Building a Resilient Workforce: Skills and Success in Commercial Building Operations

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ABSTRACT

Constructing high-performing buildings that use dramatically less energy than conventional buildings is an important aspect of addressing the challenges of energy resiliency and affordability. But existing buildings are equally important, since it is estimated that 80% of buildings that will exist two to three decades from now already exist. Roughly 30% of the energy used in commercial buildings is wasted, largely due to operational inefficiencies. Much of this energy could be recovered via low/no-cost operational changes, but this requires an operations workforce with the knowledge, skills, and abilities (KSAs) to do so. As operations technologies evolve, such as AI-driven smart technologies and demand-flexibility solutions, so must the skillsets of operators. Additionally, a large portion of the current workforce is near retirement, opening career pathways for the next generation of operations professionals.

This paper discusses required KSAs for this workforce as identified in a recently performed job task analysis and outlined in a skills standard developed by a leading industry training and credentialing program. The paper also highlights programs successful in recruiting, training, and placing new workers into energy-efficiency jobs in the commercial building sector through partnerships between industry, government, training programs and employers. One example is the BEACON Fellowship, a scalable model that trains and connects technical support professionals with building owners across Washington state who need assistance meeting the Clean Buildings Performance Standard. Other programs and models with similar aims will also be discussed, as well as how building science concepts taught in these programs can complement construction training.

Introduction

Energy use in commercial buildings is a critical factor in U.S. energy resiliency and affordability because these buildings represent 18% of overall energy consumption and a highly concentrated share of electricity demand (DOE 2025a). From an affordability perspective, energy costs are a major operating expense for commercial buildings and the businesses and institutions they house. As electricity demand rises and infrastructure investments accelerate to keep pace with new loads, energy prices are likely to become more volatile in many regions. Inefficient commercial buildings amplify this problem by consuming more energy than necessary. An estimated 30% of the energy used in commercial buildings is wasted, largely due to operational inefficiencies (DOE 2025a). This wasted energy results in higher utility costs that are often passed on to tenants, customers, and taxpayers through higher rents and service prices. In contrast, energy-efficient buildings—with modern HVAC systems, efficient lighting, smart controls, and operators who are trained in efficient practices—can significantly lower operating costs and make expenses more predictable, improving financial resilience for businesses and public services alike.

In addition to saving energy and money, improving energy efficiency in commercial buildings helps counterbalance the increasing pressures on the grid by reducing peak demand and easing stress on generation, transmission, and distribution systems.

It is important to implement advanced technology and operational strategies in new construction so that the buildings of the future are as high-performing and resilient as possible, but existing stock dominates the long-term landscape. It is estimated that about 80% of the buildings that will exist in 2050 already exist today, according to the World Economic Forum (Grainger 2022). Unlocking the full potential of existing buildings to reduce energy consumption and support the grid will require operators equipped with skills in operational efficiency and in the rapidly evolving technologies and strategies being deployed across the sector. In light of the existing workforce shortage in this industry, which will be exacerbated by impending retirements, there is an opportunity for strategic investment that can have wide-reaching benefits: increasing energy affordability and resiliency as well as economic prosperity and security by providing high quality careers for the workforce of the future.

Workforce Transformation: Skills for the Modern Building Operator

Evolution of Building Operations

Financial savings from operational improvements can often be achieved without major capital expenses through better scheduling, setpoint optimization, recommissioning, and staff training. Common drivers of avoidable energy use include heating, ventilation, and air conditioning (HVAC) conflicts between zones, extended operating hours, sensor errors, and lighting left on in unoccupied areas—problems that are discoverable and correctable with systematic operations and maintenance (O&M), analytics, and staff vigilance. Realizing these savings can be less about buying new equipment and more about deploying competent operators who can interpret data, tune systems, and maintain performance through continuous improvement practices.

Electrification of heating and cooling equipment is proliferating, driven by falling costs of highly efficient heat pumps as well as decarbonization initiatives in various states and cities across the nation. The use of electric vehicles for personal transportation and commercial fleets is on the rise as well, increasing electricity demand and requiring a new set of skills for building operators.

As utilities and regulators scale demand flexibility programs, operators will increasingly manage *when* loads run - in addition to how efficiently they run. The U.S. Department of Energy's (DOE) Grid-interactive Efficient Buildings (GEB) initiative promotes buildings that combine energy efficiency with flexible demand, which co-optimizes costs, grid services, and occupant comfort via smart technologies and communications (DOE 2025b). A related outcome is the creation of new roles for operators who are adept at demand response, thermal storage strategies, and data-driven controls.

Workforce Demographics and Impending Retirements

The building operations profession encompasses a wide variety of roles and job titles, including but not limited to facility directors, facility managers, building engineers, building operators, maintenance technicians, controls technicians, HVAC technicians, energy managers, resource conservation managers, property managers, commissioning agents, energy auditors, and

energy services professionals. As the field of building operations evolves, the issue of a skilled workforce becomes more complex. More is being asked of those who manage and maintain facilities than ever before (International Facility Management Association [IFMA] 2026). New technologies are coming to market, and new policies such as building performance standards are being implemented requiring building operators to increase efficiency and reduce or eliminate carbon. Occupant and lessee expectations are rising. . In response, training programs are evolving to include topics like electrification concepts and data analysis, and smart buildings technologies such as advanced analytics to fill these skill gaps.

The issue of an aging and retiring workforce in the trades is a significant challenge facing many economies and industries, including building operations. The shortage of skilled tradespeople is exacerbated by an increasing number of retirements among baby boomers who dominate these professions. According to a 2023 study by IFMA, the average age of a Facility Manager is approximately 49, and nearly 40% of the existing Facility Management workforce is expected to have retired by this year (IFMA 2023a) and more than half of current Facility Management (FM) professionals are expected to retire in the next five to 15 years (IFMA 2023b).[1] This trend not only threatens the sustainability and growth of these vital industries but also underscores the need for strategic investments in career pathways and accessible education to attract and retain the next generation of tradespeople. These types of strategic investments have the potential to open opportunities for women, who, in the FM industry, tend to earn similar pay to men, unlike many other industries that have pay gaps favoring men (Bebon 2023). Another group that stands to benefit are tech-savvy millennials and the following generations, who might be interested in data analytical roles rather than conventional operations positions.

Job Task Analyses

A job task analysis (JTA) is a process that identifies the required knowledge, skills, and abilities (KSAs) for a specific job. A JTA breaks down a job into its individual tasks and details how they are performed (procedures, tools, and methods). The outcome of a JTA is a clear, structured picture of a job that documents the core responsibilities and performance requirements of a specific role.

Well-defined JTAs with aligned skills standards are foundational tools for identifying and addressing workforce skill gaps. By systematically documenting the KSAs required for effective job performance and regularly validating them against industry practice, a feedback loop is created that links real-world operational demands to training, certification, and assessment.[2]

In 2011, at the request of DOE, the Northwest Energy Efficiency Council (NEEC) conducted a JTA and identified KSAs for building operators. NEEC, a non-profit trade association for the energy efficiency industry whose flagship program, the Building Operator Certification (BOC®), has been an industry-standard national training and credentialing program for building operations professionals since the 1990s, was well poised to perform this work. NEEC's team of subject matter experts identified 12 functional activities and 108 KSAs relevant to efficient building operations. The National BOC® Advisory Committee, which represents a broad spectrum of industry leaders, as well as ninety-two BOC participants reviewed the KSAs.

[1] See also JLL (2024) and Bebon (2023) for updated industry application of IFMA workforce data.

[2] In this paper, the term JTA is used interchangeably to describe both the process of conducting the analysis and the resulting documentation.

Advisory Committee members and participants rated the importance of each task as it relates to energy efficiency; commented on the years of experience required for each KSA; and provided performance indicators (BOC 2025). A detailed gap analysis was conducted, reviewing the BOC program against the KSAs. NEEC used the KSAs to develop curriculum skill standards that were then compared with the existing BOC courses to identify any gaps in training.

In 2020, NEEC began the process of conducting a new JTA survey to reassess the KSAs for building operators. The survey was distributed nationally to BOC stakeholders and graduates and the data gathered was analyzed to identify any changes that needed to be made to the BOC skills standard, curriculum content, and BOC certification exam blueprint. After reviewing data from the updated JTA, the BOC Certification Advisory Commission Scheme Committee recommended changes to the number of exam items under some of the exam domains and subdomains, as well as revising or replacing some of the exam items, to ensure the exam continues to evaluate building operators' proficiency in the correct critical work functions. The changes to the certification exam were completed in Q2 2025. An updated BOC Skills Standard based on the new JTA was released later that year and continues to serve as a guide for development and updates to the BOC training curriculum (BOC 2025).[3]

This approach of conducting well-defined JTAs and utilizing aligned skills standards enables targeted curriculum updates, ensures credentialing exams remain relevant, and highlights where additional education or experience is needed as technologies, codes, and performance expectations evolve. Just as importantly, JTA-driven skills standards like the BOC Skills Standard provides a common framework around which training providers, employers, industry associations, and public-sector partners can collaborate—supporting apprenticeships, continuing education, and career pathways that are responsive to industry needs. In this way, JTAs and skills standards not only reveal gaps in skills, but also guide the coordinated programs and partnerships necessary to build a resilient, future-ready building operations workforce.

In the following sections, we will highlight some relevant details documented in the BOC Skills Standard.

Critical Work Functions and Key Activities

The BOC Skills Standard first establishes critical work functions and key activities, as shown in Table 1 below.

Table 1. Scope of critical work functions and key activities

Critical Work Functions	**Key Activities**		
A. **Maintain Energy Using Building Systems, Equipment, and Envelope to Minimize Energy Use**	A1 Perform preventive and predictive maintenance	A2 Troubleshoot system and equipment problems and perform diagnostic testing	A3 Document equipment maintenance
B. **Operate Energy Using Systems for High Performance**	B1 Operate equipment settings and system control points	B2 Measure and monitor energy performance	B3 Sustain energy performance

[3]Text excerpted directly from the BOC Skills Standard (BOC 2025).

C. **Perform Technical and Administrative Duties**	C1 Maintain records and reports and communicate with management, co-workers, and occupants	C2 Assist in occupant education and training	C3 Maintain and obtain certification and proficiency in current and new technologies
D. **Maintain Indoor Environmental Quality (IEQ) to Standards**	D1 Measure and monitor IEQ parameters	D2 Troubleshoot IEQ issues	D3 Assist in developing and implementing an IEQ plan

Critical Work Functions. Critical work functions represent the general areas of responsibility for building operators specific to improving building energy use and performance and maintaining high performance over time. The functions give insight into what must be done to achieve the key purpose.

Key Activities. Key activities are the tasks implemented by building operators and related to the functional area of the job. They are made up of building energy performance work activities which are measurable and observable, and which result in a decision, product or service.

Required Knowledge, Skills, and Abilities (KSAs)

After establishing critical work functions and key activities, the Skills Standard then proceeds to document the technical KSAs and tools necessary to fulfil each key activity, as well as related performance indicators.

The new skills identified in the most recent BOC JTA can be broadly grouped into the following categories:

- Refrigeration-based Equipment
- Electrification and Demand Management
- Controls
- Data Analytics, Diagnostics and Optimization
- Communication

The new KSAs that have emerged from the latest JTA are listed in Table 2 below, along with their related key activity and category. The complete list of identified KSAs and performance indicators can be viewed by accessing the full text of the BOC Skills Standard (BOC 2025).

Table 2. New KSAs identified by BOC JTA

Key Activity	KSA	Category
[A1] Perform preventive and predictive maintenance	Knowledge of bidirectional EV charging including potential risks and benefits to facilities.	Electrification and Demand Management
	Knowledge of integrated controls in heat pumps.	Refrigeration-based Equipment

[A2] Troubleshoot system and equipment problems and perform diagnostic testing	Knowledge of basic troubleshooting processes and procedures including root cause analysis.	Data Analytics, Diagnostics, and Optimization
	Knowledge of the use of AI and machine learning technologies to automatically detect, diagnose, and predict faults or inefficiencies in building systems.	Data Analytics, Diagnostics, and Optimization
	Ability to install and configure data loggers.	Data Analytics, Diagnostics, and Optimization
[B1] Operate equipment settings and system control points	Ability to calculate and adjust flow in systems with pump speed and gallons per minute (GPM) water circulation settings.	Data Analytics, Diagnostics, and Optimization
	Knowledge of how to operate HVAC system components for peak demand load shedding.	Electrification and Demand Management
[B3] Sustain Energy Performance	Knowledge of variable refrigerant flow (VRF) technology.	Refrigeration-based Technology
	Knowledge of alternative energy sources (e.g, solar, wind).	Electrification and Demand Management
	Knowledge of RCx (retro-commissioning) processes.	Data Analytics, Diagnostics, and Optimization
	Skill in utilizing root cause analysis for evaluating controls systems and energy management systems to identify sources of additional energy usage in building systems.	Data Analytics, Diagnostics, and Optimization
	Skill in troubleshooting issues with integrated controls in heat pumps.	Data Analytics, Diagnostics, and Optimization
	Ability to coordinate building systems and controls security access and vulnerabilities with IT department.	Controls
[C2] Assist in occupant education and training	Knowledge of training methods.	Communication
[C3] Obtain and maintain certification/proficiency in current/ new technologies	Knowledge of industry trends.	Communication

As this list illustrates, the skills needed for building operations professionals who are ushering in the energy transformation are diverse and build upon the traditional mechanical skills required to operate and maintain physical equipment.

Some additional aspects of the skill categories mentioned above are discussed in more detail in the following sections.

Refrigerant-Based Equipment

The equipment operated in buildings is evolving, with heat pumps and variable refrigerant flow (VRF) becoming the dominant technologies for space heating, cooling, and domestic hot water (DHW) heating due to their high efficiency capabilities. These technologies are seeing rapid growth in the development of solutions suitable for most climates and environments (Cox 2024). Rapid market expansion has contributed to economies of scale and the inherent benefits of affordability and availability.

These refrigeration-based technologies require specialized skills for operation and maintenance. Importantly, the refrigerants used in this type of equipment have come under increased scrutiny because of their potentially significant contribution to global warming due to leaks, which are common. Building operation professionals must have the knowledge to discern the best options when replacing or upgrading equipment, as well as the ability to check for leaks and perform proper maintenance of these systems. An understanding of integrated controls connecting hybrid systems is also important.

Electrification and Demand Management

Commercial buildings such as offices, retail spaces, hospitals, schools, warehouses, and data centers consume significant amounts of energy for lighting, heating, cooling, ventilation, and specialized equipment—often during peak demand hours. At the same time, the U.S. power grid is becoming increasingly strained by rapid electrification of vehicles and heating systems, and the rapid growth of data centers supporting artificial intelligence (AI), cryptocurrency mining, and other electricity-intensive technologies. These trends are driving faster load growth than the grid was originally designed to provide for, making it more vulnerable to congestion, price spikes, and outages.

Commercial buildings have a unique opportunity to counterbalance these pressures and support grid resiliency as demand continues to grow. Technologies such as advanced building management systems, demand response, on-site solar generation, bi-directional EV charging and battery storage allow commercial buildings to reduce or shift electricity use during periods of grid stress and to maintain critical operations during outages. When deployed at scale, these capabilities can help offset rising loads from electrification and data-intensive industries, reducing the need for costly grid upgrades and emergency generation. In this way, commercial buildings can evolve from being energy-intensive consumers to contributing toward a more resilient, affordable, and adaptable U.S. energy system.

Operations professionals must be aware of electrical capacity constraints when electrifying equipment, which may require efficiency measures to reduce demand requirements and to avoid costly service upgrades. Awareness of local utility rate structures, e.g., demand

charges, and programs, such as demand response, are also needed, as is awareness of equipment controls and strategies for minimizing utility costs.

Controls

As the equipment used to operate buildings evolves, so do the control systems for this equipment. And as more equipment is networked within buildings and to the cloud, operators must understand the potential security vulnerabilities and how to coordinate with Information Technology (IT) departments to ensure reliability of systems is more important than ever.

Data Analytics, Diagnostics, and Optimization

With the evolution of building systems toward data-driven technology, data analytics skills are also highly desired in scoping systems for operational improvement opportunities. Data logging, whether through building automation systems, energy management systems and/or standalone data loggers, can provide valuable insight into system performance, helping operations professionals to identify opportunities for optimizing efficiency. A practical example of this is the ability to measure, calculate, and adjust flow in systems with pump speed and GPM water circulation settings. To troubleshoot issues and optimize system performance, operations professionals need to be trained in systematic processes such as root cause analysis and retro- or re-commissioning.

Technology is advancing quickly in areas such as advanced controls, analytics, fault detection and diagnostics (FDD), and AI enabled platforms. Ironically, data centers supporting AI are one of the sources of the increasing strain on the energy grid, as was mentioned earlier, but at the same time it is a promising tool for reducing energy use in buildings and helping to offset rising grid demand. AI-driven building management systems can analyze real-time data from sensors, weather forecasts, occupancy patterns, and utility prices to continuously optimize HVAC and lighting. Unlike traditional rule-based controls, these systems learn and adapt over time, reducing energy waste while maintaining comfort and operational needs. In high-performing commercial buildings, AI tools are already delivering substantial reductions in energy use and peak demand, directly lowering operating costs and easing strain on the grid (Chao et al. 2024). Adoption of AI and smart building technology continues to grow in facility operations, increasing the demand for digital skills and data driven decision making. AI doesn't replace building operators, but it can act as a support tool to help them see issues sooner and respond more effectively. Because AI can make mistakes, operators must have the hand-on skills and expertise to interpret data and discern whether the AI-based recommendations are legitimate before implementing measures in the field.

Communication

A related important but often overlooked skill set in the building operations industry is communication. Building managers and operators need to not only be able to identify opportunities for improvement, but they also need to be able to assist in occupant education and training. Operators and technicians must develop strong communication skills to effectively present identified improvement opportunities to financial decision makers, particularly when making the case for capital upgrades.

Training & Talent Pipelines: Successful Models and Programs

There are several training programs that teach some or all of the KSAs identified in the JTA. Some examples of different types are listed below.

Community Colleges. Many colleges are embedding advanced commercial building skills into existing programs of study. Some examples include:

- Bates Technical College - Tacoma, WA
  Facilities Maintenance Engineer, Associate of Applied Science (A.A.S.), offering a combination of academic and hands-on training with the option to earn certificates and credentials such as:
  - Building Care and Maintenance Certificate of Competency
  - Maintenance Technician I and II Certification
  - Boiler Operations Certificate of Training
  - EPA 608 Universal Certification (Refrigeration Technician)
- Lane Community College – Eugene, OR
  Energy Management with Building Controls Technology, Associate of Science (A.S.), with coursework including:
  - Energy accounting
  - Analysis of commercial HVAC and lighting systems
  - Troubleshooting control systems
- South Seattle College – Seattle, WA
  Sustainable Building Science Technology, Bachelor of Applied Science (B.A.S.), with upper-division coursework including:
  - Building science
  - Energy/building codes
  - Energy accounting
  - Facility Management
- Bismarck State College – Bismarck, ND
  Energy Management, B.A.S.
- Roxbury College Center for Smart Building Technology – Boston, MA
  Building Fundamentals Program
  100-hour program including certifications in:
  - Building Performance Institute (BPI) Building Science Principles
  - BOC Fundamentals of Energy Efficient Building Operations (FEEBO)
  - Urban Green Council Green Professional (GPRO)

Non-college Training Programs. BOC and other programs**.** Several national training and certification programs provide the skills needed for building operations professionals to successfully navigate the evolution of building operations. Organizations offering relevant training and/or certification programs include:

- Building Operator Certification (BOC)
- Building Performance Institute (BPI)
- Association of Energy Engineers (AEE)
- International Facility Management Association (IFMA)

Aligning Building Science and Construction Training

Cross training in building science equips construction learners with operations-aware perspectives—airflow, moisture, envelope system interactions—so they can design and deliver assemblies that operate efficiently in practice, reducing performance gaps and easing the transition from construction to operations. This alignment is increasingly important as retrofits accelerate to meet efficiency targets with existing portfolios.

Scalable Workforce Pipeline Models

Energy efficiency continues to be the largest part of the U.S. energy workforce. In 2024, the industry added nearly 100,000 jobs nationwide and grew by 4%, making it the fastest-growing energy sector (Smart Buildings Center 2026). To continue building this workforce, training alone is not enough. To realize the full benefits of improving energy resiliency and developing the workforce in the existing buildings sector, creating sustainable pipelines from recruitment to training to jobs is necessary. Scalable workforce pipeline models include the following components:

- Classroom instruction aligned to recognized KSAs
- Mentored hands-on practice
- Credential pathways
- Placement support, including apprenticeship or pre-apprenticeship opportunities in areas of need

Next, we'll look at an example of one such approach.

The BEACON Fellowship (Washington State)

Washington's Clean Buildings Performance Standard (CBPS), based on ASHRAE Standard 100 and codified in WAC 194-50, requires large nonresidential and multifamily buildings to meet energy performance and management requirements. The law requires benchmarking, energy management, and O&M plans, and—where applicable—meeting energy use intensity targets (EUIt) or following alternative compliance pathways. Building owners face tight compliance timelines, complex technical requirements, limited internal capacity, and funding constraints. At the same time, the state must grow its clean buildings workforce by an estimated 22% by 2030 to meet net-zero goals (WA Commerce 2026).

This drives demand for qualified persons (as outlined in the CBPS) familiar with the ASHRAE Standard 100 based requirements and state amendments.[4] Washington State's Department of Commerce, charged with enforcing the CBPS law, launched the Building Efficiency and Clean Operations Network (BEACON) Fellowship in 2025. The BEACON Fellowship is a statewide workforce and technical assistance initiative designed to support CBPS. Administered by the Washington State Department of Commerce with key partners including Strategic Energy Innovations (SEI), the Smart Buildings Center (SBC), and Green Building Practicum, BEACON addresses both workforce shortages and building owner compliance challenges.

[4] CBPS is based on the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 100.

Funded by a $10 million U.S. Department of Energy grant, BEACON provides no-cost, CBPS-specific support to building owners while creating paid fellowship opportunities for emerging clean energy professionals. Over three years, the project will place 60 fellows and assist more than 2,000 buildings statewide. Fellows deliver education, resource connections, benchmarking and Energy Star Portfolio Manager support, EUIt development, equipment inventories, site visits, and assistance with Energy Management Plans, O&M plans, and exemption applications. BEACON aligns with CBPS compliance milestones (beginning 2026 for the largest buildings) and prioritizes under-resourced owners.

Fellows receive structured training and mentorship through programs such as Qualified Energy Manager (QEM) and Building Operator Certification (BOC), cohort-based instruction, office hours, and professional development via SEI's Climate Corps program. This hands-on model blends classroom learning with real-world application, preparing fellows to confidently support building owners while building a strong talent pipeline for energy efficiency careers. By late 2025, fellows were placed in multiple counties with a plan to expand services statewide via remote support, demonstrating a scalable "hub and spoke" assistance model that can be replicated in other states adopting building performance standards.

Early results demonstrate strong demand and impact: hundreds of buildings served, extensive outreach across utilities, schools, local governments, and nonprofits, and meaningful reductions in knowledge and capacity gaps for building owners. Lessons learned show that the partnership-based fellowship model is adaptable, scalable, and effective at addressing both workforce and compliance needs. BEACON is now expanding through utility and regional partnerships, offering a replicable model for other states adopting clean building performance standards (R. Sheppard, Senior Project Manager, Smart Buildings Center, pers. comm. From presentation at AEE West conference, Bellevue WA, March 11, 2026).

Additional Partnership Models

Continuing to develop and expand public/private partnerships for career pipelines is key to filling the impending workforce gaps, such as those between labor/equity organizations, community-based organizations, government agencies, training and credentialing programs, and employers who can offer apprenticeships. Some examples of existing partnerships are listed below. These programs all provide training that is in alignment with the BOC KSAs.

- Center for Smart Building Technology at Roxbury Community College (Boston, MA) – Provides hands-on training through certificate programs such as BOC with tuition paid for by sources such as the Massachusetts State Employment and Training Fund. This partnership leverages connections with community-based organizations that serve targeted populations to create awareness about career pathways in the building operations field. The Center also works directly with Boston Public Schools to perform outreach and tailor curriculum to the needs of high school students to facilitate a direct pathway into certificate programs. The Center's employer partner, Automated Logic, provides internship opportunities that can lead to employment (K. James, Assistant Director, Center for Smart Building Technology, pers. comm., July 9, 2024).
- Strategic Energy Innovations (SEI) Climate Corps Fellowships – Helps public agencies, nonprofits, businesses, and educational organizations attract early-career professionals from a diverse pool of candidates. SEI has seen impressive outcomes, with 85% of fellows hired either by their fellowship site organization or other organizations. These workers often enter the workforce with high-wage jobs, which is attributed to the year-

long experience and industry certifications such as BOC that are gained through the fellowship programs. SEI has also been successful in serving diverse populations; for example, 60-70% of its fellows are women. Funding varies between sources such as federal/state governments and/or utilities (J. Pollack, Consulting Director, SEI, pers. comm., July 9, 2024).

- Los Angeles Cleantech Incubator (LACI) - Works with startups to accelerate the commercialization of clean technologies; transforms markets through partnerships with policymakers, innovators, and market leaders in zero-emission transportation, clean energy, and sustainable cities; and enhances communities through workforce development, pilots, and other programs. Their Green Jobs Workforce Programs (Building Energy Management Systems and Resilient Rebuilding) give hands-on technical training, interpersonal skills, and industry-recognized certifications to empower participants to succeed in the green economy. These programs have served nearly 100 participants to date, with 93% of participants graduating and 52% securing well-paying jobs with starting wages of at least $20/hour (S. Segado, Director of Workforce Development, LACI, pers. comm., July 8, 2026).
- PowerCorps Boston - The City of Boston's green industry workforce development program for young adults ages 18–30. Using a "learn and earn" model, members are paid to participate in hands-on training while building career readiness skills and earning industry-recognized credentials. Founded in 2022, PowerCorps has graduated five cohorts (140+ graduates) and prepares Boston residents for living-wage careers in climate and skilled trades sectors. The program reports placing an average of 75% of graduates into "economically-mobile outcomes" (M. Muhammad, Program Manager, PowerCorps Boston, City of Boston, pers. comm., July 8, 2026).

Conclusions

Commercial buildings represent a large portion of overall energy consumption and demand, and therefore they are a critical aspect in achieving greater energy resiliency and affordability in the U.S. Because a large portion of the buildings that will exist in the coming decades are already built and operating, managing energy use in these existing buildings is key. This can only be achieved by equipping building operations professionals with the additional skills needed to match evolving technology and the needs of the modern electricity grid. The commercial building operations workforce already faces a shortage of qualified workers, and this will be exacerbated with impending retirements. This presents an opportunity to provide greater energy resiliency and affordability as well as economic development by providing high quality, future-proof careers for job seekers who are changing careers or entering the workforce.

To accomplish these goals most effectively, pathways that lead from recruitment to training addressing recognized KSAs to job placement must be created. JTAs and resulting skills standards are useful tools to identify KSAs in any given industry, and one such recent example is the BOC JTA and Skills Standard for the commercial building operations sector. Successful career pathway models such as the BEACON Fellowship in Washington state utilize public and private partnerships and include components such as training aligned with identified KSAs, mentored hands-on practice, credential pathways, and apprenticeship and/or job placement support. Similar programs have been successfully deployed in various programs across the country. Policy makers, training providers, educators, employers and similar stakeholders should

take note of this replicable and scalable approach.

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AI-assisted Tools Disclosure

AI-assisted tools used: Copilot.
Used for: Research, summarizing, drafting text.
Extent: Citation research, summarizing lengthy documents, drafting initial versions of some sections (which we then rewrote or rearranged).
Human Review: The authors reviewed and verified all content, calculations, and citations.