

KEY RECOMMENDATIONS

Cultivating a Diverse and Skilled Talent Pipeline for the Equitable Transition

FEBRUARY 2023



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ABOUT IREC

The Interstate Renewable Energy Council (IREC) builds the foundation for rapid adoption of clean energy and energy efficiency to benefit people, the economy, and our planet. Its vision is a 100% clean energy future that is reliable, resilient, and equitable. IREC develops and advances the regulatory reforms, technical standards, and workforce solutions needed to enable the streamlined integration of clean, distributed energy resources. IREC has been trusted for its independent clean energy expertise for 40 years, since its founding in 1982. For more information, visit www.irecusa.org or follow IREC on [Twitter](#), [LinkedIn](#), or [Facebook](#).

ABOUT NCWE

The National Council for Workforce Education (NCWE) is committed to promoting excellence and growth in workforce education. Through strategies, actions, and policies that promote diversity, equity, inclusion, and justice, NCWE leads our members with innovative ideas and bold actions supporting their efforts to serve all members of their community inclusively, ensuring fair and equitable workforce education for all. And through partnerships with business and industry, and national leaders, NCWE assists our members in transforming workforce education programs to ensure student success and meet local labor market needs. NCWE is an affiliate council of the American Association of Community Colleges.

NCWE has been supported by a grant from the Bank of America Charitable Foundation. We are grateful for their support.

IREC would like to acknowledge with gratitude Dr. Debra Rowe and Evangeline Mengelkoch with NCWE for their counsel and innumerable contributions to the development of the Alliance.

The Alliance has integrated the findings of its predecessor convening—the National Roundtable on the Workforce for a Green and Inclusive Economy,¹ and employer studies led by the [Building Performance Association](#) and the [Solar Energy Industries Association](#).

Stock photos courtesy of Shutterstock, two cover photos courtesy of GRID Alternatives Greater Los Angeles, and logo design created with Canva.



Executive Summary

The [National Clean Energy Workforce Alliance](#) is the sole forum uniting stakeholders across the United States clean energy economy to improve recruitment, education, and placement outcomes, and ensure that the clean energy transition is inclusive of diverse and underserved communities. We are stronger and more efficient together as we learn from each other and from industries that have faced similar challenges. And, we have no time to waste; science is clear that we have a short window of time in which to avert the worst impacts of climate change.

Since January 2022, the Alliance has convened more than 500 employers, education and training providers, organized labor, community-based and energy justice organizations, workforce program designers and funders, and policymakers ([see list here](#)). These convenings are grounded in the assumption that the clean energy transition can and should be just and equitable. Proceedings acknowledge and seek to address the structural issues that currently prevent equitable access to clean energy technologies and jobs.

The Alliance is led by the [Interstate Renewable Energy Council \(IREC\)](#) and the [National Council for Workforce Education \(NCWE\)](#), independent national organizations that are recognized leaders in clean energy education and workforce development, with support from Bank of America.

With the goal of defining actionable solutions to shared workforce challenges, the Alliance has collectively identified and shared challenges, best practices, resources, and key information through structured, results-oriented meetings. [We invite you to join us!](#)

This report presents recommendations based on data collected from Alliance members through in-person and virtual meetings such as the [IREC Vision Summit](#), live polls, online surveys, and from literature review. The recommendations will help funders, program designers, and those implementing workforce programs to focus resources where they will be most impactful—and most supportive of a just transition. The recommendations integrate provisions to support the development of a diverse workforce inclusive of those historically left behind.

Summary of Recommendations

- 1 Provide resources and technical support to develop effective national, regional, and local workforce ecosystems**
 - a. Support employers by developing effective workforce processes
 - b. Support local communities with centralized resources and technical assistance
 - c. Fund local, state, and national consortia to coordinate productive workforce processes, connectivity of services, and information sharing
- 2 Conduct recruitment campaigns featuring clean energy workers as “energy heroes”**
- 3 Develop and promote career pathways for an inclusive workforce**
 - a. Make career exploration resources more readily available
 - b. Expand apprenticeship opportunities for clean energy occupations
 - c. Continue to invest in credentials and industry standards
- 4 Deploy standardized, industry-vetted curricular resources**
 - a. Support training providers with resources and technical assistance
- 5 Prioritize funding of effective training programs**
- 6 Integrate clean energy into existing education and professional development pathways**
- 7 Drive recruitment and retention by prioritizing job quality**
 - a. Foster greater connectivity between organized labor and the clean energy industry
 - b. Provide resources and technical support for employers

Summaries of Findings from the Alliance’s Initial Convenings:

- Employers
- Training and Education Providers
- Community-based Organizations

- 8 Include workforce provisions in climate and energy policy**
- 9 Promote inclusion through increased coordination of federal and state resources**
- 10 Support comprehensive clean energy workforce data collection and analysis**

Background

As the urgent need to address the climate emergency takes center stage, we stand on the cusp of the most significant growth the clean energy industry has seen. The clean energy sector will need to add more than 400,000 workers annually over the next 12 years to meet bold energy goals, driven in part by recent federal climate legislation.² A recent Report of the House Select Committee on Economic Disparity and Fairness in Growth cited clean energy as an in-demand occupation already suffering from lack of workers.³ Hundreds of billions of dollars of investment are flowing into the clean energy industries following the passage of the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA). Addressing hiring challenges and building a robust, diverse pipeline of well-trained workers will be essential.

Hiring challenges for the clean energy industry have been a recurring theme over the last decade. A January 2022 poll of the National Clean Energy Workforce Alliance⁴ indicated that top barriers to clean energy growth are a lack of skilled workers and awareness about clean energy careers. This trend is further supported by the *National Solar Jobs Census 2021*⁵ published by the IREC, which found that 89% of solar employers reported that it was “somewhat” or “very” difficult to fill their job openings, with 49% citing the small applicant pool as the most significant reason. Additional barriers must be overcome to include populations that are currently underrepresented in the clean energy industry, which is presently less diverse than the broader economy.⁶

There are a number of reasons that the supply of skilled workers has not kept pace with available jobs. Lack of awareness about opportunities for family-supporting, innovative careers in clean energy fields is a top barrier. Even where awareness or interest exist, pathways into the clean energy careers are not clearly defined or widely promoted and potential workers cannot consistently identify credible information about training and jobs. Compounding these challenges, the American educational system has long disincentivized and even stigmatized careers in the trades.

Other Solutions From Alliance Members

Bloccpower Civilian Climate Corps: <https://www.bloccpower.io/workforce-development>

Bonneville Environmental Foundation: <https://cebrightfutures.org/>

Delaware Technical Community College: <https://go.dtcc.edu/energy>

Emerald Cities Collaborative:
ACES Program: <https://emeraldcities.org/our-work/architecture-construction-engineering-students-aces/>
HVAC/R Training: <https://emeraldcities.org/our-work/hvac-r-training/>

Northeast Energy Efficiency Partnerships Equitable Workforce Best Practice Guidance: <https://neep.org/equitable-workforce-best-practice-guidance>

Pennsylvania College of Technology Clean Energy Center: <https://www.pct.edu/business/clean-energy>

South Union CDC, Houston: <https://www.southunioncdc.org/>

Stacks + Joules, New York City: <https://stacksandjoules.org/>

2. <https://www.wri.org/insights/us-jobs-clean-energy-growth>

3. <https://www.govinfo.gov/content/pkg/CRPT-117hrpt619/pdf/CRPT-117hrpt619.pdf>

4. <https://irecusa.org/wp-content/uploads/2022/04/National-Clean-Energy-Workforce-Alliance-Employer-DeBRIEF.pdf>

5. <https://irecusa.org/programs/solar-jobs-census/>

6. <https://www.energy.gov/policy/us-energy-employment-jobs-report-useer>

Recommendations

1 Provide resources and technical support to develop effective national, regional, and local workforce ecosystems

Successful workforce development programs include a range of interconnected stakeholders in sustained relationships, utilizing effective processes to address the full workforce lifecycle (Figure 1). This helps ensure labor demand and labor supply are aligned, that education and training are correlated to available jobs, and that wraparound services⁷ are available for those who need them. While necessary for the acceleration of the clean energy transition, a healthy workforce ecosystem is especially important to remove barriers for diverse and other underrepresented workers.

CLEAN ENERGY WORKFORCE ECOSYSTEM

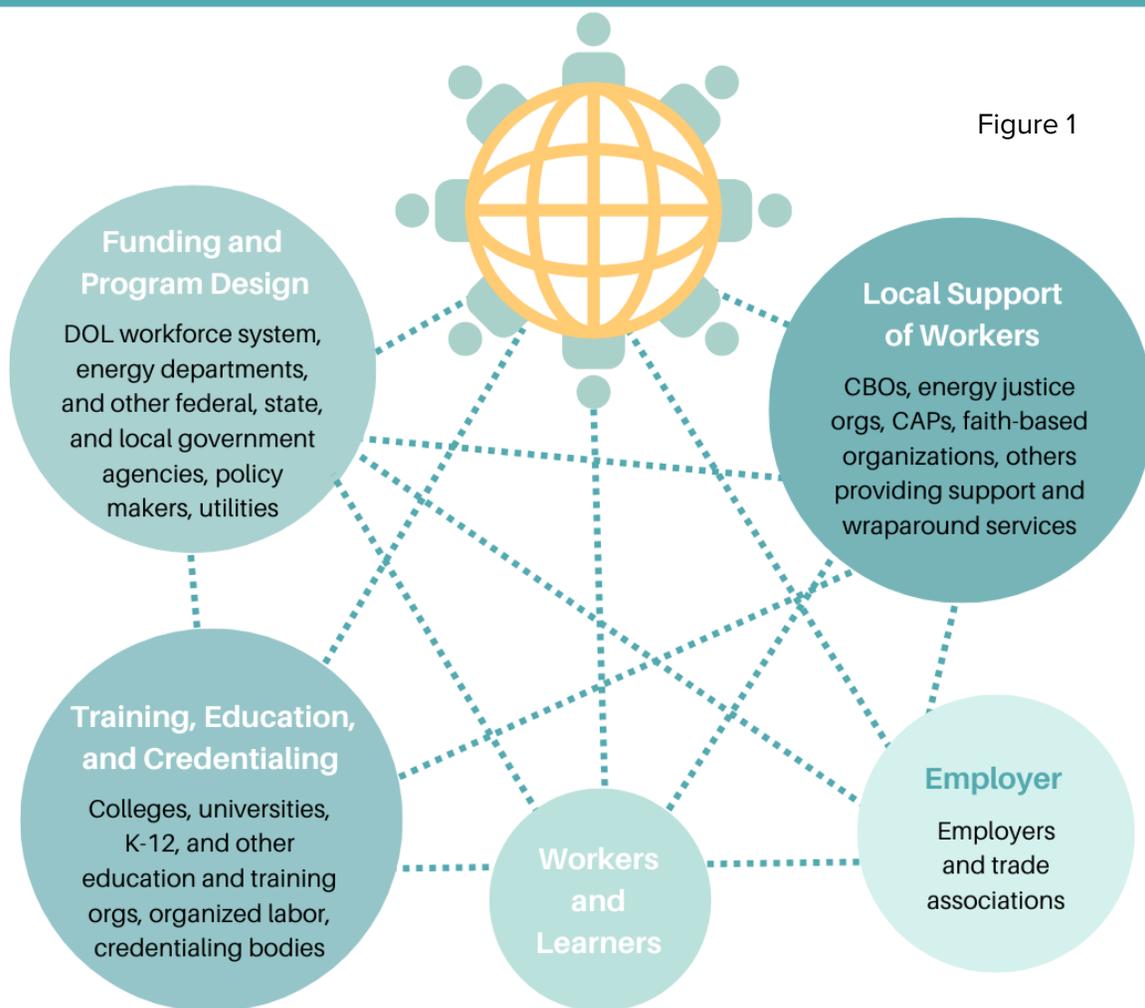


Figure 1

7. Services generally provided by state or federally funded programs to remove barriers to workforce entry. These include employability skills training, career counseling, transportation, childcare, and other support.

Stakeholder collaboration needs to be intentionally planned, executed, and maintained. Effective program and project design reflects that. The U.S. Economic Development Administration's Good Jobs Challenge⁸ 2022 funding opportunity under the American Rescue Plan illustrates how effective programming can spur development of local and regional workforce ecosystems. It expands opportunities across diverse populations, regions, and communities, focusing on coordinated and comprehensive approaches to removing systemic barriers for workers, through support services such as childcare and transportation and opening doors to a variety of paid on-the-job training opportunities.

Support employers by developing effective workforce processes

Clean energy employers are busy and cannot sit on multiple advisory committees and navigate difficult job placement processes. They need a streamlined way to connect to community-based organizations (CBOs) and training and education providers. Well designed local, regional, and national consortia can create the required streamlined processes, reducing the burden on employers while producing successful communications and outcomes.

Support local communities with centralized resources and technical assistance

It is incumbent on national and regional government and non-government entities to provide centralized resources and support to facilitate productive workforce processes at the local level. These resources should include but not be limited to funding, direct technical assistance, effective partnership models, curricular resources and teaching aids, career exploration resources, multimedia assets, educational resources and events, train-the-trainer activities, and best practices guidelines.

It is critical that the clean energy transition include increased support for CBOs that provide coordinated and synergistic wraparound services to diverse job seekers in underserved communities. *Building capacity* for existing, already overtaxed and understaffed CBOs will be necessary, so they can meet the increased need to support entry-level and transitioning workers (see [Recommendation 9](#)). To enhance success rates and meet the urgent need for streamlined services for potential employees, priority should be given to entities providing comprehensive services for learners and workers, such as the [Community College of Philadelphia Single Stop Center](#).

Strategies to Build Effective Community Partnerships for Workforce Development

The engagement of organizations in communities across the U.S. who provide employability skills, training, and other wraparound services is a critical component of the clean energy transition. Individuals within such organizations are best positioned to secure the trust of and provide guidance to learners and workers pursuing clean energy careers. At the same time, they frequently lack the capacity to seek new partnerships. In addition to funding capacity building, potential partners can incorporate the following strategies when engaging CBOs:

1. Engage trusted partners. Identify your target audience(s) and prioritize working with the organizations already serving them in your community.
2. Approach community partners with an open mind about what is needed to effectively collaborate.
3. Listen. Take direction from community partners on program design and implementation.
4. Show up. Attend events where the target audiences and organizations will be present.
5. Cultivate community partnerships as sustainable relationships, not isolated transactions.

8. <https://www.eda.gov/funding/programs/american-rescue-plan/good-jobs-challenge>

Partnerships in Action: GRID Alternatives and Homeboy Industries

Alliance member **GRID Alternatives**, the nation's largest nonprofit workforce and clean energy installer, is based in Oakland, California with offices across the U.S., in Tribal Nations, and internationally. GRID partners with community-based organizations like Los Angeles-based **Homeboy Industries**, the world's largest gang rehabilitation and re-entry program. This important partnership includes providing critical wraparound support and trauma-informed interventions, which leads to long-term individual and community prosperity. GRID's commitment to diversifying the workforce is rooted in the idea that a just climate movement should be for people and by people.



Photo courtesy of GRID Alternatives Greater Los Angeles

Fund local, state, and national consortia to coordinate productive workforce processes, connectivity of services, and information sharing

More than a decade ago, the UC Berkeley Labor Center called for creation of a “national center for a clean energy workforce,”⁹ a recommendation the Alliance supports. In addition, local and regional consortia can work together to leverage funds and maximize results. This will help reduce redundant requests of already overburdened employers and community organizations.

National consortia focused on effective workforce processes, like the Alliance, are needed to facilitate the development of centralized resources, disseminate best practices, provide technical assistance, and reduce duplication of effort. Other examples of effective consortia at the national level include the **U.S. Department of Energy's Better Building Workforce Accelerator** and **Service Year Alliance**. Another consortium, **Clean Energy Workforce and Education Alliance**, will publish recommendations in March 2023 for the K-12 coordination needed to enhance clean energy career exploration and advising.

A critical role of such consortia is to scale tested and vetted solutions. During the Alliance's convening at the **IREC Vision Summit** in October 2022, the assembled experts generally agreed that while many of the strategies needed for success are already available, the financial resources and coordination to deploy them at scale remains a challenge.

9. <https://laborcenter.berkeley.edu/the-national-center-for-a-clean-energy-workforce-a-scoping-study/>

Other Consortia

Building Efficiency for a Sustainable Tomorrow (BEST) Center: <https://www.bestctr.org/>

Center for Renewable Energy Advanced Technological Education (CREATE): <https://createenergy.org/>

Climate Literacy and Energy Awareness Network (CLEAN): <https://cleanet.org/index.html>

Municipal Water District of Orange County (MWDOC) Water and Energy Education Alliance (WEEA): <https://www.mwdoc.com/water-energy-education-alliance-weea/>

Virginia Energy Workforce Consortium: <https://virginia.getintoenergy.com/>

2 Conduct recruitment campaigns featuring clean energy workers as “energy heroes”

The clean energy industry plays a critical role in saving our planet, yet these career opportunities are some of our nation’s “best-kept secrets.” Saving the world and being a climate or energy “hero” are important to many of today’s job seekers, but it is also critical to address other drivers like job quality (see [Recommendation 7](#)). The non-energy impacts of the clean energy transition on the health and resilience of communities should also be emphasized. Robust government and non-government investment is needed to introduce the clean energy industry to new and transitioning workers, including those displaced by the shift from fossil fuels to clean energy. These campaigns are also needed to reach teachers, administrators, career counselors, parents, faith leaders, and other stakeholders who contribute to career decisions.

Multimedia and multi-channel campaigns should be launched at the national and regional level, featuring messaging developed in collaboration with the target audiences. Where youth are

targeted, outreach must include the technology platforms they frequent, coupled with the language they use. Outreach campaigns will be most effective when they include stories about real people, including diverse workers at all experience levels, so job seekers see themselves reflected in the industry.

Effective recruitment programs, such as those employed by New York City training provider [Solar One](#), leverage instructors and other staff who are members of the communities in which they are recruiting. This and partnerships with organizations who have already earned the trust of the community are the key to Solar One’s successful model of integrating solar education tied to emerging clean energy careers into CTE programs. Its team has served 2,700 students in 15 schools since 2016.

Marketing efforts should be inclusive of the full range of occupations needed—not just entry-level or technical positions—to demonstrate the potential for a sustainable career in this sector.



IREC VISION SUMMIT 2022



At the IREC Vision Summit, the Alliance heard from Francisca Peral, an instructor and graduate of [Stacks + Joules](#). Fran related how she grew her confidence and skills by participating in an all-women cohort engaged in hands-on learning. In addition to training on building automation technology and software, Stacks + Joules provides internship and job placement support, and provides mentoring for entering workers.

“ I was struggling with school and what I wanted to do in life. Stacks + Joules was a different type of teaching. It was welcoming. It made me comfortable ... and not intimidated. I graduated and saw how I could fit in and be part of something. ”

3 Develop and promote career pathways for an inclusive workforce

Even when awareness or interest exist, pathways into clean energy careers are not clearly defined or widely promoted and potential workers cannot consistently identify credible information about training and jobs. As a nascent industry, clean energy lacks standardization of occupation titles and skills requirements. For instance, not all industry occupations are listed on the U.S. Department of Labor’s (DOL) tool for

career exploration and job analysis, [O*NET](#). Lack of development of standardized job classifications results in clean energy job data that is more challenging to analyze. There are inconsistent results when job seekers use the job search tools most readily available to them, since employers do not always have a shared, standard definition of the jobs they are posting. Lack of information makes it difficult for job

seekers and incumbent workers to discern advancement pathways, an important aspect of positioning clean energy jobs as an appealing career opportunity.

Furthermore, structured employer-supported pathways, such as internships and apprenticeships, are underutilized by the industry and inconsistent across employers, making them difficult for job seekers to find and understand. There is an opportunity for established construction trade apprenticeships to embed more opportunities for learners to focus on specific clean energy technologies.

Make career exploration resources more readily available

High-quality career exploration resources, such as IREC's [Career Maps](#) and Slipstream's [Clean Energy Career videos](#) have been accessed by thousands of job seekers and those supporting them. Clean energy recruitment efforts can benefit from additional interactive recruitment and career exploration resources, such as short courses introducing clean energy topics, "Day in the Life" videos, skills assessments, career mapping tools, and easier and more centralized means to connect to training and jobs.

Educational resources to improve recruitment processes and raise awareness about clean energy careers should be created for training providers, teachers (including K-12), career counselors, and community-based organizations to encourage a more robust

talent pipeline.

In one example of a coordinated effort from our international colleagues, Solar Power Europe launched the [SolarWorks Platform](#) in 2022. The platform includes videos to introduce a range of solar jobs, and allows users to explore how their skills fit into those occupations. The platform also includes a means to connect users to training and jobs.

Clean energy leaders should collaborate with government and corporate entities that host popular job boards to increase visibility of the career exploration resources being developed. This should include U.S. DOL, which maintains a number of centralized job seeker resources; and private corporate entities, such as Indeed, LinkedIn, and others.

Expand apprenticeship opportunities for clean energy occupations

Now required by the IRA in order to access the maximum tax incentives for clean energy technology, registered apprenticeship programs (RAPs) are industry-driven, high-quality career pathways where employers actively participate in developing and preparing their future workforce. Apprentices can obtain paid work experience, classroom instruction, and a portable, nationally-recognized credential. Although there are currently very few clean energy-specific registered apprenticeship programs, this pathway is well developed in the construction trades for traditional occupations like electrician, HVAC technician, carpenter, and laborer.

Alliance members, including organized labor and the trades, are working to promote RAPs to more workers and employers and ensure that more union and non-union workers can participate in the clean energy transition. More and more employers will be able to "grow their talent from within," as ReVision Energy has done through its Electrical Apprenticeship Program,¹⁰ which is the first employer-sponsored apprenticeship program in the nation to provide the training required for renewable energy professionals to earn electrician licensure.

10. <https://www.revisionenergy.com/solar-company/solar-careers-and-training/electrical-apprenticeship-program>

In 2022, the Florida Solar Energy Center and the Florida Solar Energy Industries Association launched a [solar installer apprenticeship](#). This new program, approved by the State Apprenticeship Agency, is aligned with Florida's solar contractor license and is the first registered apprenticeship program for a solar-specific occupation. Union- and contractor association-sponsored programs are also incorporating clean energy technologies into their training curricula to ensure their members are qualified to work on these projects.

Work with a wide range of stakeholders is needed to ensure RAPs meet the evolving needs of the rapidly changing clean energy industry. Collaborations between industry, organized labor, training and education providers, and government will be needed to develop and deliver high-quality technical assistance that enables clean energy employers to utilize RAPs. The Florida solar

installer apprenticeship is a recent example of such collaboration.

In particular, coordination with and among the traditional construction trades, including organized labor, is essential to ensure that relevant clean energy competencies are incorporated in these widely-utilized training pathways. It will also be necessary to develop consensus on which job duties are relevant to each occupation. This is particularly important for multi-craft work like rooftop solar installation, where qualified workers need knowledge of general construction, carpentry, roofing, metal work, electrical, and information technology.

Apprenticeship Information

ApprenticeshipUSA, a program of the U.S. Department of Labor Office of Apprenticeships: <https://www.apprenticeship.gov/>

Continue to invest in credentials and industry standards

As a nascent industry, clean energy lacks a comprehensive and mature credentialing landscape to help workers demonstrate skills aligned with a variety of career pathways. Even when quality credentials are available, employer recognition has not sufficiently developed to ensure that investments in certification result in career advancement for workers. Important workforce development infrastructure, such as credentials and industry standards, including national skills standards such as job task analyses,¹¹ should continue to be developed with broad stakeholder input. Building out portable and “stackable” credentials that are recognized by employers and assist workers with skills

attainment and advancement opportunities should continue to be a priority. In addition, building out credentialing frameworks will help institutionalize better quality training and education.

Industry Credential Information

Better Buildings Solutions Center listing of clean energy credentials: <https://betterbuildingsolutioncenter.energy.gov/workforce/credentials>

National Center for Construction Education and Research NCCER: <https://www.nccer.org/get-involved/individuals-seeking-training/industry-recognized-credentials>

11. A JTA is a formal, industry-accepted study, validated by a group of subject-matter experts that defines competencies in knowledge, skills, and attitudes as the basis for education/training curricula.



4 Deploy standardized, industry-vetted curricular resources

Creation of standardized curricular resources for adaptation and use by a range of training providers will help reduce duplication of effort and improve the consistency and quality of training. Participation in the development of standardized curricula that align with key industry standards is an effective use of limited employer time.

Although wider availability of centralized resources is a start, training providers should incorporate experiential learning. Centralized curricular resources should be able to be tailored to a specific audience and integrate opportunities to practice job tasks under the guidance of experienced professionals.

Well-designed online learning¹² will help build capacity by cost-effectively reaching a large and geographically disparate audience.

Support training providers with resources and technical assistance

Availability of standardized curricular resources needs to be coupled with ongoing technical support and resources for training providers to ensure effective training practices. For example, IREC's [Solar Training Best Practices Series](#) gives comprehensive guidance to training providers establishing new solar programs.

Curricular Resources

IREC resources on developing interactive online training: <https://irecusa.org/online-training-development/>

U.S. DOE Building America Solution Center: <https://basc.pnnl.gov/>

New York State Energy Research and Development Authority (NYSERDA) Clean Energy Training Resources: <https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Workforce-Development/Resources>

U.S. DOE Building Science Education Solutions Center: <https://bsesc.energy.gov/training-modules>

12. <https://irecusa.org/online-training-development/>

Alliance Data on Curricular Gaps

Poll conducted during March 2022 meeting

What in-demand curricula are you missing?

1. Energy storage
2. Electric vehicle (EV) / EV infrastructure
3. Heat pump

What are the job roles corresponding to the curricula you need?

1. Installer / construction
2. Project manager
3. Operations & maintenance (O&M)

5 Prioritize funding of effective training programs

Funders and program designers should invest in well-designed, industry-validated training that meets an identified need and has the potential to scale. They are encouraged to avoid prescribing a certain strategy or delivery method in favor of incorporating multiple approaches to reach the most diverse base of learners, and meet learners where they are with regard to time and resources. For instance, for some busy professionals, self-paced, on-demand online training is appealing. Other learners may thrive in instructor-led environments.

The training provider should be able to accurately describe the rationale for the training and the recommended delivery method. They should demonstrate how the training curriculum and practices are culturally responsive and tailored to the needs of the audience, including multilingual content offered in a variety of formats to meet the needs of the learner.

Training cost and time off of work to attend training are barriers to building skills. To accelerate the growth of the workforce, learners need access to many more opportunities for *paid* on-the-job training (OJT) experiences, including but not limited to internships, fellowships, and apprenticeships. Paid OJT ensures more equitable access to career-enhancing learning opportunities, rather than limiting them to those who can “work for free.”

For a comprehensive look at what constitutes quality clean energy training, IREC, an ANSI-accredited standards developer, maintains a [national standard for training providers](#).

Attributes of Quality Training

- Created with industry/ employer input and validation
- Developed using a research-supported instructional design process
- Aligned with a defined occupation that is in-demand in the relevant market
- Based on standards, certifications, and/or input from subject matter experts
- Includes evaluation that measures acquired knowledge and skills
- Provides opportunities to practice job tasks and make decisions as learners would on the job

Photo: Utility-scale solar tour with Fluke



6 Integrate clean energy into existing education and professional development pathways

The skills required for clean energy careers are not all specific to clean energy occupations. Many of the skills are currently taught, albeit without introduction to their relevance to clean energy technologies. Since clean energy is not a traditional academic discipline, relevant clean energy information often must be included in existing curricula and programs at all levels of training, education, and professional development to get the attention it needs.

Integrating clean energy education and training into existing programs results in a more resilient program that is less vulnerable to political shifts in resource allocation. Technical programs where this has worked well include: electrical, architecture, construction, HVAC/R, pre-engineering and engineering, agriculture, business, and automotive. This strategy introduces clean energy topics to a larger population while offering learners a broader and more flexible skill set. These integrated programs ideally include information on why clean energy is needed and market trends and legislation that promote clean energy to prepare learners for informed participation in the clean energy economy.

Outreach is needed to presidents and deans of colleges and universities, state and federal departments of education, professional trade associations, unions, developers and publishers of educational materials, and other stakeholders to promote the value and urgency of integrating

clean energy topics into education, job training programs, and professional development opportunities. To support this integration, faculty resources and technical assistance are needed. This includes updating educational materials, including assessments; access to career pathway information; and construction and updating of labs.

For example, the Pacific Northwest National Laboratory (PNNL) is leading a project to convene major textbook publishers with the goal of providing vetted clean energy content to include in mainstream textbooks. The [Illinois Green Economy Network](#) developed curricular modules on heat pumps, energy efficient buildings, and solar. Faculty can use these modules in multiple ways: to recruit additional students into the field, to update their curricula, and to educate the public to build consumer demand.

Consortia Helping Education Programs Integrate Clean Energy

Sustainability Education, and Economic Development (SEED) Center: <https://theseedcenter.org/>

Center for Renewable Energy Advanced Technological Education (CREATE): <https://createenergy.org/>

Building Efficiency for a Sustainable Tomorrow (BEST) Center: www.bestctr.org



7 Drive recruitment and retention of workers by prioritizing job quality

A critical element of the just transition is ensuring that the available jobs are high quality, including family-sustaining salaries and benefits and a safe and supportive work environment. Beyond salary and benefits, company culture is important to retaining workers. Changes are needed to support new and diverse workers. Focusing on job quality benefits both the worker and the employer, who will experience improved work outcomes as a result of better qualified and higher-performing staff.

Focusing on job quality benefits both the worker and the employer.

Federal policy, such as the IRA, and state and local policies that mandate fair labor practices for clean energy development are important drivers of job quality (see [Recommendation 8](#)). Where mandates do not come into play, there are other key strategies to support employers who understand the benefits of positioning themselves as “preferred employers” in a competitive marketplace.

Foster greater connectivity between organized labor and the clean energy industry

In 2021, 10% of solar and 11% of energy efficiency workers were represented by a union or under a project labor agreement (PLA). Although studies of the experiences of union versus non-union workers specific to the clean energy industry are just getting underway, we know from adjacent sectors that union workers benefit from higher salaries and greater access to medical insurance and other benefits. Data also shows that increased participation in unions increases wages across a sector.¹³

This data supports that access to union pathways for more workers in clean energy will have a positive impact on job quality. Even where union opportunities are not available, employers can influence job quality by voluntarily adhering to labor practices such as offering prevailing wages and leveraging registered apprenticeships. These strategies are particularly important given that union participation is not as common on residential

projects. If we do not implement drivers of job quality other than union participation, we risk a bifurcation between residential and larger projects, where smaller jobs have less supported and ultimately less qualified workers.

Two areas of collaboration are recommended by the Alliance to unite union and non-union shops to address workforce needs. One is to ensure alignment of training and training standards through collaborative efforts including a broad range of union and non-union stakeholders. The second is the further development of pre-apprenticeship models and programs leading to clean energy and related RAPs. For instance, in 2022 Job Corps announced an expansion of their [pre-apprenticeship opportunities](#) for high-growth sectors, including clean energy. In partnership with construction trades unions and other stakeholders, students spend a year developing employability and technical skills to prepare them to succeed in a variety of RAPs.

13. <https://www.dol.gov/general/workcenter/union-advantage#:~:text=Unions%20raise%20wages%20for%20all,%241%2C169%2Fweek>

Provide resources and technical support for employers

More educational resources and technical support for clean energy employers are needed to help promote effective recruitment, development, and retention processes. These resources should integrate content focused on building a diverse workforce. Examples include guidance on more effective collaboration with CBOs and training providers, assistance in deploying on-the-job training experiences, and resources to foster a welcoming workplace culture, such as the Solar Energy Industries Association's [Diversity, Equity, Inclusion, & Justice Certification Program](#).

Employers need support with integrating training as a driver of work quality and employee retention, rather than regarding it as a time commitment that detracts from profit-generating activities. When considering diversity in the workforce, employers can grow their candidate pool by reducing unnecessary barriers, such as blanket requirements for college degrees and prohibitions on engaging workers with prior justice system involvement.

Additional resources should be directed to minority- and women-owned businesses to support business development and other capacity-building activities. For example, Emerald Cities Collaborative's [Boston Contractor Academy](#) provides training and mentoring to BIPOC and women-owned businesses, while facilitating access to a range of energy efficiency, renewable energy, and building electrification projects.

Other Employer Resources

Renewables Forward: <https://www.renewablesforward.org/>

SEED Center's techniques for effective employer collaboration with community colleges: <https://theseedcenter.org/wp-content/uploads/2019/09/Connecting-with-3.pdf>

Alliance Members Focus on Equity, High Road Jobs at Vision Summit

On October 19, 2022, Alliance members and other clean energy leaders from government, businesses, nonprofits, and energy justice organizations convened at the [IREC Vision Summit](#). The goal was to pursue strategies for building and expanding a diverse clean energy workforce. Through panel discussions and interactive breakout sessions, participants advanced workforce solutions to address the climate emergency and expected surge in clean energy job opportunities.

A number of themes emerged as the experts in attendance envisioned the future workforce:

Intentionality. Effective workforce development does not happen by accident. This is especially true when you want job growth to be accompanied by gains for workers in communities who have not historically benefitted from clean energy. Attendees reinforced that workforce development must be planned for, coordinated, and executed in a strategic and thoughtful way.

Partnerships. The concept of the workforce as an ecosystem was frequently discussed, and participants acknowledged that our programs are only as strong as the partner networks upon which they are built. Potential strategies for effective partnerships with overburdened CBOs were shared by participants (see [Recommendation 1](#)).

Inclusion. To dramatically scale the workforce, clean energy will need to include new people and populations. These include but are not limited to black, indigenous, and people of color (BIPOC) individuals, opportunity youth, women, disabled individuals, U.S. veterans, and individuals with prior justice system involvement. “Banning the Box,” referring to removing checkboxes that require individuals to disclose their justice system involvement, was a frequently mentioned initiative to remove a key barrier for non-violent offenders to participate in the clean energy transition. In order to attract these new individuals to our industry, they will need to see themselves represented in our outreach.

Scaling. Participants commented that many of the workforce solutions we need to meet bold clean energy goals already exist either within clean energy or other industries, but that we lack the necessary coordination to scale these solutions.

Below: Panelists and participants discuss the future clean energy workforce at the 2022 IREC Vision Summit.



Workplace culture. Many of the breakout discussions focused on shifting culture to embrace employees as “whole people.” A more productive workplace culture results if employees have meaning, mission, and a purpose to their work.¹⁴ They need to feel part of a bigger picture, be included in the decisions about the future of the organization, and be afforded work-life balance. It was noted that outreach to and support of employers needs to support this paradigm shift from viewing employees as an asset to viewing them as whole people.

Systemic change. Attendees acknowledged that a significant change in how we focus our work is needed. They noted that the educational and other systems within which clean energy is growing are fundamentally flawed, and that we are part of driving change to improve inclusion and to remedy the current disconnect between the training and education workers receive and the skills needed by employers.



8 Include workforce provisions in climate and energy policy

Effective federal, state, and municipal clean energy goals include workforce policy and roadmaps¹⁵ describing the correlation between technology goals and the workforce needed to get there. For example, in 2019 the State of New York passed the [Climate Leadership and Community Protection Act](#) to reduce greenhouse gas emissions 40 percent by 2030 and no less than 85 percent by 2050. Included in the Act are provisions to ensure that 40 percent of benefits from clean energy investments go toward disadvantaged communities to secure a just transition. The Act prioritizes training programs for the state’s most underserved populations—low-income individuals, veterans, disabled workers, single parents, and individuals with prior justice system involvement—and will also help integrate workers displaced by the energy transition.

Workforce policies for the just transition should reinforce the desired balance between labor supply and demand by including provisions for the development of local and regional workforce ecosystems (see [Recommendation 1](#)). Policy provisions will vary, but should always include fair labor standards and diversity, equity, and inclusion provisions to ensure that job growth is accompanied by equity and prosperity gains.

The energy transition will not happen based on climate and energy policy alone. Synergistic labor, economic development, education, and other policies are needed to acknowledge and make provisions for the urgent need to transition to a clean energy economy.

15. <https://www.ilr.cornell.edu/news/research/climate-jobs-roadmap-nyc>

Resources for Policy Makers

ACEEE Cities and Clean Energy Workforce Development Topic Brief: https://www.aceee.org/sites/default/files/pdfs/cities_workforce_development_v2_0_2.pdf

American Cities Climate Challenge High-Road Workforce Guide for City Climate Action: https://www.usdn.org/uploads/cms/documents/workforce-guide_4.12.21_form.pdf

Center for American Progress How State and Local Governments Can Make Climate Jobs Good Jobs Fact Sheet: <https://www.americanprogress.org/article/fact-sheet-state-local-governments-can-make-climate-jobs-good-jobs/>

Cornell ILR Climate Jobs Institute’s Research and Policy Library: <https://www.ilr.cornell.edu/worker-institute/labor-leading-climate#research-and-policy>

National Governors Association Workforce Development & Economic Policy: <https://www.nga.org/bestpractices/workforce-development-economic-policy/>



9 Promote inclusion through increased coordination of federal and state funding

The clean energy industry is not fully leveraging the U.S. Department of Labor, state workforce funding sources, and other available resources due to lack of awareness and coordination. As the “new kids on the block,” clean energy does not have the mature networks and access to opportunities of more established sectors. Existing and new opportunities to provide support and wraparound services will need to be better leveraged if we are serious about engaging diverse workers and special populations, such as U.S. veterans, individuals with disabilities, and individuals with prior justice system involvement.

Better coordination between government entities funding workforce efforts is needed to ensure we leverage and scale existing resources and successes and reduce duplication of effort. Most “clean energy” workforce challenges are not unique and cross-sector solutions should be encouraged and promulgated. A coordinating entity for the clean energy workforce that is cross-cutting across agencies would help accelerate this coordination at the federal level, with similar roles recommended at the state and municipal levels.

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Additional coordination between funding entities can help accelerate the level of investment to expedite the growth of clean energy workforce development. This is increasingly necessary as the need to dramatically transform our energy systems becomes more urgent. New legislation such as the IRA and BIL move clean energy workforce development in a positive direction with a focus on quality jobs and fair labor practices. However, they are not yet accompanied by sufficient investment in the workforce infrastructure needed to support clean energy goals. For instance, apprenticeship provisions in the IRA will require significant outreach and stakeholder coordination to implement effectively. While some of these costs can and should be borne by employers, centralized resources and support are critical to accelerate and scale quality solutions.



10 Support comprehensive clean energy workforce data collection and analysis

More comprehensive clean energy job and labor market research available in a centralized location is needed. With it, workforce efforts can be more responsive and resources can be targeted where there is the most need. This will help avoid the missteps of the past, in which training opportunities did not align with employer needs or a sustainable career. Better data and tracking will help measure the effectiveness of individual programs and progress against industry goals, such as increased diversity of workers. Workforce funding needs to include provisions for longitudinal tracking of learners and job seekers. Funders are becoming more sophisticated in what they are asking their grantees to track, but are not necessarily supporting that structurally.

U.S. DOL efforts to expand and update clean energy job classifications should be accelerated with support from industry. This will help lead to the standardization of job classifications and titles that is needed to better measure workforce trends and data.

Clean Energy Job Market Data and Sample Studies

IREC 2021 Solar Jobs Census: <https://irecusa.org/programs/solar-jobs-census/>

E4 the Future 2022 Energy Efficiency Jobs in America: <https://e4thefuture.org/energy-efficiency-jobs-in-america-2022-setting-the-stage-for-transformation/>

U.S. Energy and Employment Report (2022): <https://www.energy.gov/policy/us-energy-employment-jobs-report-useer>

Conclusion

We have our work cut out for us to overcome workforce challenges and build an inclusive and vastly larger pipeline of highly-trained workers prepared to deliver on the promise of a just transition to a low-carbon economy.

Fortunately, many effective workforce development strategies already exist, such as those featured in this report, which have been vetted by members of the Alliance and beyond. As we enter a bold new era of climate action, the key will be for funders to allocate resources wisely, and for other workforce stakeholders to plug into shared resources, best practices and collaborative networks of professionals facing similar challenges. The National Clean Energy Workforce Alliance is building a community for this purpose. [We invite you to join us.](#)

[Click Here for the List of Active Alliance Member Organizations](#)



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<https://irecusa.org/programs/the-national-clean-energy-workforce-alliance/>