce	Workforce	Workforce	Workforce	Workforce	Transfer or Workforce
Possible Partners	Industry (employment)	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities	Industry (employment) Industry (train/equip) K-12

* - Some, not all, programs

Figure 5. Overview of types of programming offered at community colleges

As illustrated in Figure 5, we have identified six attributes of programs offered at community colleges, related to both the student and administrative experience and perspective: accreditation type, credit vs. non-credit, funding sources, time to create new course, degree pathway, and possible partners. These attributes are summarized next, with further detail provided in Appendix C:

- **Accreditation type.** Based on the program type, an entire college can be accredited through the Higher Learning Commission, or a specific program can be accredited by either a professional (e.g., ABET [formerly the Accreditation Board for Engineering and Technology]) or industry (e.g., ESCO for HVAC technologies) organization.
- **Credit vs. non-credit.** An institution can have both credit-based programs, referred to as academic programs, and non-credit-based programs, referred to as non-academic programs. In many cases, depending on funding, accreditation, and other factors, these two branches of the same community college will operate independently of one another.
- **Funding sources.** Funding source is almost directly correlated to accredited, credit-based programs. Funding sources for these building efficiency programs include the U.S. Department of Education, the Perkins Act, and student fees; non-credit programs are funded mostly by student fees with support, often from industry partners that can come in various forms (e.g., equipment, education materials, instructors).
- **Time to create course.** Accreditation also impacts the amount of time required to create a new course; that is, an institution’s curriculum committee will need to thoroughly vet any course that is being offered for credit, which could take years. Conversely, non-credits courses can be developed and integrated into a college in as little as 6 weeks given the motivation, interest, and need for the education they provide.

- **Degree pathway.** From a student’s perspective, an important attribute of these programs is their career pathway upon completion of the program. One option is to transfer into a 4-year bachelor’s degree program; another is to continue directly into the skilled workforce.
- **Possible partners.** The final attribute of building efficiency programs is external partners that employ students, provide training curriculum and materials, and serve as a pipeline for future students.

Building Efficiency Programs at Community Colleges

The previous section provided an overview of the role and value of community colleges and the variety of ways that students and workers access training and education through community colleges. This section features a set of illustrative cases studies that describe examples of some of the programs outlined in Figure 5. The purpose of this section is to 1) outline how different programs incorporate education and training elements related to the building efficiency industry and 2) provide best practices and lessons learned from the development of these innovative and pioneering programs.

Lanier Technical College Case Study

A college in the Georgia Technical College system, Lanier Technical College serves students from seven counties surrounding Gainesville (Williams, F., 2025). This system includes 24 colleges and has a centralized curriculum for their trades programs. Although this system allows resources to be shared as well as consistent training, the content developed for these programs is more than a decade old. To address a critical gap in the building efficiency workforce, Lanier Technical College developed the Building Automation Systems program. Students with traditional trades training (i.e., HVAC technicians, electricians) could install HVAC systems but not necessarily program or troubleshoot building control and automation system, whereas engineers from 4-year institutions had the theoretical understanding of these systems but lacked the hands-on experience and training to work with these systems in the field. To fill this gap, this program includes various options for students such as stackable certificates, a diploma, and an Associate of Applied Science degree.

The program director surveyed industry and identified two tiers of building automation skills; the first tier is for low-voltage system technicians who will complete the installation and setup of these systems. These students will learn ASHRAE standards for these building control systems and prepare to take the state license for low-voltage systems. For the second tier, a variety of 2000-level courses were developed for students looking to complete their diploma and Associate of Applied Science degree. This tier is designed for existing or prospective building supervisors/managers, programmers, intellectual property specialists, and even entrepreneurs looking to design and install building automation systems. Classes for this second tier of students involve the design and management of these systems, programming skills required to design and troubleshoot, and a hands-on internship in the field.

Although this program has made significant strides to fill this gap in the building efficiency workforce, work remains. Despite the many layers of building automation skills across this field, the U.S. Department of Labor still classifies this work under the HVAC designation. To address this issue, Lanier Technical College has worked with ESCO—one of the nation’s leading HVAC accreditors—to develop an accreditation and graduate certification for Building Automation Systems (ESCO Group, 2025). One of the key messages the program director shared was to encourage other community colleges to become industry accredited. These accreditations increase the value of these programs for employers and within their own community colleges.

College of the Canyons Case Study

College of the Canyons in California has been integrating building efficiency into many of its program offerings for more than a decade (Oliver, J., 2025). Although the programs have been more heavily focused on residential buildings, College of the Canyons has offerings for both residential and commercial buildings. This includes introduction to and alignment with the USGBC's Leadership in Energy and Environmental Design (LEED) programming, courses in its Architectural Drafting and Technology and Construction Management associate degree programs, and its Architectural Sustainable Design and Development and Construction Management certification programs.

Over the last 5 years, program administrators have received feedback from their alumni—especially from the architecture programs—that employers often expected a level of *energy* literacy that the LEED-focused programs were not necessarily providing. This was largely in response to California-specific policies and regulations, especially the Title 24 Building Standards Codes (California Energy Commission, 2025). Depending on the size and type of architecture and engineering firms where alumni worked, former students were being asked to either perform building energy and energy performance modeling or at least have sufficient familiarity and fluency to work with consultants their firms might hire. College of the Canyons spent several years exploring how best to address this emerging need and in response developed a Bachelor of Science in Building Performance degree program, which was first offered in January 2025.

Within this new bachelor's degree program, students are required to complete 120 credit hours, many of which are taught by the Architecture and Construction Management departments. Classes include building energy modeling, sustainable building certification systems, and building codes and zoning. The degree also includes a work experience requirement that can be with local employers, the school's campus facilities team, or DOE's Industrial Training Assessment Center⁴ in partnership with the University of California, Irvine and the Kern County Community College District. The program prepares students for the California Certified Energy Analyst exam as well as the LEED Accredited Professional exam. This degree program also has earned DOE's Zero Energy Design Designation—one of the first for a community college (U.S. Department of Energy, 2024b). Development of the bachelor's degree program was guided by the college's engaged advisory board, which meets twice per year and comprises contractors, architects, and engineers from across the region.

Although community colleges typically serve a hyper-localized student body, they have found interest in this bachelor's degree program from students across the country. The architectural topics and energy performance content are often the initial interest for prospective students, yet many students are employed and appreciate the flexibility built into this community college program—including evening and weekend classes. Students also value the alignment with, and transferability of, many of the professional skills developed in the program to a variety of fields in the construction, building design, and engineering fields.

⁴ <https://www.energy.gov/mesc/locations-industrial-training-and-assessment-centers>

Milwaukee Area Technical College Case Study

The Milwaukee Area Technical College (MATC) in Wisconsin has been offering building energy programs focused on commercial and institutional buildings in various formats for more than 20 years (Wilinski, T., 2025). In the past, it has offered a Building Operator Certification, a Building Automation Systems (BAS) certificate that allows dual enrollment for high school students, and an Associate of Science degree in Sustainable Facilities Operations. Most students who enrolled in these were existing professionals being asked to perform more tasks related to energy management. However, the school has struggled to continue these energy-specific programs long term; the BAS program is the only one of those three that is still running. There are three reasons for this. The first challenge is recruitment: Many lack familiarity with and awareness of the field. The second challenge is students finding employment before they complete their degree programs—an issue that many community college programs face, particularly in the skilled trades. Although students complete the necessary training to obtain a well-paying entry-level trades job, they leave these programs before they learn the skills that would prepare them for the mid-level building efficiency occupations. See the Green Buildings Career Map for examples of entry- and mid-level occupations in the building efficiency workforce (Interstate Renewable Energy Council, Inc., 2025). The final challenge is the difficulty in finding and retaining knowledgeable instructors who have the credentials and experience required for accredited programs—a challenge faced by community colleges generally.

Despite the challenges MATC’s building energy programs have faced, there was still demand for skilled and knowledgeable facilities operations and maintenance staff in Wisconsin. Several years ago, to find a solution, a group of health industry stakeholders collaborated with MATC to develop and register a Facilities Maintenance Technician (FMT) apprenticeship program, which has been running since 2019. In this program, students begin with a two-semester pre-apprenticeship program at MATC, followed by five semesters of classes during which they complete their hands-on apprenticeship program with a participating employer. Although the FMT program is not energy focused, energy is incorporated throughout: There are two building systems classes in the pre-apprenticeship phase and an energy auditing and automated building control systems class during the apprenticeship phase. Overall, the apprenticeship requires both “on-the-job” hours of work experience and instruction time, which can be applied toward an Associate of Applied Science degree or a variety of other diplomas if desired.

Although the FMT program began with larger “anchor” employers from the healthcare industry, it has expanded to include participation from employers both large and small, representing a variety of industries and sectors. Most participants in the program are existing entry- or mid-level employees a company wishes to support in their career development through the formal structure offered by the pre-apprenticeship and registered apprenticeship program.

Over the years, MATC has received support in the development and evolution of all its building-energy-related programs from the Building Energy Smart Technologies Center, an initiative funded by the National Science Foundation that has worked for more than a decade to support building science and technician education at 2-year schools across the country.

College of the Desert Case Study

Since 2013, College of the Desert in California has been developing a robust Building and Energy Systems program (Galicia, R. and Brown, G., 2025). The motivation to create this program was twofold. First, with the introduction of Title 24—California’s latest residential building code—program leadership recognized the importance of providing training and education to meet these new regulations. Second, program leadership saw many former students leaving their trade jobs because of a sense of stagnation. The education and training they initially received in their community college classes were not sufficient for them to progress in their field. To address these issues, College of the Desert created this program to connect a variety of existing programs—HVAC, Construction Technology, and Architecture Technology—through a series of stackable certificates, culminating in an Associate of Science degree.

The program has three primary goals for its students: The first is for building trade students of all disciplines to work together. For example, one of the core classes in this program, Zero Net Energy Building Science, is taught by a different instructor each week. Each new professor offers their expertise and perspective from various building trade fields, so students understand that each building operates as a complex system. The second goal is for students to customize their own learning experience. Within the Associate of Science degree, students can pursue 13 distinct specialties and earn four certificates along the way – Building Automation Control, Building Commissioning Technician, Building Energy Consultant, and Building Inspection Technology. These specialties allow students to return to the classroom after they have gained some work experience to continue to develop as professionals and chart their own course. The final goal is to deliver relevant content as quickly as possible. This program advises students to take their core and elective classes first so they can immediately apply their training in the workforce. In addition, this program structures each semester around two 8-week blocks where students take fewer, but more concentrated, classes during each block with the goal that students immediately apply the new skills they learn. Again, this allows former students to return to the classroom to gain new expertise rapidly and then use it in the field just as quickly.

Alabama Energy Infrastructure Training Center Case Study

Recognizing the growing need for the next generation of skilled labor workforce and decreasing unemployment in Alabama, the Alabama Community College System (ACCS) developed the ACCS High School Career Roadmap (Cox, C., 2025). The major goals of this roadmap are to expose Alabama high schoolers to Alabama’s 16 major industrial sectors and ensure by 2029 every Alabama high school senior will have earned at least one postsecondary credit or workforce credential. Part of this effort was the development of the Alabama Energy Infrastructure Training Center and Network (AEITCN). Based at Beville State Community College, the center offers training in five disciplines—HVAC, weatherization, electric vehicles, connectivity, and solar/microgrids—to all 24 colleges in the ACCS. Each discipline has a mobile teaching laboratory that can be transported to colleges across the state to ensure students gain valuable practical experience.

Within the weatherization discipline at the AEITCN is a robust offering of Tier 1 and 2 Weatherization training courses that focus on providing industry-recognized certifications for students. The Tier 1 trainings include Retrofit Installer Technician (40 hours), Crew Leader (40 hours), Energy Auditor (90 hours), and Quality Control Inspector (16 hours). The curricula for

these courses are aligned with the U.S. Department of Education’s Job Task Analysis and provide a certification that is valid for 3 years. These courses are delivered in lecture-lab format and include both a written and field practical exam. The courses prepare students for other certification exams, such as the Building Performance Institute’s (BPI’s) Home Energy Professional Quality Control Inspector Certification Exam and Home Energy Professional Energy Auditor Certification Exam. There are several Tier 2 Weatherization training courses such as Occupational Safety and Health Administration (OSHA) 10 and 30, Lead Paint Certified Renovator (and renewal), ASHRAE 62.2 Ventilation, Duct & Envelope Testing and Zone Pressure Diagnostics, Combustion Appliance Zone Testing, Basic Refrigeration & HVAC Operations, Basic HVAC Electrical Operations, and Residential Load Calculations. These single-issue courses are more specific in scope than their Tier 1 counterparts and are generally shorter in duration (4–32 hours).

In addition, through the Alabama Department of Economic and Community Affairs, the AEITCN was awarded a grant through the Alabama Weatherization Assistance Program to train members of community action groups for free. The intent of this award was twofold: First, these trainings provide building science and weatherization education to members of these community action groups who can provide this same education to the communities they work in. Second, these training can help build capacity of members of these groups who can become certified to provide various weatherization services (e.g., home energy audits), increasing the capabilities of these groups.

Energy Smart Academy at the Santa Fe Community College Case Study

Founded 15 years ago, the Energy Smart Academy (ESA) was developed as the DOE’s Weatherization Training Center for New Mexico (Best, D. et al., 2025). A part of the Santa Fe Community College, ESA offers many services in the weatherization ecosystem. ESA provides four core weatherization training programs: retrofit installer technician, crew leader, energy auditor, and quality control inspector. Each of these programs is accredited by the Interstate Renewable Energy Council and is aligned with NLR’s Job Task Analyses. Beyond these comprehensive programs, ESA offers a variety of trainings, some of which prepare students for various certification exams. For example, the Building Science Principles, Healthy Home Evaluator, and Energy Auditing Software trainings prepare students to take these respective BPI exams. Others train students on emerging technologies. Last year, ESA rolled out a Cold Climate Air Source Heat Pumps course and is currently developing a Heat Pump Water Heater course. In addition, ESA has developed classes for organizations that employ weatherization workers (i.e., Weatherization Assistance Program agencies). These courses are developed for new and existing employees seeking certification and recertification in various weatherization topics, including pressure diagnostics, combustion training, insulating and air sealing, and auditing software along with ASHRAE and OSHA certification classes. In addition, ESA can conduct Residential Energy Services Network (RESNET) trainings and is a BPI testing center. Relatedly, in support of the City of Santa Fe’s latest building code, ESA has developed a variety of water conservation trainings for indoor and outdoor water usage in both single- and multifamily residential buildings.

Although ESA conducts a wide range of weatherization training, the organization still faces several challenges. The primary challenge is that for much of their trainings the main audience is weatherization agencies from all over the United States. However, both ESA and these organizations rely in part on grants and similar, discontinuous funding sources to pay for these courses. In addition, many of their existing courses teach more advanced building science concepts. Although ESA would want to open their trainings to a wider audience, this would require the development of a sequence of introductory building science principles. However, this would require even more staff and resources to teach. Another complication is many existing professionals have extensive on-the-job experience and would need some of but not all these foundational classes. Although a possible solution would be to offer credit to these individuals for this experience, granting these ad hoc credits would require even more administrative burden on ESA.

Opportunities To Expand Building Efficiency Programming at Community Colleges

It is clear from the background and case studies that community colleges are an integral part of training the next generation of the building efficiency workforce. The wide range of programs available allows rapid adoption and adaptability to new demands from employers and industry. However, as each case study attested to, community colleges face an array of challenges as they attempt to provide better education and training in this field. This section is intended to support community colleges that wish to implement building efficiency programming, either for the first time or by expanding existing offerings. The first part articulates the barriers that community colleges may face as they integrate new building efficiency content at their institution along with strategies and best practices gleaned from the literature and from the case studies. The second part outlines a spectrum of approaches community colleges can take to add building efficiency topics into their programs.

Challenges and Strategies for Building Efficiency Programs in Community Colleges

Based on the literature review and case studies, we identified five primary challenges that community colleges face when developing and maintaining building efficiency programs. For each challenge, we offer potential strategies to address these issues. Although this does not encompass every challenge that schools face, it highlights the most significant and frequently cited barriers.

1. **A mismatch between identified industry/employer needs and occupation and industry data.** For community colleges to create a new credit-based class or program, they must persuade administrators and decision makers about the employer or industry demand. This is often done by pulling data from the BLS. However, these data do not exist for most building efficiency occupations. Some of these occupations fall into the more broad, “traditional” trades occupations that may use a new technology (e.g., air source heat pump). In this situation, it is possible to pull only standardized data for HVAC technicians or electricians and does nothing to illustrate demand for specific building efficiency training or education for those workers. This is a similar challenge for more niche or emerging occupations, such as energy auditors or building automation technicians, which fall under even broader occupational categories—therefore, it is not possible to show supply or demand for these specific workers through standardized data.

Although community colleges can supplement BLS data with testimony from local employers or industry stakeholders, the limitations of standard labor data for new and emerging industries and occupations can create challenges to developing new programs. Approaches such as curricular enhancements within existing programs can help address this challenge by embedding new content and concepts into existing approved and established programs. Another approach available to community colleges is to pilot new content in non-credit training programs.

2. **Lack of awareness of/interest in these careers from students or potential students.** There is often a disconnect between an occupation title and the skills and knowledge needed to

qualify and be successful in that position. For example, students may not connect a building-efficiency-specific program (e.g., Building and Energy Systems program) with a particular occupation (e.g., Building Inspector) they are familiar with. Therefore, students may not be interested in or may be reluctant to enroll in these programs. In addition, workers in some traditional building occupations (e.g., facilities managers and maintenance) must understand how energy works as a system in buildings to effectively do their jobs. However, as we saw in some of our case studies, programs marketed with terms such as “energy efficient” or “sustainable” in the title may not resonate with the populations likely to pursue training or education in those fields, particularly in certain regions and political climates.

These types of disconnects can be overcome by both building career awareness (e.g., testimonials/statistics pertaining to employment upon completion of a program) among current and prospective students and by conducting basic market research to ensure courses or programs are being named and marketed appropriately. In addition, in 2024, the national nonprofit Advance CTE—which oversees the career framework used by nearly 13 million high school students enrolled in CTE programs, including 325,000 students focused in Architecture and Construction—released an updated national career cluster framework that highlights sustainability, resilience, and energy in its new Construction, Advanced Manufacturing, and Energy and Natural Resources Clusters (Advance CTE, 2023). Community colleges could align the nomenclature of their program offerings with these clusters to align and attract high school students to consider their programs.

- 3. Difficulty in recruiting quality instructors.** This challenge is not unique to the building efficiency space but is one that community colleges face in much of their programming. The main issue is the balance between finding instructors with experience and credentials that meet the schools’ requirements, which has several underlying causes. First, community college instructors often receive relatively low compensation compared to what professionals may earn in positions working in the industry. Second, although many potential instructors have years of hands-on and on-the-job experience, they may not have a degree from a 2- or 4-year institution. Often, this lack of formal credentials disqualifies these experts from these positions. Another issue is that building efficiency occupations (e.g., building energy auditor) and technologies (e.g., heat pumps) continue to evolve rapidly. Therefore, it is difficult for instructors to provide quality training and also stay informed with the latest developments in the field without working multiple jobs.

Working with local building efficiency industry associations, certifying agencies, or even a local utility may help identify potential pools of local professionals who may be interested and well-suited to address the needs of a new program. In addition, tapping into new funding streams described in Item 2 in this list could help existing instructors receive the certifications they need to teach new and evolving content.

- 4. Demand from local employers.** This is and should be a primary driver when deciding whether to develop new offerings—and in what way. Although building efficiency workers are present in 99.9% of U.S. counties, in-demand occupations vary greatly (Building Performance Association, 2024). For example, there are many community college programs across the country that educate workers in building automation and building controls work. However, in our case study interviews, we heard these types of programs can be difficult to

sustain in the long term based on the building type and are most successful in dense urban areas with building stocks that are most likely to use those technologies (i.e., large commercial and multifamily buildings). Similarly, an industry that is in demand at the state level may have no demand at a specific local level, or vice versa. Another example pertains to specific building technologies that are more appropriate for certain climates than others, such as heat pumps or cooling systems, or specific building materials. In addition, there are several industry-recognized accreditations for building energy auditors that are specific to programs such as the Weatherization Assistance Program or Home Energy Score.

It is important to understand which programs are most active in your region through conversations with your local utility, local government, or other employers to ensure you are aligning your approach with your local industry. In general, there must be a balance between staying up to date with evolving demand but not getting ahead of market demand. In addition, several of the community colleges we spoke with highlighted how aligning building efficiency programs or content with industry-recognized accreditation is both important and challenging. The value of this is that it can support student recruitment and buy-in from local employers. The challenge is that the building efficiency industry is still fairly fragmented in this space, with a variety of certifications available and recognized for different occupations, technologies, programs, and regions.

5. **School capacity.** As with any undertaking for creating new programming, community colleges will need to ensure they have the time and financial resources to research and build the program. This element alone may dictate which of the approaches described in Item 4 is most appropriate for a school (e.g., embedding content vs. building a new course or program). Many people we spoke with for our case studies indicated there was a building efficiency “champion” already on staff who helped move new programming ideas forward. However, although these “champions” are often essential to enter new territory, they are not a sustainable foundation for a program. Therefore, it is important for schools to understand there may be funding streams available to support new building efficiency programming that are distinctly different from many of the funding streams traditionally used by community colleges.

Over the last few years, significant funding for building efficiency workforce development has been available from state energy offices, other state offices, and the philanthropic sector. Although these types of funding streams can vary based on economic and political climates, it is valuable to be aware of alternative funding sources that can help build programs that may be able to be self-sustaining once established.

One additional challenge that is important to note—though it is not the responsibility of community colleges to implement solutions—is the overall lack of consistency in industry standards, certifications, and curricula (Srivastava et al., 2025). Because of the more organic way that building efficiency technologies and education evolved over the last several decades, there are many similar certification pathways that energy efficiency professionals can pursue, and it is not always clear which is the most appropriate. There are regional differences in terms of standards; there are specific requirements for programs such as the Weatherization Assistance Program or Home Energy Score or for local utility-funded programs; and there are state and local jurisdiction requirements for trades worker licensing.

The overlaps, redundancies, and lack of reciprocity between programs can be frustrating to contractors (workers and employers). But it may also be confusing for community colleges trying to determine the best approach to support students in preparing for these career pathways, as discussed in the following section.

Approaches for Community Colleges To Add Building Efficiency Programming

One additional challenge outlined in the research and case studies was the resource-intensive nature of developing new curriculum associated with building efficiency programs. Although content is available both free and at cost, knowing what is industry-vetted and aligned and ensuring it remains up to date in a rapidly changing industry can be added challenges. In addition, demand for building efficiency knowledge and training can manifest in different communities, economies, and industry sectors—not all community colleges must provide the same education and training in terms of both content and depth of knowledge. This section offers four types of approaches seen at community colleges across the country based on background research and the case studies (Figure 6).



Figure 6. The spectrum of approaches to expand building efficiency programming at community colleges

The following provides detail on each of the categories shown in Figure 6. Additional resources to support next steps in any category are available in Appendix D.

- Recognition of Existing Offerings.** For schools that see value for their institution, for student recruitment, or student outcomes, a variety of recognition programs are available through the federal government that may allow your school to market existing program as energy-aligned with no programmatic changes needed. Some examples of recognition programs more relevant to building efficiency include the U.S. Environmental Protection Agency’s (EPA’s) 608 Certification for air-conditioning and refrigeration technicians (U.S. Environmental Protection Agency, 2024); DOE’s Energy Skilled recognition program for heat pump and heat pump water heater training programs (U.S. Department of Energy, n.d.) and energy assessment programs. In addition, there are several industry accreditations a program can seek out from various organizations, including BPI (Building Performance Institute, Inc., n.d.), RESNET (Residential Energy Services Network, 2021), ESCO (ESCO Group, 2025), LEED (U.S. Green Buildings Council, Inc., 2025), OSHA (“Training | Occupational Safety and Health Administration,” n.d.), Building Operation Certification (Building Operator Certification, 2025), North America Technician Excellence certification

(NATE, 2025), and Association of Energy Engineers (Association of Energy Engineers, 2025).

- **Curricular Enhancement.** Curricular enhancement is a relatively simple approach that can help build energy literacy for students and improve their awareness of potential career pathways. Some programs already teaching content related to one or more building efficiency topics may determine they want to integrate building efficiency or building science topics or activities into certain courses without changing course learning objectives. This approach can allow instructors to introduce advanced building technologies or concepts that students may encounter when they enter the workforce or explicitly draw connections between what students are learning in class—for example, heat pumps or building automation—and concepts such as energy efficiency or sustainability, which may not otherwise be apparent. In addition, minor enhancement or adjustments to curriculum can typically be made without having to reaudit a course for accreditation compliance. See Appendix D for examples of resources to help embed building efficiency elements into existing course curricula.
- **New Courses in Existing Programs.** If a school or instructor sees interest from students or employers for increased knowledge or skills in certain topic areas, it may make sense to create a course to address this. This will require input from advisory and/or curriculum committees as well as approval from administrators and therefore takes more time than the approaches described previously (typically 6 months to 1 year). When developing a new course, schools will first want to ensure the content is industry-aligned and possibly look to recognition programs to help inform content (meaning see what courses or content are required for a program to be industry recognized and align from the start) Schools will also need to consider whether the course will be required or optional (if required, will this increase total credits for the program, or is the new course replacing something else?). Finally, one option to consider is to pilot a new course as a non-credit offering. This option is often easier and faster to accomplish, allows community colleges to quickly respond to new demand, and allows testing and evaluation to determine whether there is sustained demand for the content and how best to present it to students.
- **New Stand-Alone Programs.** The most time-, labor-, and resource-intensive approach for a school would be to develop a stand-alone training or degree program that teaches building efficiency topics. This is a significant task for a college because not only does the curriculum for a new program need to be developed, procured, or adapted, but also it must be reviewed and vetted by an institution’s curriculum committee to ensure the institute retains its various accreditations. This approach is most appropriate for schools that are seeing a rapid and significant increase in demand from employers, often related to new investments in the region. However, as in the example of the College of the Canyons Building Performance’s case study from the previous section, the demand may be less a response to a large-scale change in the regional economy or infrastructure and more a response to an industry shift that is not being addressed by other stakeholders.

Additional Considerations and Solutions

For community colleges interested in taking any of these approaches to increase building efficiency offerings for students, several other factors are important to consider. First, program directors should examine the composition of the advisory committee members in programs related to building efficiency to ensure building efficiency concepts are being represented—even in more traditional building trades programs. Seeking out local stakeholders from your utility, your weatherization assistance program agency, or others can help ensure your programming stays current. This could especially be the case if new requirements, programs, or rebates for certain technologies are being rolled out by local government or utilities that may affect the work and therefore training needs of local trades workers.

Second, it may be valuable to first connect with other schools or organizations that have worked with other community colleges in this space. Two national nonprofits—the Building Efficiency for a Sustainable Tomorrow (BEST) Center and the Sustainable Education and Economic Development (SEED) Center—have worked over the last decade or so to help community colleges expand building efficiency programming. The SEED Center, run by the National Council for Workforce Education, supports sustainable and clean technology education at 2-year schools by sharing resources, including curriculum and innovative practices. The BEST Center, funded by the National Science Foundation, supports 2- and 4-year schools in developing advanced building technology programming mainly for commercial building work, including HVAC, building controls and automation, and facilities management and maintenance. Its website includes curriculum, research, and other resources. Regardless of the approach taken, high-quality resources abound to support the addition of building efficiency curriculum at community colleges.

Third, in addressing the concern around lack of standardization of certification and curricula, one valuable role for community colleges engaged in this space is to work with other key stakeholders in their region and state to align these approaches—in particular, connecting with state weatherization offices, state energy offices, and utility programs as well as state and local education boards and offices. Although individual programs and course titles can be tailored to local markets, aligning standards across a state—and to the extent possible across the United States—can make the training and education that students receive at community colleges more portable and transferable and make the students themselves more valuable in the workforce.

Conclusion and Future Steps

This report has underscored the importance of community colleges in the development of the building efficiency workforce and the challenges these institutions face. Given that a majority of this workforce has less than a bachelor's degree, community colleges should be prioritized in efforts to improve and standardize building efficiency training and education.

Locally, we encourage community college administrators and instructors to connect with state and local governments, industry partners, and local businesses to make informed decisions about the topic areas, technologies, and approaches to training and education that may be most effective for their students and local economies. Nationally, we encourage the development of broad coalitions to outline performance criteria for emerging building efficiency occupations to ensure robust educational programs for both employers seeking qualified employees and students looking for nationally recognized credentials.

Through these efforts, we can continue to improve education and training of the building efficiency workforce to further accelerate the adoption of high-performance and efficient building technologies at scale.

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Appendix A. Building Efficiency Occupational Profiles

This appendix provides an overview of key elements for eight priority building efficiency occupations referenced in the first section of this report. This information is pulled from a variety of sources including [O*NET](#) and the DOE [Green Buildings Career Map](#) and [HVAC Career Map](#). These short profiles are intended to provide basic data to help inform community college decision makers about how they might incorporate building efficiency content into existing trades-related training programs, including which industry-recognized credentials they may wish to align with.

HVACR Mechanics

Install or diagnose and repair heating, central air conditioning, HVAC, or refrigeration systems.	
Alternative Job Titles	Conditioning Technician, HVAC Installer, HVAC Service Tech, HVAC Specialist, Refrigeration Mechanic, Refrigeration, Service Technician
<u>2024 Median Pay</u>	\$59,810 per year; \$28.75 per hour
2023–2033 Projected Employment Change	9%
Education and Training	High School Diploma or Equivalent, Post-Secondary Technical Training
<u>Credentials</u>	EPA, HVAC Excellence, NATE, NCI, OSHA 10 or OSHA 30, BPI-Building Science Principles (BSP) Certificate of Knowledge, BPI Building Analyst Technician (BA-T), BPI Building Analyst Professional (BA-P)

Plumbers, Pipefitters and Steamfitters

Assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, or other liquids or gases. May install heating and cooling equipment and mechanical control systems.	
Alternative Job Titles	Drain Technician, Fire Sprinkler Service Technician, Pipe Welder, Plumbing Installer, Service Plumber, Sprinkler Fitter
<u>2024 Median Pay</u>	\$62,970 per year; \$30.27 per hour
2023–2033 Projected Employment Change	6%
Education and Training	High School Diploma or Equivalent
<u>Credentials</u>	Commercial Plumbing Inspector (ICC), UPC Residential and Commercial Plumbing Inspector (IAPMO), UPC Journeyman Plumber (NITCC)

Electricians

Install, maintain, and repair electrical wiring, equipment, lighting, and control systems.	
Alternative Job Titles	Control Electrician, Electrical Journey Person, Industrial Electrician, Inside Wireman, Maintenance Electrician, Wireman
<u>2024 Median Pay</u>	\$62,350 per year; \$29.98 per hour
2023–2033 Projected Employment Change	11%
Education and Training	High School Diploma or Equivalent; Post-Secondary Technical Training
<u>Credentials</u>	Electrical Plans Examiner, Certified Apprentice Lighting Technician, Residential and Commercial Electrical Inspector, Certified Electrical Inspector – Master

Insulation Workers (Floor, Ceiling, and Wall)

Line and cover structures with insulating materials that increase the thermal efficiency and performance of buildings.	
Alternative Job Titles	Attic Blower, Insulation Installer, Insulation Mechanic, Insulator, Retrofit Installer, Spray Foam Installer, Warehouse Insulation Worker
2024 Median Pay	\$50,730 per year; \$24.39 per hour
2023–2033 Projected Employment Change	4%
Education and Training	Post-Secondary Technical Training; Apprenticeship/Journey-Level Certification
Credentials	High Performance Insulation Professional - Intermediate , High Performance Insulation Professional - Entry , OSHA

Insulation Workers (Mechanical)

Apply insulating materials to pipes, ductwork, or other mechanical systems to help control and maintain temperature.	
Alternative Job Titles	Commercial Insulator, Heat and Frost Insulator, Industrial Insulator, Insulation Installer, Insulation Mechanic, Insulator, Insulator Journeyman, Mechanic Insulator, Mechanical Insulator
2024 Median Pay	\$53,920 per year; \$25.92 per hour
2023–2033 Projected Employment Change	4%
Education and Training	High School Diploma or Equivalent; Apprenticeship/ Journey-Level Certification
Credentials	High Performance Insulation Professional - Intermediate , High Performance Insulation Professional - Entry , OSHA

Glaziers

Install glass in windows, skylights, store fronts, and display cases or on surfaces such as building fronts, interior walls, ceilings, and tabletops.	
Alternative Job Titles	Commercial Glazier, Field Glazier, Glass Installer, Glass Technician, Glassman, Glazer, Glazier Worker
2024 Median Pay	\$55,440 per year; \$26.65 per hour
2023–2033 Projected Employment Change	4%
Education and Training	High School Diploma or Equivalent; Apprenticeship
Credentials	Architectural Glass and Metal Technician (AGMT) , Fenestration Master , Fenestration Associate , Installation Masters

Energy Auditors

Collect and analyze energy usage data for buildings or building systems and provide an audit report to outline energy performance, recommendations, and cost savings potential.	
Alternative Job Titles	Building Performance Consultant, Energy Advisor, Energy Consultant, Energy Rater, Home Energy Inspector, Home Performance Consultant
2024 Median Pay	\$72,120 per year; \$34.67 per hour
2023–2033 Projected Employment Change	0%
Education and Training	High School Diploma or Equivalent, 2-Year Degree, Vocational or Technical School, or 4-Year Degree in Engineering or Related Field
Credentials	P.E., Certified Energy Manager (CEM), Certified Measurement and Verification Professional (CMPV), Energy Efficiency Professional (EEP), CEP Certified Energy Procurement Professional, Certified Energy Auditor (CEA), LEED AP, Certified Sustainable Building Advisor (CSBA), RESNET HERS Rater, BPI Building Analyst Technician (BA-T), BPI Building Analyst Professional (BA-P), or BPI Energy Auditor

Weatherization Technicians

Perform a variety of activities to weatherize homes and make them more energy efficient, including repairing windows, insulating ducts, and performing HVAC work and advising clients on energy conservation measures.	
Alternative Job Titles	Field Technician, Weatherization and Housing Inspector, Weatherization Installer, Weatherization Worker
2023 Median Pay	\$47,090 per year; \$22.64 per hour
2023–2033 Projected Employment Change	3%–5%
Education and Training	High School Diploma or Equivalent
<u>Credentials</u>	BPI-Building Science Principles (BSP) Certificate of Knowledge, Air Leakage Control Installer, Infiltration and Duct Leakage Certifications, NCCER Weatherization Technician

Appendix B. Community Colleges by State that Offer at Programs for Building

Table B-1. Data from National Center for Education Statistics, 2023

State	Total Number of Community Colleges	Number of Community Colleges Offering Programs for Building Efficiency Priority Occupations	Share of Community Colleges Offering Programs for Building Efficiency Priority Occupations
Alabama	22	14	64%
Arkansas	22	15	68%
Arizona	22	13	59%
California	114	51	45%
Colorado	15	3	20%
Connecticut	1	0	0%
Delaware	1	1	100%
Florida	28	14	50%
Georgia	22	22	100%
Hawaii	7	3	43%
Iowa	16	13	81%
Idaho	4	3	75%
Illinois	48	33	69%
Indiana	2	2	100%
Kansas	25	16	64%
Kentucky	16	16	100%
Louisiana	14	12	86%
Massachusetts	16	3	19%
Maryland	16	3	19%
Maine	7	7	100%
Michigan	28	16	57%
Minnesota	26	17	65%
Missouri	14	9	64%
Mississippi	15	15	100%
Montana	6	1	17%
North Carolina	58	48	83%
North Dakota	5	2	40%
Nebraska	6	5	83%
New Hampshire	7	1	14%
New Jersey	19	3	16%
New Mexico	17	8	47%
Nevada	4	4	100%
New York	37	9	24%
Ohio	22	13	59%
Oklahoma	12	0	0%

State	Total Number of Community Colleges	Number of Community Colleges Offering Programs for Building Efficiency Priority Occupations	Share of Community Colleges Offering Programs for Building Efficiency Priority Occupations
Oregon	17	7	41%
Pennsylvania	14	8	57%
Rhode Island	1	0	0%
South Carolina	16	15	94%
South Dakota	4	3	75%
Tennessee	13	3	23%
Texas	56	33	59%
Utah	2	2	100%
Virginia	23	20	87%
Vermont	1	0	0%
Washington	33	13	39%
Wisconsin	16	16	100%
West Virginia	9	2	22%
Wyoming	7	5	71%

Appendix C. Details on Types of Programming Offered at Community Colleges

Figure C-1 (Figure 5 repeated here for convenience) shows the many types of building efficiency programs offered at community colleges differentiated by six program attributes.

Building Efficiency Program at Community Colleges							
	Bachelor's	Associate's	Applied Associate's	Short-Term Credential	Skills Training	Registered Apprenticeship	High School CTE
Accreditation Type	Accredited College and Programs	Accredited College and Programs*	Accredited College and Programs*	Accredited College	Industry Accreditation*	Various: Federal and State	Based on college partner
Credit vs. Non-credit	Credit-based (~120 credits)	Credit-based (~60 credits)	Credit-based (~48 credits)	Both (Various)	Not credit-based (Days to Months)	Both (Years)	Credit-based (Various)
Funding Sources	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Federal/State DOE and Student Fees	Student Fees and Corporate Sponsors	Various (Federal, state, employer)	Federal/State DOE
Time to Create New Course	Years	Years	Years	Months to Years	Months	Months to Years	Months to Years
Degree Pathway	Transfer	Transfer or Workforce	Workforce	Workforce	Workforce	Workforce	Transfer or Workforce
Possible Partners	Industry (employment)	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities CBO	Industry (employment) Industry (train/equip) Utilities	Industry (employment) Industry (train/equip) K-12

* - Some, not all, programs

Figure C-1. Overview of types of programming offered at community colleges

Accreditation. Colleges can be accredited in two ways: First, most reputable colleges have an institutional accreditation from the Higher Learning Commission (HLC), which is the accreditation agency recognized by the U.S. Department of Education. Second, individual programs or departments within a college can be accredited by a professional organization (e.g., ABET, formerly the Accreditation Board for Engineering and Technology). At the community college level, both first-year students and students involved in dual enrollment programs would look for their college to be accredited through the HLC. However, few if any building efficiency programs that offer associate’s degrees, certificates, or more general training will be accredited by a professional organization. Apprenticeship programs can be additionally accredited by either the U.S. Department of Labor or recognized state apprenticeship agencies.

Credit vs. non-credit. Community college programs that align with some sort of accreditation usually structure their programs around students earning credits that lead to certificates and associate’s degrees. As mentioned previously, these institutions can structure their programs so a credit earned toward a certificate can be transferred to an associate’s degree that can then be transferred to a bachelor’s degree. Likewise, these credits can be earned toward a terminal certificate or associate’s degree with no structure or intent to be transferred to a higher degree. An institution can have both types of programs, with the credit-based programs referred to as academic programs and the non-credit-based programs as non-academic. In many cases, given the funding, accreditation, and other factors, these two branches of the same community college will operate independently of one another. Apprenticeships are structured in both ways. Although all apprenticeships have a structured training program, some of these programs include

classes where credits are earned. In these instances, these credits could be used to complete a certificate, associate's degree, or bachelor's degree in the future.

Funding sources. Funding source is almost directly correlated to accredited, credit-based programs. Funding sources for these building efficiency programs include the U.S. Department of Education, the Perkins Act, and student fees, whereas non-credit-based programs are funded primarily by student fees and in some cases by industry partners. Unlike the other program types, apprenticeships pay their students to participate. Although programs are primarily funded by the companies who benefit from the work completed by the apprentice and the employee pipeline created through the apprenticeship, these companies can seek support through state and federal tax credits and grants.

Time to create new course. Similar to funding source, the time to create a new course is aligned with accreditation. To maintain accreditation, any new course must be thoroughly vetted by an institution's curriculum committee. It is typical for a new credit-based course to take 2 years to be implemented. In many cases, these courses are usually piloted in the non-academic (non-credit) part of an institution for these first 2 years before being approved and offered to students for credit. Non-credit courses, however, can be developed and integrated into a college in as little as 6 weeks given the motivation, interest, and need for the education they provide. Without the need to cater to an accreditation body, these courses are mobile and can develop and morph rapidly. The time to create an apprenticeship or dual enrollment program varies significantly. If a company or college has previously developed these programs, creating a program for a new skill/specialty/course could happen relatively quickly given the existing infrastructure. However, creating a registered apprenticeship or high school/college partnership from scratch requires a significant amount of development before students can even begin to apply.

Degree pathway. From a student's perspective, one of the most important attributes of a building efficiency program at a community college is the pathway on which their program will set them. For a student graduating with a pre-engineering or pre-architecture associate's degree, one pathway is to continue toward a bachelor's degree at the same or another institution. Some community colleges have agreements with 4-year institutions where students can immediately transfer into their programs. However, the programs that community college students can transfer into can be limited, and some community college credits may not be accepted by certain 4-year institutions—requiring students to repeat classes. Another pathway for students in other associate's degree programs along with the other program types in Figure C-1 is directly into the skilled workforce. It is important to note that given the stackable nature of many of the courses in the skills training, short-term credential, and registered apprenticeship type programs, students initially in these programs may shift their focus over time to earning an associate's and even a bachelor's degree.

Possible partners. Building efficiency programs rely on a wide range of external partners; these partners provide a variety of services for community colleges. These services include employing students both during and after their studies, providing resources for training such as curriculum for courses and equipment for students to practice with and on, and serving as a pipeline for future students. We have identified four primary partners for building efficiency community college programs: industry, utilities, community-based organizations, and K-12 schools.

Appendix D. Building Efficiency Curriculum and Career Resources

Table D-2. Additional Resources for Community Colleges To Add Building Efficiency Programming

Resource	Link	Description	Audience
ASHRAE's Educator Resources	https://www.ashrae.org/professional-development/educator-resources	ASHRAE sells textbooks and guides on different building performance topics.	College
Building Efficiency for a Sustainable Tomorrow	https://bestctr.org/courses-and-programs/	Compiles curricula on different building energy topics from various colleges. Curricula can be downloaded for registered users.	College
Building Performance Institute Recruitment Toolkit	https://www.bpi.org/_cms/docs/recruitment-toolkit.pdf	Free materials and strategies designed to help recruit more students and employees for the following industries: HVAC/heat pumps, home performance, and residential building energy efficiency. These are fast growing industries, and the need for workers continues to increase. The Toolkit was developed using market research and input from industry experts to streamline your recruitment efforts and support the growth in the energy efficiency and HVAC sectors.	Community and Technical Colleges
Building Science Education Solutions Center	https://bsesc.energy.gov/	The Building Science Education (BSE) Solution Center provides curated and free-to-use training materials on the fundamentals of building science. Training covers a range of building science topics, technologies and occupations.	College
Clean Energy Bright Futures (Energy in Education Series)	https://www.youtube.com/playlist?list=PL7cxwWN6aQSRZQZ11vD4gMmP1NkmrCIWn https://www.cebri	Short videos based education series covering basics of energy and diving into energy-related careers. K-12 energy curriculum resources.	High School

Resource	Link	Description	Audience
	ghtfutures.org/resource-library/		
CREATE – Center for Renewable Energy Advanced Technological Education	https://createenergy.org/teaching-materials/	Energy teaching materials designed for community college, technical college, and high school use. Teaching materials include instructor guides, student handouts, answer keys, and additional resources for each of the lessons explored in the Solar Institutes. Documentation is also provided for each lesson referencing the US DOE Energy Literacy Standards (ELS) and the Next Generation Science Standards (NGSS). Lesson Plan topics covered are Solar PV, Energy Storage, Energy Fundamentals, Bioenergy, SCADA and Energy Management & Efficiency	Community College, Technical College, High school"
DOE Energy Literacy Framework	https://www.energy.gov/energysaver/energy-literacy-essential-principles-energy-education	Interdisciplinary approach to teaching and learning about energy. The framework identifies seven Essential Principles and a set of Fundamental Concepts to support each principle. It presents energy concepts that, if understood and applied, will help individuals and communities make informed energy decisions.	All
DOE Energy Skilled Recognition	https://bsesc.energy.gov/recognition	The Department of Energy recognizes training and certification programs that prepare workers for in-demand jobs in building energy efficiency. Interested learners can explore recognized training programs.	College
EcoRise: Green Building Lessons for a Sustainable Future	https://www.ecorise.org/portfolio/green-building-lessons/	Energy and Sustainability curriculum for high school students. Project-based lesson plans explore the relationship between the built and natural environment and give students the tools to become LEED credentialed.	High School

Resource	Link	Description	Audience
Energy Industry Fundamentals 2.0	https://getintoenergy.org/eif-2-0/ https://getintoenergy.org/educators/	EIF 2.0 by the Center for Energy Workforce Development is an energy curriculum designed for learners in High School and beyond. This free, virtual course offers 120 hours of instruction, including labs and interactive exercises to connect participants with foundational learnings about energy, and career path opportunities. Students who successfully complete the program will earn an industry recognized credential.	Community College, Technical College, and High School
Green Building Career Map	https://greenbuildingcareermap.org/	The Green Buildings Career Map is a highly interactive tool that explores an industry exploding with job opportunities across four major sectors of the green buildings and energy efficiency industry, charting possible progression between those occupations, and identifying the sorts of credentials necessary to do them well.	Community College, Technical College, and High School
Green Education Foundation Institute - Green Building Course	https://www.gefinstitute.org/curriculum-pack-topics.html#year%20	GEF Institute's Green Building Course introduces students to the key principles of green building and the five components of green building that include energy, water, sustainable sites, materials and resources, and indoor environmental quality. The program includes all materials and resources for a capstone project, which involves a school-wide audit in which students make recommendations for effective changes necessary to upgrade interiors, energy and water systems, and site and landscapes to accommodate for green efficiencies.	High School
National Energy Education Development (NEED)	https://www.need.org/educators/curriculum-resources/	Resources for educators include curriculum guides, lesson plans, and activities covering a range of energy topics and careers for education levels across K-12.	High School

Resource	Link	Description	Audience
ORISE	https://orise.orau.gov/k12/teachers/lesson-plans.html	STEM K-12 lesson plans and activities that include energy and electricity lessons.	High School
SEI Energize Schools	https://www.energizeschools.org/curriculum.html	SEI's Energize Schools curriculum engages students in sustainability projects, develops valuable career skills, and is aligned with Common Core, Next Generation Science Standards, and California Career Technical Education. The curriculum is available at no cost to teachers.	High School
BuildingsNEXT Building Science Education Series	https://www.energy.gov/cmei/buildings/buildingsnext/buildingsnext	The BuildingsNEXT Science Education series is designed to educate students and working professionals on building science principles that are paramount to the successful design of high-performance, energy-efficient buildings. Instructional content is presented in modules, covering specific topics.	College
Sustainability Education & Economic Development	https://theseedcenter.org/building-sciences/	Provides a collection of curriculum modules/lesson PowerPoint slides covering a range of topics and technologies in the building sciences.	Community College, High School"
U.S Green Building Council	https://www.usgbc.org/education/k12-education https://centerforgreenschools.org/initiatives/education-events	USGBC has a variety of resources for K-12 teachers and students. Their Center for Green Schools has online courses and events for educators as well as other resources to help those looking to bring green building education to their K-12 classrooms.	High School
Utah Office of Energy Development K-12 Curriculum	https://energy.uth.gov/homepage/education/curriculum/#searchButtons	Curriculum that meets State SEED standards to help students understand the critical role of energy and minerals. Covers all education levels from elementary to high school. Includes lesson plans and activities such as designing energy efficient heating and cooling system for a home.	High School

Resource	Link	Description	Audience
Weatherization Assistance Program Standardized Curriculum	https://nascsp.org/wap/waptac/doe-trainings-tools/wap-standardized-curricula/	A collection of weatherization education curricula including modules that align with Job Task Analyses for weatherization occupations. Each Module contains a Sample Course Schedule, Hands-on Props where applicable, and a glossary of Key Terminology. A Module is broken into smaller chapters or sections, each including a PowerPoint Presentation with detailed Speaker Notes, a Lesson Plan with prop lists and creative ideas to engage trainees, and suggested Handouts & Resources, including worksheets, articles, and other materials the instructor can use for background research or as homework in the class.	College High School"
Wisconsin KEEP	https://www.uwsp.edu/wcee/wcee/keep/keep-lessons/ https://airtable.com/appRx24fYf5wdCHye/shrNHLriPYCSGfudB/tblXiRP0DZ2thEugT	K-12 Energy Education Program (KEEP) provides interdisciplinary curriculum for Wisconsin educators interested in teaching a variety of energy topics including Energy Concepts, Careers in Energy, Climate Change, Energy Conservation, and Renewable Energy for grade levels K-12.	High School
Illinois Green Economy Network (IGEN) Building Sciences Curriculum	https://www.igencc.org/building-sciences/	Curriculum, lecture notes, and problem sets used in Illinois community colleges to introduce building science and heat pump concepts.	Community College