Growing the Economy of the Future: Job Training for the Clean Energy Transition

In the last two years, the Biden administration and Democrats in Congress have taken historic action to address the climate crisis by increasing investments in the clean energy industry. Investments in the Inflation Reduction Act and the Bipartisan Infrastructure Law have increased the demand for workers who can fill roles in a range of clean energy occupations, from manufacturing workers building wind turbines or solar panels to HVAC installers putting in heat pumps. This need creates an opportunity for millions of Americans to start stable careers they can build a family around that do not require a four-year college degree. In addition, new investments in clean energy infrastructure present an opportunity to more intentionally employ women and people of color in the energy sector and the skilled building trades where they have been historically underrepresented.

The clean energy workforce is growing rapidly as the economy transitions away from fossil fuels.

Even before the passage of the landmark climate provisions in the Inflation Reduction Act (IRA), the clean energy workforce was growing faster than the overall economy. From 2021 to 2022, the Department of Energy found that job growth in clean energy roles grew by 3.9%, outpacing the national employment growth rate of 3.1% in that same window.

The Bureau of Labor Statistics (BLS) also predicts long-term demand for workers in these industries: BLS projects wind turbine service technicians to be the fastest-growing occupation between 2022 and 2032, with solar photovoltaic installers also among the top 15. Eight states, including New Mexico, had solar installers as their fastest-growing job from 2017 to 2019. Additionally, the second quarter of 2023 had a 13% increase in clean power projects under construction or in advanced development compared to the second quarter of 2022. BLS also predicts job growth in geothermal, wind, and solar electric power generation while also expecting an employment decline in fossil fuel electric power generation through 2032.

Forecasting the exact number of jobs created by a policy is difficult, but when paired with the industry's job and economic forecasts, it is clear that jobs in the clean energy economy will grow significantly in the United States in the coming years. (See below for recent trends in clean energy jobs in each state.) This expanding need for people who can build and maintain clean energy infrastructure is occurring alongside a long-term decline in the number of building trades workers, brought about by an aging workforce and lagging investment in worker training.

The construction sector is still stabilizing from massive employment losses during the Great Recession, which contributes to a broader shortage of trades workers throughout the economy. For example, BLS forecasts that the United States will average 73,500 job openings for electricians every year through 2032, reflecting the growing need for these workers and the continued trend of retirements.

Change in Clean Energy Jobs, 2021-2022			
State	Total Clean Energy Jobs, 2022	Clean Energy Jobs Growth, 2021-2022	Growth Rate, 2021-2022
Alabama	44,063	2,205	5.3%
Alaska	5518	149	2.8%
Arizona	63,092	2,441	4.0%
Arkansas	21,948	946	4.5%
California	527,696	13,116	3.6%
Colorado	66,388	2,584	4.0%
Connecticut	42,896	1,081	2.6%
Delaware	12,453	197	1.6%
District of Columbia	15,125	736	5.1%
Florida	164,037	2,722	4.8%
Georgia	80,710	3,866	5.0%
Hawaii	13,924	227	1.7%
Idaho	14,375	721	5.3%
Illinois	126,806	3,773	3.1%
Indiana	81,249	2,868	3.7%
Iowa	34,756	957	2.8%
Kansas	26,430	1,068	4.2%
Kentucky	34,008	1,956	6.1%
Louisiana	31,141	1,573	5.3%
Maine	13,560	536	4.1%
Maryland	81,383	1,356	1.7%
Massachusetts	121,939	4,556	3.9%
Michigan	119,623	4,370	3.8%
Minnesota	62,619	2,003	3.3%
Mississippi	21,503	1,080	5.3%
Missouri	56,279	2,207	4.1%
Montana	10,535	337	3.3%

Nebraska	21,918	784	3.7%
Nevada	32,891	1,025	3.2%
New Hampshire	16,860	390	2.4%
New Jersey	56,932	3,065	5.7%
New Mexico	12,619	749	6.3%
New York	171,377	5,054	3.0%
North Carolina	105,151	1,965	1.9%
North Dakota	9,255	295	3.3%
Ohio	108,006	4,504	4.4%
Oklahoma	22,625	1,298	6.1%
Oregon	58,231	1,581	2.8%
Pennsylvania	99,956	4,042	4.2%
Rhode Island	14,536	255	1.8%
South Carolina	56,478	1,549	2.8%
South Dakota	13,148	445	3.5%
Tennessee	81,054	4,021	5.2%
Texas	248,891	5,198	5.5%
Utah	43,904	1,366	3.2%
Vermont	16,162	71	0.4%
Virginia	97,156	3,388	3.6%
Washington	81,257	1,984	2.5%
West Virginia	9,743	341	3.6%
Wisconsin	71,870	405	0.6%
Wyoming	8,374	30	0.4%

Source: U.S. Department of Energy
Note: Job growth is shown between 2021 and 2022 and primarily reflects changes in employment patterns that occurred prior to the passage of the Inflation Reduction Act. Additionally, clean energy job growth does not include traditional transmission and distribution. The underlying data does not include estimates for insular areas.

Clean energy jobs can provide pathways into the middle class for a broad set of communities across the country.

Creating more pathways for training and obtaining jobs in the clean energy sector is especially important given the opportunity these jobs offer for higher salaries that can springboard more

Americans into the middle class. While the broad range of clean energy occupations pay different wages depending on the sector, electricians, construction managers, and wind turbine technicians all were paid close to or above the national average salary.

One recent study also found that job listings for clean energy occupations were both more common in areas that currently rely on fossil fuel extraction and were in occupations that pay above the national average. There is also an emerging contingent of labor and climate groups working together to expand worker protections and increase pay in a range of clean energy fields.

In the energy field, momentum for unionization continues to grow. The Department of Energy's recent energy employment report highlighted that the share of energy sector employees represented by a union was 11% last year, higher than the national unionization rate of 7%. The report also found that unionized energy sector employers were able to fill job vacancies more quickly, likely due to the better pay, benefits, and worker safety available in unionized workplaces. Unions, such as the Plumbers and Pipefitters Local 412 in New Mexico, can help train workers.

The Department of Energy's report also highlights how veterans make up a larger share of the U.S. energy workforce (9%) compared to their share of the U.S. workforce in all industries (5%). There are even several programs aimed at training and retraining veterans for clean energy jobs. Department of Energy-funded Solar Ready Vets Network, for example, connects veterans with workforce development programs providing career training, professional development, and employment opportunities in the solar industry.

The United States must expand investments in the clean energy workforce to meet the needs of the clean energy transition.

Investing in career and technical education and community colleges supports important pathways to create clean energy jobs.

From as early as elementary school, our education system can help lay the groundwork for career paths in the trades that students can pursue as adults. High school career and technical education (CTE) programs help students gain the knowledge, experience, and technical skills necessary for certain postsecondary programs or careers—including in clean energy. The Bipartisan Infrastructure Law is already investing $72 million in programs training people for clean energy careers by partnering with existing institutions like community colleges and trade schools.

In 2020, 29 states had career and technical education programming that set students up for careers in clean energy, including through courses, academic pathways, and certification programs. NYC Solar CTE Program, for example, weaves lessons on solar energy, installation, and careers into the curriculum of existing electrical, engineering, and construction programs at technical high schools in New York City.

Two-year community college programs, which are shorter and cheaper than programs at four-year institutions, can also train students for and connect them with clean energy jobs while

reducing the need for burdensome student debt. Successful programs have flexible curricula and are responsive to the needs of the local clean energy job market.

For instance, California's Kern Community College District is using grant money from the Department of Energy to connect with local clean energy employers and students from underrepresented communities. The grants also help fund the inclusion of information on microgrid technology, carbon capture, and sequestration in its related curricula, enriching and expanding the program to equip future workers in the industry with its latest technologies. Additionally, CNM Ingenuity, Central New Mexico Community College's workforce development arm, provides opportunities for workers to begin or advance their solar careers.

Apprenticeship programs create additional ways for people to train for unionized trades careers that are vital to the energy transition.

Registered apprenticeships are joint partnerships that are often between educational institutions, employers, and unions that allow people to earn money and learn technical skills on-the-job and in the classroom, while letting employers train and invest in their future employees. The IRA supports the successful Registered Apprenticeship (RA) program by requiring that clean energy construction projects using IRA funds hire registered apprentices.

There are currently over 600,000 active registered apprentices in the United States, including more than 2,000 in New Mexico. Across the country, average wages for registered apprentices during their training exceed both the federal and state minimum wages, with graduates earning significantly more later in their careers. However, the growing demand for clean energy workers means that RA programs should create more training slots for roles crucial to the energy transition like electricians, pipefitters, and water treatment specialists. It is also critical to support workforce intermediaries who connect employers and secondary schools to help establish apprenticeship programs, such as through the bipartisan Apprenticeship Pathways Act.

There is also a growing need to ensure consistent job quality for workers across large commercial electrification projects and smaller residential jobs. One way to improve wages and working conditions in the residential sector is to bundle small commercial and residential projects using direct installation. This would both decrease costs and make the projects large enough to qualify for Project Labor or Community Workforce Agreements. An example of this in practice can be seen with the California Energy Commission's Equitable Building Decarbonization Program. They are piloting free, statewide installation of electric technologies for certain groups of households—a way of bundling residential projects that includes labor guidelines that can help close the gap between commercial and residential job quality.

Training programs can also effectively help people currently working in some fossil fuel industries access new positions in the clean energy sector.

While there is important work needed to provide people currently working in many fossil fuel industries with new skills that qualify them for clean energy jobs, there are several clean energy industries where the job requirements are more of a one-to-one match with skills certain fossil fuel workers already have. The overlapping skillsets required between people working in hydraulic fracturing and geothermal power, fossil fuel power plants and offshore wind power, or between oilfield work and clean hydrogen production suggest a viable pathway for an

employment transition for current energy sector workers. While this transition process is difficult, several recent policy and program developments point to how this approach.

The first commercial scale powerplant repurposing of fracking infrastructure for geothermal use was reported in August 2023. Recent reports also suggest that geothermal energy may soon be economically viable in Texas, allowing it to join California and Nevada as leaders showing how retrofitting gas infrastructure can build on existing worker skillsets to push the clean energy transition forward.

As training programs expand, policymakers must ensure that training is offered to help match current energy workers with similar positions focused on clean energy. Some recent data show that clean energy job opportunities are growing in areas with higher shares of fossil fuel extraction workers, which is promising for the prospects of job availability for these newly-trained and retrained workers. Several important tax credits in the IRA offer bonus credits for siting new clean energy facilities in communities that rely or have relied on fossil fuels for both jobs and local revenues.

Ensuring women and people of color have equitable access to and benefits from clean energy job and training programs will strengthen the workforce.

A Department of Energy report found that half of the new workers in the energy sector were women. This is a positive development for the energy sector, which otherwise continues to have an all-around lack of gender and racial diversity. Across clean energy sectors, the workforce is predominantly white and male. Over the last four years, the labor force participation rate for women and people of color in clean energy has remained virtually unchanged.

In 2022, women represented only 26% of the energy workforce despite women making up 47% of the overall workforce. Additionally, Black workers represented only 9% of the energy workforce, much lower than their 13% share of all jobs (see table below). Despite these trends, non-white workers in the energy sector represented 24% of the workforce, only 1 percentage point higher than their representation in the entire U.S. workforce, which was 23%.

Participation of women and people of color in the clean energy workforce will be critical for strengthening the overall labor force and economy and connecting diverse populations with the industry's high-quality jobs. Full participation of women and people of color in the clean energy workforce would help meet the industry's needs. A diverse workforce and management team have greater levels of innovation, which can help increase revenue, especially given the clean energy sectors heavy reliance on innovation.

Data on the Demographics and Characteristics of the United States Energy Workforce Show the Need for Greater Diversity

	Share of the Energy Workforce (2023)	Share of the National Workforce (2023)
Male	73%	53%
Female	26%	47%

White	75%	77%
Hispanic or Latino	18%	19%
Black	9%	13%
Asian	7%	7%
American Indian or Alaska Native	2%	<1%
Native Hawaiian or Other Pacific Islanders	1%	<1%
Source: U.S. Department of Energy		

These gaps in participation in the clean energy workforce motivate the need for workforce development programs to improve racial and gender equity to grow the clean energy sector and expand the middle class most effectively. Among active registered apprentices across all fields, women and people of color are disproportionately underrepresented. Apprentices who are women and people of color are also paid less than their male and white counterparts, even when adjusting for differences in occupations.

The clean energy industry is making encouraging strides to include women in its workforce, though well-designed government policies can support these trends. For example, the CHIPS and Science Act requires funding recipients to have a plan to provide child care for their workers—which should help address one of the key factors that keeps many women out of the labor force.

In addition, the IRA, the Bipartisan Infrastructure Law, and a recent Labor Department rule extended wage protections and apprenticeship requirements to companies using federal tax credits to produce batteries, solar components, wind power, and carbon capture infrastructure. The Labor Department also released a proposed rule and FAQs to define these requirements. These expanded wage rules make these jobs more appealing to a broader range of potential employees while helping to grow the middle class and catalyze investment in clean energy.

Sustained investments in the industry are critical for maintaining American leadership and a robust and diverse workforce.

Given recent federal investments, the United States is poised to see employment growth in the clean energy industry. But continued federal investment, including in research and development, is critical for both maintaining American leadership in the industry and sustaining its growth. This includes sustained investments in the National Renewable Energy Laboratory, which employs over 3,000 people focused on clean energy research, as well as in other national labs and universities that are making fundamental discoveries in clean energy technology like successful nuclear fusion ignition.

The United States must also diversify pipelines into clean energy jobs by investing in successful career and technical education, community college, and apprenticeship programs. By broadening and strengthening the clean energy workforce, the United States can deliver a transition away from fossil fuels that protects the climate and grows the middle class.