

Summary: Solar Energy Technologies Office Workforce Request for Information and Convenings

July 2021

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Overview

On May 4, 2021, the U.S. Department of Energy (DOE) Solar Energy Technologies Office (SETO) published a Request for Information (RFI) on programs that support the development of a diverse and skilled clean energy workforce. The purpose of the RFI was to solicit feedback from industry, academia, government agencies, worker organizations (including unions), and other stakeholders on issues related to the employment needs of the solar industry, and the perceived value of different workforce development programs, training strategies, and tools.

To supplement the RFI, SETO hosted four virtual convenings that brought together the utility-scale solar industry, the distributed generation solar industry, and labor and other workforce training organizations to hear direct feedback on the questions in the RFI. In addition, SETO held listening sessions with about a dozen other organizations and staff who could not participate in the virtual convenings. Altogether, SETO received 45 responses from the RFI and heard directly from 80-100 other stakeholders via the convenings and listening sessions. This document summarizes the stakeholder feedback that SETO received as a result of this process.

While both the RFI and convening series were focused on solar deployment and solar industry members, much of this information is relevant across clean energy technologies and programs. It is important to recognize that DOE is intentionally reviewing our workforce development programming and support to focus on clean energy careers more holistically.

Note: This document is only a summary of information gathered by the DOE. None of the information in this document is a commitment to perform work on any specific topic area. There is no potential funding tied to this document. DOE will use the information gathered to determine how and whether to develop future programming.

RFI Question 1: What job categories in the solar industry are the most in-demand (i.e., the types of jobs you hire most frequently)? What job categories are the hardest to find qualified candidates for (i.e., the types of jobs most difficult to fill)? What are the qualifications—educational background, experience, training, skills, and/or certifications—necessary to fill these positions?

Many companies relayed that almost every job category across their industry was in high demand, and that they were making plans for additional hires in construction, skilled trades, business development, and a wide variety of office positions. In general, photovoltaic (PV) installer positions were identified as one of the most in-demand labor categories. For both larger-scale utility and distributed generation systems, developers described an enormous demand for on-site workers. Tasks involved transporting, placing and bolting modules to racking systems, installing racking/tracking systems, driving piles, and operating equipment. Qualifications required for a PV installer position include a high school education/GED, basic construction knowledge and experience, and the ability to learn safety protocols and PV installation basics.

The most common certifications associated with these positions included those from the North American Board of Certified Energy Practitioners (NABCEP), the National Center for Construction Education and Research (NCCER), and Occupational Safety & Health Administration (OSHA 10). Some companies indicated these certifications were not always necessary for entry-level positions, and some employers preferred to train their employees in-house.

Some companies said that on-site construction accounted for the vast majority of the labor needed for new solar installations, while others said that for every on-site laborer, several more were needed behind the scenes, in the office, making sales, designing systems, securing permits, managing logistics, and planning business strategy. Residential, commercial, and industrial solar sales positions were described as other frequent hires and positions that do not require a college degree. Other in-demand positions were listed as project designers, field technicians, and team leads. Project supervisors were described as needing at least five years' experience in management and field construction, typically a college degree, and specific skills in logistics, engineering, contract administration, and scheduling.

Electricians were commonly identified as one of the most difficult positions to fill, especially those with solar experience and a valid state certification. These jobs are in especially high demand, because certain states require licensed electricians to be on site or to perform certain job functions. Licensed electricians were typically expected to have 4-5 years of apprenticeship or similar training experience. Additionally, there is increasing competition across industries for electricians, including building construction, electric vehicles and associated infrastructure, and other growing industries.

Other difficult-to-fill positions were those that required a technical degree, including in data acquisition, electrical and mechanical engineering, product development, business operations, and finance. Skilled operations and maintenance technicians were identified as one of the jobs requiring the most specialization and training. Executive-level positions, often requiring an MBA or advanced business degree, were also difficult to fill.

Across the board, companies described fierce labor market competition. Workers with construction backgrounds are needed for many other types of infrastructure projects, and those with technical backgrounds compete for a wide variety of other high-paying careers. Utility-scale developers conveyed that the labor market was especially tight in rural areas, where they sometimes need thousands of temporary workers to complete large projects, and in new solar markets, where it can be difficult to find enough workers with the appropriate background and experience. SETO predicted this would become a recurring challenge, and that every state and region would need a strong and growing workforce supporting the solar industry in the years to come.

Another common theme that contributed to labor market challenges was the shifting location and seasonality associated with many solar jobs in many markets. As mentioned, larger projects often require a large workforce on a temporary job site, and some residential installers face challenges completing installations in snow and other adverse weather conditions depending on location, thus adding seasonal and locational variability to some careers in that sector as well. This makes it a challenge to prepare workers for stable careers in a single region and underscores the need for workers to have a broader skill set across many clean energy sectors.

All in all, many stakeholders cited labor market limitations as a major concern in rapidly expanding the solar market.

RFI Question 2: Has your company developed a diversity, equity, and inclusion (DEI) strategy and/or taken steps to hire and promote people from groups currently underrepresented in the workforce? Is there any support DOE could provide that would encourage your company to take those steps?

Many companies described impressive efforts to improve diversity within their workforce and create a more inclusive workplace environment. Companies have hired diversity officers, initiated DEI task forces, offered implicit bias trainings for hiring managers, undertaken targeted recruitment efforts at Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs), and pursued other efforts to engage and recruit members of under-resourced communities in their hiring efforts. In particular, many distributed generation solar companies saw that they had an enormous role to play in hiring from within local communities, as they looked to deploy solar on multi-family and affordable housing in low- and moderate-income communities, on Tribal lands, and in rural areas of the country. Some stakeholders affirmed that the solar industry was already more diverse than other energy sectors, such as oil and gas. Other respondents acknowledged that the solar industry had not done enough to increase the diversity of its workforce, but expressed confidence that the available data was a lagging indicator and that current industry-wide efforts would soon start to have a measurable impact. Overall, many stakeholders affirmed that a focus on DEI must play a critical role in efforts to expand the clean energy economy.

SETO welcomed various recommendations for how to continue to support this priority. Some stakeholders suggested that SETO could provide direct support to HBCUs, MSIs, or Tribal colleges through scholarships, equipment and lab support, industry networking opportunities, or other programs. Another proposal was for SETO to develop a roadmap to increase diversity and inclusion within solar companies. This would be particularly useful for small companies that do not have the resources to employ team members who specialize in diversity and inclusion.

Many stakeholders encouraged SETO to continue prioritizing training programs oriented around diverse and under-resourced communities, including previously incarcerated individuals and at-risk youth. Respondents emphasized that providing wrap-around services such as GED support,

safe and reliable housing, and crisis counseling, must be a critical component of these programs and that SETO must consider constraints related to providing these wrap-around services, such as training costs, transportation accessibility, IT availability, and dependent care. SETO was encouraged to make training programs available in other languages, particularly Spanish. Most important, stakeholders emphasized the critical need to partner with organizations already imbedded in diverse communities. Those organizations have community trust, can recruit program participants, and can provide general community outreach and education about the benefits of the transition to the clean energy economy.

SETO also received specific recommendations on creating mentoring programs to increase diversity in management and executive positions and in creating entrepreneurial ecosystems that will foster diversity in small businesses and start-up companies. One respondent recommended SETO convene industry executives in a high-profile event to obtain commitments from major companies to adopt more inclusive hiring practices. Others proposed that SETO certify or designate companies that take proactive steps to improve DEI outcomes and that SETO create a databank of information related to company DEI practices, so that companies could make more informed supply-chain decisions.

In general, SETO was urged to look beyond its traditional applicant pool and ensure it is open to diverse perspectives and backgrounds and receiving applications from a broad range of organizations. Other stakeholders recommended SETO include clearer diversity metrics within its funding opportunities and require awardees to set ambitious benchmarks for diversity and pay equity. Public recognition of intentional, thoughtful efforts and results could further incentivize best practices.

RFI Question 3: Does your company employ labor-union-affiliated workers? Why or why not?

Many companies involved in large commercial or utility-scale solar development indicated that they employ unionized labor as electricians, carpenters, iron workers, laborers, operating engineers, and similar roles. Union labor currently is used most often for projects over 5 megawatts (MW) in scale; small residential solar installers were much less likely to employ union labor. Experiences were more mixed in the commercial market, where some states and private customers require union labor on public projects. Many companies reported that they had positive experiences working with unions and found union members to be well-trained and reliable. One installer said that in their experience, the cost was comparable and the quality was better. It was also recognized that some unions have clear areas of expertise and optimal training programs, such as those related to building out high-voltage transmission systems. However, companies said that the availability of union labor varied widely by region, and in some parts of the country, particularly rural areas, it was much more difficult to hire union labor.

In general, many installers expressed apprehension about the potential union labor requirements linked to tax credits or other incentives. Installers cited concerns about higher costs, the lack of available, local union labor in certain areas of the country, and the administrative paperwork that could be required. Some installers pointed out that the margins on large-scale projects were only getting tighter and they needed to look for efficiencies and cost savings wherever possible. They further emphasized that costs increase with additional operational and administrative requirements and it was not their intention to reduce wages or benefits.

Most installers clearly indicated that they wanted to create good-paying jobs. Recognizing the current limitations to union labor nationally, some installers suggested utilizing prevailing wage requirements as union infrastructure catches up to labor needs across the country. Other stakeholders cautioned that even prevailing wage requirements should not be set for projects under 5 MW, as that could add significant costs to certain commercial projects. Installers urged that any union mandate at this time would stall rapid deployment efforts, but said they are open to working with union shops to help build on a more available local, unionized workforce. Many also felt that non-union employers already offered wages and benefits similar to the unionized workforce. And installers generally expressed their need to hire as many qualified people as possible and not have their hiring practices constrained by union requirements.

On the other hand, representatives of labor organizations suggested that perceptions of labor shortages were exaggerated. They suggested that the only real shortage was in low-skilled, low-wage workers, for “one-and-done” jobs. Union representatives said it was their job to create a sustainable workforce, with family-supporting wages, commensurate with the training their members received to prepare them for lifelong careers in the skilled trades. They also emphasized the higher quality and craftsmanship their members would bring to projects, and argued that “cheaper was not always better” if it means sacrificing quality that could lead to increased health and safety risks or higher maintenance costs in subsequent years.

Representatives of both industry and labor organizations recommended further analysis around cost differentials between projects built with union labor versus non-union labor or under prevailing wage requirements. They said to include an examination of life-cycle costs and benefits of union versus non-union labor, and compensation and benefits for renewable energy versus fossil fuel careers.

Beyond perceptions about wage and cost differences, installers cited a key concern related to the impact of union labor categories on project efficiency. Installers said they would typically pay construction workers to perform many different types of tasks, from installing racking equipment one day to bolting modules the next, and it was difficult to do this and maximize the efficiency of their operations if they were required to follow project labor agreements and have only certain workers perform certain types of tasks. This approach also allowed them to hire and train local

employees on multiple tasks, as opposed to potentially bringing in non-local union labor to complete several different types of tasks.

Union members suggested SETO could help facilitate the development of national collective bargaining agreements in partnership with industry similar to the Memorandum of Understanding that exists in California for ground-mounted solar photovoltaic systems between the five trades International Brotherhood of Electrical Workers (IBEW), Laborers' International Union of North America (LIUNA), Operating Engineers, Carpenters, and Ironworkers. Given that unions do not always have existing relationships with the solar industry in all parts of the country, SETO could play a critical role in bringing these sides together and help foster productive outcomes. Another proposal was for SETO to work with the Department of Labor (DOL) to help standardize labor classification requirements that could be integrated into project labor agreements.

Some stakeholders also pointed to union policies that prohibited members from having criminal records or past drug convictions as the reason that union programs were not well suited for providing opportunities to diverse populations. Some people felt that unions generally were not tied to their communities and sometimes lacked diversity. A few respondents provided positive examples of working with union chapters to facilitate union engagement with K-12 students or expand the diversity of union programs. SETO was urged to consider programs that would help union programs improve diversity and better connect with under-resourced communities. Some community-based organizations saw themselves not as competitors with unions, but rather, as well positioned to introduce members of their community to the solar industry, which could lead to increased interest in union membership and apprenticeship programs.

Overall, many respondents urged SETO to support multiple pathways or “on-ramps” into the solar industry workforce.

RFI Question 4: What do you believe would be the most effective use of DOE funding in supporting the clean energy workforce? What do you believe would be the most effective use of DOE funding intended to promote diversity and inclusion within the clean energy workforce?

Stakeholders suggested many different types of programs and actions that SETO could undertake to support the clean energy workforce generally, and specific actions to promote diversity and inclusion within the workforce. Most respondents were broadly supportive of additional training programs, in partnership with colleges and universities, community-based organizations, established training providers, or the labor community. Establishing new collaborations with industry and working with state-based job boards or other federal agencies, such as the DOL, was encouraged. Stakeholders provided a variety of recommendations for the format and focus of these programs, including pre-apprenticeship programs, work-based learning programs, and other training strategies. Many stakeholders highlighted the importance of providing multi-

faceted programs, to include previously mentioned wrap-around services for certain populations, educational programs that prepared participants for various careers in the clean energy sector.

Several stakeholders advocated for additional support to community-based organizations that were already in the field working on these issues and acutely in need of additional financial resources. Some of these organizations have specific areas of focus, such as formerly incarcerated individuals, at-risk youth, or disadvantaged or environmental justice communities. It was recommended that SETO look to form networks of these programs, partnered with minority-owned businesses, and establish environmental justice training hubs across the country. One critical theme that emerged among several stakeholders was the value in providing trainees with stipends or subsidized employment or compensation, so that many different types of people, particularly those from under-resourced communities, could have the financial resources to participate in the training program. Stakeholders emphasized the need for training programs to take into consideration the educational background and learning abilities of the worker and meet participants “where they are.”

One central recurring theme was the importance of SETO’s role in amplifying the opportunities available in the solar industry and broadening the funnel of people interested in clean energy careers. Of particular focus was SETO’s role in promoting clean energy careers among young people and people from diverse backgrounds, and starting early through vocational schools or other K-12 education programs. Stakeholders proposed bold ideas for communications campaigns, comparing them to World War II–style “We Want You” recruitment messages or modern-day Department of Defense Super Bowl advertising. Many stakeholders saw an opportunity for political leaders or celebrity ambassadors, as well as the federal government more broadly, to convey the dignity in blue-collar trade crafts and remind parents that a university education is not the only path to the middle class. Focusing on diverse leaders and role models in such a high-profile communications campaign could also be another way to help make the industry more inclusive. Highlighting the many benefits of union apprenticeship programs, one member said: “We’re the best secret out there, but we don’t have to be.”

Stakeholders also suggested a variety of research and analysis projects. Some proposals were for clean energy market research focusing on where careers in solar and other clean energy technologies were growing fastest, the most in-demand skill sets, expected wages, and growth opportunities. This analysis would allow colleges and existing training providers to prioritize resources and help generate increased interest in various career paths. One respondent proposed geographic information system (GIS)-based models that correlated solar resource availability, job growth, existing educational institutions, and employment characteristics to determine how to prioritize federal/non-federal workforce resources.

Others advocated for additional research on training best practices to help identify the most effective and nimble models, from within and outside of the clean energy industry, to engage

with local communities and build diverse training-to-job pipelines. SETO could administer a program to designate or certify companies or training providers that followed these best practices. Another idea was to fund an analysis of the most transferrable types of skills from fossil industry employment to the clean energy industry and explore where such programs would be most successful.

Many stakeholders applauded SETO's actions in issuing the RFI and hosting the convenings to hear from different stakeholders, and urged SETO to take further steps to bring the different groups together to better understand the Administration's priorities and each other's points of view. All stakeholders emphasized their interest in continuing to be a part of these conversations and offered to continue to provide their perspective and subject matter expertise.

Finally, some respondents recommended that SETO, perhaps in collaboration with other DOE clean energy programs, establish a public-private industry task force or advisory committee to study many of these issues and provide further recommendations on the optimal use of federal funding.

RFI Question 5: What training strategies do you believe are most effective: online learning, classroom and lab instruction, on-the-job training, hybrid models, etc.? Are there training models that you believe the DOE should fund?

The broad consensus from RFI respondents was that "hybrid" classroom/hands-on training programs were the most effective. Many people said that hands-on training with power tools, and the experience of being up on a roof, were essential to learning industry skills. Other material still required classroom instruction, and a hands-on testing environment was critical to enabling students to learn new skills without suffering real-world implications of falls or incorrect wiring. Industry partners noted that one challenge with hands-on training is the lack of experienced trainers. The solar industry is still nascent, and not many experienced installers and developers have moved on from manual work to training prior to or during retirement. Labor unions suggested that a craft approach could be a solution to the lack of solar-specific trainers. Coordinating with manufacturers can also be helpful in weaving technology-specific skills into a craft apprenticeship model approach.

Many organizations relayed their experience transitioning to virtual work environments during the COVID-19 pandemic, and some pointed to successful outcomes, but most were eager to return to in-person classroom instruction and hands-on training. Organizations that had shifted to online learning described higher levels of trainee attrition and less engagement and motivation.

Respondents disagreed on whether online/virtual learning was more or less accessible and inclusive, as such programs allow for flexible schedules, do not require traveling to training facilities, and can be accessed by people with disabilities. However, they require online computer access and broadband connectivity, and thus do not serve all communities.

SETO welcomed the participation of major national labor unions and learned about the success of their apprenticeship programs, which typically include a mix of classroom and on-the-job training, last two to five years, and require passing various exams to become certified within the union. Many labor unions have substantial training capacity, with hundreds of training locations across the country and sophisticated recruitment and job placement programs. The programs are wide-ranging and cover all the facets of a particular trade craft, with only about 5% of the training for the electrical apprenticeship focused on solar-specific skills. Many programs require apprentices to have a high school diploma or GED, pass a drug test, and be employed within the industry in order to participate. Unions emphasized that their recruits needed only “attitude and aptitude” to embark upon lifelong careers in the trade crafts. This model also requires industry to coordinate closely with unions to support the apprenticeship model and hiring practices.

Some union organizations advocated strongly for SETO to help encourage more unionization of the solar industry. They suggested that SETO could use procurement policies to facilitate project labor agreements or advocate for Congressional legislation that would tie union participation percentages or Davis-Bacon Act prevailing wage requirements to project eligibility for the investment tax credit or any other deployment subsidy. While SETO is primarily responsible for administering competitive funding opportunities from funds appropriated by Congress, the office welcomed the input from labor unions on these important policy considerations.

Other labor advocates suggested that SETO’s most important role is to simply amplify the message around the availability and benefits of apprenticeship programs that provide participants with the expertise and flexibility to work across many different sectors. Some suggested that under-resourced or minority communities are often less likely to be aware of the opportunities that unions provide. To address this, SETO could focus outreach and recruitment efforts in under-resourced schools, MSIs, HBCUs and community organizations. Another idea was for SETO to work with labor unions to fund specialized training that would allow electricians to become specialists in solar-plus-storage, electric vehicle storage, or other emerging technologies.

Other stakeholders advocated for SETO to work with the DOL and other agencies to help build a solar or clean-energy-specific apprenticeship program outside of the existing union framework. This would require developing baseline programs of study, identifying required skill sets, and working with the DOL to develop and define labor classifications. Proponents argued that only small portions of existing multi-year union apprenticeship programs focus on solar and renewable energy, and that this was not well-suited to all types of workers, as some people interested in a career in the solar industry may not have the inclination and time to participate in the union program. They argued that the time was right to establish a new framework for a national apprenticeship program focused specifically on the many different, in-demand careers within the clean energy industry.

Some stakeholders advocated for a hybrid approach in which SETO worked with the DOL to standardize solar and other clean energy job and wage classifications and facilitated consistent adoption across the country, allowing for a standardized prevailing wage approach to project labor agreements. Labor unions also suggested that SETO could support the expansion of training capacity and association training infrastructure to be fully developed and supported across the country.

From the RFI, SETO also learned about efforts to develop apprenticeship programs in Florida and Oregon and that there is a perception that national unions have attempted to block the creation of new apprenticeship programs. For this reason, they felt that more direct federal support would be critical to launching this type of national program. Ideally, in the mind of proponents, states would recognize a new national certification or apprenticeship program that could be potentially incentivized through procurement policies, labor agreements, and tax policies. Alternatively, some respondents urged DOE to consider supporting the formation of a new solar installer union or clean energy union that would centralize recruitment and create a new apprenticeship program.

Finally, other stakeholders felt that SETO should not attempt to prescribe the best training format or type of program, but should identify broad objectives and then let applicants, both union and non-union, propose different ways to achieve those goals.

RFI Question 6: Do you believe DOE support for curriculum standardization, certifications, career mapping platforms, which outline different career pathways in the clean energy industry, and/or other types of research and tools would be an effective use of government funding?

Many stakeholders cited the lack of curriculum standardization as a key challenge for the industry and urged SETO to foster the development of a national clean energy accreditation program that could be deployed through vocational schools, community colleges, or other training providers, and used to develop certifications to ensure that the solar industry has attractive and accessible career paths. Some organizations described this as an especially important need, because of the high costs and expertise needed for many organizations to develop new curriculum.

Respondents emphasized that there were many existing certification programs, and that SETO should not be looking to “reinvent the wheel,” but rather should look for ways to improve coordination and standardization among various programs. Some proposals called for SETO to help develop a national certification program for PV installation that would attempt to streamline requirements across different state licenses and establish baseline levels of solar knowledge. One proposal envisioned a broad-based training and fast-track certification program built around statewide curriculum standards and on-the-job training programs, which SETO could develop in partnership with industry and job research centers, then roll out in community colleges and in

partnership with union training facilities across the country. Additional links to consortiums of four-year colleges would further allow students to pursue stackable credentials, including other certifications, or advanced degrees in engineering and computer software. The DOE's Home Energy Professionals certification program was identified as something that SETO should look to emulate.

Respondents also recommended that SETO establish a clearinghouse with all available educational resources and learning platforms, or at a minimum, all those that SETO has funded. This would make a single entity responsible for the management and upkeep of educational resources and create a "one-stop shop" for anyone interested in the sector. It was emphasized that such efforts would have little value unless they were kept up-to-date through continuous funding, and that they were accompanied by a national, high-profile communications effort to highlight availability of these resources. Some recommended that SETO develop standardized textbooks and other curricula, or standardized textbooks for a young adult audience.

Other respondents highlighted barriers that could prohibit the creation of a standardized national curriculum related to differences in state licensing requirements, the variation in system design, and the skills necessary for solar deployment in different regions of the country, all with different climates and unique challenges. Others suggested that solar companies, technologies, and manufacturers often have unique practices and they might resist efforts at standardization, particularly for the more nuanced and customizable installation techniques. To address barriers related to the variability of solar installation requirements and licenses across states, some respondents advocated for SETO to collect, track, and document these regulatory differences to make it easier for solar companies to do business in new states and emerging markets.

Similarly, many respondents voiced support for new career mapping platforms, case studies, or other tools that help people understand various career pathways and opportunities and the associated training requirements. Such tools will help trainees, especially young people, understand the opportunities in the clean energy industry and find ways to move within and between industries. It could also help training providers understand the gaps between traditional electrical careers and more advanced clean energy technical skill sets, so that a curriculum could be developed specifically to address those gaps.

However, some respondents tempered the enthusiasm for advanced certifications and holistic career mapping platforms by suggesting that SETO support for introductory content and entry-level job placement would be the most effective way to help diverse communities get started in the industry. They said that training pathways, particularly for entry-level positions, were straightforward and widely understood. SETO was urged to act quickly and help create multiple pathways to help people get started in the industry.

Some stakeholders felt generally that curriculum standardizations, certifications, and career mapping efforts were unnecessary, as those things were already being addressed by

organizations such as NABCEP, Interstate Renewable Energy Council (IREC), and the Solar Energy Industries Association (SEIA). Solar companies and training providers expressed opinions on existing solar credentials, like NABCEP. Some companies felt that the training was valuable, and there was certainly a place for it. Other training providers felt that it could sometimes be prohibitively expensive for trainees and that many of the requirements were overly cumbersome and not necessary for entry-level PV installer jobs. Some felt that it was more important to place trainees in on-the-job programs and provide them the hands-on experience they needed to get started with a career in the industry.

RFI Question 7: Do you believe DOE support for virtual reality (VR) or artificial intelligence (AI) in learning programs would be an effective use of government funding?

Of all the responses generated through this RFI, there was the most divergence on the question of federal support for VR/AI-based learning programs. About half the respondents felt it was critical for SETO to embrace new types of learning technologies and enthusiastically supported emerging VR/AI-based learning platforms. These technologies were commonly described as the “wave of the future,” and proponents argued that the successful incorporation of these technologies would ultimately lower costs per trainee; reduce risks that are inherent in potentially dangerous outdoor electrical work; allow trainees to determine whether they’d be comfortable working on a residential rooftop; and increase accessibility to these learning programs by removing barriers associated with location and transportation.

On the other hand, a substantial number of respondents indicated federal support could be put to better use by supporting established on-the-job training and credentialing programs. Respondents felt that VR/AI was still an immature technology, best supported through private-sector research, and that such platforms were unlikely to be widely accessible due to high upfront costs for necessary training equipment.

One respondent pointed out that such programs often have implicit racial biases, and if such training programs were developed, it would be important to have HBCUs or other minority-serving organizations involved in the development of these programs.

RFI Question 8: How could DOE funding be used to support continued education, job placement, and wrap-around needs of the clean energy workforce and ensure that workers have pathways for growth and well-paying careers within the solar and other clean energy industries?

Stakeholders suggested that an employee-centered approach that fully supports employees through recruitment, skills training, mentorship, career mapping, prevailing wage/benefits, safety standards, and wrap-around services is critical to ensuring that workers have pathways to growth and family-supporting careers. Reducing barriers to entry, outreach to community-based organizations, facilitating transitions between clean energy jobs, supporting expansion of training

infrastructure, and standardizing requirements are also important elements of an effective training program. The key to optimizing training programs is to ensure that such an employee-centered approach is integrated with industry-driven requirements in terms of types of jobs/classifications, skills training, locations, and company culture.

Many respondents emphasized that funding for wrap-around services included basic job prep, technical literacy, and soft skills, as well as finding ways to provide career training, but that transportation needs, dependent care, psychological health, and other issues are often especially critical for under-resourced communities and generally more difficult to obtain than financial support for traditional workforce training, and therefore is an area where federal support is critical.

One proposal was to intentionally create cohorts of similar training programs for recent graduates, veterans, and returning citizens, and ensure that those programs shared resources and best practices and leveraged successful outcomes from one another's network, to ensure the longer-term sustainability of the program and continuous support for its participants. One research-oriented proposal was for SETO to better understand how people progress through careers in the solar industry and what types of additional training or credentials are the most valuable, and then prioritize supporting programs in those areas.

Another idea was for SETO to create no-cost leadership institutes for careers in the solar energy industry, or the clean energy sector more broadly. Such a program could be specifically designed to help people move from entry-level positions into management-level career tracks and focused on recruiting participants from under-resourced communities.

