

Beyond the Toolbox: Building Durable Clean Energy Careers through Community-Led Workforce Practices

Daphany Sanchez, Kinetic Communities Consulting Corporation

Cristina Garcia, Latinx in Sustainability

George Nunez, Bronx Tech Hub

Lisa Anne Hamilton, The Marable Group

McKenna Dunbar, The Grid Foundry

ABSTRACT

This paper explores how community-based organizations (CBOs) and minority- and women-owned businesses (MWBs) are reshaping workforce programs, corporate structures, and internal policies to expand access to clean energy careers. Drawing from practical experience, we feature culturally responsive training, wraparound support, mentorship, and employer accountability systems that strengthen pathways into project management, community engagement, data analysis, and technical assistance, improving retention and mobility for diverse professionals, including underemployed and justice-impacted workers.

We identify barriers to equitable advancement, including unstable funding, certification disparities, fragmented employer practices, and policy frameworks that favor short-term roles over lasting careers. In response, we propose enabling policies that align workforce investments with community priorities, formalize reentry, advancement, and credential-recognition pathways, standardize skills validation, and embed employer obligations for retention, wage growth, and mobility.

Our analysis highlights community-led workforce innovation, including multi-stakeholder partnerships and train-and-place models, with comprehensive support and transparent metrics that demonstrate measurable career progression. We examine how these models are structured and implemented, including funding braids, data-sharing agreements, outcome dashboards, and employer accountability tools that translate values into durable, scalable practice. By codifying effective strategies and addressing challenges, this paper offers a practical roadmap for building equitable, multi-track career pathways in the building energy sector. When local organizations lead with authenticity, supported by strong partnerships and sustained investment, the result is a resilient clean energy workforce that reflects national diversity and delivers better outcomes for residents, owners, and the public sector.

Introduction

The transition toward a decarbonized and energy-efficient built environment requires a workforce that is skilled, sufficient in number, and reflective of the diverse communities most affected by energy and housing policies. Recent federal investments, such as the Inflation Reduction Act (IRA), generated significant momentum for clean energy deployment and workforce development. However, as IRA-related funding fluctuates within the current policy landscape, workforce programs face growing instability (National Academies of Sciences, Engineering, and Medicine [NASEM] 2024; U.S. Department of Energy (DOE 2024). In its 2024 consensus report on accelerating decarbonization, NASEM, the nation's leading independent scientific advisory body, found that workforce gaps and unstable program funding

are among the primary constraints on achieving U.S. decarbonization goals, making its findings a central reference point throughout this paper. This uncertainty complicates efforts to build durable and equitable career pathways in the clean energy sector. In response, states and localities are exploring innovative workforce strategies, braided funding models, and policy alignment efforts to sustain capacity for workforce development and deployment.

At the same time, the energy efficiency and building retrofit sectors face persistent labor shortages that compound longstanding structural barriers to workforce participation. Women, people of color, justice-impacted individuals, and other underrepresented populations remain underrepresented in high-quality clean energy careers despite their essential role in advancing climate goals (Muro et al. 2019; E2 et al. 2021). Structural inequities embedded in hiring practices, credentialing systems, and policy frameworks continue to limit access to training, stable employment, and career advancement (Muro et al. 2019; NASEM 2024). These barriers reduce workforce diversity and slow the deployment of energy efficiency and electrification projects. Workforce shortages in retrofit and building electrification sectors can increase labor costs and delay project delivery, highlighting the importance of expanding inclusive pathways into the clean energy workforce (DOE 2024; McDowell et al. 2024).

Many workforce programs continue to prioritize short-term training completion and rapid job placement while giving insufficient attention to retention, career mobility, and long-term workforce stability (NASEM 2024). This imbalance contributes to high turnover, reduced worker retention, and diminished program effectiveness. Addressing these challenges requires workforce systems that support workers across the entire career lifecycle.

Community-based organizations (CBOs) and minority- and women-owned businesses (MWBs) are increasingly pioneering workforce models that integrate culturally grounded recruitment, wraparound supports, mentoring, employer accountability mechanisms, and flexible career ladders (Pollin et al. 2023; NASEM 2024). These models recognize that workforce success extends beyond technical training. Durable careers require ongoing support, recognition of nontraditional credentials, wage mobility, and opportunities for advancement. Partnerships rooted in trust and shared community interests have been shown to significantly improve outreach and participation among historically underserved populations (Sanchez, Levine, and Tajima 2018).

Definitions

To provide a shared analytical framework that guides this analysis and subsequent recommendations, we define key concepts used throughout the paper. *Wraparound supports* refer to comprehensive services such as transportation assistance, childcare, healthcare access, and legal aid that address nontechnical barriers to workforce participation and retention (NASEM 2024). *Multi-track career ladders* describe flexible career pathways that extend beyond entry-level technical roles to include project management, program administration, community engagement, and other specialized roles within the clean energy sector (Muro et al. 2019). *Braided funding* refers to the strategic combination of public, private, and philanthropic funding streams to create resilient and sustainable workforce initiatives (Pollin et al. 2023). *Recognition of prior learning (RPL)* acknowledges skills and knowledge gained through informal education, work experience, or community leadership and applies them toward formal credentials or employment qualifications (IREC 2024). *Living wages* refer to earnings sufficient to cover basic household needs, including housing, food, childcare, healthcare, and transportation, without reliance on public assistance, typically benchmarked against regional

living wage estimates rather than the federal minimum wage (Glasmeier 2024). *Justice-impacted individuals* are people who have been affected by the criminal legal system, including those with arrest or conviction records, individuals currently or formerly incarcerated, and people completing community supervision. The term is used in workforce development to encompass the full population facing employment barriers related to involvement with the criminal legal system, rather than narrower terms such as "formerly incarcerated" (NASEM 2024). Finally, *structural racism* refers to systemic policies and institutional practices that perpetuate inequities in access to training, employment opportunities, and career advancement (Wilson 1996).

Clean Energy Career Lifecycle Framework

To organize this analysis, we introduce a Clean Energy Career Lifecycle Framework, an original framework developed by the authors that examines workforce development across five interconnected stages: recruitment, hiring, retention, advancement, and entrepreneurship. The framework adapts career pathways models from workforce development scholarship (Symonds, Schwartz, and Ferguson 2011) and sector-based career ladder research (Muro et al. 2019) to the specific conditions of the clean energy sector, extending them to include entrepreneurship as a distinct fifth stage. Many clean energy workforce programs focus primarily on training and initial job placement. In contrast, this framework emphasizes sustained worker support, employer accountability, and career mobility across the full employment lifecycle. Each stage presents distinct barriers and opportunities. Recruitment strategies determine whether historically excluded populations can access workforce programs. Hiring practices influence whether workers obtain stable and equitable employment. Retention mechanisms such as wraparound supports and supportive workplace practices determine whether workers remain in the sector long enough to build skills and experience. Advancement pathways shape long-term wage mobility and leadership opportunities. Entrepreneurship and consultancy pathways allow workers to transition into business ownership or specialized service roles within the clean energy ecosystem. Figure 1 presents the framework alongside traditional workforce programs.

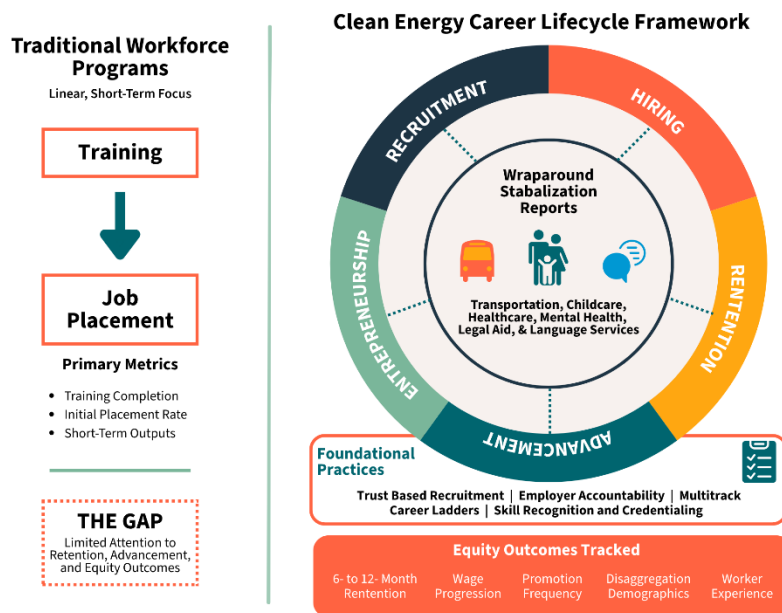


Figure 1. Clean Energy Career Lifecycle Framework compared to traditional workforce programs. Traditional programs focus on two linear stages, training and job placement, and measure success primarily through completion and initial placement rates. The Clean Energy Career Lifecycle Framework expands the workforce model to five interconnected stages, embeds wraparound stabilization supports throughout the full lifecycle, and tracks equity outcomes, including retention, wage progression, promotion frequency, and disaggregated demographic data. The framework is circular by design: workers who reach the entrepreneurship stage become employers and mentors who recruit the next generation of clean energy workers, often from their own communities. Source: Authors’ framework.

Analyzing workforce initiatives through this lifecycle lens reveals how community-led workforce models simultaneously address structural barriers across multiple stages. The framework also provides a practical structure that utilities, program implementers, and policymakers can use to design workforce initiatives that support durable clean-energy careers rather than short-term job placements.

We use a qualitative research approach that combines literature review, practitioner experience, and illustrative case studies from community-led workforce initiatives across the United States. Peer-reviewed scholarship, policy reports, and workforce development literature were reviewed to identify structural barriers that affect equitable participation in the clean energy workforce. Case studies were selected to illustrate diverse implementation models, including workforce training initiatives, legal accountability frameworks, mentorship programs, and community capacity-building strategies. Each case was analyzed using a consistent analytical framework that examined recruitment strategies, wraparound supports, employer accountability mechanisms, and career ladder structures across the workforce lifecycle.

Structural Barriers to Durable Clean Energy Careers

To deepen understanding of systemic barriers affecting marginalized populations in clean energy careers, this analysis draws on theoretical frameworks from workforce development and critical race theory. Crenshaw (1989) introduced the framework of intersectionality, which

shows how overlapping identities of race and gender shape access to opportunity in ways that single-axis analyses fail to capture. Wilson (1996) documents how the disappearance of stable employment from urban communities of color has produced lasting effects on labor market participation, family structure, and economic mobility. Together, these frameworks highlight how barriers in credentialing, hiring, and career advancement reflect enduring structural inequalities rather than isolated incidents.

Workforce development scholarship complements this perspective through career pathways frameworks that promote durable employment through integrated education, training, and supportive services (Symonds, Schwartz, and Ferguson 2011). These frameworks encourage the design of multi-stage, accessible, and inclusive career ladders that recognize systemic barriers and the diverse experiences of workers. Developing an equitable and sustainable clean energy workforce requires addressing structural barriers that limit access, retention, and advancement for historically marginalized populations. The urgency of addressing these barriers is reflected in labor market projections. The U.S. Department of Energy (DOE) estimates that the clean energy workforce exceeded 3.4 million workers in 2022 and will require significant expansion to meet national decarbonization goals (DOE 2024). At the same time, construction and retrofit industries report persistent shortages of qualified workers. Workforce gaps are increasingly recognized as a major constraint to building electrification and energy-efficiency deployment (McDowell et al. 2024).

These barriers operate at multiple levels, including unstable funding mechanisms, restrictive credentialing systems, inconsistent employer practices, and fragmented policy frameworks. Together, these factors impede the development of durable career pathways. Structural racism intensifies these challenges and disproportionately affects women, Black, Indigenous, and people of color, justice-impacted individuals, and other underserved populations.

Credentialing and Certification Can Create Unequal Access

Industry credentialing and certification requirements frequently create barriers that disproportionately affect marginalized workers. Formal credentials can be costly, time-consuming, and difficult to obtain, particularly for justice-impacted or underemployed individuals who lack access to educational resources or flexible training opportunities (NASEM 2024; IREC 2024). Common barriers include certification exam fees, rigid training schedules, and limited recognition of experiential learning. Credentialing systems often fail to acknowledge skills gained through community-based work or informal training pathways. As a result, qualified candidates may be excluded from advancement opportunities. These practices contribute to persistent racial and socioeconomic disparities in hiring and career progression within the clean energy sector (Muro et al. 2019).

Fragmented Employer Practices Limit Inclusion and Advancement

Employers in the clean energy sector frequently lack standardized hiring, retention, and advancement practices designed to support workforce diversity and long-term career mobility. Recruitment practices often rely on narrow skill requirements and informal networks such as referral-based hiring. These approaches exclude qualified candidates who lack access to existing professional networks (Muro et al. 2019). After being hired, workers from underserved communities may encounter limited professional support, stagnant wages, and unclear

opportunities for advancement (NASEM 2024). Without explicit employer commitments to retention, wage growth, and career pathways, early gains in workforce diversity are often undermined by high attrition and limited upward mobility.

Policy Silos Prioritize Short-Term Outcomes Over Long-Term Equity

Workforce development policies often operate within separate institutional silos across energy, housing, social services, and economic development agencies. Limited coordination between these programs restricts access to comprehensive wraparound supports that are essential for worker stability and success (Sanchez, Levine, and Tajima 2018). Policy frameworks frequently prioritize short-term metrics such as job creation and placement rates rather than long-term measures of career durability and equity (Pollin et al. 2023). This fragmentation makes it difficult to scale effective community-led workforce models. It also limits the integration of racial and economic equity considerations within clean energy labor market policies.

Structural Racism Underpins Persistent Inequities

Structural racism remains a central factor shaping inequities within the clean energy workforce. Discriminatory hiring practices, unequal access to education, residential segregation, and barriers faced by justice-impacted individuals collectively restrict access to stable employment and career advancement (E2 et al. 2021; Muro et al. 2019). These patterns reflect broader labor market inequalities documented across U.S. industries, where racial and gender disparities persist in hiring, wages, and opportunities for advancement (Wilson 1996; Crenshaw 1989). Addressing these inequities requires intentional program design, equitable policy reform, and authentic partnerships with affected communities (Muro et al. 2019). Figure 2 summarizes how these barriers operate across the lifecycle stages.

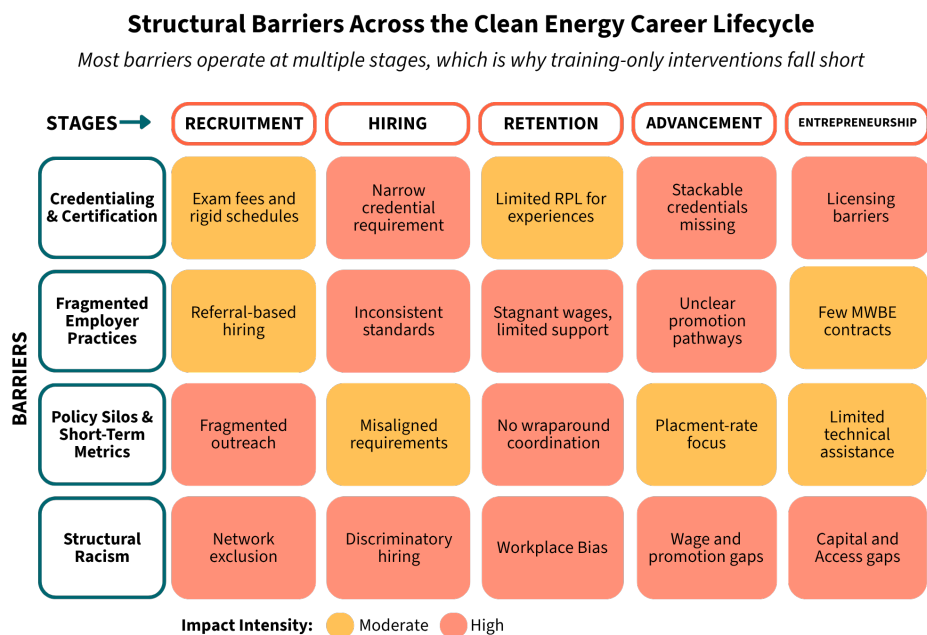


Figure 2. Structural barriers across the clean energy career lifecycle. Credentialing and certification gaps, fragmented employer practices, policy silos, and structural racism each affect multiple stages of the workforce

lifecycle. Reading across rows shows how a single barrier compounds across recruitment, hiring, retention, advancement, and entrepreneurship, which is why training-only interventions fall short and integrated workforce systems are required. Source: Authors' synthesis.

Operationalizing the Career Lifecycle Framework: Community-Led Workforce Models

To address structural barriers that limit equitable access and advancement in clean energy careers, many community-based organizations (CBOs) and minority- and women-owned businesses (MWBs) are developing workforce infrastructure models grounded in trust, cultural competence, and comprehensive support. These models operationalize the Clean Energy Career Lifecycle Framework through five core components: trust-based recruitment systems, wraparound stabilization supports, employer accountability structures, flexible multi-track career ladders, and entrepreneurship and consultancy pathways. These components respond directly to the structural barriers described above and align with established career pathways frameworks (Symonds, Schwartz, and Ferguson 2011).

These models can be applied across multiple institutional settings. The five core components can be embedded within energy efficiency programs, building decarbonization initiatives, utility procurement processes, and community development projects. Embedding workforce pathways within these long-term systems reduces reliance on short-term grants and creates more stable opportunities for training, employment, and advancement. Integrating workforce development into decarbonization programs aligns labor-market investments with the scale of building retrofitting and electrification required to meet climate goals.

Community-led workforce models are also consistent with emerging labor market trends that emphasize skills-based hiring and flexible career mobility. As automation and digital tools reshape workforce requirements, skills validation and nontraditional career pathways are becoming increasingly important across the energy sector. Community-led workforce models that emphasize mentorship, skills recognition, and career mobility are well-positioned to support both experienced workers and younger professionals entering the clean energy workforce.

Trust-Based Recruitment Systems

Effective recruitment requires more than outreach. It requires building trust within communities that have historically been excluded from workforce initiatives. CBOs are often deeply embedded in these communities and can leverage cultural competence and local networks to identify candidates and build long-term relationships (Muro et al. 2019). Trust-based recruitment approaches help address widespread distrust of institutions and increase participation among populations frequently excluded from traditional training-to-employment pipelines. Programs that combine multilingual outreach with community-led information sessions have demonstrated measurable improvements in engagement (Sanchez, Levine, and Tajima 2018).

Wraparound Stabilization Supports

Long-term success in clean energy careers depends on removing nontechnical barriers, including financial, logistical, and social barriers, that disproportionately affect marginalized workers. Wraparound supports such as transportation assistance, childcare, language services, mental health resources, and legal support are essential for stabilizing workers' lives and

enabling consistent participation in training and employment (Pollin et al. 2023). When workforce programs integrate stabilization services alongside technical training, participants are better positioned to maintain employment and build long-term career mobility.

Employer Accountability Structures

Employer accountability is essential for ensuring that workforce programs translate into durable employment outcomes. Multi-stakeholder coalitions that include utilities, contractors, CBOs, labor unions, and public agencies can establish shared hiring standards, retention benchmarks, and wage growth targets (Pollin et al. 2023). Accountability mechanisms often include monitoring systems that track workforce outcomes such as retention rates at six and twelve months, wage progression, and promotion frequency. These metrics can be disaggregated by demographic characteristics to ensure that workforce initiatives are producing equitable outcomes.

Flexible Multi-Track Career Ladders

Many clean energy careers require a diverse set of skills that extend beyond traditional technical roles. Community-led workforce programs increasingly support flexible career ladders that include opportunities in project management, data analysis, community engagement, and technical assistance. These pathways allow workers with different skill sets and interests to progress within the sector while earning sustainable wages and accessing opportunities for advancement (Muro et al. 2019). Credential recognition systems that acknowledge prior experience and alternative learning pathways further strengthen mobility.

Entrepreneurship and Consultancy Pathways

In addition to traditional career ladders, many community-led workforce models are expanding pathways into entrepreneurship and consulting. Minority- and women-owned businesses play an increasingly important role as contractors, service providers, and specialized consultants within clean energy projects. Collaborative workforce models can support workers in developing small business capabilities and building professional networks while remaining connected to workforce initiatives. These pathways create additional opportunities for economic mobility while strengthening local ownership within the clean energy sector. Together, these elements form a comprehensive workforce infrastructure model that addresses systemic barriers while centering equity and long-term sustainability. To illustrate how community-led workforce infrastructure models operate in practice, the following section presents case studies that demonstrate these strategies across diverse regional contexts.

Case Study Snapshots from Community-Focused Organizations Across the U.S.

Each case demonstrates how community-led organizations, including place-based CBOs, MWBEs, and national nonprofits serving communities of identity, apply elements of the Clean Energy Career Lifecycle Framework, including trust-based recruitment, wraparound supports, employer accountability, and career mobility pathways, address local workforce challenges and support durable employment outcomes. The cases represent a range of workforce strategies,

including justice-impacted workforce pipelines, legally enforceable community benefits agreements, hybrid climate workforce training models, mentorship networks, and community-based energy access initiatives. Together, they demonstrate how workforce infrastructure can be adapted across different regional contexts and institutional settings.

Justice-Impacted Solar Training Nationwide

Justice-impacted individuals face significant barriers to entering licensed and regulated trades, and correctional education programs rarely align with industry-recognized credentials or employer demand. This mismatch leaves an underutilized workforce at a time when building electrification and retrofit deployment is constrained by shortages of credentialed labor, and it increases recidivism risk for individuals leaving correctional facilities.

Electrivate, an initiative of The Grid Foundry, partnered with FLIPP Inc., a NABCEP-accredited training provider and registered apprenticeship intermediary, to establish a correctional-to-clean-energy workforce pipeline. Since 2022, the partnership has coordinated workforce initiatives across Henrico County, the City of Richmond, Albemarle County, Piedmont Regional Jail, and Henrico Regional Jail East. The model integrates community-based workforce training and correctional education into a unified strategy to support clean energy workforce development.

The program operates through several training platforms, including CREED (Clean Renewable Energy Education and Development), FACER (FLIPP's Accelerated Clean Energy Reentry initiative), and the Maryland Justice Project. Cohort-based instruction combines NABCEP PV Associate preparation with training in electrification, solar fundamentals, and energy efficiency retrofits. Program design prioritizes worker-centered outcomes, including living wages, safe working conditions, opportunities for advancement, and employer commitments to second-chance hiring. Instruction integrates technical training with policy literacy and the regional energy market context.

Oversight aligns with Department of Labor reporting requirements, including credential tracking, cohort completion verification, and employment placement documentation. Since its launch, the initiative has served more than 502 individuals across correctional and community training sites. According to Raye Elliott, Founder of FLIPP Inc., the FACER Project "achieved a 100 percent completion rate with all 28 participants, 21 of whom earned the NABCEP PV Associate credential. Five participants secured full-time renewable energy positions, including project coordinator and technician roles. More than half of the cohort is now employed full time" (R. Elliott, pers. comm., 2026).

The initiative demonstrates a scalable workforce pipeline that reduces the risk of recidivism while strengthening the labor supply for building decarbonization projects.

Analysis of Community Benefits Agreements and Workforce Accountability in Alabama Developments

Community Benefits Agreements (CBAs) and Host Community Agreements are frequently used as tools for community engagement in infrastructure development. However, when developers rely on generic contract templates from unrelated projects, the resulting agreements may not reflect local workforce needs or environmental justice priorities. In some cases, agreements are negotiated quickly with limited community participation. This can lead to

provisions that are difficult to enforce and provide limited accountability for workforce commitments.

The Marable Group, a co-author of this paper, conducted a legal assessment for this analysis to identify standards that improve CBA enforceability and workforce outcomes. The analysis examined the Community Benefits Agreement between New Flyer of America, a transit bus manufacturer whose Anniston, Alabama facility produces electric and hybrid buses, Jobs to Move America, and Greater Birmingham Ministries, representing the Alabama Coalition for Community Benefits. The study also reviewed a case study produced by the Jay Mehta Community Benefits Agreement Resource Center documenting coalition-building and negotiation processes (Last 2025). Seventy percent of participants met the CBA definition of targeted populations, and job placement reached 86 percent (Last 2025). Researchers compared the workforce outcomes described in the case study with the contractual language in the CBA. The analysis examined how coalition-building activities shaped enforceable workforce provisions.

Within one year of signing the agreement, the first pre-apprenticeship program cohort achieved strong representation from underrepresented groups. Seventy percent of participants met the CBA definition of targeted populations, and job placement reached 86 percent (Last 2025). The agreement also required employers to monitor workforce metrics and assign corporate staff to track recruitment outcomes and partnership engagement. The analysis found that effective CBAs depend not only on legal language but also on strong coalition-building processes. Agreements developed through sustained collaboration between labor organizations, community groups, and employers were more likely to produce enforceable workforce outcomes.

This case illustrates how legally structured employer accountability mechanisms can strengthen workforce recruitment, training, and retention commitments within clean energy infrastructure development.

Community-Based Climate Workforce Training in New York City

Many clean energy workforce programs overlook workers from communities that have historically been excluded from accredited employment pathways. These workers often possess transferable skills from sectors such as construction, facilities management, and community organizing. However, rigid credentialing systems limit their ability to demonstrate relevant capabilities. This creates barriers to workforce entry and slows project deployment due to labor shortages.

Bronx Tech Hub developed a training model that combines building science education with digital skills, artificial intelligence project coordination, and community engagement training. The program prepares workers for emerging hybrid roles, including retrofit outreach coordinators, climate data curators, energy program navigators, and community project managers. Training programs operate through cohort-based fellowships and partnerships with MWBEs, utilities, academic institutions, and local government agencies. Curriculum development is aligned with employer workforce needs. Funding is braided across grants, workforce contracts, and institutional partnerships. Participants receive technical training, applied project experience, and career navigation support.

The program expands workforce participation by validating lived experience and accelerating worker readiness for decarbonization projects. Participants gain access to stable

employment pathways while employers benefit from improved community trust and project delivery capacity.

Latinxs in Sustainability Mentorship Network Through Virtual, National Networks

Latinx professionals remain underrepresented in professional, managerial, and leadership roles across the sustainability and clean energy fields, even as Latino workers hold a substantial share of clean energy installation and construction jobs (E2 et al. 2021). Many students and early-career professionals entering these sectors are first-generation college graduates or the first members of their families to work in professional environments. Limited representation and mentorship opportunities can create barriers to career advancement.

Latinxs in Sustainability (LiS), a 501(c)(3) nonprofit building community among Latinx professionals in the sustainability sector, developed the Inclusive Mentorship Program to connect early-career professionals with experienced mentors. The program matches mentors and mentees based on sustainability interests and geographic location. Participants meet regularly for discussions on career guidance and leadership development. Program resources include mentorship guides, structured discussion topics, and cohort-based virtual meetings. The initiative also launched La Sala, a quarterly virtual community space where members share experiences and professional advice. Since launching in 2022, the mentorship program has facilitated 71 mentor-mentee pairings. The 2025 cohort included 36 participants. Participant feedback indicates that mentorship relationships improve career navigation, professional confidence, and leadership development. The program demonstrates how mentorship networks can strengthen retention and advancement for underrepresented professionals in clean energy careers.

Community Capacity Building for Clean Energy Access in New York City

Neighborhood Housing Services (NHS) of Queens serves diverse low-income communities but initially lacked the technical capacity to integrate clean energy education and financing into its programs. This limited residents' access to energy-efficiency and renewable-energy solutions. KC3 partnered with NHS Queens to build organizational capacity in clean energy technologies, financing strategies, and community outreach. Training workshops and technical demonstrations strengthened staff expertise in clean energy program delivery. Outreach strategies leveraged NHS Queens' established relationships with immigrant and multilingual communities. Data dashboards and referral systems were developed to track participation and connect residents to energy-efficiency services. Within the first year, the Clean Energy Hub engaged more than 1,200 residents. Approximately 85 percent of participants came from low-income or historically underserved communities. Participant feedback indicated strong satisfaction with the quality of training and the accessibility of services. Sixty-five percent of residents pursued energy-efficiency upgrades or renewable energy solutions after participating in the program.

Implications for Energy Efficiency Program Administrators: Implementation Strategies

Building an equitable and resilient clean energy workforce requires more than traditional training programs. Applying the Clean Energy Career Lifecycle Framework highlights the need for coordinated strategies across recruitment, hiring, retention, advancement, and

entrepreneurship. Workforce systems must support workers across the full career lifecycle while adapting to changing labor market conditions, including skills-based hiring, hybrid technical roles, and increasing demand for digital and community engagement skills.

Utilities, program implementers, and workforce partners play critical roles in designing workforce systems that respond to these evolving needs. For administrators of energy-efficiency and building-decarbonization programs, workforce capacity directly influences project timelines, installation costs, and customer satisfaction. Workforce development is therefore both an operational requirement and an equity priority.

The following are implementation strategies that utilities and program administrators can adopt to support innovative, community-led workforce systems. These strategies expand labor pools, strengthen workforce retention, and align workforce development with the scale of building electrification and retrofit activity required to meet climate goals.

Recruitment

Recruitment strategies that expand access to historically excluded workers form the foundation of an equitable workforce system. CBOs and MWBEs often serve as trusted intermediaries that connect workforce programs with local communities. Their cultural competence and deep networks allow them to reach workers who may not engage with traditional workforce pipelines.

Emerging recruitment models increasingly rely on trusted community intermediaries and peer ambassador networks rather than conventional job postings. Programs that partner with local organizations and invest in sustained relationships demonstrate stronger participation rates among populations historically excluded from clean energy careers.

Utilities and program administrators can strengthen recruitment pipelines through community referral agreements, workforce participation requirements embedded in program procurement processes, multilingual outreach strategies, and peer-based community ambassador programs. These approaches broaden participation while strengthening trust between workforce programs and local communities.

Hiring

Hiring practices strongly influence whether workforce initiatives produce durable employment outcomes. Traditional hiring models often rely on narrow credential requirements or informal professional networks, which can exclude workers with relevant skills but limited formal credentials.

Emerging hiring strategies increasingly emphasize skills-based hiring and cohort recruitment pipelines. Cohort hiring allows groups of candidates to enter workforce programs together, strengthening peer networks and improving long-term retention outcomes. Programs that validate transferable skills from industries such as construction, facilities management, and community organization can significantly expand the clean energy labor pool.

Utilities and program administrators can encourage equitable hiring by embedding workforce expectations into procurement processes and program contracts. These expectations may include transparent hiring standards, paid on-the-job training, mentorship programs, and workforce outcome reporting tied to program participation. These approaches help ensure that workforce programs produce stable employment rather than short-term placements.

Skill Recognition and Workforce Innovation

Clean energy workforce systems are evolving as new technologies and program delivery models emerge. Workforce programs must increasingly recognize diverse learning pathways and new hybrid roles that combine technical knowledge with digital, analytical, and community engagement skills. Recognition of prior learning allows workers to receive credit for skills developed through work experience, informal training, or community leadership. This approach reduces barriers created by rigid credential systems and allows workers to transition more quickly into clean energy careers.

Workforce innovation is also generating new occupational roles that bridge technical and community-facing work. Positions such as energy program navigators, retrofit outreach coordinators, climate data analysts, and community-based project managers are Hybrid positions such as those described in the Bronx Tech Hub case study are becoming increasingly common across energy efficiency and decarbonization programs. Programs that integrate skills validation, leadership development, and mentorship structures enable workers to move into these emerging roles while strengthening workforce diversity.

Retention

Retention remains one of the most challenging stages of workforce development. Many workforce programs measure success primarily through job placement rather than long-term employment outcomes. Effective retention strategies require transparent monitoring systems and continuous feedback mechanisms.

Program administrators increasingly use workforce dashboards to track indicators such as six-month retention rates, twelve-month retention rates, wage progression, promotion frequency, employer compliance with workforce standards, and worker satisfaction scores. These indicators allow administrators to identify barriers and adjust program design.

Quantitative data should be complemented by qualitative feedback gathered through worker surveys and exit interviews. These insights provide important context on workplace conditions and structural barriers that may affect workforce participation and long-term career development. Evaluation frameworks that track wage progression, career mobility, and worker satisfaction enable programs to adapt strategies and improve equity outcomes.

Advancement

Career advancement is essential for building durable workforce systems. Clean energy workforce programs must provide pathways for workers to advance beyond entry-level positions. Flexible skills validation systems support advancement by recognizing diverse forms of knowledge and experience. Competency-based credentials and stackable certifications allow workers to demonstrate skills incrementally as they continue to gain experience. Programs that integrate mentorship, leadership development, and career coaching help workers move into specialized and supervisory roles while strengthening leadership diversity within the clean energy sector.

Policy & Program Design Implications

Effectively addressing structural barriers and scaling community-led workforce initiatives requires policy and program designs grounded in principles of equity, durability, and integration. As the federal funding landscape becomes increasingly uncertain and political support fluctuates, workforce developers, utilities, and community organizations must adopt proactive strategies to sustain and advance equitable clean energy career pathways. In an environment where federal support for workforce development may contract or waver, stakeholders can implement several strategies to maintain momentum.

Diversify and Braid Funding Sources

Reliance solely on federal grants exposes workforce programs to volatility. Braided funding, which combines utility energy efficiency budgets, local and state workforce dollars, philanthropic contributions, private investments, and innovative sources such as Donor Advisor Funds (DAF), creates a more stable financial base (Pollin et al. 2023). This multi-source funding approach encourages flexibility and resource sharing, enabling programs to sustain critical wraparound supports such as childcare, transportation, and healthcare even during federal funding gaps (NASEM 2024).

Build and Leverage Local Partnerships

Local community-based organizations (CBOs), minority- and women-owned businesses (MWBs), labor intermediaries, and faith-based networks possess deep ties and knowledge essential for recruiting and supporting underrepresented workers (Muro et al. 2019). Cultivating authentic, long-term partnerships strengthens program resilience and community trust, providing buffers against shifting federal priorities (NASEM 2024). Moreover, innovative hiring approaches, including cohort-based recruitment, blind resume reviews, and competency-focused assessments, can reduce bias and improve access for marginalized workers.

Embed Data-Driven Accountability

Developing transparent outcome dashboards that track retention, wage growth, advancement metrics, and qualitative worker feedback facilitates continuous program improvement and demonstrates impact to stakeholders and funders (NASEM 2024). Clear and accessible data enhance credibility and support advocacy for sustained local and private investment as federal funding recedes.

Advocate for Local Policy Alignment and Integration

In the absence of sufficient federal policies, state and local governments can fill the gap by aligning workforce equity goals with clean energy mandates. Embedding enforceable employer obligations within procurement processes and coordinating cross-sector programs across housing, social services, and economic development provides holistic support to participants (NASEM 2025; Last 2025). Building broad coalitions amplifies advocacy efforts and leverages local political will.

Innovate Recognition and Credentialing Systems

Community-led initiatives may develop flexible, competency-based credentialing that values lived experience and informal learning, fostering career advancement amid limited federal certifications (IREC 2024). Collaboration between training providers and employers on skills validation strengthens workforce mobility and inclusion.

Develop Leadership Capacity within Communities

Investing in leadership training and coaching for CBOs, MWBEs, worker-advocate groups, and frontline workers ensures that affected communities guide program design and policy development (Muro et al. 2019). Empowered leadership sustains long-term engagement, preserves institutional knowledge, and ensures responsiveness amidst challenging external conditions. Effective leadership development examples include cohort-based leadership academies, peer mentoring programs, and access to professional coaches focused on equity-centered workforce transformation.

Conclusion

An equitable clean energy workforce requires more than training pipelines; it requires durable workforce systems that support workers across recruitment, hiring, retention, and advancement. This paper shows that community-led models, especially those led by community-based organizations and minority- and women-owned businesses, are essential because they combine technical training with wraparound supports, mentorship, culturally grounded engagement, and employer accountability. The Clean Energy Career Lifecycle Framework offers a practical way to align workforce development with both labor market demand and equity goals.

Despite barriers such as funding instability, credential inequities, fragmented employer practices, and policy uncertainty, stakeholders can strengthen these models through braided funding, flexible credentialing, stronger partnerships, and rigorous accountability. Utilities, implementers, and policymakers must treat equity as core workforce infrastructure rather than a secondary objective. Future research should examine long-term retention, wage mobility, and career advancement across community-led workforce models. Scaling the clean energy transition will depend not only on technology and policy, but on workforce systems that reflect and support the communities they intend to serve.

References

- Crenshaw, Kimberlé. 1989. “Demarginalizing the Intersection of Race and Sex: A Black Feminist Critique of Antidiscrimination Doctrine, Feminist Theory and Antiracist Politics.” *University of Chicago Legal Forum* 1989 (1): 139–67.
- DOE (U.S. Department of Energy). 2024. *United States Energy and Employment Report 2024*. Washington, DC: U.S. Department of Energy. <https://www.energy.gov/policy/us-energy-employment-jobs-report-useer>.

- E2, American Association of Blacks in Energy, Energy Efficiency for All, BW Research Partnership, Alliance to Save Energy, and Black Owners of Solar Services. 2021. Help Wanted: Diversity in Clean Energy. Washington, DC: E2.
- Glasmeier, Amy K. 2024. Living Wage Calculator. Cambridge, MA: Massachusetts Institute of Technology. livingwage.mit.edu.
- IREC (Interstate Renewable Energy Council). 2024. National Solar Jobs Census 2024. Albany, NY: Interstate Renewable Energy Council.
- Last, Athena Nicole. 2025. A Case Study of the New Flyer of America Inc. Community Benefits Agreement: Lessons Learned in the Bus Manufacturing Industry. Los Angeles: Jay Mehta Community Benefits Agreement Resource Center, Jobs to Move America.
- McDowell, Brinn, Jeremy Stefek, Elena Smith, Bailey Pons, and Quaran Ahmad. 2024. National Wind Energy Workforce Assessment: Challenges, Opportunities, and Future Needs. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5000-87670.
- Muro, Mark, Adie Tomer, Ranjitha Shivaram, and Joseph W. Kane. 2019. Advancing Inclusion through Clean Energy Jobs. Washington, DC: Brookings Institution Metropolitan Policy Program.
- NASEM (National Academies of Sciences, Engineering, and Medicine). 2024. Accelerating Decarbonization in the United States: Technology, Policy, and Societal Dimensions. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25931>.
- Pollin, Robert, Jeannette Wicks-Lim, Shouvik Chakraborty, Gregor Semieniuk, and Chirag Lala. 2023. Employment Impacts of New U.S. Clean Energy, Manufacturing, and Infrastructure Laws. Amherst, MA: Political Economy Research Institute, University of Massachusetts Amherst.
- Sanchez, Daphany, Alexandra Levine, and Laura Tajima. 2018. “Using Partnerships to Drive Energy Efficiency and Preserve Affordability.” In Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: American Council for an Energy-Efficient Economy.
- Symonds, William C., Robert B. Schwartz, and Ronald F. Ferguson. 2011. Pathways to Prosperity: Meeting the Challenge of Preparing Young Americans for the 21st Century. Cambridge, MA: Pathways to Prosperity Project, Harvard University Graduate School of Education.
- Wilson, William Julius. 1996. When Work Disappears: The World of the New Urban Poor. New York: Alfred A. Knopf.