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Clean Energy Apprenticeships and People with Disabilities

Opportunities for Apprenticeship Expansion

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The workforce needs of the clean energy sector in the United States are growing. To meet this sector's labor force demands, employers and workforce development professionals are seeking new approaches to train workers quickly and more effectively. The Partnership on Inclusive Apprenticeship (PIA) is an initiative funded by the U.S. Department of Labor's Office of Disability Employment Policy that seeks to expand access to one such approach: registered apprenticeships for people with disabilities in high-growth sectors (such as clean energy). This brief discusses the need and opportunities for building inclusive apprenticeship in the clean energy sector (box 1).

BOX 1

Research to Support the PIA Project

The Department of Labor set an aspirational goal that at least 7 percent of apprentices in registered apprenticeship programs should be qualified people with disabilities. To build evidence about inclusive apprenticeship opportunities throughout the U.S., the Office of Disability Employment Policy contracted with the Urban Institute to document the different models of inclusive apprenticeship planned or implemented, describe how apprenticeship programs are designed to be inclusive of disabled people, and learn what advice, resources, and assistance employers need to develop and maintain inclusive apprenticeship programs. The research project began in 2020 and will continue through 2024. This brief is the first in a series of publications on inclusive apprenticeship being released during the project.

Registered Apprenticeship Programs in the U.S. for People with Disabilities

Registered apprenticeship programs (RAPs) provide on-the-job learning and related instruction in specific occupations and deliver occupational skills that are recognized and transferable across employers. Apprentices are employed during their training, contribute to production, earn progressively higher wages, and receive an industry-recognized credential upon completion.[1] RAPs adhere to guidelines around the length of related instruction and on-the-job learning and meet other standards for registration set forth in 29 CFR part 29, and are registered by either the DOL Office of Apprenticeship or a federally recognized state apprenticeship agency (box 2) (Gardiner et al. 2021).

BOX 2

Elements of Registered Apprenticeship Programs

The elements of an RAP include the following:

- approval by the Office of Apprenticeship or a state apprenticeship agency, or sometimes both
- standards of apprenticeship that include the work process schedule; the on-the-job learning, related instruction, and apprentice wage progression requirements for the RAP; and other regulatory requirements for RAPs
- at least 144 hours of related instruction for each year of the apprenticeship in a physical or virtual classroom
- at least 2,000 hours of on-the-job learning overseen by a mentor at the employer's job site
- wage increases over the course of the apprenticeship (wage progression), which can be tied to time in the program or to demonstration of skill competency
- a work process schedule that outlines the major job functions, competencies, and/or hours an apprentice completes in the RAP
- an industry-recognized credential upon completion of the apprenticeship
- a sponsor to oversee the program, maintain fidelity to the standards of apprenticeship, and collect basic data on apprentices (sponsors can be employers, consortia of employers, unions, community colleges, state or local workforce agencies, or nonprofits)
- a written apprenticeship agreement between an apprentice and either the program sponsor or an apprenticeship committee acting as an agent for the sponsor

Sources: Title 29 CFR Part 29; Gardiner et al. 2021.

[1] Discover Apprenticeship," Apprenticeship.gov, last updated September 2020, https://www.apprenticeship.gov/sites/default/files/Career_Seeker_Fact_Sheet.pdf.

Registered Apprenticeship is expanding rapidly in the U.S.: between FY 2014 and FY 2023 the annual number of new registered apprentices almost doubled from 150,499 to 278,343.[2] Studies show that RAPs have positive outcomes for apprentices and employers (Kuehn et al. 2022; Walton, Gardiner, and Barnow 2022). Because of Registered Apprenticeship's promise as a successful workforce training model, DOL supports efforts to expand it to new industries (beyond construction) and to groups traditionally underrepresented in apprenticeships, including people with disabilities.[3]

Inclusive apprenticeship programs have all the elements of RAPs but are designed to support access and completion for apprentices with disabilities and other underrepresented groups. This includes using inclusive teaching practices for related instruction (such as using principles of Universal Design for Learning, an approach that accommodates the needs and abilities of all learners and eliminates barriers in the learning process) and ensuring all training materials are accessible.[4] Inclusive on-the-job learning design requires making workplace technology accessible and providing accommodations (e.g., modifying work schedules, buying or modifying equipment, and making worksite adjustments).[5] Box 3 summarizes one program sponsor's recommendations for making apprenticeships inclusive.

BOX 3

Examples of Inclusive Apprenticeship Practices

Down Syndrome Innovations (DSI) sponsors a registered apprenticeship program for industrial manufacturing technicians. Its recommendations for making apprenticeships inclusive are as follows:

- Start with **inclusive hiring practices**. An example is having sponsors or employers conduct "working interviews" instead of formal interviews, where applicants can tour the company, shadow someone in the role, and, when possible, try the job or a few tasks. This helps everyone know whether it's the right fit for an applicant.
- Once an apprentice is hired, make **onboarding practices** more hands-on. Instead of treating onboarding as a one-time event, divide it into shorter intervals to give the apprentice time to

[2] All national apprenticeship data come from "Data and Statistics," Apprenticeship.gov, accessed November 12, 2023, https://www.apprenticeship.gov/data-and-statistics. The data are frequently updated, so numbers could change.

[3] For example, the American Apprenticeship Initiative, launched in 2015, provided $175 million in five-year grants to increase apprenticeships in nontraditional industries and for underrepresented groups. "The American Apprenticeship Initiative (AAI) and AAI Evaluation: Background," Apprenticeship.gov, accessed November 12, 2023, https://www.apprenticeship.gov/sites/default/files/aai-background-document-final_0.pdf.

[4] "Universal Design for Learning," Cornell University Center for Teaching Innovation, accessed November 12, 2023, https://teaching.cornell.edu/teaching-resources/designing-your-course/universal-design-learning.

[5] A guide on how to design inclusive apprenticeships can be found here: "Designing Inclusive Apprenticeship: A Guide for Recruiting & Training Apprentices with Disabilities," Partnership for Inclusive Apprenticeship, accessed November 12, 2023, https://www.dol.gov/agencies/odep/program-areas/apprenticeship/pia/designing.

absorb the material. DSI also recommends allowing parents or employment professionals to be involved and provide support during the onboarding process, if appropriate.

- In terms of **accommodations for people with disabilities**, DSI recommends that employers provide job coaches who can give additional support, including visuals and prompts when needed. It is also important to train other employees on how to work with people with disabilities and give them a practical toolkit, so they become comfortable and confident. When the job coach role is no longer needed, coworkers become the natural supports. This builds sustainability and helps people with disabilities maintain their employment, even if things in the company change.

Source: Communication with the DSI employment coordinator, June 6, 2023.

Employment in the Clean Energy Sector

Concurrent with its focus on inclusivity and accessibility, the Biden administration is prioritizing the clean energy industry and clean energy jobs. For example, in December 2021 it released the Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, which specifies the role of workforce development: "Meeting the challenges of climate change and achieving the goals of this order requires an investment in the Federal Government's employees and a workforce with the knowledge and skills to effectively apply sustainability, climate adaptation, and environmental stewardship across disciplines and functions."[6]

In addition, the Infrastructure Investment and Jobs Act and the Inflation Reduction Act of 2022 prioritize investments and well-paying jobs in clean energy.[7] The Inflation Reduction Act specifically emphasizes RAPs by requiring that a certain percentage of labor hours be allocated to apprentices, increasing from 10 percent in 2022 to 15 percent by 2024. Moreover, some projects using Inflation Reduction Act funds that hire apprentices may receive tax benefits up to five times larger than projects that do not hire apprentices.[8]

[6] "Executive Order on Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability," WhiteHouse.gov, December 8, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/12/08/executive-order-on-catalyzing-clean-energy-industries-and-jobs-through-federal-sustainability/.

[7] "Apprentices 'Earn While they Learn' to Build a Clean Energy Future," U.S. Department of Energy, November 15, 2022, https://www.energy.gov/articles/apprentices-earn-while-they-learn-build-clean-energy-future.

[8] Bernice Diaz and David B. Chidlaw, "Inflation Reduction Act: Wage and Apprenticeship Requirements," *Energy Law Blog*, *National Law Review*, November 15, 2022, https://www.energylawinfo.com/2022/11/inflation-reduction-act-wage-and-apprenticeship-requirements/. This tax benefit is available for many types of energy projects, including renewable energy storage and alternative-fuel vehicles.

For purposes of this brief, clean energy sources are those that may be substituted for, and subsequently reduce the dependence on, fossil fuels. Primary among them are wind and solar power, which together accounted for about 14 percent of utility-scale electricity generated in 2022.[9] Both industries added jobs between 2020 and 2021, with solar jobs increasing 5.4 percent and wind jobs increasing 2.9 percent.[10] The growth of clean energy is more apparent when looking solely at the installation of new energy capacity, of which wind and solar accounted for 87 percent (in megawatts).[11] The Partnership on Inclusive Apprenticeship, which focuses on developing apprenticeships in high-growth, high-demand fields (such as clean energy) by working with employers and apprenticeship intermediaries to design programs and recruit apprentices, describes clean energy as "a powerhouse of accessible employment opportunities."

Tables 1 and 2 highlight clean energy sector employment and the percentage of employers reporting hiring difficulties in 2022. The second column in each table shows the size of the workforce by industry. For solar and wind power, the construction industry accounted for the largest number of jobs. Every industry in these sectors has reported that hiring is very or somewhat difficult. The percentage of solar industry employers reporting hiring difficulties ranged from 73 to 99 percent. For wind, this percentage ranged from 50 to 100 percent.

TABLE 1

Employment and Hiring Difficulties by Solar Power Industry, 2022

Solar industry	2022 workforce (#)	% employers reporting hiring difficulties
Construction	175,302	97%
Professional and business services	54,616	84%
Manufacturing	44,875	73%
Wholesale trade	28,150	78%
Utilities	10,173	75%
Other	33,026	99%
Total	346,142	N/A

Source: *U.S. Energy and Employment Report 2023* (Washington, DC: US Department of Energy, 2023; figures 8 and 9).
Note: N/A = not available.

[9] "Frequently Asked Questions (FAQS): What is U.S. electricity generation by energy source?," U.S. Energy Information Administration, October 20, 2023, https://www.eia.gov/tools/faqs/faq.php?id=427&t=3.

[10] "2022 U.S. Energy and Employment Report Fact Sheet," U.S. Department of Energy, accessed November 12, 2023, https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20Fact%20Sheet_0.pdf.

[11] Authors' calculation from table called "Generation Capacity Additions and Retirements" from "Energy Infrastructure Update for September 2023," Federal Energy Regulatory Commission, November 20, 2023, https://cms.ferc.gov/media/energy-infrastructure-update-september-2023.

TABLE 2

Employment and Hiring Difficulties by Wind Power Industry, 2022

Wind industry	2022 workforce (#)	% employers reporting hiring difficulties
Construction	45,088	93%
Professional and business services	32,779	80%
Manufacturing	23,543	50%
Wholesale trade	12,860	75%
Utilities	8,609	50%
Other	2,701	100%
Total	125,580	N/A

Source: *U.S. Energy and Employment Report 2023* (Washington, DC: US Department of Energy, 2023: figures 12 and 13).
Note: N/A = not available.

This demand for workers makes the clean energy sector attractive for RAPs in numerous occupations, including those in construction (e.g., electricians, roofers, plumbers and pipefitters, carpenters), professional and business services (e.g., sales, accounting), and manufacturing (e.g., solar equipment, wind turbines). Clean energy jobs also have higher-than-average hourly wages: a Brookings Institution report that used a more expansive definition of clean energy found that average hourly wages for clean energy production ($28.41), energy efficiency ($25.90), and environmental management ($27.45) occupations exceeded the national average ($23.86) (Muro et al. 2019).[12] Other aspects of clean energy jobs also make them attractive for RAPs. For example, many of these jobs do not require a bachelor's degree. Also, approximately 15 percent of clean energy production and energy efficiency jobs involve either one or more years of on-the-job training or an apprenticeship or internship, compared with about 5 percent of jobs nationally.

Apprenticeships in the Clean Energy Sector

Registered Apprenticeship holds promise as a workforce training model that can help clean energy sector employers meet their workforce needs while increasing inclusion for people with disabilities. Data from DOL's main apprenticeship-data-collection system, Registered Apprenticeship Partners Information Data System (RAPIDS), and data uploaded by state apprenticeship agencies indicate that few clean energy–specific RAPs exist.[13] For example, the research team identified nine hydro operator / hydroelectric

[12] Brookings included hydroelectric, nuclear, geothermal, biomass, and other power sources (e.g., tidal) in addition to solar and wind. Examples of clean energy production occupations include power plant operator and wind turbine technician; an example of an energy efficiency occupation is energy-efficient product manufacturer; an example of an environmental management occupation is waste management treatment operator.

[13] All state apprenticeship agencies provide data to RAPIDS except for those in the District of Columbia, Minnesota, and Washington.

machinery operator RAPs, eight hydroelectric-station operator RAPs, six wind turbine technician RAPs, and four solar mechanic (st-2) RAPs. But many electrician programs incorporate clean energy content. For instance, the residential lineman apprenticeship includes solar project workflow processes and solar sales, as well as residential and commercial project design, site inspections, and on-site installation training. All are general skills that a lineman would need. Similarly, various construction occupations, such as electrician, can support clean energy projects.

It is not clear what share of apprentices in these occupations report a disability. RAPIDS data indicate that the number of people with disabilities in all construction, utility, and manufacturing occupations, including clean energy–focused ones, is small but growing. The data show the following:

- Of 607,509 active apprentices in FY 2023, 5,578 (1 percent) self-identified as having a disability.[14] Although a small percentage of all apprentices, this represents an increase from 186 apprentices (or 0.05 percent of 318,013 apprentices) in FY 2014. More than half of active apprentices did not self-identify as having or not having a disability, suggesting that the share of apprentices with a disability may be higher.
- The number of construction apprentices (across all occupations) that self-identified as having a disability increased from 17 (0.01 percent of construction apprentices) in FY 2014 to 2,325 (1.2 percent of construction apprentices) in FY 2023. The number of electrician apprentices (the largest construction occupation, and an important part of the clean energy workforce) that did so increased from 10 (roughly 0 percent) to 814 (1.4 percent) during the same period.

The research team reached out to apprenticeship intermediaries and clean energy employers and had not found evidence of existing inclusive RAPs in the clean energy sector as of the writing of this brief. (The team did identify an effort to connect veterans, many of whom have disabilities, with clean energy RAPs; see box 4). But conversations with RAP operators and intermediaries indicate that inclusive clean energy RAPs are in development.

[14] All registered-apprenticeship sponsors required to develop an affirmative action plan (generally, those with five or more apprentices) must begin inviting each apprentice and applicant for apprenticeship to self-identify as an individual with a disability within two years of the date of program registration (in Office of Apprenticeship states) or on a timeline determined by the state (in state apprenticeship agency states). More information is available at "Disability Self-Identification: A Guide for Apprenticeship Sponsors," Apprenticeship.gov, accessed November 12, 2023, https://www.apprenticeship.gov/sites/default/files/eeo-disability-self-id-sponsor-guide.pdf.

BOX 4

The Partnership on Inclusive Apprenticeship's Effort to Connect Veterans to Solar Careers

PIA partnered with the Interstate Renewable Energy Council and The Solar Foundation to work with veterans interested in solar careers, through the Solar Ready Vets Network. The network is connecting veterans and military spouses to employers interested in starting or expanding RAPs for in-demand occupations, which include installation work in construction and electrical, manufacturing of batteries and solar panels, and logistics, distribution, and sales. Examples of other high-demand occupations that are adjacent to clean energy occupations but critical to the sector include finance, accounting, and cybersecurity to protect powerplants on the grid.

Source: "Solar Ready Vets," Interstate Renewable Energy Council, accessed May 7, 2024, https://irecusa.org/programs/solar-ready-vets/.

Clean energy employers should consider inclusive RAPs for several reasons, including because they can alleviate worker shortages, improve employers' hiring practices, and support training approaches that are inclusive of disabled people via job accommodations and mentoring. Each of these reasons is described below.

Inclusive Apprenticeship Can Alleviate Staff Shortages and Increase Employment of People with Disabilities

Employers need workers, but with unemployment rates low across the country, recruitment can be challenging. People with disabilities may be an untapped resource. In 2023, 8 percent of the working-age (i.e., 16 to 64), noninstitutionalized civilian population had a disability.[15] That same year, among working-age people with disabilities, the employment-population ratio (the percentage of the population employed) was 37 percent, considerably lower than among people with no disability (75 percent).[16] Moreover, among certain subgroups of underrepresented populations, the share of people with disabilities is higher. For example, about 30 percent of veterans have a service-connected disability.[17]

[15] Per authors' calculation from table A of "Persons with A Disability: Labor Force Characteristics—2023," Bureau of Labor Statistics, news release no. USDL-24-0349, February 22, 2024, https://www.bls.gov/news.release/pdf/disabl.pdf.

[16] "Persons with A Disability: Labor Force Characteristics—2023," Bureau of Labor Statistics.

[17] "Economic News Release: Employment Situation of Veterans," Bureau of Labor Statistics, news release no. USDL-24-0544, March 20, 2024, https://www.bls.gov/news.release/pdf/vet.pdf.

There is also opportunity to increase employment among disabled people through inclusive apprenticeship. The data show that the 2023 unemployment rate for people with disabilities (8 percent) was about twice that of people without disabilities.[18] Furthermore, as of 2023, nearly 6 in 10 people with disabilities were not participating in the labor force (that is, were neither employed nor unemployed). Making apprenticeship programs more inclusive could help match employers with potential employees and could help increase employment of people with disabilities overall.

Employers Can Benefit Greatly from Hiring People with Disabilities

Inclusive hiring practices have benefits for businesses. One study found that companies defined as "disability inclusion champions" saw higher revenues, net incomes, and profit margins than other companies in the sample (AAPD and Disability:IN 2018).[19] Specifically, compared with other employers, champion employers had on average:

- 28 percent higher revenues ($50 billion versus $39 billion),
- more than double the net income ($5.7 billion versus $2.7 billion), and
- 30 percent higher profit margins (16 percent versus 12 percent).

Champions also outperformed other companies in terms of total shareholder returns. The same study noted that concerns about the costs of accommodations hold employers back from establishing inclusive practices, when, in fact, a large share of accommodations cost nothing (see the next section).

Businesses and industries are starting to acknowledge the benefits of hiring and retaining disabled people. The U.S. Chamber of Commerce notes that "when businesses recognize and embrace different perspectives, they are better able to create value, serve customers, support employees, and solve problems."[20] In an article for Solar Power World, Christianson (2021) describes the rationale for designing inclusive apprenticeships in the solar industry: "Launching an inclusive apprenticeship program can offer a low-cost way to help companies of all sizes diversify their workforces, boost

[18] "Persons with A Disability: Labor Force Characteristics—2023," Bureau of Labor Statistics.

[19] "Disability inclusion champions" are companies assessed as providing leading-edge disability programs and initiatives that can be implemented by others (AAPD and Disability:IN 2018).

[20] "Diversity, Equity, and Inclusion," U.S. Chamber of Commerce, accessed November 12, 2023, https://www.uschamber.com/diversity.

productivity, reduce turnover and absenteeism, enhance their brand images and more. All of these factors can drive a company's mission and yield key advantages for its bottom line."[21]

Sponsors Can Design RAPs with an Inclusion Focus

Clean energy sector growth will likely spur development of clean energy–specific RAPs. New programs can build inclusion into every step of the process: recruitment, enrollment, on-the-job learning, related instruction, and supports.

Providing apprentices with the opportunity to self-identify and request job accommodations is a central part of an inclusive RAP. Accommodations for jobs in construction-related occupations, for example, can involve tools, vehicles, lifting aids, and protection from the elements. Accommodations are not expensive, on average. According to the DOL Job Accommodation Network, more than half of surveyed employers (56 percent) reported that accommodations cost nothing, and another 37 percent experienced a one-time cost, with a median of $300.[22]

Mentoring, a Cornerstone of RAPs, May Be Particularly Beneficial for People with Disabilities

In addition to on-the-job learning, mentors can provide input, support, and encouragement as apprentices process new information, manage stress, gain confidence, and persist through challenges. Mentors, with training to support apprentices with disabilities, can also help apprentices identify strategies and accommodations to successfully complete their work.[23] They can then help apprentices identify any needed accommodations.

Conclusion

The clean energy sector is growing rapidly, and registered apprenticeship programs will likely follow in a range of occupations, from those in construction to those in manufacturing and management. Employers in the solar and wind sectors report challenges hiring workers for a range of occupations and

[21] Josh Christianson, "Diversifying the Solar Workforce through Inclusive Apprenticeships," Solar Power World, December 21, 2021, https://www.solarpowerworldonline.com/2021/12/diversifying-the-solar-workforce-through-inclusive-apprenticeships/.

[22] "Costs and Benefits of Accommodation: Accommodation and Compliance: Low Cost, High Impact Report," Job Accommodation Network, accessed November 12, 2023, https://askjan.org/topics/costs.cfm?csSearch=4389867_1.

[23] "On-Site Mentoring," Job Accommodation Network, accessed November 12, 2023, https://askjan.org/solutions/On-site-Mentoring.cfm.

industries. RAPs generally, and inclusive apprenticeships specifically, are promising strategies to train workers for in-demand jobs that pay above-average wages. The combination of industry interest and federal support for inclusive clean energy RAPs can expand apprenticeship opportunities, including opportunities for people with disabilities. Educating employers about the benefits of inclusive apprenticeships and the generally minimal costs of accommodations could create further opportunities.

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