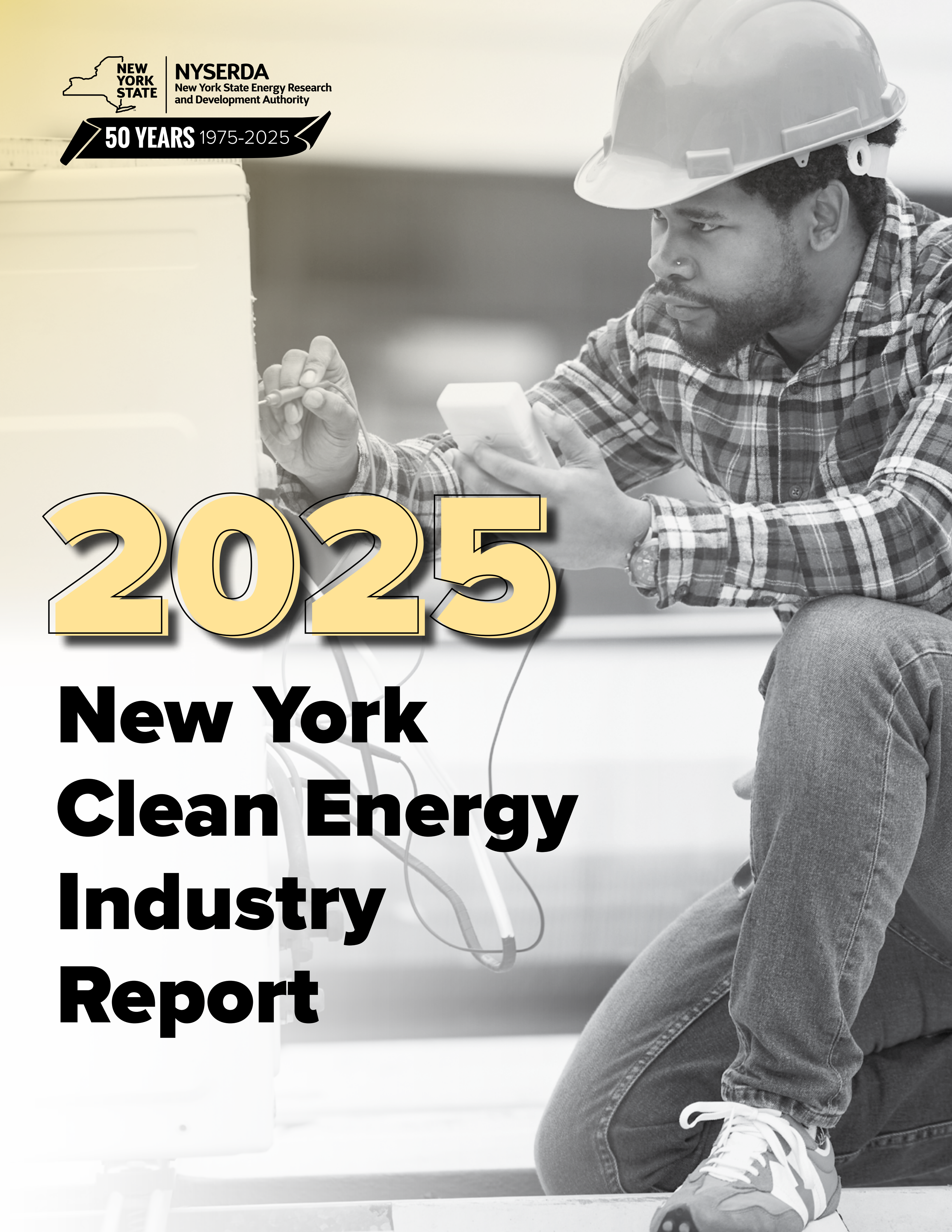
NEW YORK STATE
NYSERDA
New York State Energy Research and Development Authority
50 YEARS 1975-2025

2025 New York Clean Energy Industry Report



Letter From NYSERDA President & CEO

Dear Partners,

I am pleased to share with you NYSERDA's 2025 New York Clean Energy Industry Report.

Herein, you will find a comprehensive update of New York State's clean energy industry landscape with highlighted trends and data that show the remarkable progress we've made in advancing a vibrant, clean energy economy. This report also demonstrates the impact of Governor Kathy Hochul's commitment to realizing the benefits of our State's energy transition by providing opportunities to build our skilled workforce across all sectors of the clean energy industry.

The report, which includes data through the end of 2024, demonstrates that New York's policies and investments have continued to catalyze the clean energy transition. **Since 2023, New York added over 6,000 jobs in the clean energy sector and as of the end of 2024, had more than 184,000 clean energy workers** — the largest number of total jobs since NYSERDA's clean energy job tracking began. These figures confirm that the energy transition is a source of real job opportunities resulting in good-paying, clean energy jobs for more New Yorkers year after year.

Doreen M. Harris
President and CEO, NYSERDA

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Executive Summary

Introduction

The 2025 New York Clean Energy Industry Report is the ninth edition of annual reports tracking clean energy employment across New York State. The report was commissioned by the New York State Energy Research and Development Authority (NYSERDA) to better understand the composition of the clean energy economy.

This year's report explores the continued growth of clean energy jobs, includes a deep dive into the building decarbonization and energy efficiency workforce, and provides an overview of traditional energy jobs.

The data in this report comes from multiple sources, including the 2025 United States Energy and Employment Report developed by the U.S. Department of Energy, supplemental surveys of New York businesses and workers, economic impact modeling, and additional secondary data. The growth observed in this report is consistent with the high level of private and public investments in 2024 and may vary in future reports given changing policy contexts.

Key Findings

1

New York added 6,000 new clean energy jobs in 2024, marking another year of steady growth in this sector.

This represents annual growth of just over 3%, bringing the total number of clean energy jobs to 184,500. Clean energy employment grew faster than the overall State economy (2%) and the national average of just under 3% (Figure 2). New York State ranked 15th in year-over-year growth, a notable improvement from 25th and 26th in the two previous reporting years.

2

In 2024, the building decarbonization and energy efficiency sector, the renewable electric power generation sector, and the grid modernization and storage sector all added jobs.

The building decarbonization and energy efficiency sector added the most jobs, increasing by over 5,400 from the prior year, a 4% increase. Renewable electric power generation and grid modernization and storage also demonstrated steady growth (3% and 8% increases, respectively) (Figure 4).

3

Building decarbonization and energy efficiency employers expect increased need for key occupations over the next three years.

Employers report an expected need for insulation workers (36% over the next three years), energy auditors (29%), HVAC workers and plumbers (both 25%), cost estimators and sales (23%), and electricians (21%) (Figure 20). However, employers report difficulty hiring for many of these occupations and cite a need for better access to trained talent, pointing to the importance of State workforce development support in these areas (Figure 21).

4

Employment increased across nearly all segments of the clean energy value chain in 2024.

The most jobs were added in the installation segment, gaining 3,500 workers at a growth rate of 3%. Notably, professional services had the highest growth rate at 7%, gaining over 1,700 workers (Figure 8).

5

Clean energy workers continue to earn higher wages and benefits than other workers.

Entry-level clean energy employees enjoy an average wage premium of 12% more than workers in the same roles outside the clean energy industry. Additionally, 90% of clean energy employers across the 60 occupations reported offering healthcare coverage, significantly exceeding the national average across all occupations.

6

Clean energy workers in New York report high rates of satisfaction with their careers.

Nearly all (92%) clean energy workers indicate being very or somewhat satisfied with their career, compared to 77% for those not working in clean energy (Figure 40). Clean energy workers also note more confidence in promotion or advancement within their career than workers not in clean energy. Nearly two-thirds (65%) of clean energy workers indicated feeling very confident of promotion or advancement in the next 12 months, while this figure drops to just over a quarter (26%) for those not in clean energy fields (Figure 41).

7

Training programs such as those offered by the Board of Cooperative Education Services, technical high schools, the Conservation Corps, YouthBuild, and AmeriCorps are key entry points to a clean energy career.

Participation in these programs range from 53% to 72% for clean energy workers, versus only 7% to 12% for those not in clean energy (Figure 37).

8

New York State's clean energy economy continues to attract immense investment, with an average of $6 billion annually invested between 2022-2024, the largest since tracking began in 2011 (Figure 51).

Four out of five Clean Energy technology sectors saw increased investment in the most recent three-year average (2022–2024) compared to the prior period (2021–2023). The largest percentage increase occurred in grid modernization and energy storage, which rose by 48%, adding $182 million in new investment. Renewable electric power generation experienced a nearly equivalent gain of 47%, translating to a $969 million increase, led by several large outlier deals (Figure 52).

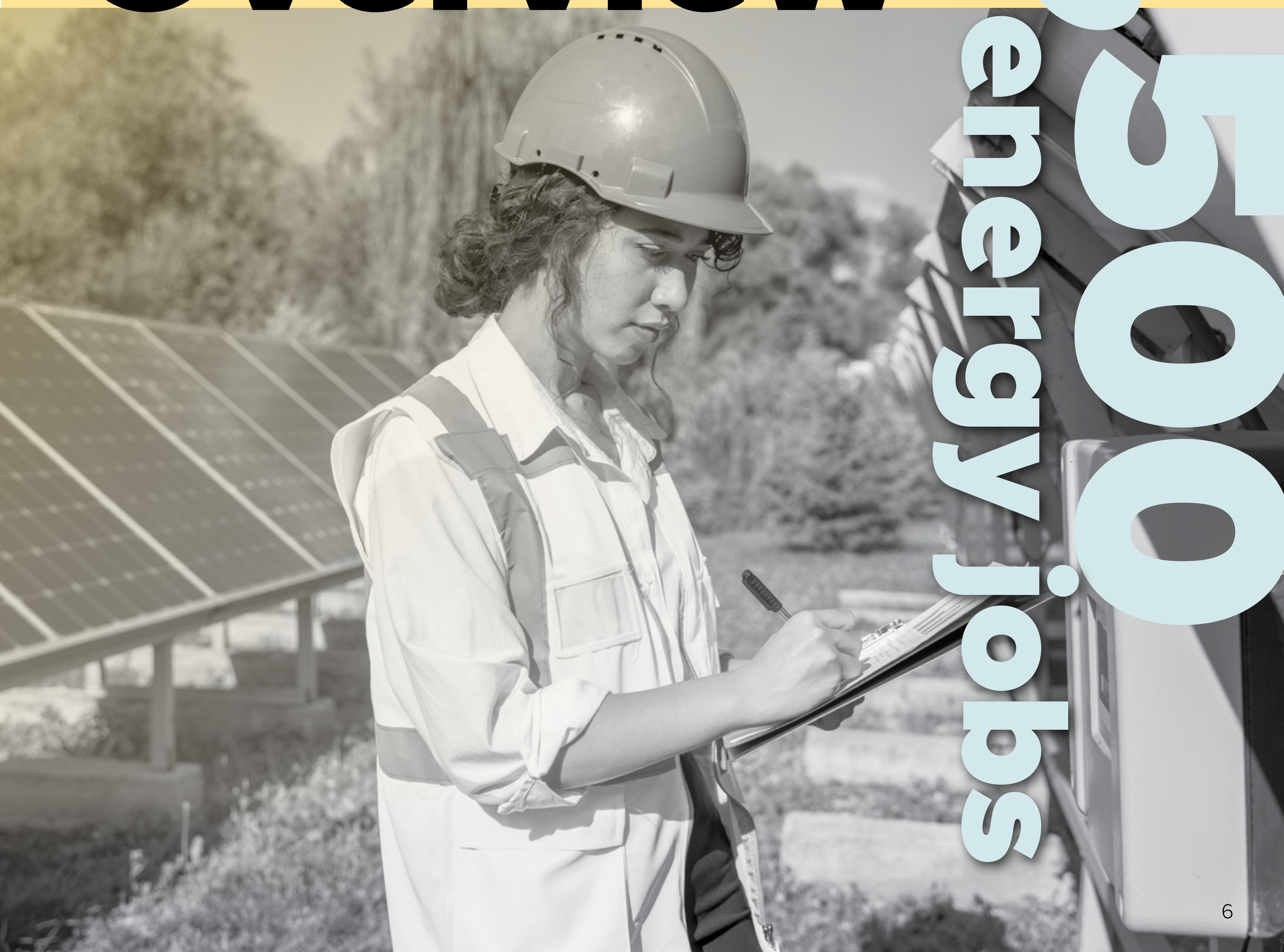
9

The role of private capital in New York State's clean economy is growing.

In the first tracking period of 2011, private investment made up 43% of total funding, but by the most recent period this share surpassed public investments at 65%, led by a few high-level investments. From 2022 to 2024, private capital accounted for $3.3 billion annually across 33 deals, compared to $2.7 billion in public funding spread across 1,150 deals (Figures 53 and 54). This shift highlights the growing scale of private sector participation leveraged to advance New York State's clean energy transition.

Clean Energy Industry Overview

184,500 clean energy jobs

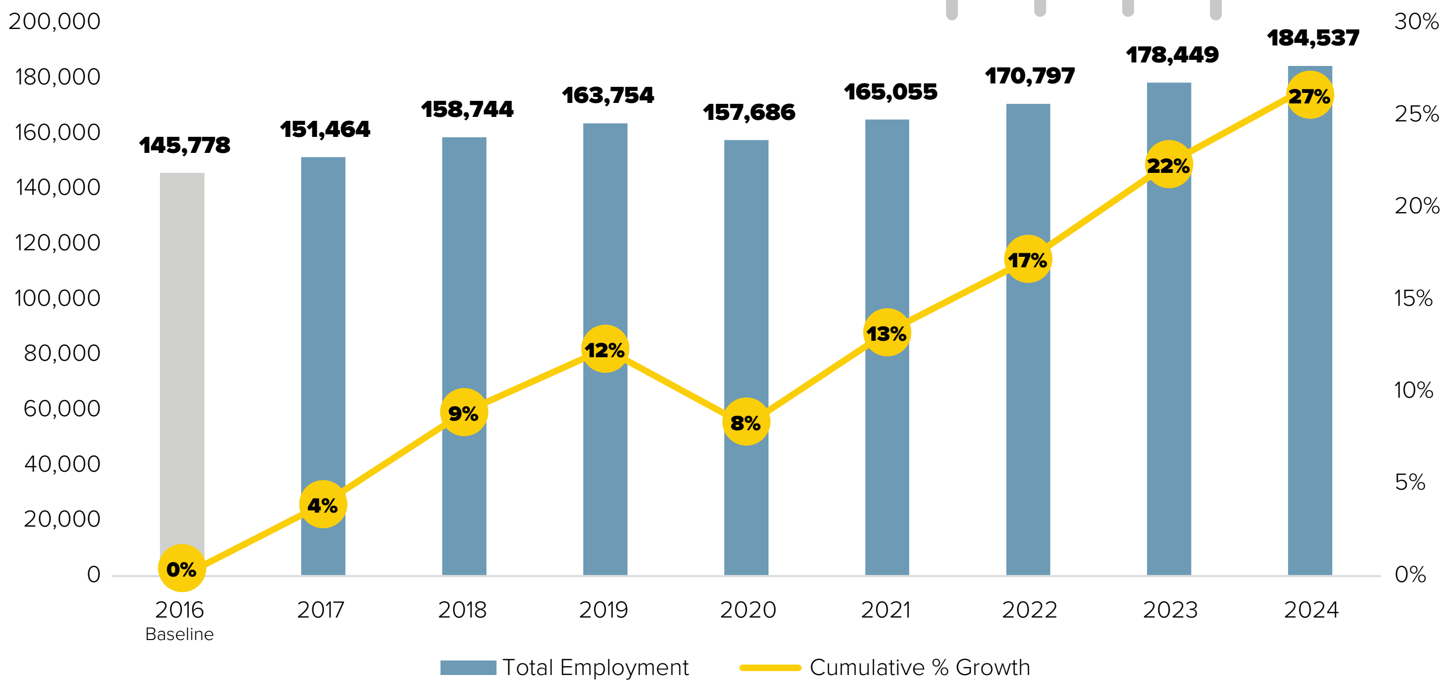


Total Clean Energy Employment

Employment in New York State's clean energy sector grew 3% in 2024, adding 6,088 jobs to the economy.

This pace of growth aligns with previous year-over-year trends, reflecting the sector's sustained momentum and enduring role in the State's economic landscape (Figure 1).

Figure 1. Clean Energy Employment in New York State, 2016–2024

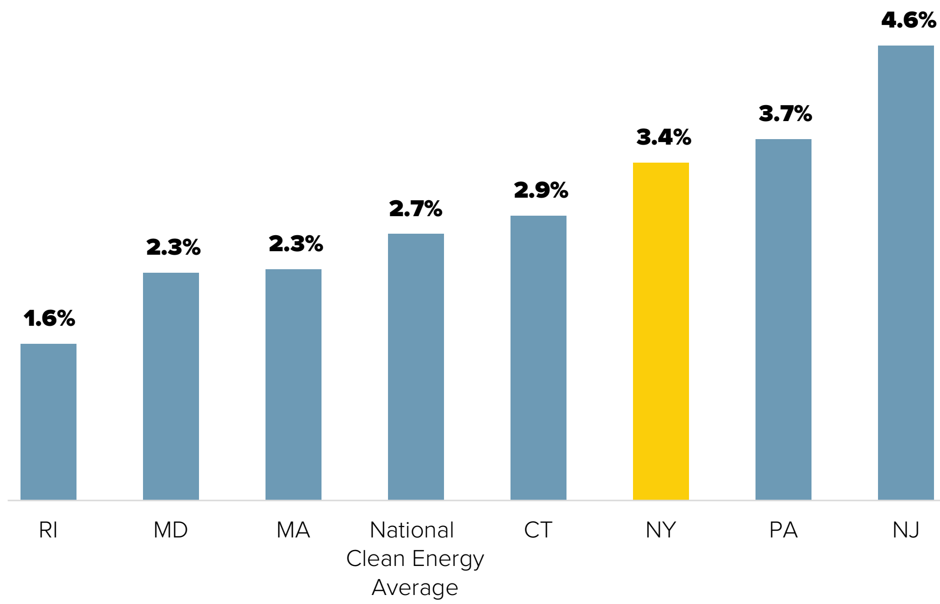


6,000+ new clean energy jobs

The continued growth in the State's clean energy workforce is especially impressive considering the size of the existing clean energy workforce, which ranks third in total number of clean energy jobs in the country.

New York State's clean energy growth ranked 15th among all other states, notably higher than the rank of 25th and 26th in the previous two years. The State also surpassed the national clean energy growth rate by nearly a percentage point and grew faster than nearby states like Connecticut and Massachusetts (Figure 2).

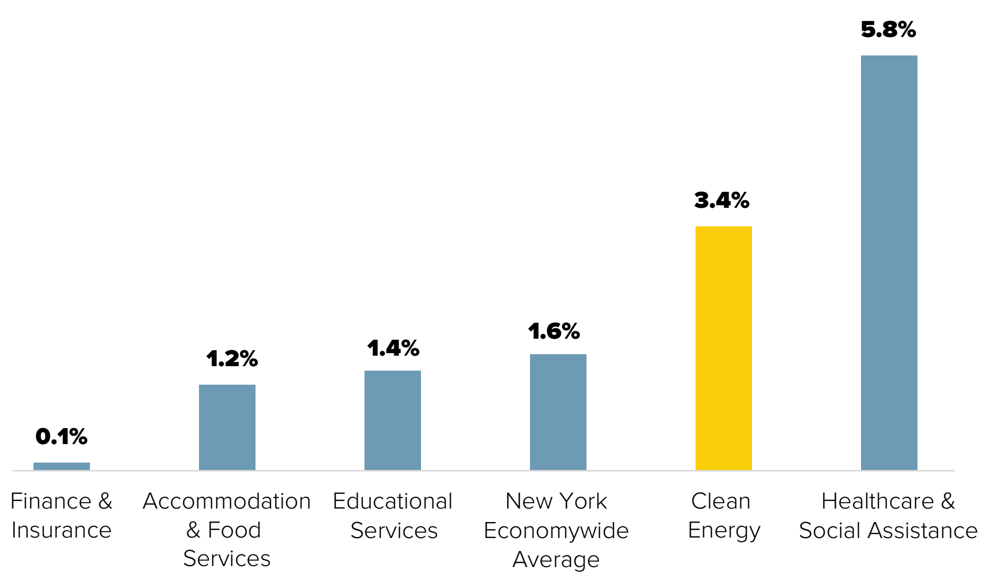
Figure 2. Clean Energy Employment Change by State, 2023–2024



Additionally, New York's clean energy industry outgrew the overall State economy.

This included industries like Accommodation and Food Services, Educational Services, and Financial Services (Figure 3).

Figure 3. Employment Change by Industry in New York State, 2023–2024[1]



Three out of five clean energy sectors grew in 2024.

The three sectors experiencing growth were:

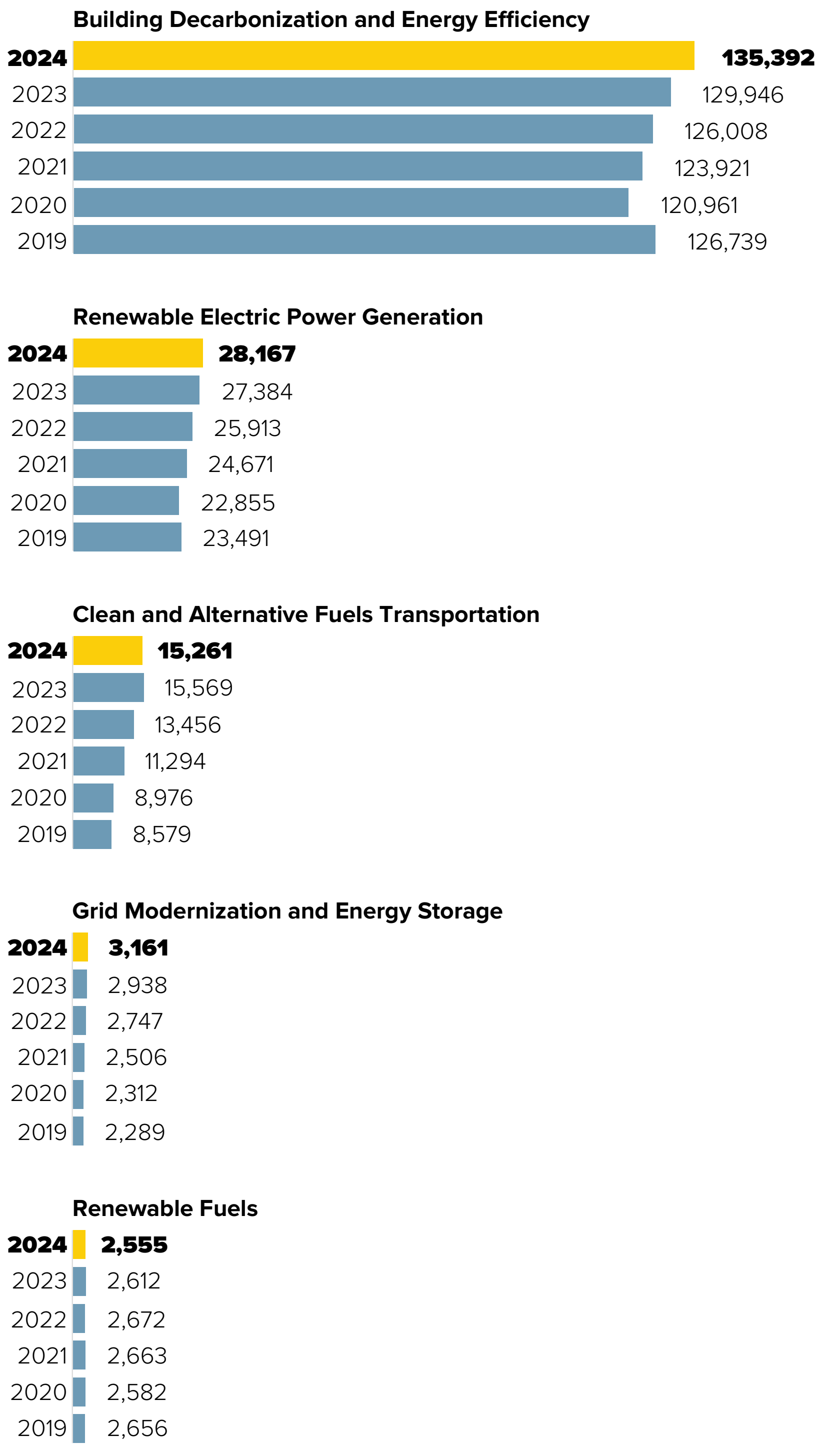
- building decarbonization and energy efficiency
- renewable electric power generation
- grid modernization and storage

Building decarbonization and energy efficiency added the greatest number of jobs, increasing by over 5,400 jobs at a rate of 4%. This large number of jobs is unsurprising given these sectors' prominence in the State's clean energy economy, making up nearly three-quarters (73%) of the clean energy workforce.

Grid modernization and storage saw the largest growth rate, growing by 8% and adding 222 jobs to the State's economy.

The clean and alternative transportation sector, along with renewable fuels sector, saw employment decreases, both by approximately 2%. The losses in clean and alternative transportation are similar to those observed nationally, with the country's clean and alternative transportation sector seeing a larger, 3% decrease. Approximately 300 jobs were lost statewide in the clean and alternative transportation sector, while renewable fuels lost about 60 jobs (Figure 4).

Figure 4. Clean Energy Employment by Sector, 2019–2024



The energy efficiency sector makes up the majority of clean energy establishments in the State at 88%.[2]

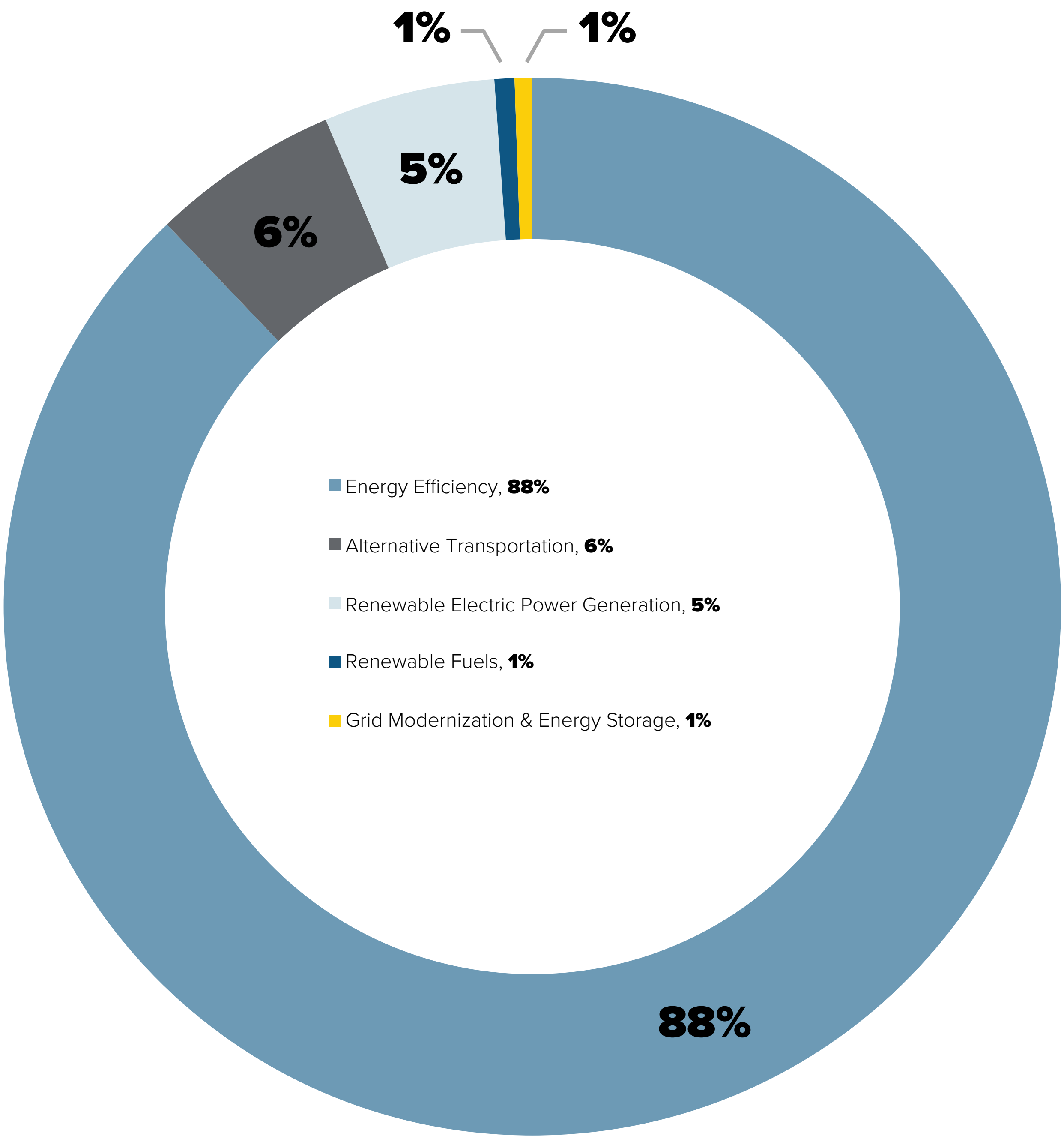
Energy efficiency employers tend to be smaller in size than other technologies, often consisting of local contractors and specialized service providers across a broader geographic area.

Alternative transportation and renewable electric power generation make up the next two largest shares, at 6% and 5%, respectively (Figure 5).

Unlike energy efficiency, renewable electric power generation employers are typically larger, reflecting the scale and concentrated footprint of projects such as solar and wind farms.

88% energy efficiency sector

Figure 5. Clean Energy Establishments by Technology, 2024



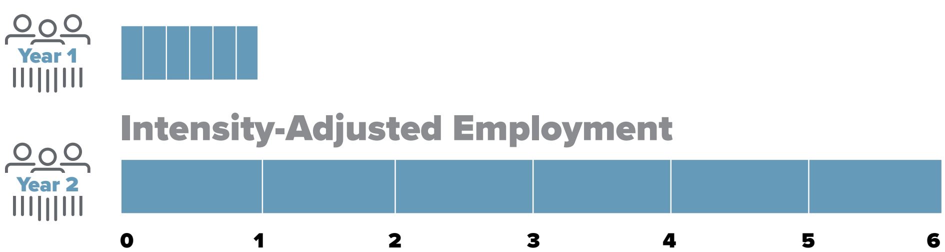
Clean Energy Employment Intensity

Intensity-adjusted clean energy employment metrics are used to measure the concentration of clean energy activities within the broader labor force. The clean energy job totals presented in the previous section include all workers who dedicate any portion of their work week to producing, installing, or supporting clean energy goods and services. For example, an electrician who spends only 25% of their time installing or maintaining solar systems is still counted as a clean energy worker in Figure 1.

The intensity-adjusted metric refines this count by weighting each worker according to the proportion of their labor hours devoted specifically to clean energy activities. Workers are categorized based on whether they spend less than half, more than half, or all of their labor hours on clean energy tasks.[3]

An increase in total clean energy employment indicates that more workers overall are engaged in the clean energy economy. In contrast, an increase in intensity-adjusted employment suggests that those workers are spending a larger share of their work week on clean energy–related activities. This shift may reflect growing consumer demand, new policy incentives, or other market forces expanding the clean energy sector.

Figure 6. Example of Intensity-Adjusted Clean Energy Employment[4]



An example can illustrate the importance of tracking intensity-adjusted clean energy employment.

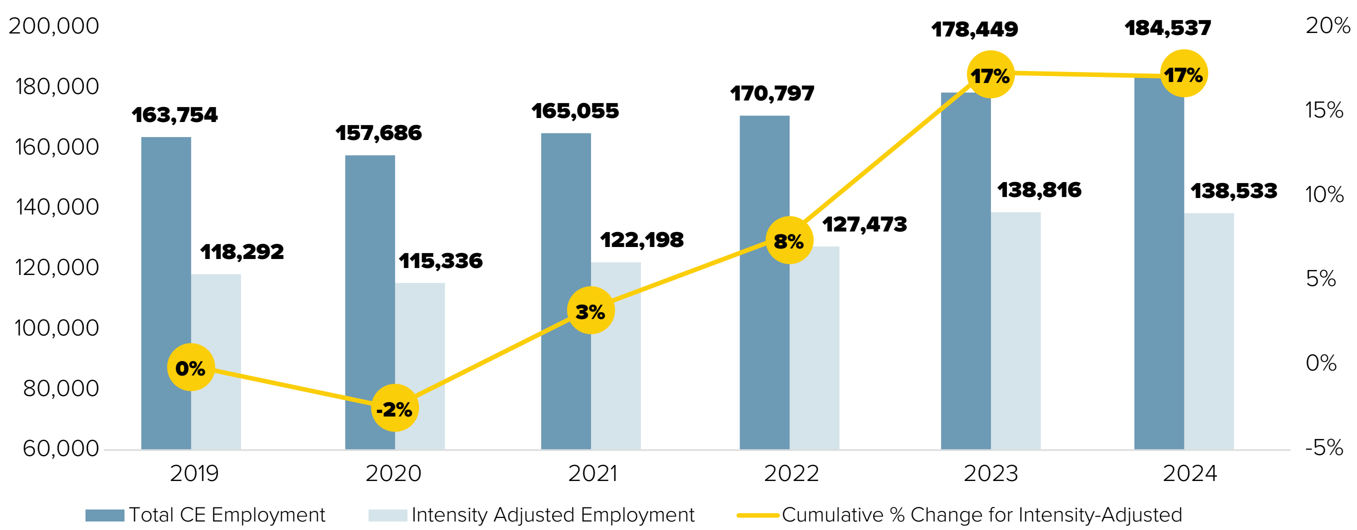
For instance, in 2023, an HVAC technician might have devoted only one-third of their time to installing high-efficiency systems.

If, in 2024, a State rebate program for heat pumps were introduced, that same technician might now spend a greater share of their week installing efficient heat pumps.

This shift would not necessarily increase the number of HVAC workers in Figure 1, but it would be reflected as growth in intensity-adjusted employment, as shown in Figures 6 and 7.

Intensity-adjusted employment has grown by 17% since 2019. Intensity-adjusted employment remained the same since last year, however this is following a 9% growth between 2022 and 2023,[5] which is the fastest year-over-year change since employment tracking began in 2016 (Figure 7).

Figure 7. Intensity-Adjusted Clean Energy Employment, 2019–2024



Clean Energy Value Chain Employment

This section offers a summary of clean energy employment across various segments of the value chain, with a focus on industries in New York State that show notable levels of clean energy activity.

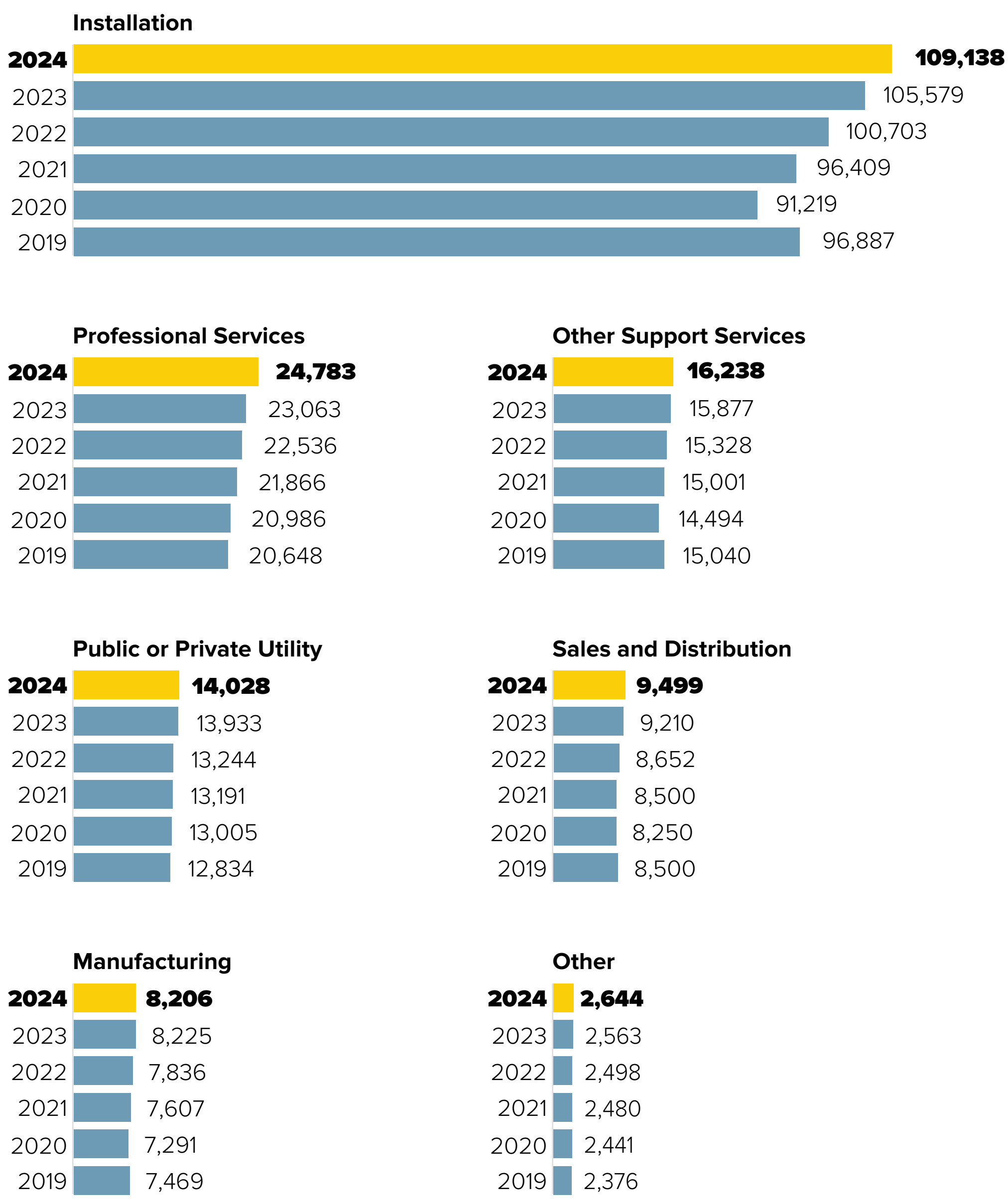
These key value chain segments reflect federally recognized industry classifications, including construction, manufacturing, wholesale trade, professional and business services, other support services, additional industries, and utilities.[6]

Nearly every value chain segment saw employment growth from 2023.

The installation segment saw the largest number of new jobs—which includes occupations like construction laborers, carpenters, and electricians—gaining 3,500 workers at a growth rate of 3%.[7]

The highest growth rate was the professional services segment at 7%, gaining more than 1,700 workers (Figure 8).

Figure 8. Clean Energy Employment by Value Chain Segment, 2019–2024



Geography of Clean Energy Jobs and Workers

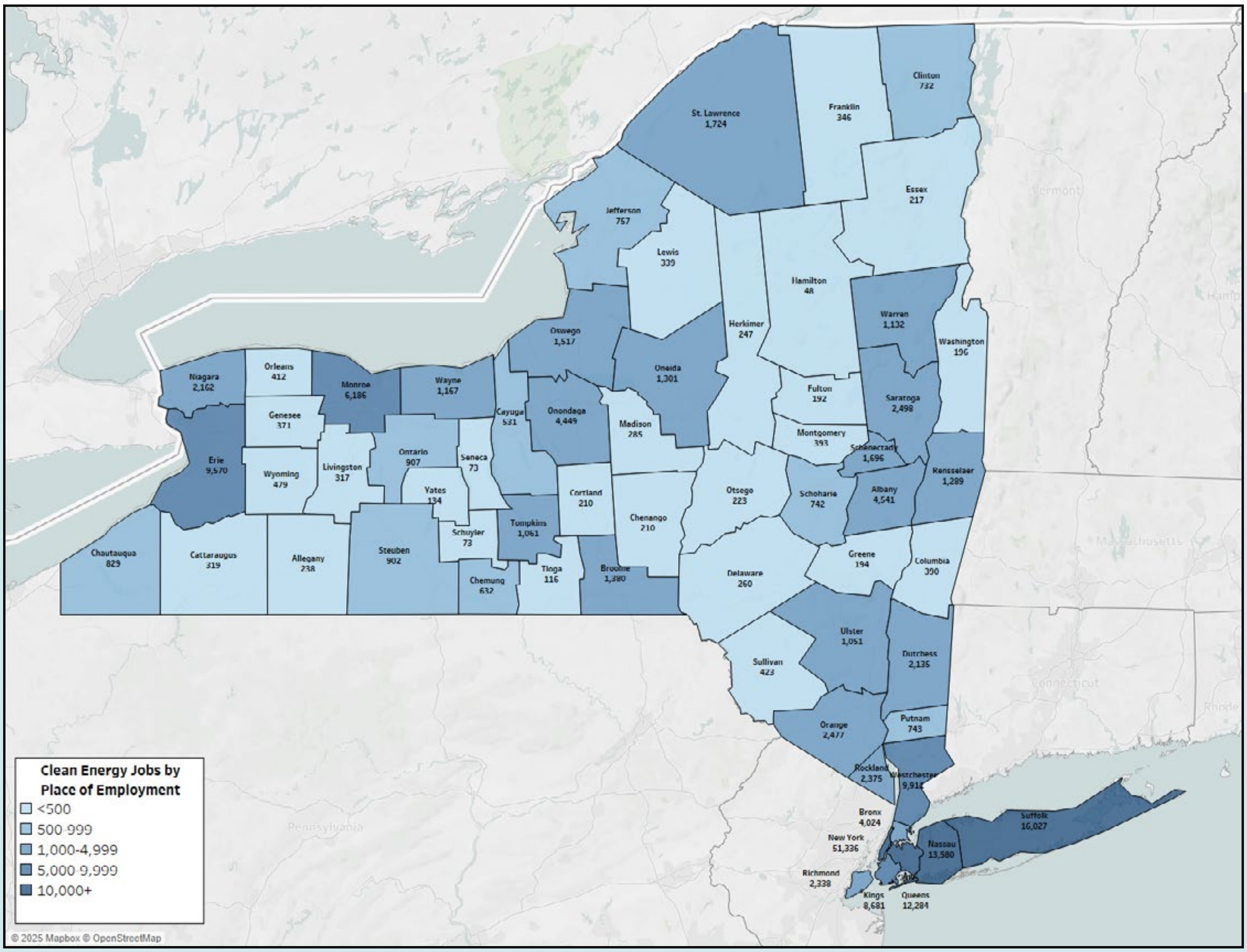
Understanding both where clean energy jobs are located and where clean energy workers live offers valuable insight into the relationship between talent and economic opportunity. This section examines the geographic distribution of clean energy jobs and workers to better reveal patterns, overlaps, and gaps in the clean energy workforce.

By absolute numbers, Downstate counties have the most jobs, with the most in New York County (51,336 jobs), followed by Suffolk County (16,027), and Nassau County (13,580 jobs). In all three of these counties, employment is concentrated in building decarbonization and energy efficiency, with New York County having the largest concentration of building decarbonization and energy efficiency jobs as a fraction of all clean energy jobs, at 86%.

Outside of Downstate New York, the largest number of clean energy workers work in Erie County (9,570 jobs) and Monroe County (6,186 jobs). These counties follow similar trends to the State wholly, with a majority of the employment residing in building decarbonization and energy efficiency sectors. Additionally, Erie County has the third largest concentration of grid modernization and storage workers in the State, at 7.2%. Only three of the State's 62 counties have fewer than 100 clean energy jobs (Figure 9).

Clean energy jobs drive

Figure 9. Clean Energy Jobs (Place of Employment) by County, 2024



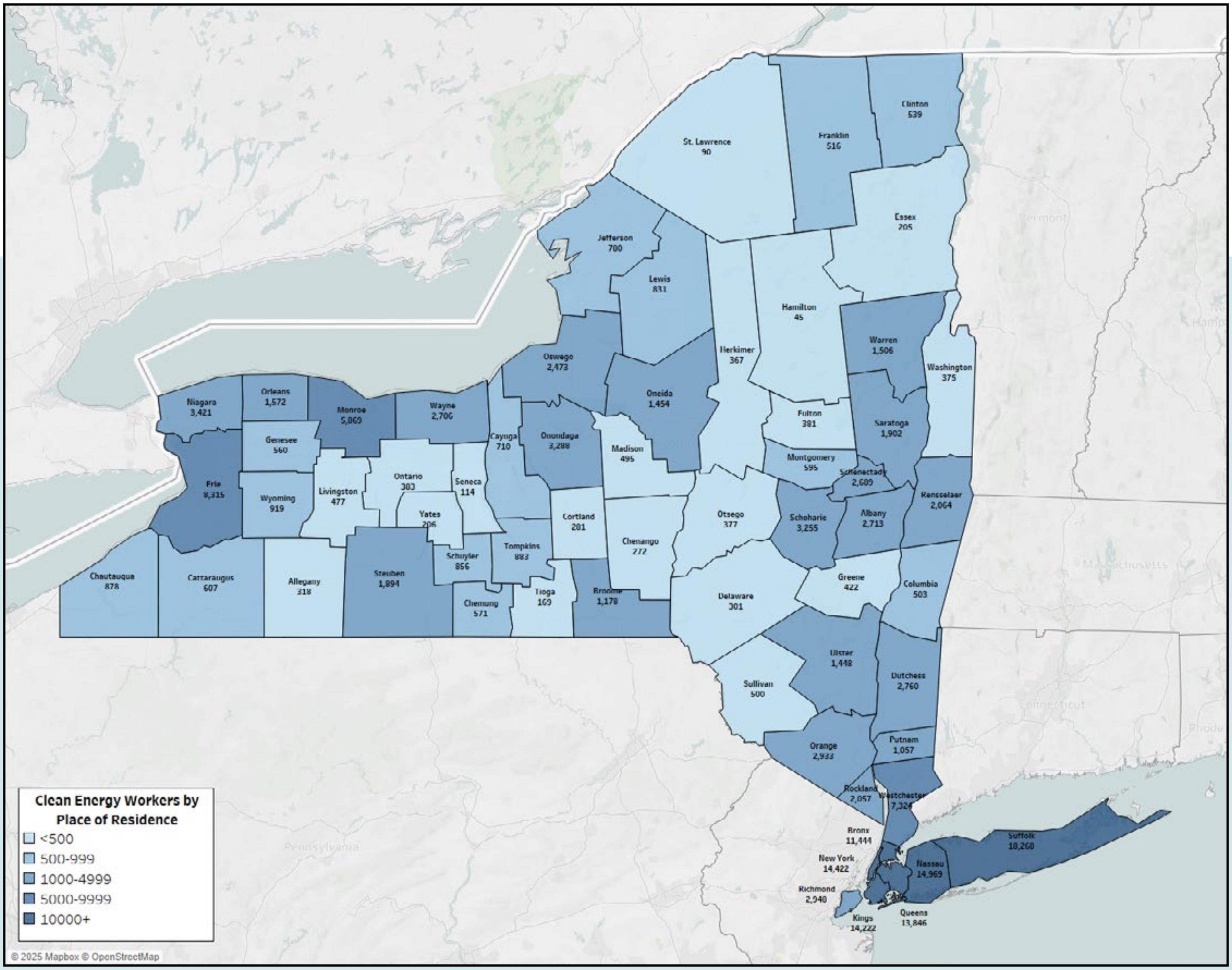
Twenty-nine counties have 1,000 or more residents who work in clean energy, three more counties than in 2023, while only two counties have fewer than 100 residents who work in clean energy (Figure 10).

The largest concentrations of clean energy workers generally mirror the same counties where employment is located, indicating that workers tend to live somewhat near the major clean energy project and job hubs.

However, some counties are key exporters of clean energy workers: for example, the Bronx has 65% more clean energy workers than clean energy jobs. The Bronx is located next to two key importer counties: New York County, with 52% more jobs than clean energy workers, and Queens County with 31%.

A similar dynamic appears in western New York, where Wayne and Orleans Counties export workers into the larger job hubs of Monroe and Erie.

Figure 10. Place of Residence for Clean Energy Workers by County, 2024



Clean Energy Demographics

The racial and ethnic composition of the clean energy workforce has remained largely unchanged over time.

Compared to the overall workforce in New York State, individuals identifying as women, Hispanic or Latino/a, Black, or Asian continue to be underrepresented in clean energy jobs. While still underrepresented compared to the entire labor force, the clean energy workforce is more representative than the electric transmission and distribution (T&D) and traditional energy workforce. There has been a gradual increase in the participation of Hispanic/Latino/a and Asian workers since data collection began in 2019 (Table 1). Much of this underrepresentation is likely shaped by the dominance of installation and construction occupations within the sector that make up the bulk of clean energy jobs and have historically struggled with workforce diversity. Building a more inclusive and representative clean energy workforce will demand sustained commitment from employers, educational institutions, training organizations, and policymakers alike.

Table 1. Clean Energy Demographics, 2024

	Overall Clean Energy				T&D and Traditional Energy Workers,	New York's Labor Force,
	2019	2022	2023	2024	2024	2024
Women	26%	26%	26%	26%	20%	49%
Men	73%	74%	74%	74%	80%	51%
Hispanic or Latino/a	12%	15%	15%	15%	19%	19%
White	75%	72%	72%	72%	78%	58%
Black	9%	9%	9%	9%	11%	14%
Asian	2%	8%	8%	8%	6%	9%
Native American	4%	1%	1%	1%	0%	1%
Pacific Islander	1%	1%	1%	1%	1%	0%

Among clean energy workers in selected value chain segments, the installation and utilities sectors have the smallest percentage of women, at only 20%.

Professional and other support services have the highest participation of women at 42%. While high compared to clean energy generally, this is still below the total New York State labor force.

As for Hispanic or Latino/a representation, participation is relatively low in professional and other support services at only 11%, four percentage points behind the overall clean energy workforce, and eight behind the total State labor force. Racially, clean energy workers are generally similar across value chains, with somewhat higher Asian representation in the professional and other support services value chain (Table 2).

Table 2. Clean Energy Worker Demographics by Value Chains, 2024

	Installation & Utilities	Manufacturing	Professional & Other Support Services	Sales & Distribution	Overall Clean Energy
Women	20%	30%	42%	33%	26%
Men	80%	70%	58%	67%	74%
Hispanic or Latino/a	17%	15%	11%	16%	15%
White	72%	72%	72%	72%	72%
Black	9%	9%	9%	10%	9%
Asian	6%	8%	12%	10%	8%
Native American	2%	1%	1%	1%	1%
Pacific Islander	1%	0%	0%	0%	1%

Clean Energy Unionization

Labor unions play a critical role in advocating for workers' rights and protections, providing high-quality training, ensuring minimum pay and benefits, and representing employees in industry decision-making. Union membership density varies significantly by geography and sector.

Economywide, 21% of New York State's workers are union members, more than double the national average of 10%, making it the second most unionized state in the nation, following only Hawaii.[9]

Table 3. New York State and National Unionization Membership Rates, 2024[8]

	New York	National
Clean Energy	13%	8%
Traditional Energy	9%	6%
Economy Wide	21%	10%

In New York, 13% of clean energy workers are union members (Table 3).

While this is lower than the statewide average, it exceeds the national average for clean energy unionization (8%). Notably, New York clean energy unionization rate also exceeds the rate for traditional energy in New York (9%). Additionally, the national clean energy average decreased from its rate of 9% in 2023, while New York State grew modestly from 12%.

Among all value chain segments, public and private utilities exhibit the highest unionization rate, with 19% of workers represented by unions.

In contrast, sales and distribution roles have the lowest unionization rate, with less than 3% of workers unionized (Table 4). Every segment of New York State's clean energy value chain shows higher unionization rates than the corresponding national averages, underscoring the State's comparatively strong labor representation within the clean energy economy.

Table 4. Unionization Rate In Clean Energy by Value Chain, 2024

	State Average Membership Rate[10]	State Average Coverage Rate[11]	National Average Membership Rate	National Coverage Rate
Installation	16%	17%	11%	12%
Professional Services	3%	4%	2%	3%
Public or Private Utility	19%	20%	12%	13%
Manufacturing	10%	11%	7%	8%
Sales and Distribution	3%	3%	2%	2%
Other Support Services	5%	5%	3%	3%
Other	4%	6%	3%	4%
Total	**13%**	**14%**	**8%**	**9%**

Detailed Clean Energy Sector Employment

Building Decarbonization and Energy Efficiency

The building decarbonization and energy efficiency sector includes workers engaged in a range of activities such as research, manufacturing, sales, installation, repair, and professional services.[12]

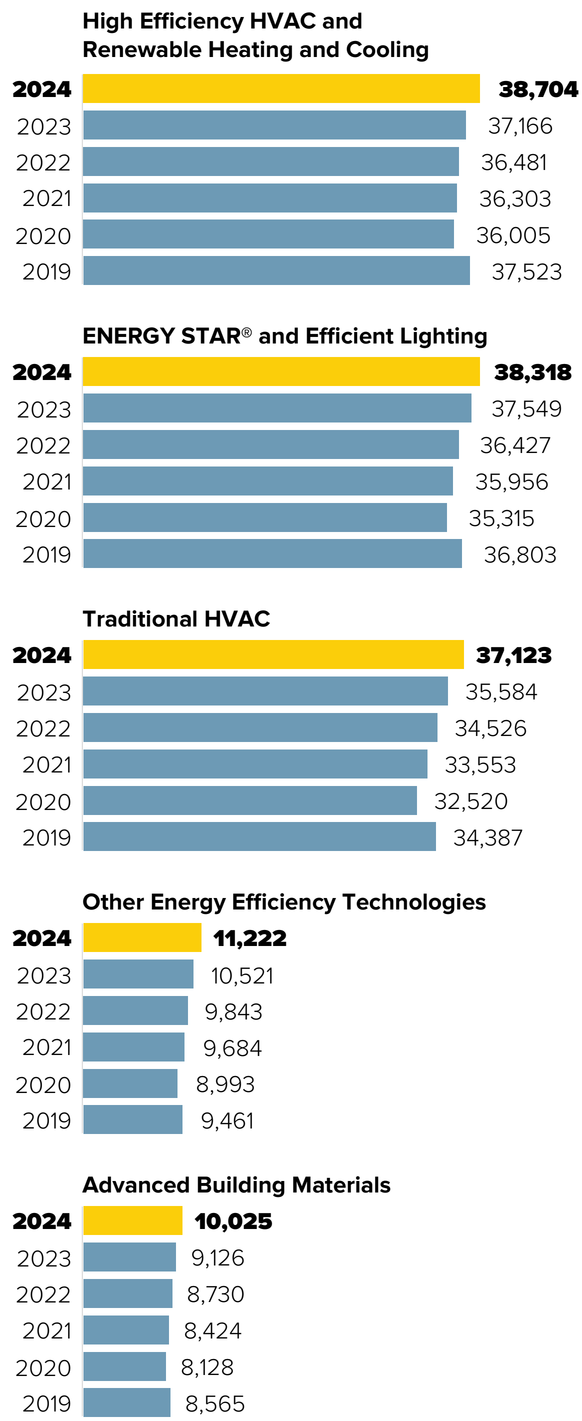
The main goal of this sector is to reduce carbon emissions and enhance the energy performance of residential, commercial, and industrial buildings. This sector is comprised of a variety of subsectors, including ENERGY STAR® appliances, lighting systems, HVAC equipment, advanced building materials such as insulation, solar thermal systems for heating and cooling, and other energy-saving solutions such as recycled construction materials and water-efficient products and appliances.

Every subsector in the building decarbonization and energy efficiency sector saw growth from 2023.

Notably, advanced building materials grew by 10%, adding almost 900 jobs.[13] High-efficiency HVAC and renewable heating and cooling, as well as traditional HVAC also had strong growth, gaining over 1,500 workers each and growing 4% (Figure 11).

Additional details on employment in the buildings sector can be found in the Deep Dive on Building Decarbonization and Energy Efficiency Section of the report.

Figure 11. Building Decarbonization and Energy Efficiency Employment by Subsectors, 2019–2024[14]



Renewable Electric Power Generation

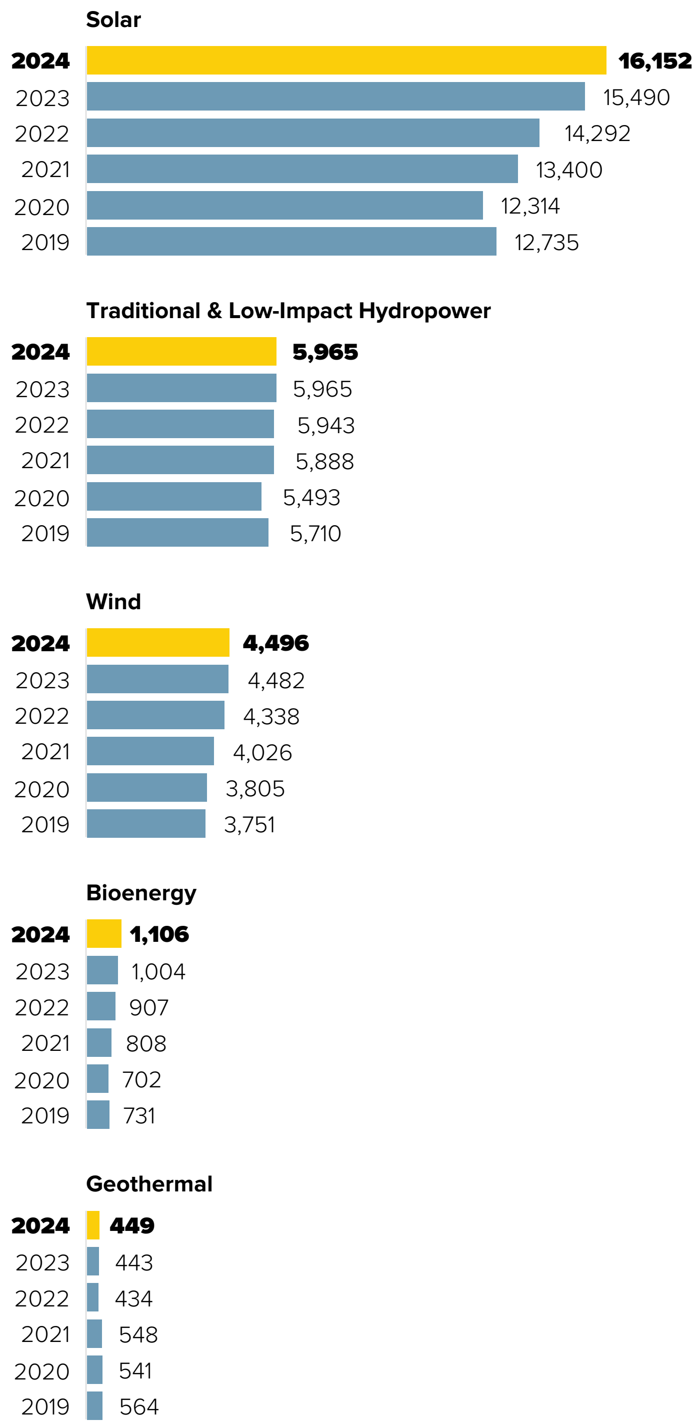
Jobs in renewable electric power generation involve people working across multiple areas, including research, development, production, manufacturing, sales, installation and construction, maintenance, repair, and professional services, all focused on technologies that generate electricity from renewable sources including solar, wind, geothermal, bioenergy, and hydropower systems.

Solar accounts for the highest share of New York State's renewable electric power generation employment, accounting for more than half of the workers in the sector, followed by hydropower, wind, and bioenergy, which continues to grow rapidly.

Solar generation gained over 660 jobs since 2023, growing by 4%.

Bioenergy saw a double-digit growth rate at 10%, adding more than 100 jobs into the economy (Figure 12).

Figure 12. Renewable Electric Power Generation Employment by Subsector, 2019–2024[15]



Clean and Alternative Transportation

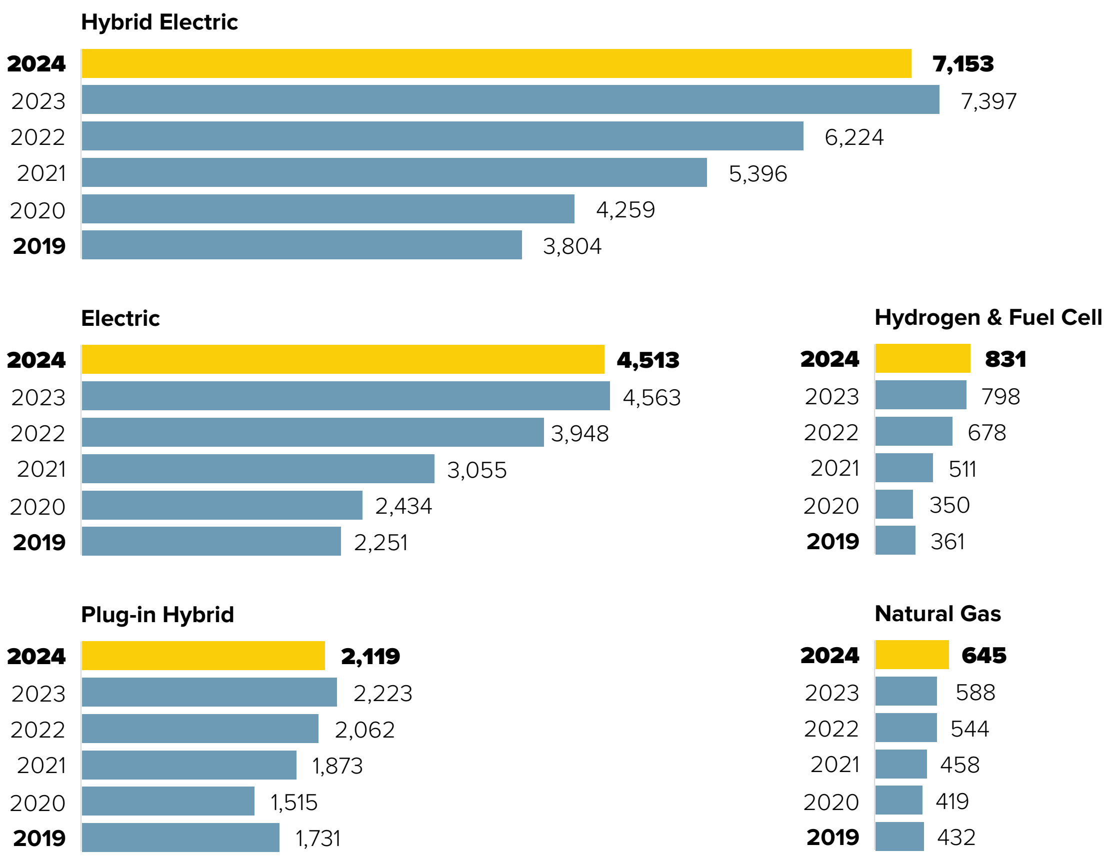
The clean and alternative fuels transportation sector includes workers across different stages of the value chain for clean vehicle technologies. This covers areas such as manufacturing, sales, repair, maintenance, and professional support services like legal, financial, engineering, and consulting. The sector focuses on a variety of vehicle technologies that use clean or alternative fuels, including electric vehicles, plug-in hybrids, hybrid electrics, natural gas vehicles, hydrogen-powered vehicles, and fuel cell technologies.

Most clean and alternative transportation subsectors saw decreases in employment in 2024. Larger subsectors in clean and alternative transportation, including hybrid electric vehicles, electric vehicles and plug-in hybrids, all experienced slight decreases in employment, ranging from 1 to 5%.

The small and evolving subsector of hydrogen and fuel cell vehicles experienced a double-digit growth rate of 10%, gaining nearly 60 jobs, while the small natural gas subsector gained 30 jobs at 4%.

These trends likely occurred due to a decline in manufacturing due to cooling demand for these vehicles, while smaller, emerging technologies saw growth related to research maintenance positions (Figure 13).

Figure 13. Clean and Alternative Transportation Employment by Subsector, 2019–2024



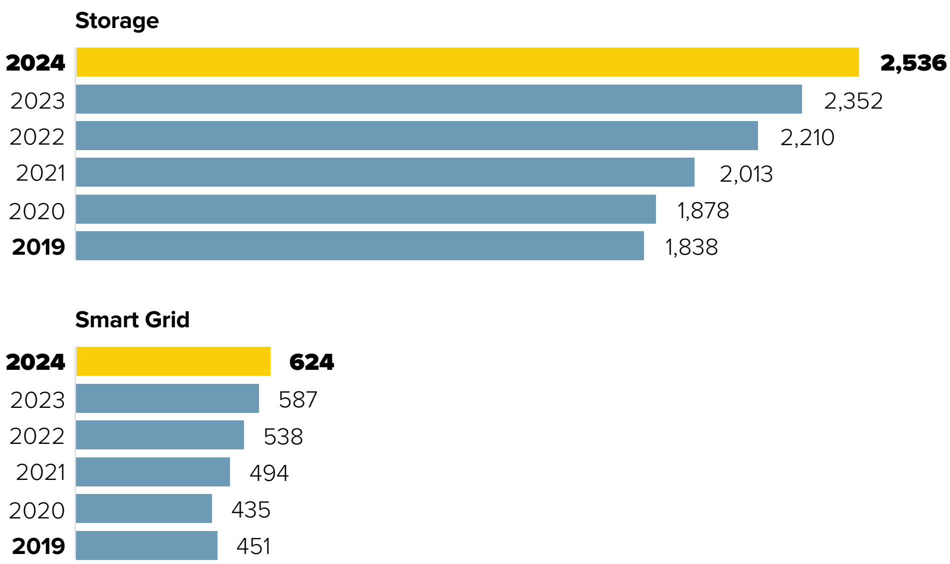
Grid Modernization and Storage

Grid modernization and energy storage include workers engaged in activities such as construction, manufacturing, and wholesale trade, along with those providing legal, financial, and engineering services that support smart grid and energy storage technologies.[16]

Both subsectors in grid modernization and storage saw high growth rates in 2024.[17]

Storage added 185 jobs, an increase of 8%, while smart grid gained nearly 40 jobs, an increase of 6% (Figure 14).

Figure 14. Grid Modernization and Energy Storage Employment by Subsector, 2019–2024

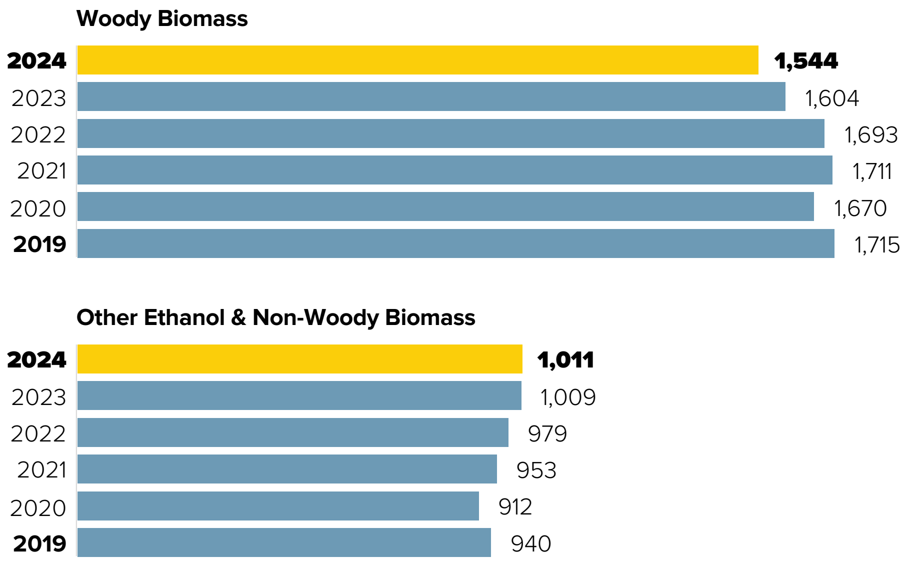


Renewable Fuels

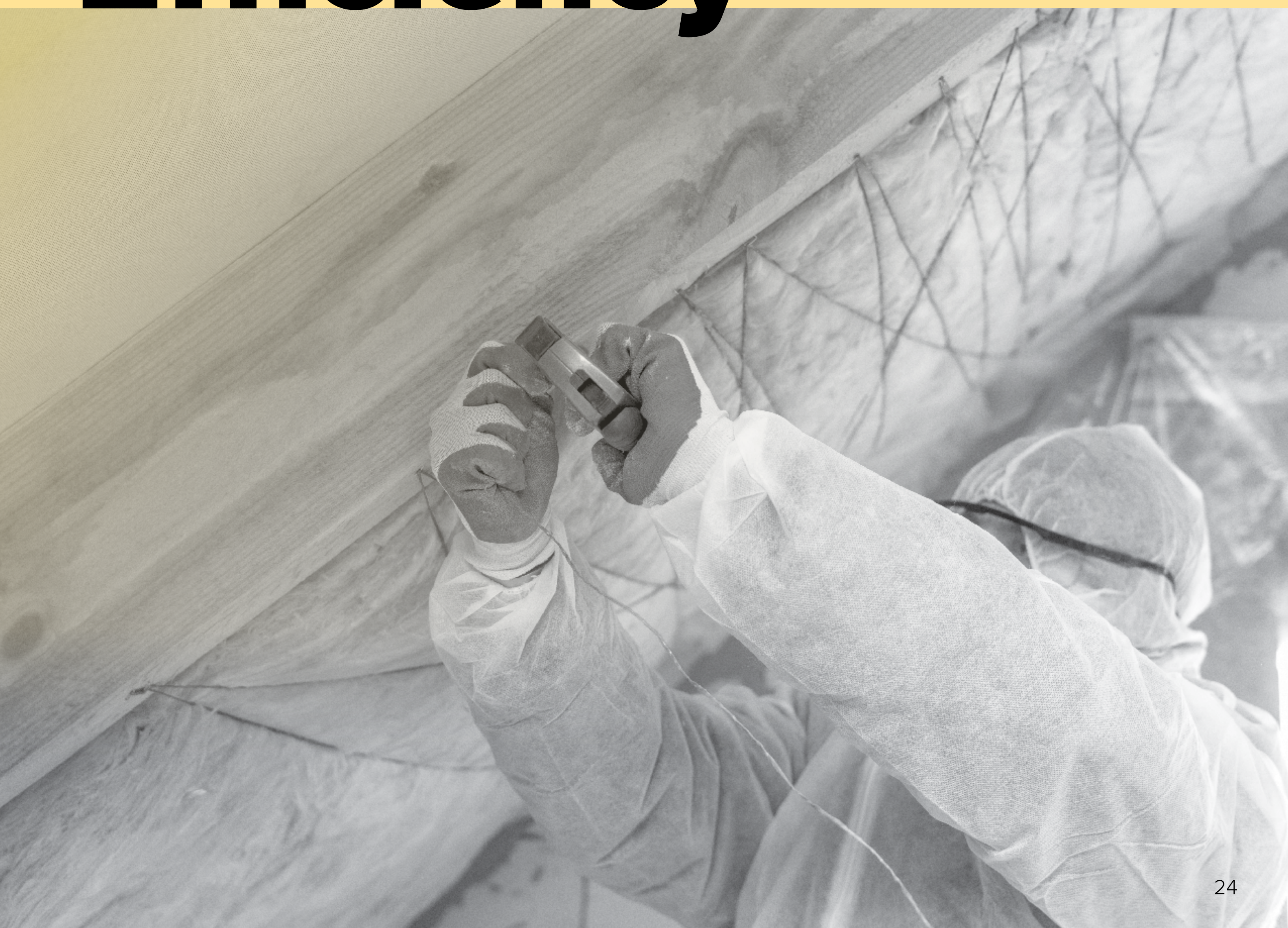
The renewable fuels sector consists of workers involved in the production, distribution, sales, and professional or business services that support renewable fuels and related technologies. These fuels are derived from both woody and non-woody biomass sources.

Employment in other ethanol and non-woody biomass remained unchanged between 2023 and 2024, while woody biomass lost 60 jobs, declining -4% (Figure 15).

Figure 15. Renewable Fuels Employment by Subsector, 2019–2024[18]



Deep Dive:
Building Decarbonization and Energy Efficiency



31%

of economy-wide emissions come from buildings

Building decarbonization and energy efficiency contribute to reducing energy costs, improving building quality, and improving health outcomes.

Building decarbonization and energy efficiency are also a cornerstone of New York State's energy transition strategy and are essential to meeting ambitious statewide targets as buildings are responsible for approximately 31% of economy-wide emissions.[19]

To support this transformation, NYSERDA and utilities provide a suite of programs offering both financial incentives and technical assistance to facilitate low-carbon building practices across the State.[20]

Decarbonizing buildings involves maximizing energy efficiency, electrifying systems such as HVAC and hot water, and ensuring that new energy efficiency and electrification technologies integrate seamlessly with a modernized, cleaner electric grid.

Photo credit: SL Green

NYSERDA's On-the-Job Training for Energy Efficiency and Clean Technology

NYSERDA has provided funding for clean energy businesses to hire and train new workers through its On-the-Job Training Program. Since 2018, NYSERDA has issued over $18.5 million to fund wage subsidies for on-the-job training of new hires working on building efficiency and renewable energy projects.

Funding is available through this program for training related to a wide variety of energy efficiency technologies including high efficiency heating, ventilation, and air conditioning (HVAC), renewable heating and cooling, high efficiency water heating, insulation and/or air sealing, high efficiency lighting and controls, and building automation and controls. The program provides wage subsidies to help reduce the financial risk of hiring and training new workers and is designed to address clear clean energy skills gaps with robust training.

Additional program information can be found at **nyserda.ny.gov/OJT.**

Survey Findings

The building decarbonization and energy efficiency sector is a key driver of clean energy employment in New York.

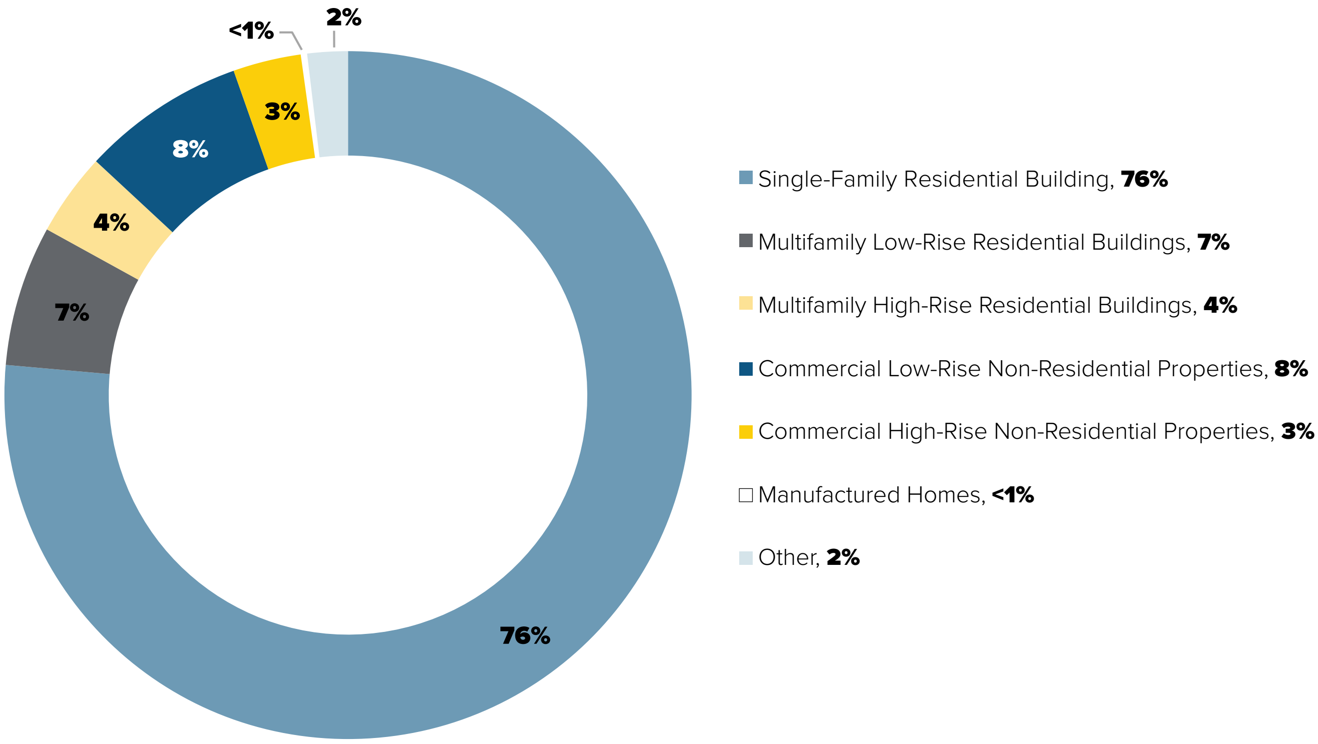
Nearly three-quarters (73%) of the State's clean energy workforce are employed in this sector. Building decarbonization and energy efficiency jobs have grown 22% since 2016 and 4% from 2023 to 2024, indicating steady and sustained growth.

This section presents survey findings from 225 contractors engaged in core building decarbonization activities through technologies such as ENERGY STAR and efficient lighting, high-efficiency HVAC and renewable heating and cooling, and advanced building materials. These insights provide a foundation for understanding occupational and workforce trends among building decarbonization employers, as well as identifying which support resources are most commonly utilized—and why some contractors may not be taking advantage of them (refer to Appendix C: Building Decarbonization and Energy Efficiency Contractor Survey Questionnaire for the detailed questionnaire).

Residential building activity is a key driver of the building decarbonization industry. Over three quarters (76%) of contractors reported that single-family residential buildings are the properties they work on most frequently.

This is followed by multifamily low-rise residential buildings at 7% and multifamily high-rise residential buildings at 4%. By contrast, 8% of contractors identified commercial low-rise properties as their primary focus, and 3% selected commercial high-rise properties (Figure 16). This is more or less consistent with the New York State building stock, which is made up of roughly 92% single-family buildings, 3% multifamily buildings, and 2% commercial.[21] Multifamily and commercial buildings have considerably larger square footage and consequently require larger and more complex projects.

Figure 16. Type of Property Your Business Works on Most Frequently



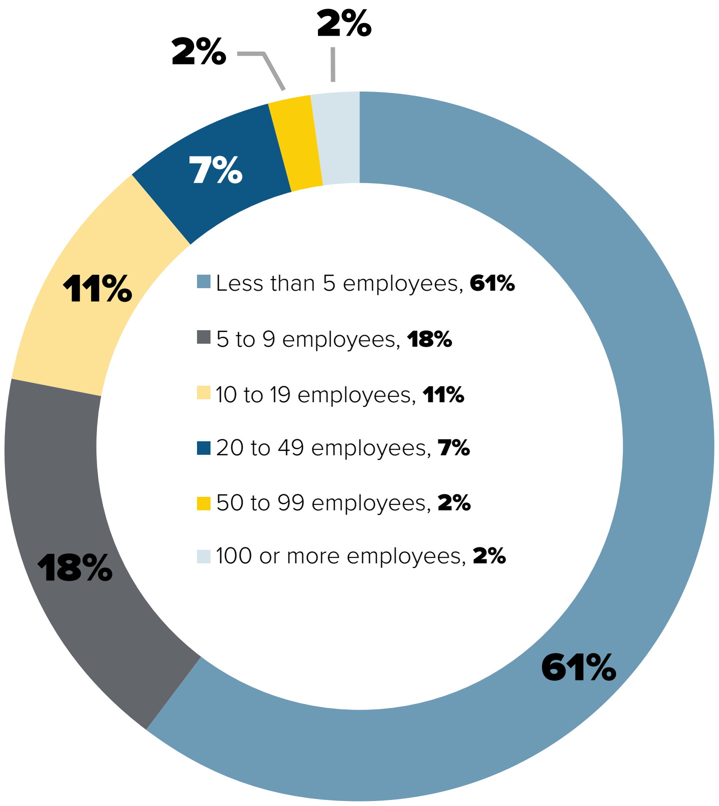
The majority of firms are small, as 61% employ five or fewer workers (Figure 17).

Smaller employers are much more likely to specialize in single-family residential work.

For example, 83% of firms with fewer than five employees identified single-family residences as their focus, compared to only 44% of firms with 50 to 99 employees.

Larger firms are more likely to concentrate on commercial projects, which means that while most contractors report working on residential buildings, a significant share of overall decarbonization activity by value is likely concentrated in the commercial sector.

Figure 17. How many permanent (non-contract or temporary) employees work at your current location?



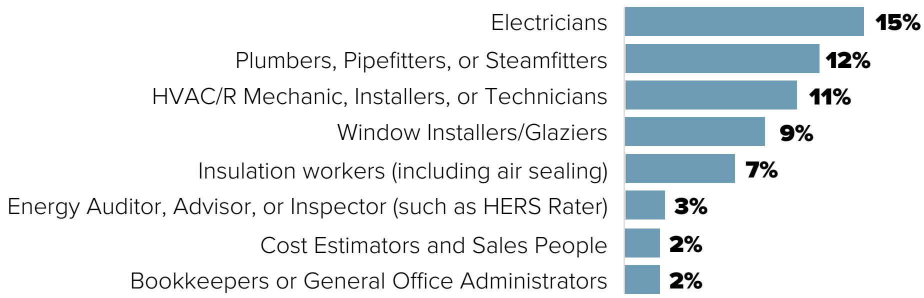
Unionization rates in building decarbonization and energy efficiency jobs vary by occupation.

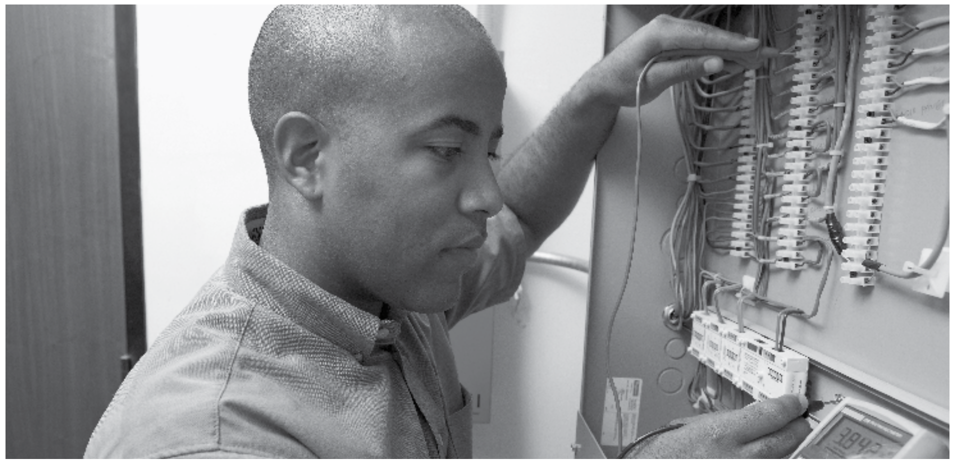
Electricians have the highest rate at 15% — this is greater than the clean energy average in the State of 13%.

Plumbers, pipefitters, and steamfitters have the second highest rate at 12%, followed by heating, ventilation, air conditioning, and refrigeration (HVAC/R) mechanics, installers, and technicians at 11%.

The unionization rate drops significantly for professional occupations. Energy auditors, advisors, and inspectors have a unionization rate of only 3%, while cost estimators and salespeople, as well as bookkeepers and general office workers unionization rates are only 2% (Figure 18).

Figure 18. Percent of Workers Covered by Unions by Occupation





Unionization for workers is more present as employers grow.

In six of the eight surveyed occupations, employers with less than 10 employees have lower unionization rates than those with 10 to 49 employees. These correlations also translate to property type: employers who primarily work on multifamily residential properties have higher unionization rates than employers focusing on single-family properties (Table 5).

Table 5. Unionization by Occupation and Primary Property Type

	Single-Family Residential	Multifamily and Commercial Properties	Less than 10 Employees	10 to 49 Employees
Electricians	13%	20%	12%	16%
HVAC/R Mechanics, Installers, and Technicians	8%	16%	9%	11%
Window Installers/ Glaziers	8%	14%	0%	9%
Insulation Workers	5%	16%	3%	5%
Plumbers, Pipefitters, and Steamfitters	4%	23%	11%	8%
Bookkeepers and General Office Administrators	2%	1%	1%	1%
Cost Estimators and Salespeople	1%	5%	1%	2%
Energy Auditors, Advisors, and Inspectors	1%	7%	0%	4%

CASE STUDY 1

Insulators Local 12: Apprenticeship & Journeypersons Training

FUNDING SUPPORT

$860k

WORKERS TRAINED

280

HOURS OF TRAINING

150

The International Association of Heat and Frost Insulators and Allied Workers, Local 12, was awarded $860,000 in funding as part of **NYSERDA's Apprenticeship and Pre-apprenticeship Clean Energy Training Program** to support the development of a diverse and inclusive pipeline of skilled talent to meet projected workforce needs of the clean energy sector.

The award will support the training of 280 apprentices and journey workers to assess the need for buildings improvements to substantially reduce energy usage. The training will develop a variety of skills, including in insulation assessment and training in thermography as tools to enhance the efficacy of assessments.

Apprentices will receive over 150 hours of training in insulation and vapor barriers. Leveraging the earn-as-you-learn model, apprentices are paid while being trained. Journeypersons will have the opportunity to participate in the thermographic and assessment awareness course, where upon completion, individuals will receive an Infrared Thermography and Mechanical Assessment certificate.

Career Outreach and Awareness: The Building and Construction Trades

In addition to training program, the funding awarded will also support Local 12's development and implementation of a K-12 career awareness and outreach program, which will include custom tailored materials into K-4, 5-8, and 9-12 segments and distributed across New York State.

The material is designed to highlight careers in the energy efficiency industry, highlighting the importance of energy efficiency and proper insulation.

Additionally, Local 12 will conduct localized outreach throughout the five boroughs of New York City and Long Island to participate in activities such as career days and hands-on demonstrations.

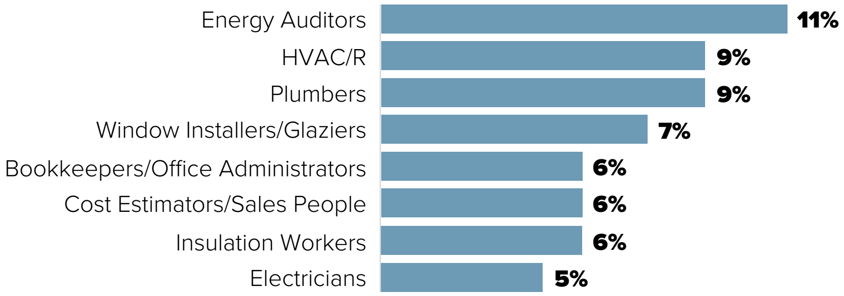
> *"Heat and Frost Insulators Local 12 thanks and congratulates NYSERDA for its vision in supporting the training of the workforce of the future and developing the technologies that will save New York State millions and millions of dollars in energy costs. This partnership will also allow Local 12's already strong apprenticeship and journey person programs to create career opportunities for the jobs of the future. It's an exciting opportunity."*

– John Jovic, Business Manager, Local 12 Heat and Frost Insulators

Contractors reported that they have been increasing their building decarbonization and energy efficiency workforce over the last 12 months and that they expect to continue growing.

Energy auditors, advisors, and inspectors experienced the largest growth rate, increasing by 11%, followed HVAC/R mechanics, installers, and technicians, and plumbers, pipefitters, and steamfitters, both at 9% (Figure 19).

Figure 19. Increase in Number of Workers Reported from 12 Months Ago to Now



CASE STUDY 2

Nontraditional Employment for Women

FUNDING SUPPORT

$500k

TRAINEES GRADUATED

80

With roughly half a million dollars of funding support from NYSERDA's Workforce and Development Program, Nontraditional Employment for Women's (NEW) "Green Collar Prep" program provides free pre-apprenticeship training for women for green jobs, including in the building and construction trades and building maintenance and operations industries.

NEW's pre-apprenticeship program includes support with job placement as well as wrap-around services, such as support with housing, childcare, professional development, and accessing tools and equipment. NEW's programs are available to women who live in historically underserved areas of New York City and who meet certain income requirements.

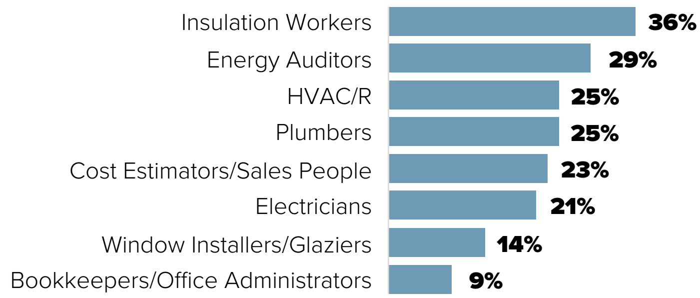
Between 2020 and 2025, NEW has graduated over 80 trainees. Graduates leave the Green Collar Prep program with certifications that qualify them to enter union apprenticeship programs as well as OSHA certifications required for construction work. Additional details on the Green Collar Prep program can be found in NYSERDA's case study.

Contractors expect growth to continue in these occupations over the next three years.

Employers report a predicted 36% increase in the insulation workforce for the next three years.

The next largest predicted growth rate is for energy auditors, advisors, and inspectors, at 29%. Every occupation is expected to grow by a double-digit percentage in the next three years, except bookkeepers and general office administrators at 9% (Figure 20).

Figure 20. Expected Increase in Workers in Three Years

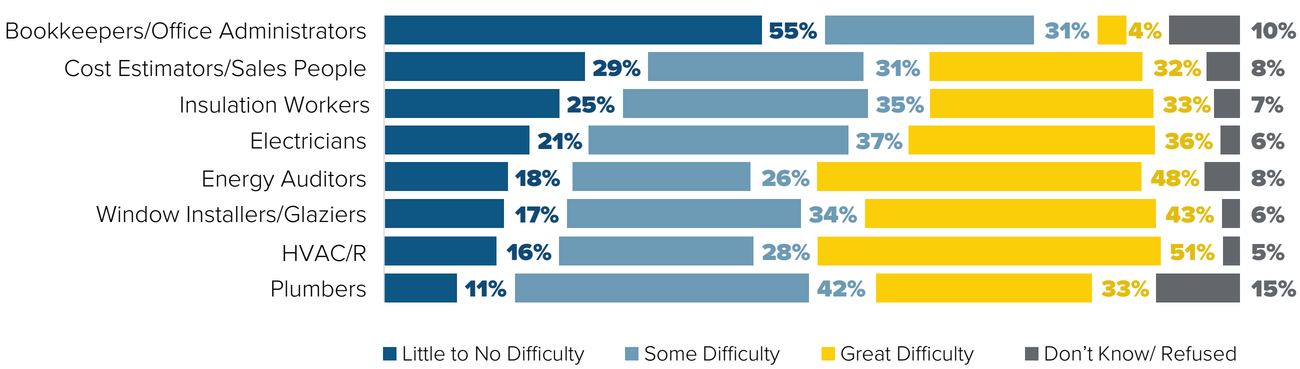


Despite expected growth, building decarbonization employers indicate difficulty hiring qualified workers among all occupations.

Over half of employers indicated experiencing some or great difficulty hiring qualified workers for all occupations, except for bookkeepers and general office administrators (Figure 21).

HVAC/R employers experienced the most difficulty hiring qualified workers, with 51% reporting great difficulty, and 28% reporting some difficulty. The next hiring difficulty was with window installers and glaziers (77% some or great difficulty), followed by energy auditors (74% some or great difficulty each).

Figure 21. Please indicate your level of difficulty hiring qualified workers for the following occupation(s).



Almost half (43%) of building decarbonization and energy efficiency employers report there are license requirements to install heat pumps in buildings.

For those who report requirements, the most common cited certification is the EPA 608, identified by 77% of the employers (Figure 22). Employers were also asked where their employees usually go for these certifications, in which the most identified sources were online and webinar programs, wholesaler programing, the Building Performance Institute (BPI), and Air Conditioning Contractors of America (ACCA) (Figure 23).

Figure 22. Are specific certifications or license requirements required to install heat pump systems within buildings? Yes (please tell us the name(s) of the certifications or licenses required).

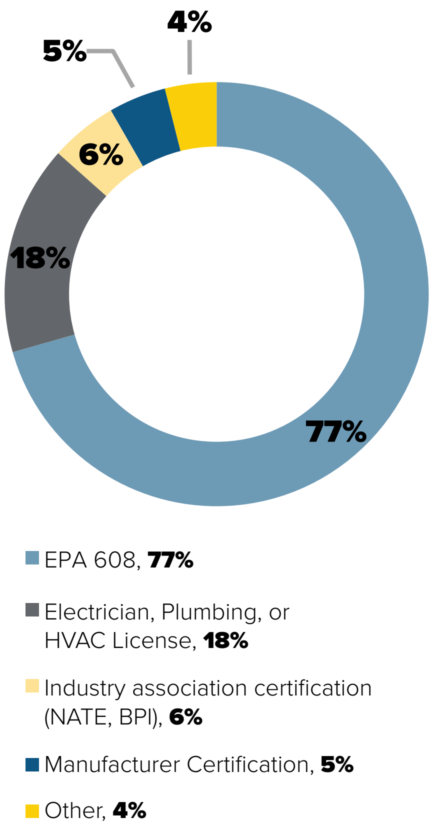
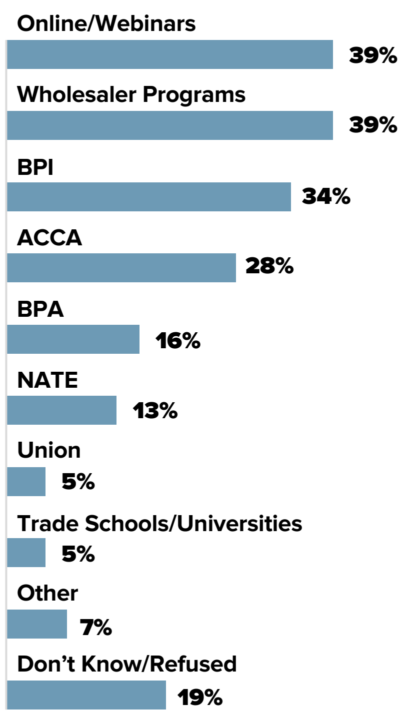


Figure 23. Where do your employees go to earn the certifications you previously listed?



Employer expectations for prior work experience vary across occupations.

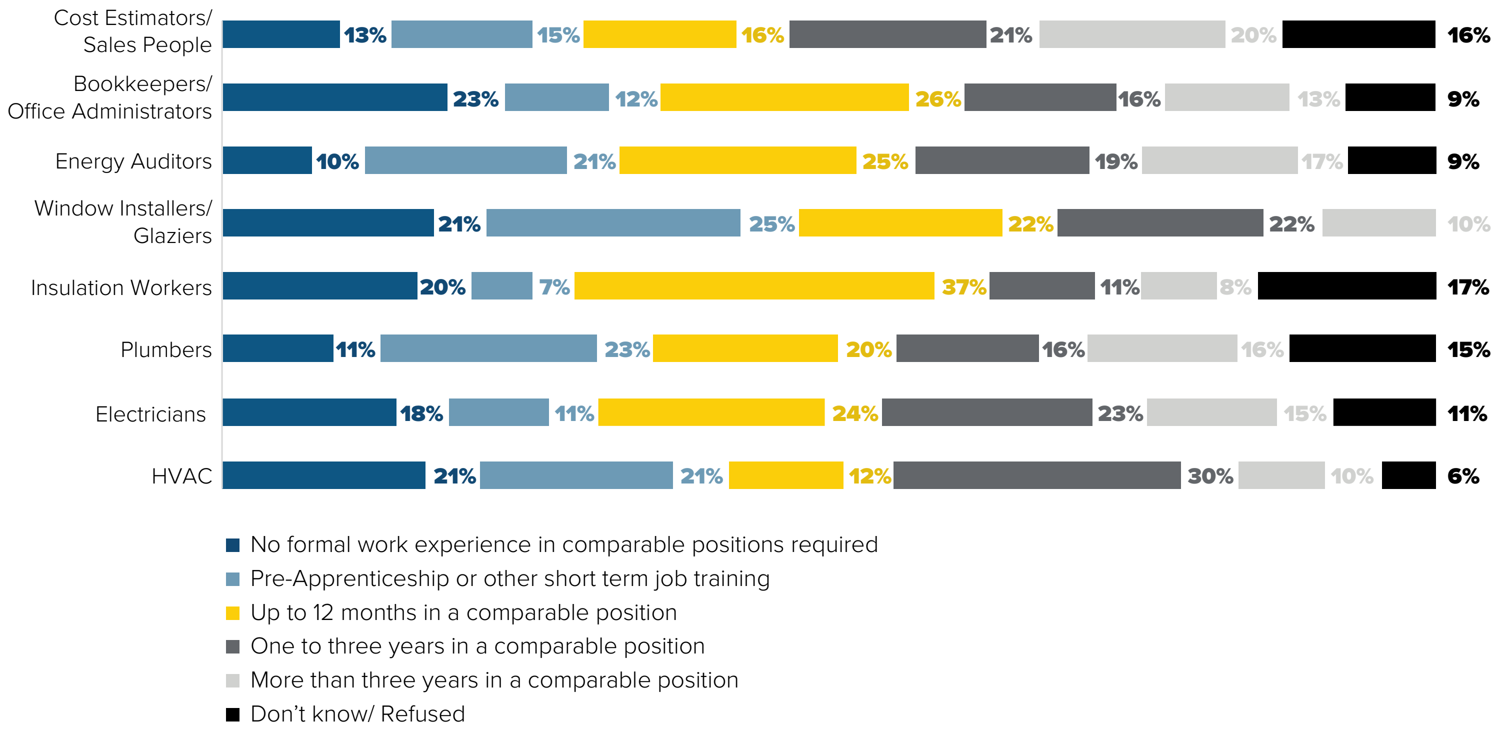
HVAC roles are among the most accessible, with 21% of employers requiring no prior experience and another 21% accepting short-term training.

Electricians (24%) and insulation workers (37%) are most likely to require up to a year of relevant experience, while window installers show a similar split between short-term training (25%) and up to a year (22%).

Higher thresholds are more common among plumbers (16% requiring one to three years, 16% more than three years), energy auditors (19% one to three years, 17% more than three years), and cost estimators (21% one to three years, 20% more than three years) (Figure 24).

For employers who report that applicants are not qualified, the most commonly cited type of qualification was work experience (44%), followed by technical skills or knowledge (30%), and soft skills (15%).

Figure 24. Please indicate the minimum required level of prior work experience you expect entry-level applicants to possess.



Looking ahead: NYS Building Decarbonization Workforce Development

In May 2025, the NYS Public Service Commission authorized $83 million in funding for NYSERDA's Workforce Development and Training Programs under its Energy Efficiency and Building Electrification (EE/BE) Orders. NYSERDA proposed to direct 2026-2030 EE/BE ratepayer funds toward three primary workforce development activities across all portfolios.

- **Clean Energy Career Pathways Training**
- **Targeted Skills Training and Upskilling**
- **"Earn as you Learn" Wage Reimbursement and Retention Incentives**

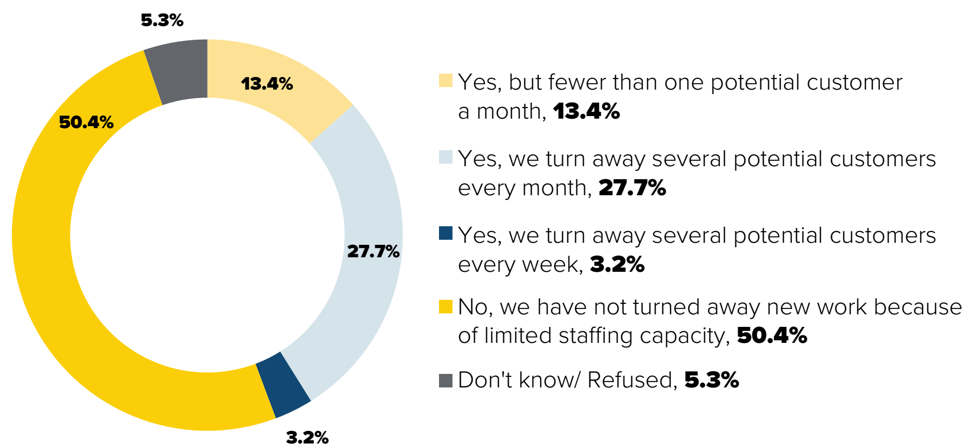
Nearly half (44%) of building decarbonization contractors reported turning away new work due to limited staffing capacity in the last six months.

Over a quarter (28%) turn away several potential customers every month, while 13% have turned away customers in the last six months, but fewer than one potential customer a month, and 3% turn away several potential customers every week. The other half (50%) have not needed to turn away any work in the last six months due to staffing capacity (Figure 25).

Larger firms turned away new work at higher rates than smaller firms.

Less than half (46%) of firms with five to-nine employees report having turned away some amount of new work in the last six months, while this figure rises to 63% with firms of 50 to 99 employees. This may be correlated with the difference in project size, given small firms are more likely to work on smaller, single-family residential projects requiring less long-term capacity, while larger projects usually more complex, require a larger number of workers, and require a longer time commitment.

Figure 25. In the past six months, has your company turned away new work because of limited staffing capacity?



When asked what resources or incentives would make contractors more willing to take on additional staff, the number one response was more access to trained talent, with 66% of contractors indicating this response.

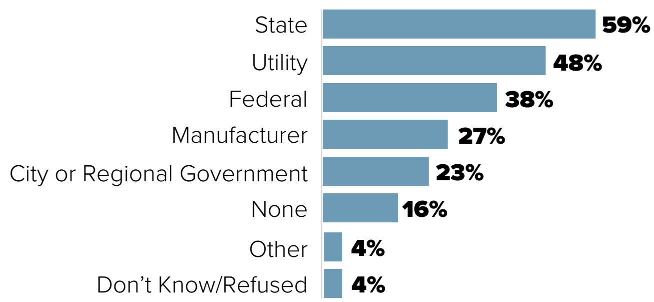
On the job training funding was the second most selected response, at 51%, followed by additional financial incentives at 45% (Figure 26).

Figure 26. Would any of the following resources or incentives make your company more willing to take on additional staff? – Multiple responses permitted; percentages may sum to more than 100%

State incentives, such as those through NYSERDA, are the most used incentives among contractors, with 59% of surveyed respondents using at least once before.

This is followed by utility incentives or rebates (48%) and federal incentives or rebates (38%) (Figure 27). About half (48%) of the contractors surveyed participated in a State or local direct installation or subsidized energy efficiency programs, such as EmPower+, Comfort Home, or National Grid's Direct Install program.

Figure 27. Please tell us which types of incentives/rebates you have used for at least one project — Multiple responses permitted (percentages may sum to more than 100%).



For those who do not participate in incentive programs, the most common reason is unclear or too complicated application requirements (30%), followed closely by not being familiar with the programs (29%) (Table 6).

Unfamiliarity with programming is slightly more prevalent for State and local direct installation programs (32%), which provide no- or low-cost energy efficiency upgrades directly to customers, than for rebates and incentives (29%), where customers purchase equipment and later receive a financial rebate.

Table 6. Why does your company not participate in incentive programs?

Reason	Incentives and Rebates	State or Local Direct Installation Programs
Unclear or too complicated application requirements	30%	23%
Not familiar with these programs	29%	32%
Not financially viable for my company	11%	14%
Qualification standards are too difficult to achieve	4%	6%
Too busy/ already have enough work orders	4%	11%
Other	11%	8%
Don't know/ refused	12%	7%

Clean Energy Compensation

Clean Energy Wages

Wages and benefits are a key metric in evaluating the quality of employment opportunities in the clean energy sector, along with critical to attracting and retaining talent. Clean energy occupations often offer workers higher compensation compared to similar roles in other industries.[22]

One factor contributing to these wage premiums is New York State's prevailing wage framework. Under State labor law, contractors are required to pay prevailing wages and benefits to specific workers engaged in public works, select publicly funded private developments, and designated renewable energy projects.[23, 24] Prevailing wages are also commonly used to establish the wage floor in collective bargaining agreements, which are widespread in clean energy construction. State policy further requires Project Labor Agreements, a type of collective bargaining contract, for major clean energy projects, guaranteeing that workers receive prevailing wages and supplemental benefits. These policies ensure fair compensation, prevent companies from undercutting competitors by offering substandard wages, and strengthen overall job quality in clean energy.

Clean energy workers often earn higher wages than their peers in the same occupational categories, particularly those who are new to the field.[25]

Entry-level clean energy employees enjoy an average wage premium of 12%, with 79% of occupations showing higher wages at this stage.[26] While the prevalence and size of wage premiums declines somewhat with experience, it remains significant, with 67% of mid-level workers and 63% of the most experienced workers in the tested occupations earning more than their counterparts outside the clean energy sector (Table 7).

Table 7. Summary Clean Energy Wage Premium Statistics

	Hourly 25th Percentile Wage	Hourly 50th Percentile Wage	Hourly 75th Percentile Wage	Wage Premium, All Percentiles
Share of Tested Occupations with a Clean Energy Wage Premium	79%	67%	63%	N/A
Average Premium	12%	5%	1%	6%
Median Premium	13%	3%	1%	3%

$39.32/hr

average median wage of 10 occupations critical to New York's clean energy transition

Table 8 highlights 10 key occupations critical to New York State's clean energy transition, each offering median wages above the statewide median of $28.16 per hour.[27, 28] On average, these occupations provide a median wage of $39.32, exceeding both the living wage for a single adult without children along with the State's minimum wage by more than $20 per hour.[29, 30]

Among these roles, building operators, building control technicians, and maintenance and repair workers stand out with the highest wage premiums:

- 45% at the 25th percentile
- 42% at the median
- an impressive 52% at the highest end

Table 8. Wages of Ten Prominent Clean Energy Occupations

SOC	SOC Name	Hourly 25th Percentile Wage	Hourly 50th Percentile Wage	Hourly 75th Percentile Wage	Hourly 25th Percentile Wage Premium*	Hourly 50th Percentile Wage Premium*	Hourly 75th Percentile Wage Premium*
17-3000	**Drafters, Engineering Technicians, and Mapping Technicians**	$32.13	$36.25	$44.22	13%	3%	1%
47-2030	**Carpenters**	$30.43	$38.04	$43.44	14%	15%	-1%
47-2060	**Construction Laborers**	$25.82	$33.65	$43.61	11%	14%	4%
47-2070	**Construction Equipment Operators**	$33.79	$45.92	$58.16	13%	11%	3%
47-2110	**Electricians**	$35.46	$44.21	$56.64	19%	15%	6%
47-2131	**Insulation Workers, Floor, Ceiling, and Wall**	$27.77	$30.78	$37.68	15%	-3%	-25%
47-2150	**Plumbers, Pipefitters, and Steamfitters**	$29.60	$36.02	$49.18	-2%	-7%	-3%
49-9020	**Heating, Air Conditioning, and Refrigeration Mechanics and Installers**	$32.74	$38.43	$43.93	23%	13%	4%
49-9050	**Electrical Power-Line Installers and Repairers**	$43.67	$50.38	$61.05	15%	1%	3%
49-9071	**Building Operators/ Building Control Technicians/ Maintenance and Repair Workers**	$31.82	$39.49	$52.95	45%	42%	52%

** The wage premium measures the wage for the given occupation in the clean energy sector compared to the same occupation economy-wide, including the clean energy sector.*

Clean Energy Benefits

While this report does not have the data on statewide healthcare coverage, national data shows access to healthcare coverage among clean energy occupations has remained steady over the past year.

In 2024, 90% of clean energy employers across the 60 occupations surveyed reported offering healthcare coverage.

This is the same rate as in 2023 and up from 86% in 2022 (Table 9).[31] This level of access significantly exceeds the national average across all occupations, which stands at 75%.[32]

Table 9. National Healthcare Coverage Rates Among Clean Energy Occupations

	2022	2023	2024	2024 Economy-Wide
Average	86%	90%	90%	75%
Median	86%	91%	92%	N/A

Table 10. National Healthcare Coverage Rates Among Ten Prominent Clean Energy Occupations

SOC	SOC Name	Healthcare coverage
49-9071	**Building Operators / Building Control Technicians / Maintenance and Repair Workers**	92%
51-4120	**Welders, Cutters, Solderers, and Brazers**	92%
49-9050	**Electrical Power-Line Installers and Repairers**	92%
49-9020	**Heating, Air Conditioning, and Refrigeration Mechanics and Installers**	88%
47-2060	**Construction Laborers**	87%
47-2110	**Electricians**	87%
47-2150	**Plumbers, Pipefitters, and Steamfitters**	87%
47-2073	**Operating Engineers and Other Construction Equipment Operators**	87%
47-2131	**Insulation Workers, Floor, Ceiling, and Wall**	82%
47-2030	**Carpenters**	78%

Clean Energy Employment & Training in Disadvantaged Communities

As the clean energy economy expands, a central focus is ensuring that this growth leads to job creation and greater economic opportunity within disadvantaged communities (DACs).

These communities, identified through criteria established by the State's Climate Justice Working Group, are defined as areas facing cumulative environmental pollution, public health risks, and heightened vulnerability to climate change impacts. In March 2023, the Climate Justice Working Group formally adopted a framework that designates DACs across the State, using a mix of environmental, socioeconomic, and health-related indicators to guide this identification.[33]

The location of clean energy jobs plays a crucial role in determining which workers can access them and which communities benefit from clean energy growth. To better understand these dynamics, this section of the report examines how clean energy employment opportunities are distributed across DACs.

The analysis relies on county-level clean energy employment data that is proportioned down to the census tract level, which is the scale at which DACs are defined.[34] Because census tracts are often very small—sometimes covering only a few city blocks—the totals for clean energy jobs within DACs are aggregated back up to the county level. This method helps reduce the margin of error that can arise from combining highly localized census-tract designations with broader county-level employment data. Even so, the findings should be interpreted as estimates rather than precise counts.[35]

Across the State, DACs account for nearly 60,000 clean energy jobs, or about one-third (33%) of the statewide total. This share is nearly in line with the 35% of New Yorkers who live in DACs (Table 11).[36, 37] While the DAC clean energy employment rate is somewhat lower than the population share, this may be partly explained by lower employment rates for DAC residents statewide—though an important issue to address, this is a consideration limited to the clean energy industry.

Table 11. Disadvantaged Communities Statistics, 2024

	Clean Energy Workers in DACs	Percent of all Clean Energy Jobs[39]
By Place of Employment	59,480	33%
By Place of Residence	50,403	30%

35%
New York State population living in DACs

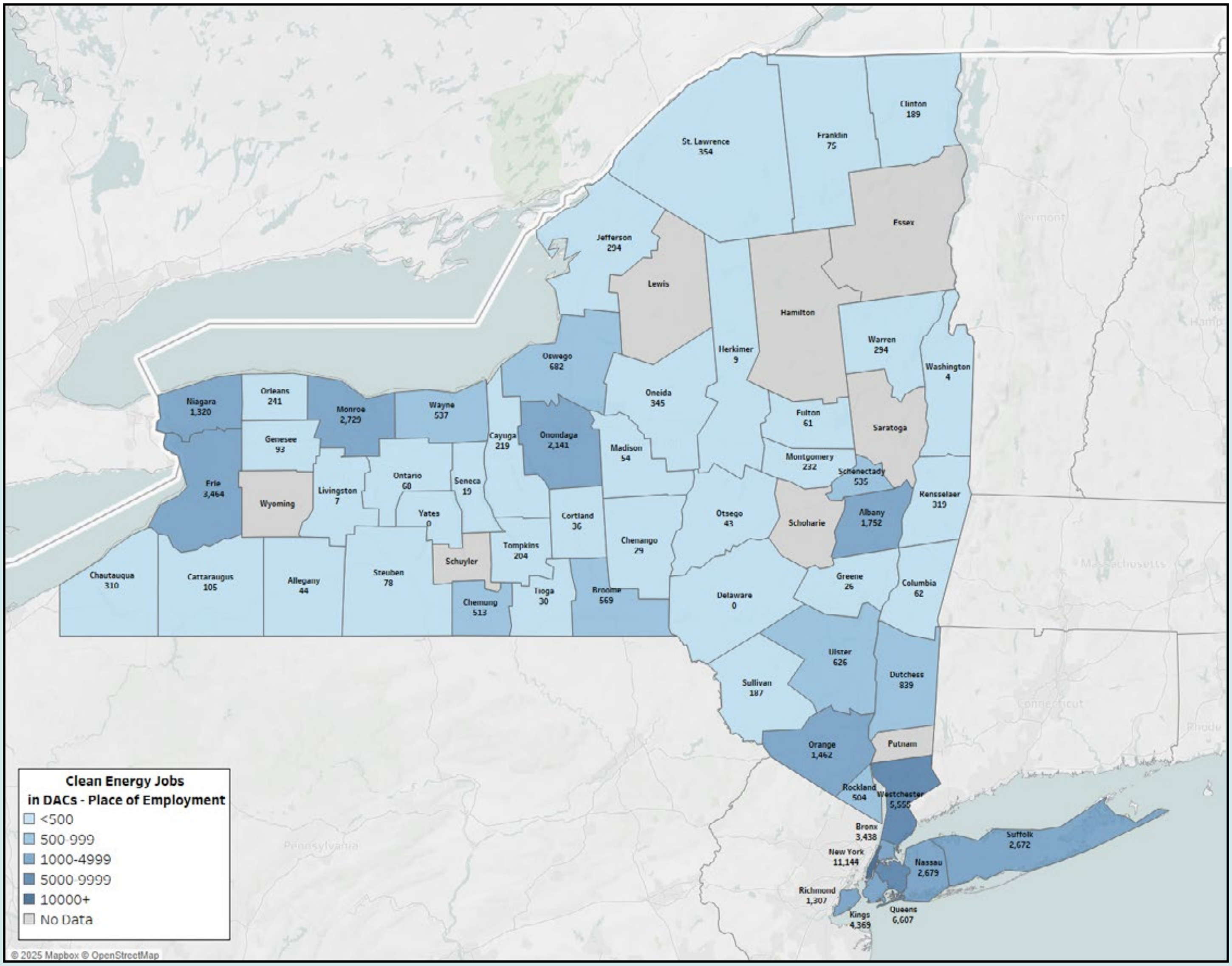
5%
unemployment rate for population not in DACs[40]

9%
unemployment rate for population in DACs

These jobs are spread across the State, with 35 counties each reporting 100 or more clean energy jobs within DACs.

The counties with the highest totals include New York, Queens, Westchester, Kings, and Erie, consistent with the fact that these counties have the highest concentrations of DACs within their county boundaries (Figure 28).

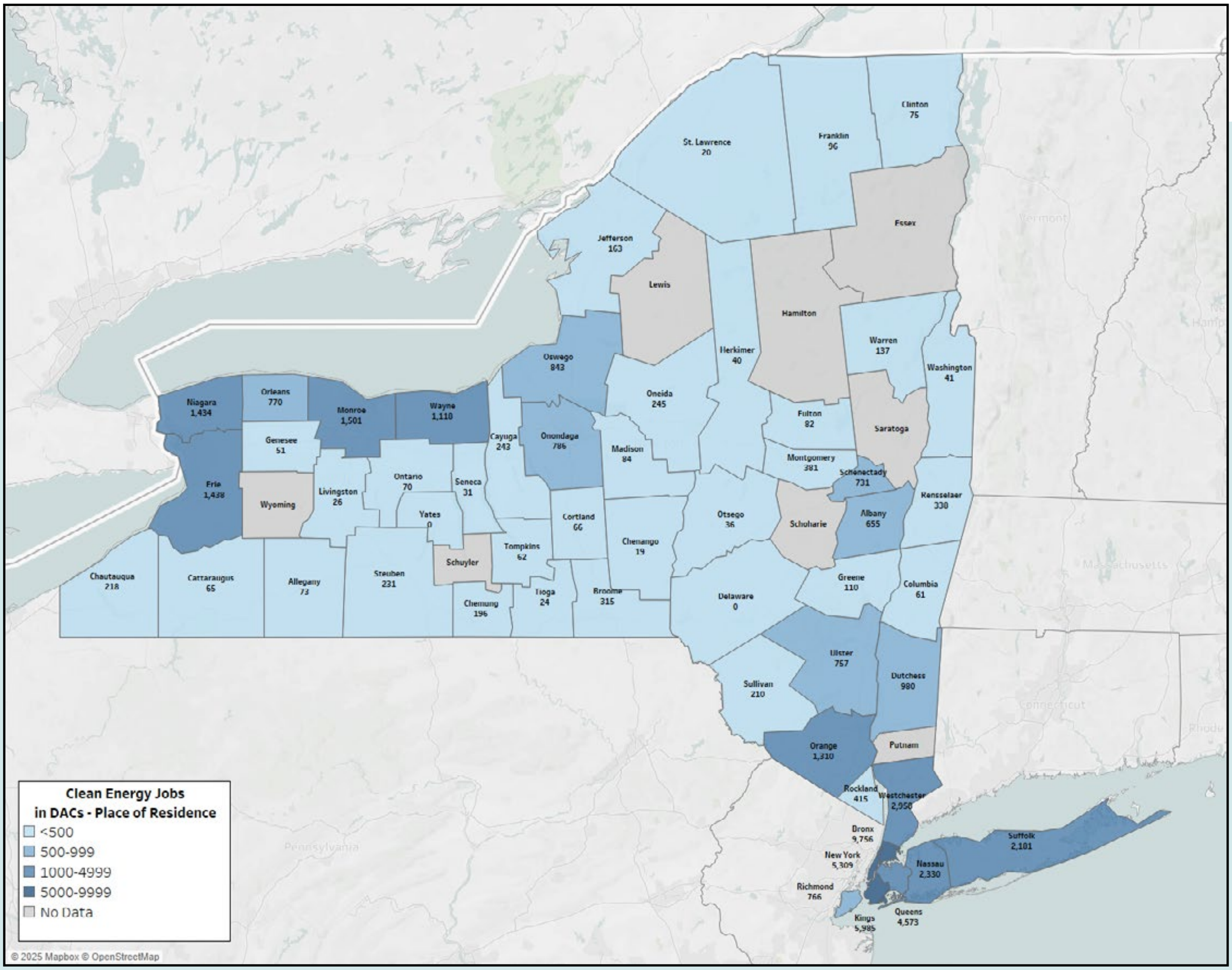
Figure 28. Clean Energy Jobs in Disadvantaged Communities[41]



When looking at clean energy jobs by place of residence, there are approximately 50,000 clean energy workers living in DACs, about 30% of the workforce (Figure 29).[38]

Despite higher-than-average unemployment rates, these areas demonstrate comparatively strong participation in clean energy employment.

Figure 29. Clean Energy Workers Living in Disadvantaged Communities



Clean Energy Hiring

Clean energy employers experiencing difficulty hiring decreased significantly in 2024, with nearly a quarter (24%) reporting no difficulty.

The same amount of employers report hiring workers as “very difficult” as last year at 26%, however those reporting “somewhat difficult” dropped from 73% to 49% (Figure 30).

The share of employers reporting hiring difficulties has risen steadily since 2019, with 2024 marking the first decline, bringing levels back to pre-pandemic norms. While nearly all employers (99%) experienced some degree of hiring difficulty in 2023, about three-fourths (76%) experienced hiring difficulty in 2024. This rate is most comparable to 2019 levels of hiring difficulty, with 77% of clean energy employers reporting difficulty that year (Figure 31).

Figure 30. Employer-Reported Hiring Difficulty, 2021–2024

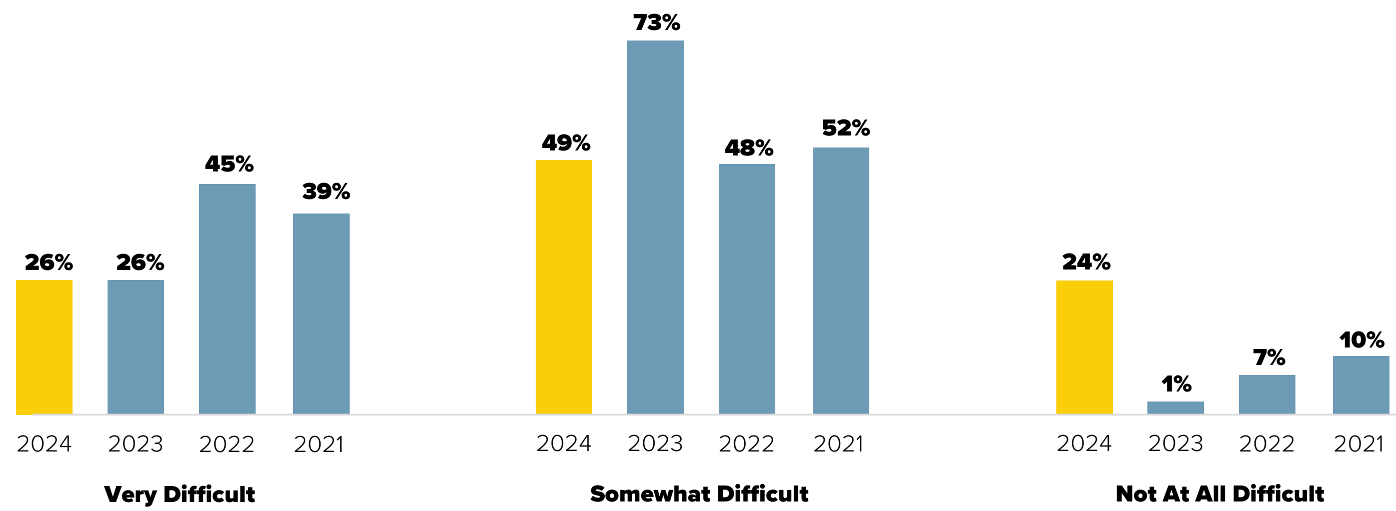
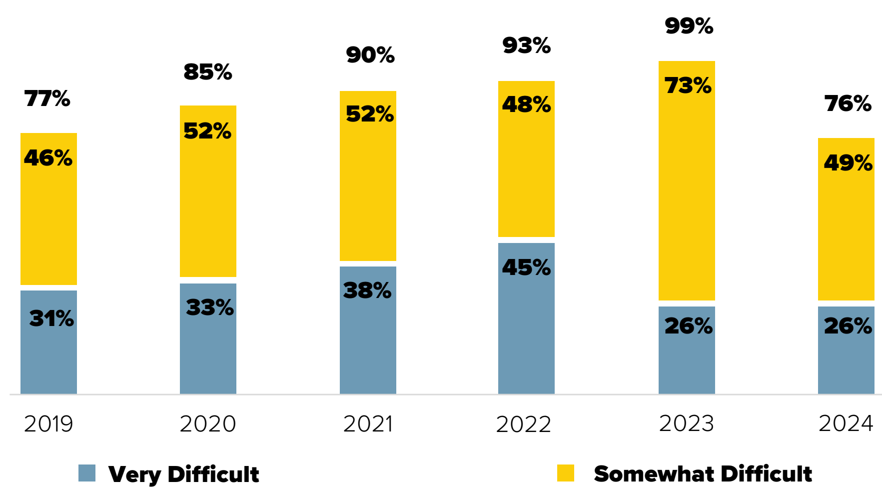


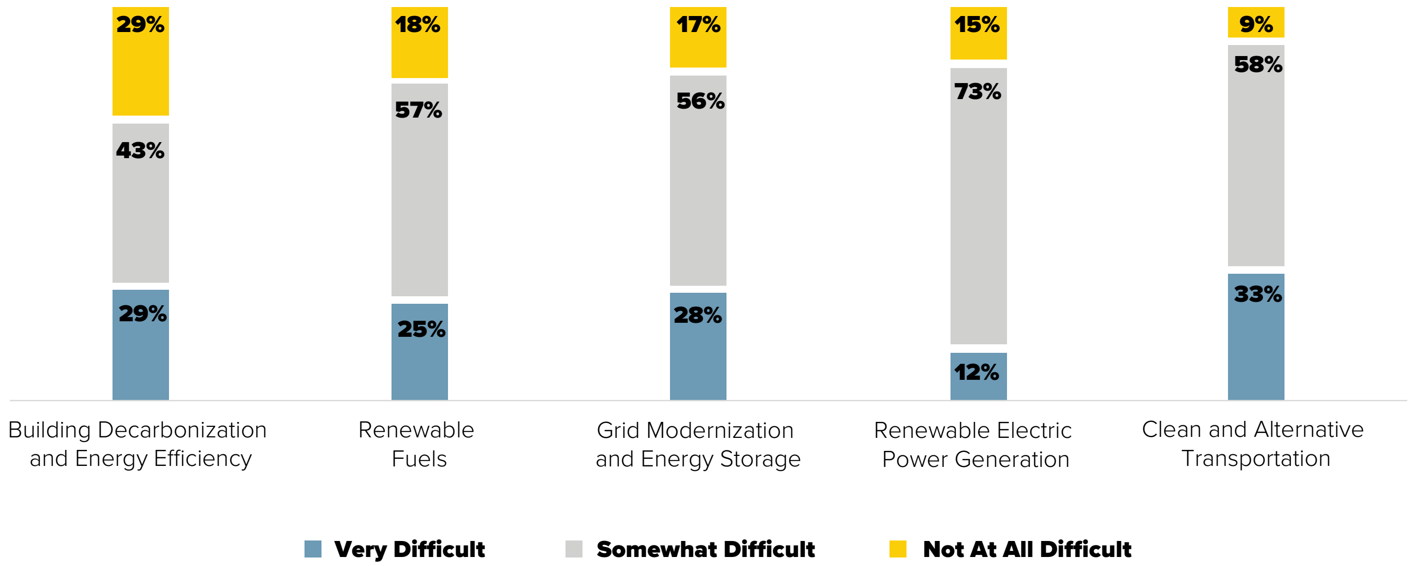
Figure 31. Severity of Employer-Reported Hiring Difficulty, 2019-2024



Building decarbonization and energy efficiency employers have the highest percentage of employers reporting no difficulty with hiring, at 29%. However, an equal share of employers report significant difficulty hiring.

As for the clean energy technology sector facing the most reported hiring difficulty, clean and alternative transportation report hiring difficulty at high rates, with a third (33%) finding hiring "very difficult," and 58% reporting hiring as "somewhat difficult" (Figure 32).

Figure 32. Employer-Reported Hiring Difficulty by Technology, 2024



Clean Energy Training Inventory

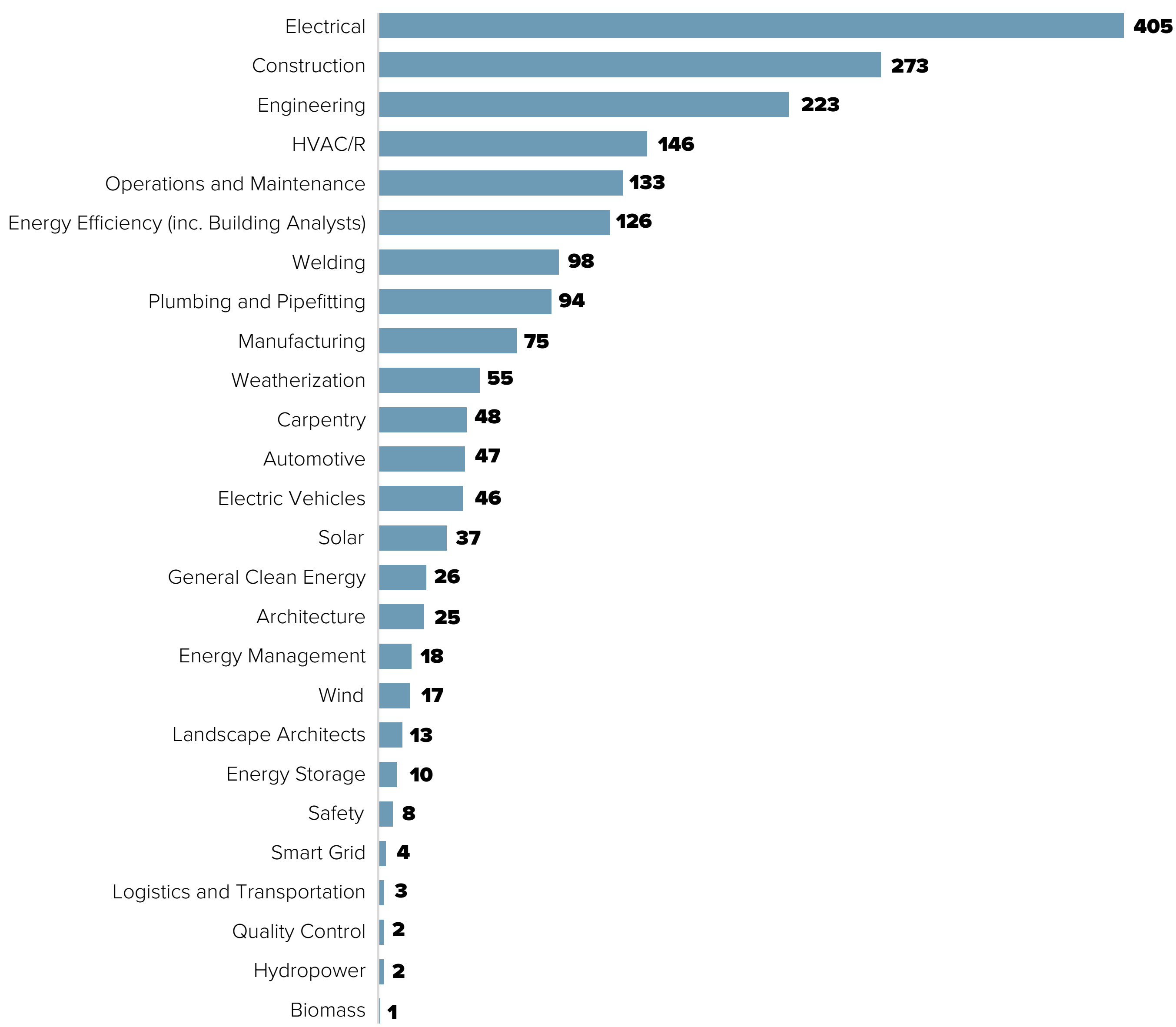
More than 1,900 distinct training programs have been identified and validated through an ongoing training inventory.

The research team has maintained and refined on an annual basis a comprehensive database focused on clean energy career training opportunities in New York State. This evolving resource includes both in-person and online programs offered by New York-based companies, training providers, and academic institutions.

Priority was given to training aligned with installation and manufacturing roles, key segments of the clean energy workforce, and on occupations most prominent in the sector, including electrical and construction trades as well as engineering. To avoid double-counting, each program was categorized based on its primary occupational focus when it spanned multiple job types. The research approach also concentrated on key workforce entry points, such as Registered Apprenticeship programs, labor unions, and institutions of higher education, to reflect common training pathways for clean energy workers.

Training and educational programs focused on electrical work, construction, engineering, HVAC/R, and operations and maintenance are among the most frequently identified (Figure 33).

Figure 33. New York Clean Energy Training Programs by Occupational Focus



The most cited type of provider is private companies, which account for 27% of all training programs and often offer Registered Apprenticeship opportunities.

Other leading sources of training include four-year universities and community colleges, each representing 14%, along with unions, which provide 13% of the programs identified (Figure 34).

Figure 34. New York Clean Energy Training Programs by Training Provider Type

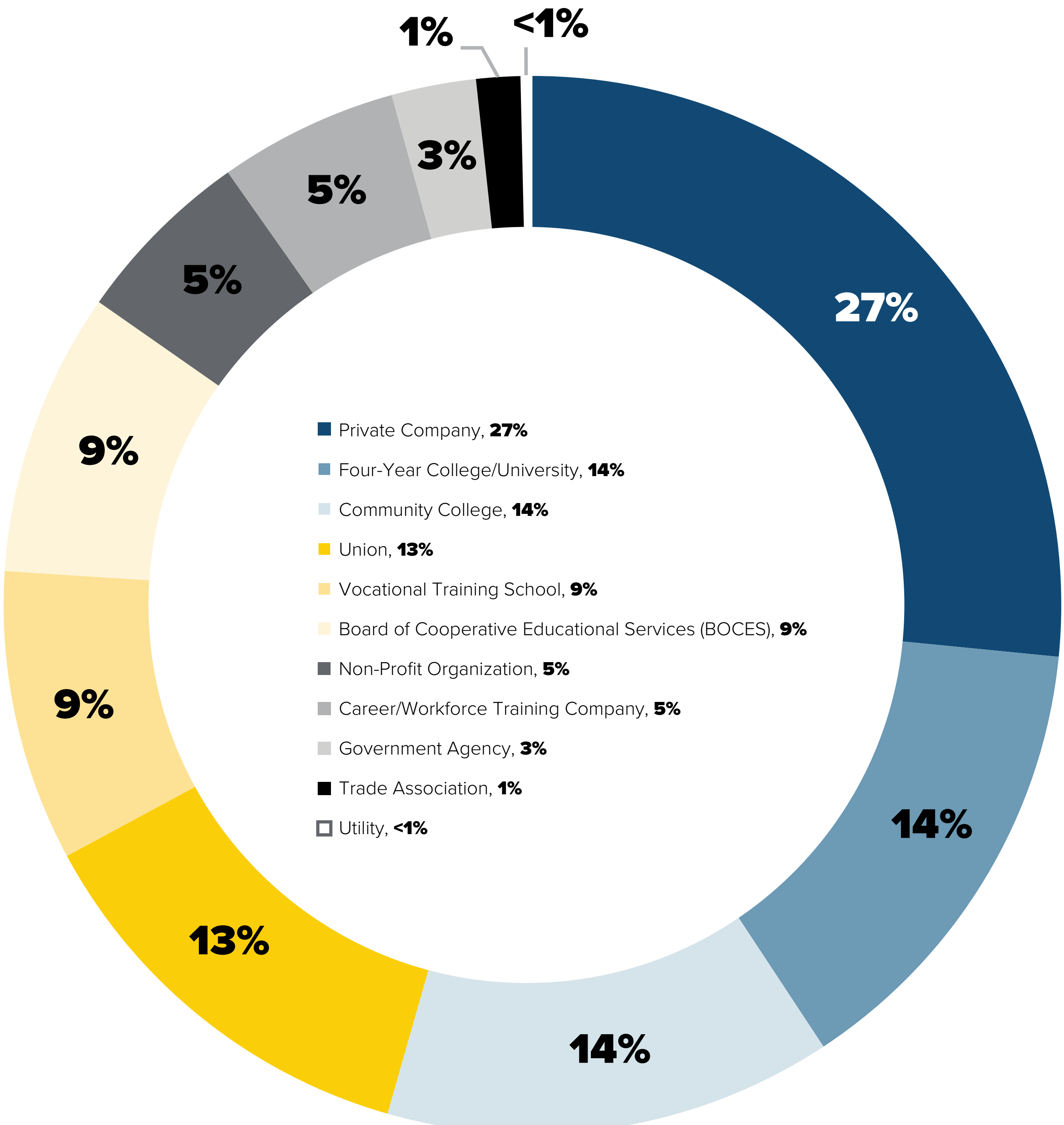


Table 12. New York Clean Energy Training Programs by Occupational Focus and Training Provider Type

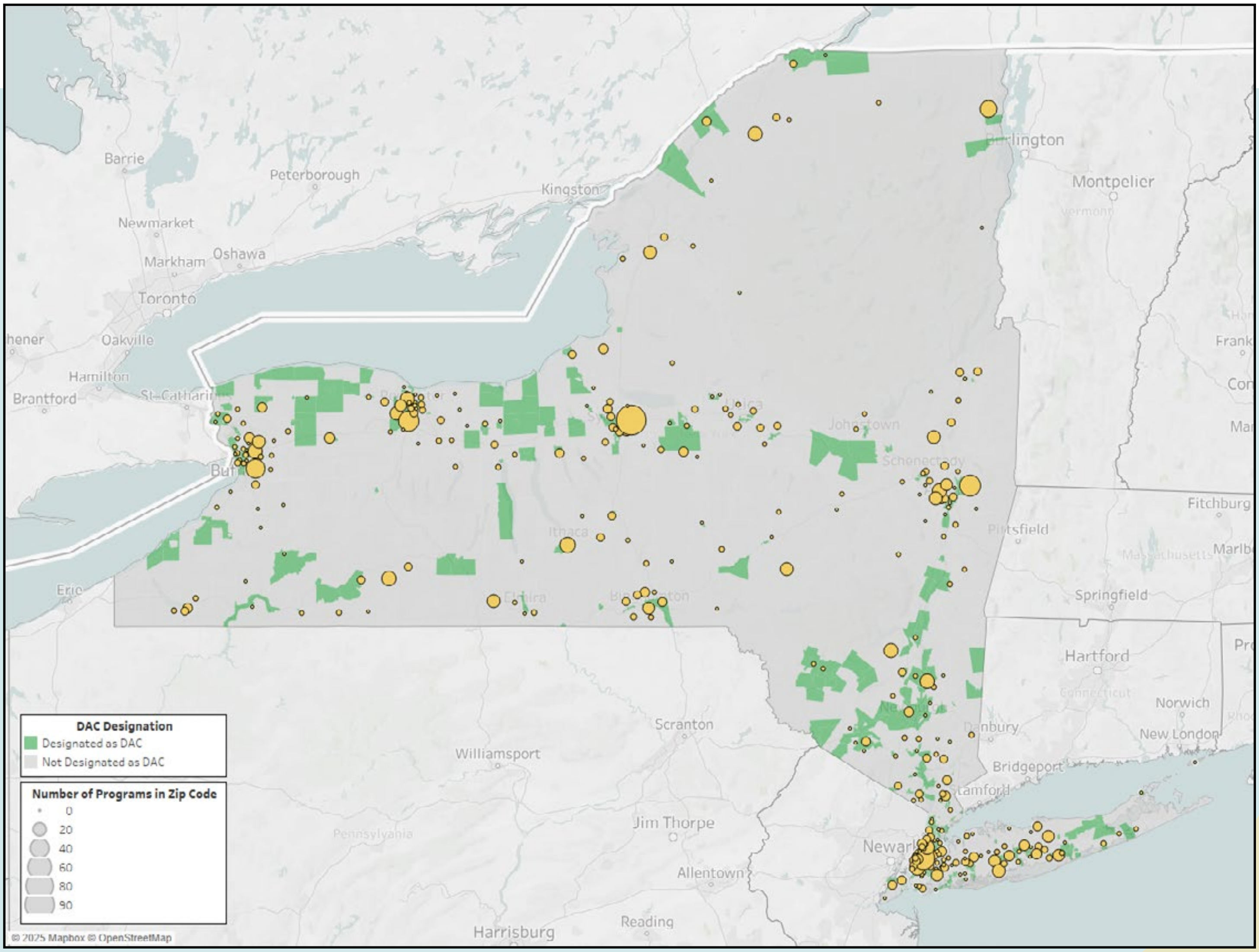
	Private Company	Four-Year College/University	Community College	Union	Vocational Training School	Board of Cooperative Educational Services (BOCES)	Non-Profit Organization	Career/Workforce Training Company	Government Agency	Trade Association	Utility	Grand Total
Electrical	170	12	37	81	36	32	4	6	20	5	2	**405**
Construction	79	27	24	71	13	34	3	12	3	6	1	**273**
Engineering	16	130	61	4	5	1	1	2	2	1		**223**
HVAC/R	14	11	35	13	26	23	8	10	4		2	**146**
Operations and Maintenance	69	6	4	21	4	4	7		9	8	1	**133**
Energy Efficiency (inc. Building Analysts)	27	4	14		21		23	36		1		**126**
Welding	27	2	14	3	7	42	1	1	1			**98**
Plumbing and Pipefitting	41	1	6	22	13	8			2	1		**94**
Manufacturing	28	5	10	18	6	1	4		3			**75**
Weatherization	2		5		17		26	3	2			**55**
Carpentry	15		2	9	5	14				3		**48**
Automotive	4	7	17		12	6	1					**47**
Electric Vehicles	6	8	11	1	2	3	7	8				**46**
Solar	2	5	10		2		7	10			1	**37**
General Clean Energy	3	9	4		1		1	6	2			**26**
Architecture	2	20	3									**25**
Energy Management	1	7	1				4	3	1	1		**18**
Wind	3	4	7					3				**17**
Landscape Architects	10			1		2					13	
Energy Storage	2	4					2	1	1			**10**
Safety	2			2			2	2				**8**
Smart Grid		2					2					**4**
Logistics and Transportation			1			2						**3**
Hydropower	1							1				**2**
Quality Control				1			1					**2**
Biomass								1				**1**
Grand Total	**514**	**274**	**265**	**246**	**172**	**168**	**107**	**106**	**50**	**26**	**7**	**1,935**

Training programs in New York State are heavily concentrated in urban centers, particularly in and around New York City, as well as in cities like Buffalo, Rochester, and Syracuse.

In these areas, training opportunities frequently coincide with designated DACs suggesting that urban DAC populations may face fewer barriers to accessing workforce programming, particularly in terms of geographic proximity and transportation.

In contrast, several rural DAC regions, including the North Country, Southern Tier, Central Adirondack Region, Rural Western New York, and the Catskill Mountain Area, show limited or no presence of training programs. This spatial mismatch highlights potential access disparities for rural disadvantaged communities, where transportation constraints may further exacerbate the lack of local training opportunities (Figure 35).

Figure 35. Location of Training Programs and Disadvantaged Communities



Building a More Equitable Clean Energy Workforce

Achieving equitable growth in the clean energy economy requires a thorough understanding of the barriers that currently limit access to clean energy employment and entrepreneurship for priority populations[42] and DACs.

To support meaningful participation, it is essential to identify these obstacles and develop targeted programs and policies that expand opportunity where it is most needed.

This section of the report contributes to that goal by first examining the existing landscape, highlighting both the challenges and opportunities, and then identifying actionable strategies to address the barriers encountered by underrepresented groups.

The insights presented here are primarily based on survey data collected from two key groups: clean energy employers and a broad sample of workers, including those both inside and outside the clean energy sector. The employer survey focused exclusively on businesses within the clean energy industry, while the worker survey included questions designed to distinguish respondents from priority populations to enable comparative analysis.

While the survey results offer valuable high-level insights into workers' concerns, aspirations, and perceived challenges, the findings should be viewed as a starting point rather than a comprehensive account.

Surveys, by nature, are limited in their ability to capture the full depth and nuance of individual experiences. As such, the data in this section should be considered preliminary and indicative of themes that warrant deeper investigation.

Complementary qualitative methods—such as focus groups, one-on-one interviews, and ethnographic studies—are recommended to enrich understanding and more fully represent the lived experiences of current and prospective clean energy workers.

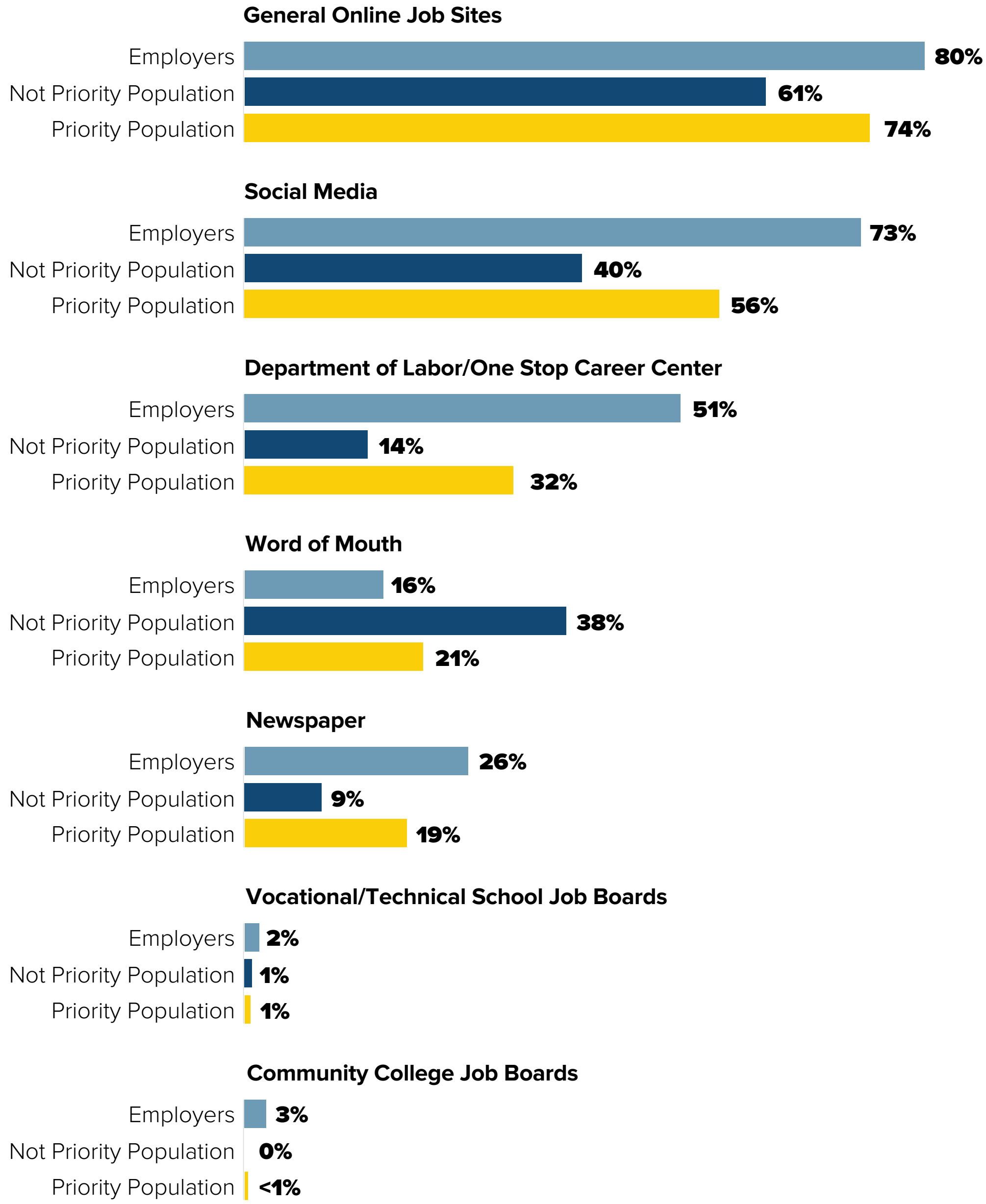
Connecting Talent and Employers

Both employers and workers were asked what resources they utilize to find jobs or talent.

For both employers and workers, general online job sites, such as Indeed, Monster, and Career Builder are the most utilized, followed by social media.

When looking at respondents in priority populations and respondents not from priority populations separately, there is a notable difference in the utilization of word of mouth for finding work, as 38% of respondents not in priority populations use this measure, compared to 21% of respondents from priority populations (Figure 36).

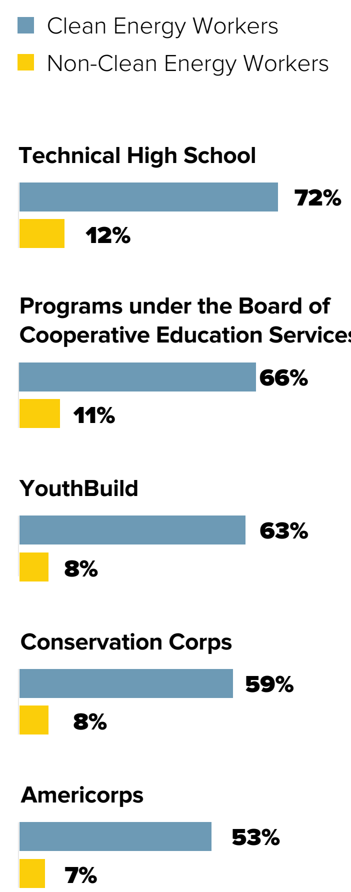
Figure 36. Where Talent and Employers Look For One Another



Clean energy workers are much more likely to participate in various training programs, such as those offered by the Board of Cooperative Education Services, technical high schools, the Conservation Corps, YouthBuild and AmeriCorps.

Participation in these programs range from 53% to 72% for clean energy workers, versus only 7% to 12% for those not in clean energy. These participation rates among clean energy workers highlight the value of these programs as key pathways into the sector (Figure 37).

Figure 37. Rate of Participation in Relevant Training and Education Opportunities



Survey participants were also asked to identify to what extent career advancement in clean energy had been a challenge.

For ten-out-of-eleven challenges, respondents in priority populations had higher rates of finding challenges “considerable,” as opposed to respondents not in priority populations.

While those not in priority populations experience these challenges less than those in priority populations, their difficulty has risen in many categories from last year’s report.

The difference between ratings of these challenges are statistically significant between populations for seven challenges:

- getting academic degrees of the certifications needed
- developing technical skill and expertise
- communicating effectively with hiring managers
- lack of basic information about clean energy careers early in education
- comfortability communicating with employees
- experiencing prejudice developing resumes and related materials.[43]

The highest-rated challenge in terms of difficulty for respondents in priority populations is effectively communicating with employers and hiring managers, with 35% of these workers identifying the challenge as considerable (Figure 38).

As for those respondents not in priority populations, the most considerable issue is finding employment opportunities that are near where they live or are willing to live, with 33% labeling as considerable (Figure 39).

Figure 38. Issues Identified as “Considerable” Challenges

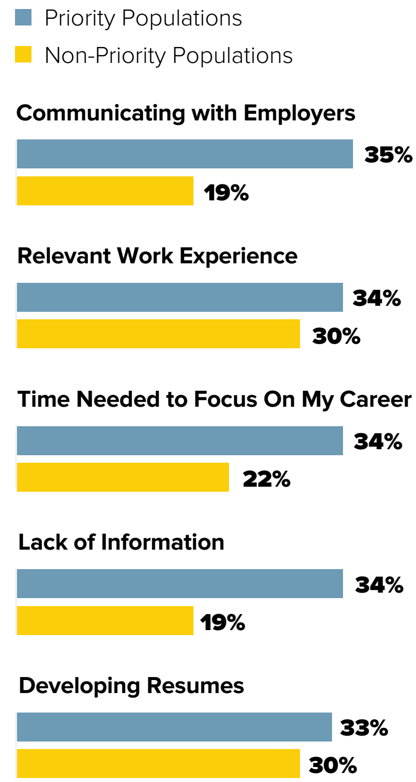
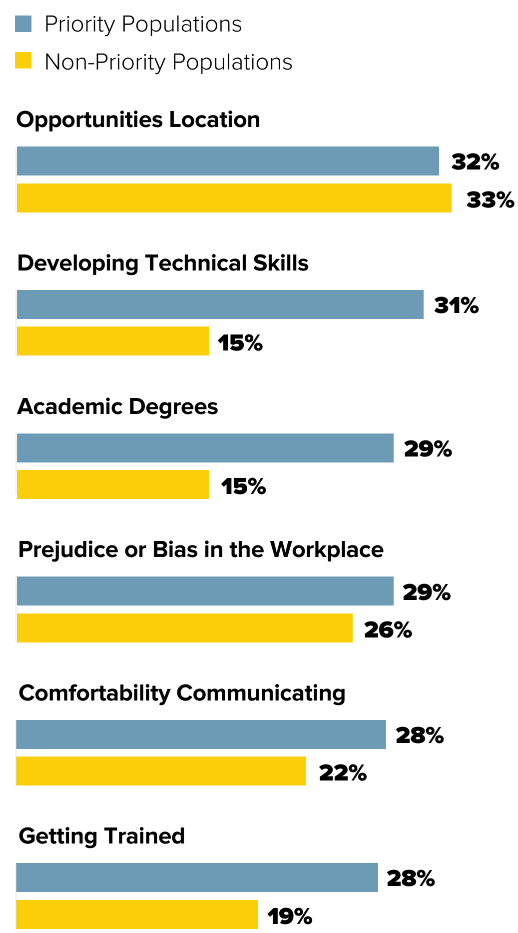


Figure 39. Other Issues Identified as “Considerable” Challenges

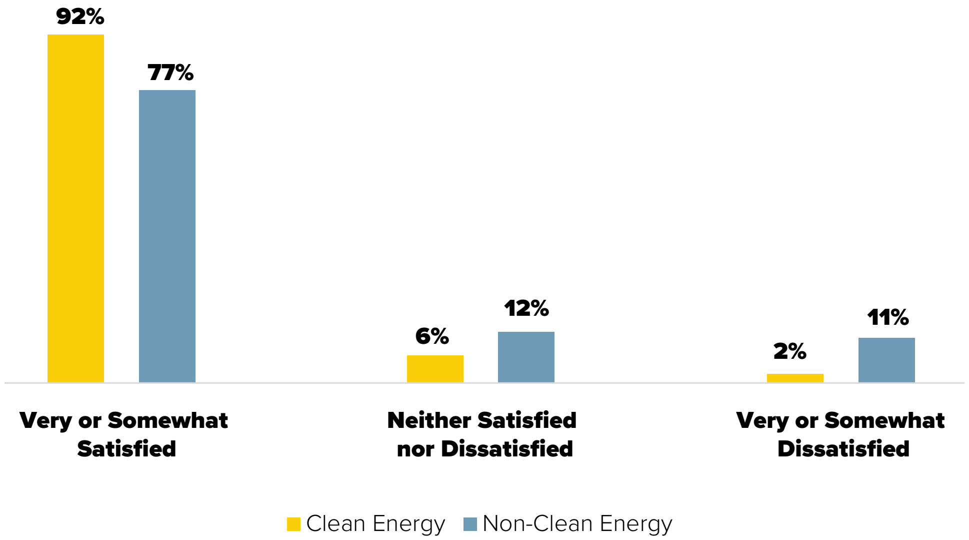


Clean Energy Career Satisfaction and Advancement

Clean energy workers are satisfied with their careers at a strikingly high rate.

More than nine in ten (92%) clean energy workers indicated being very or somewhat satisfied with their career, while this figure drops to 77% for those not working in clean energy (Figure 40).

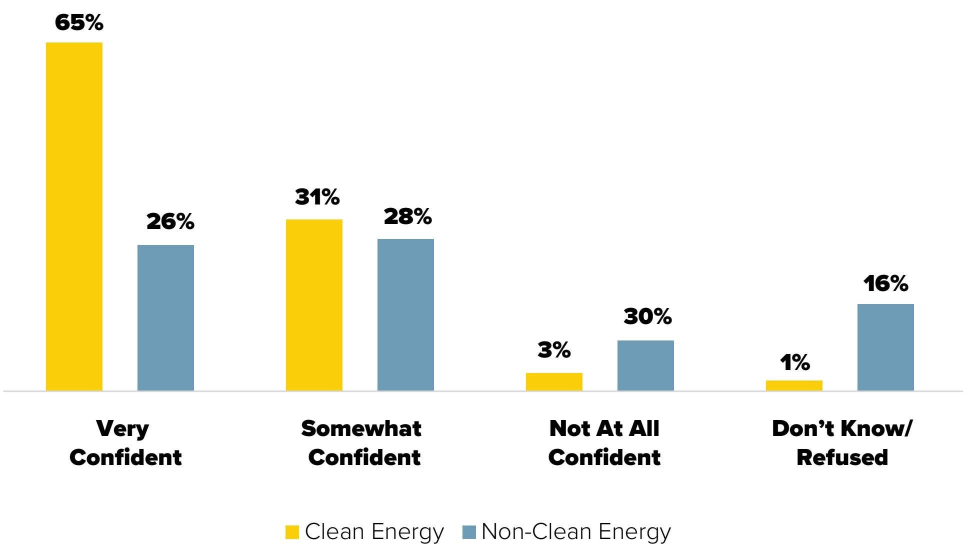
Figure 40. Career Satisfaction



Clean energy workers also show more confidence in promotion or advancement within their career than workers not in clean energy.

Nearly two-thirds (65%) of clean energy workers indicated feeling very confident of promotion or advancement in the next 12 months, while this figure drops to just over a quarter (26%) for those not in clean energy fields (Figure 41).

Figure 41. Confidence in Promotion or Advancement in New Job in Next 12 Months

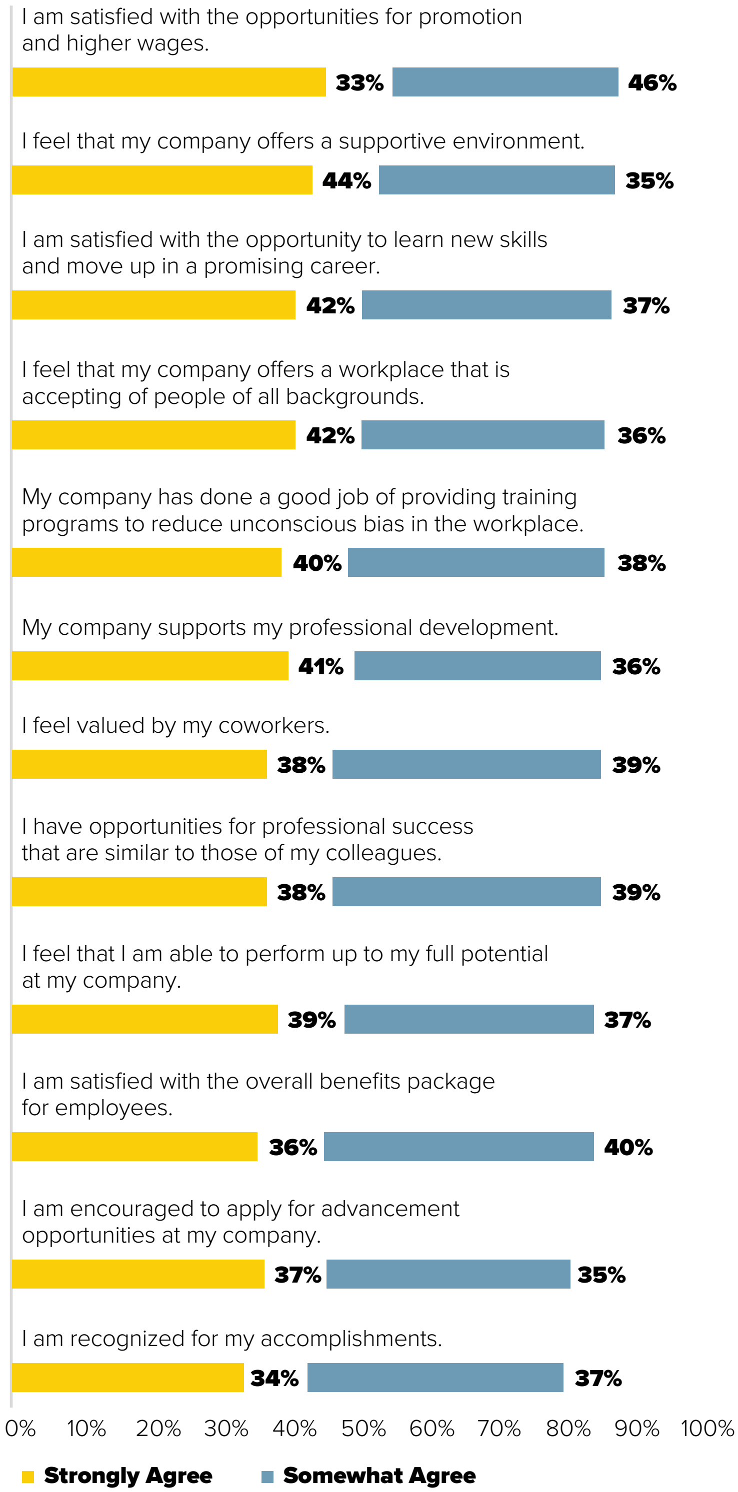


Clean energy workers were more likely to strongly agree with selected perceptions of workplace optimism at rates higher than workers not in clean energy.

When asked if workers are satisfied with the opportunities for promotion and higher wages, 46% of clean energy workers strongly agree, compared to 30% of those not in clean energy.

Other significant differences in optimism between clean energy and other workers include satisfaction with the opportunity to learn new skills and move up in a career, company support of professional development, training programs to reduce unconscious bias in the workplace, and applying for advancement opportunities (Figure 42).

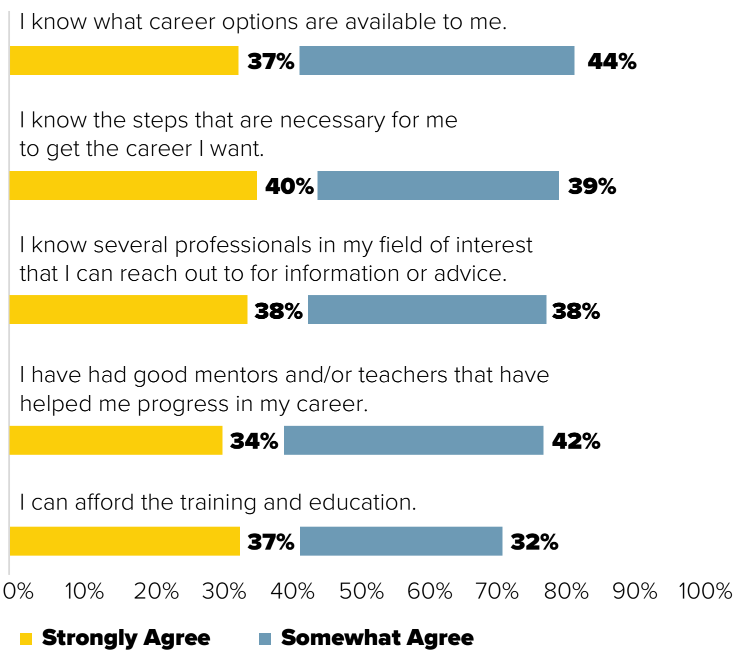
Figure 42. Fit, Recognition, and Opportunity within Their Current Clean Energy Company



Clean energy respondents typically demonstrate an awareness of the resources available to support their career advancement.

Eight-in-ten (81%) of clean energy workers reported knowing what career options are available to them, while 78% report knowing the steps that are necessary to get the career they want, and 76% know several professionals in my field of interest that I can reach out to for information or advice (Figure 43).

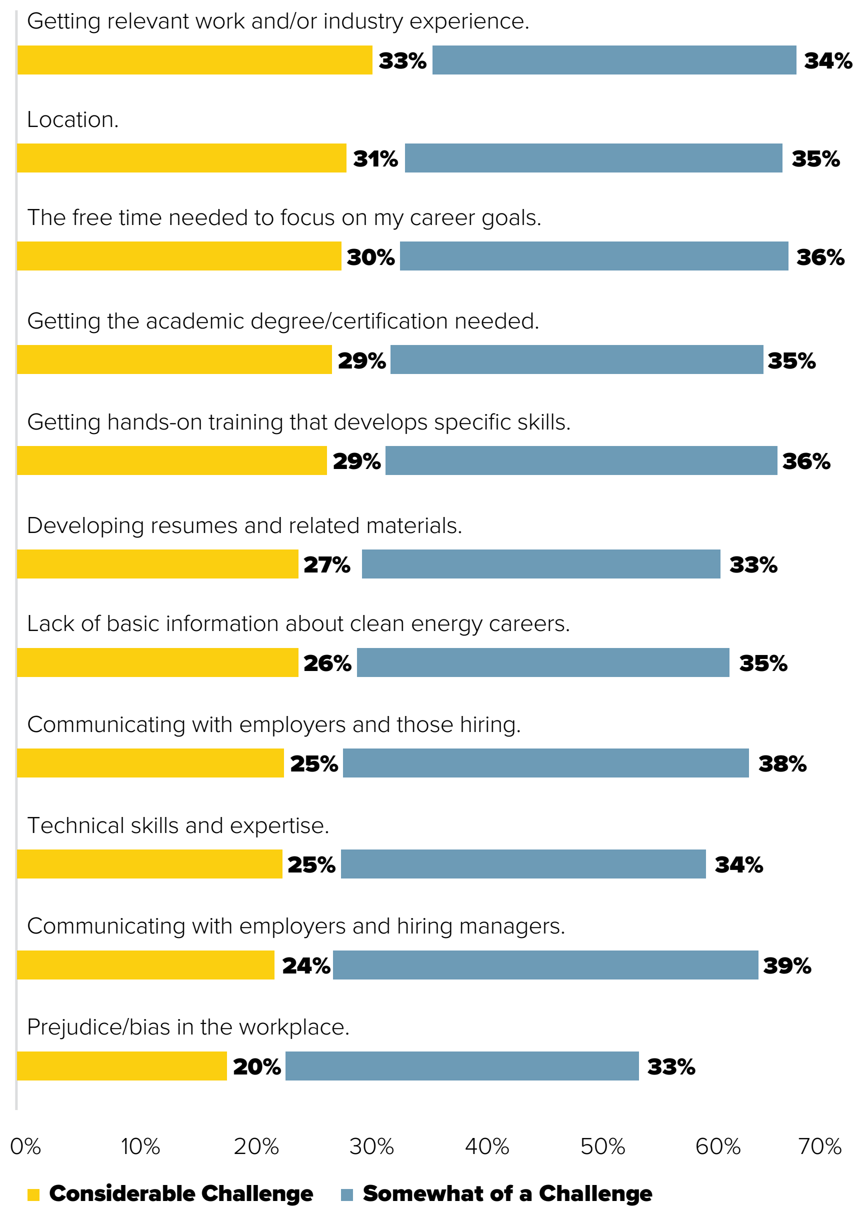
Figure 43. Available Resources to Current Clean Energy Workers



While clean energy workers are generally satisfied with their careers and see advancement opportunity, many still face obstacles.

The most identified obstacle among clean energy workers was gaining relevant work or industry experience, with 67% of workers labeling this issue as a considerable or somewhat of a challenge. Other key obstacles include having the free time needed to focus on career goals, finding employment opportunities that are near where they live or are willing to live, and getting hands-on training that develops specific skills (Figure 44).

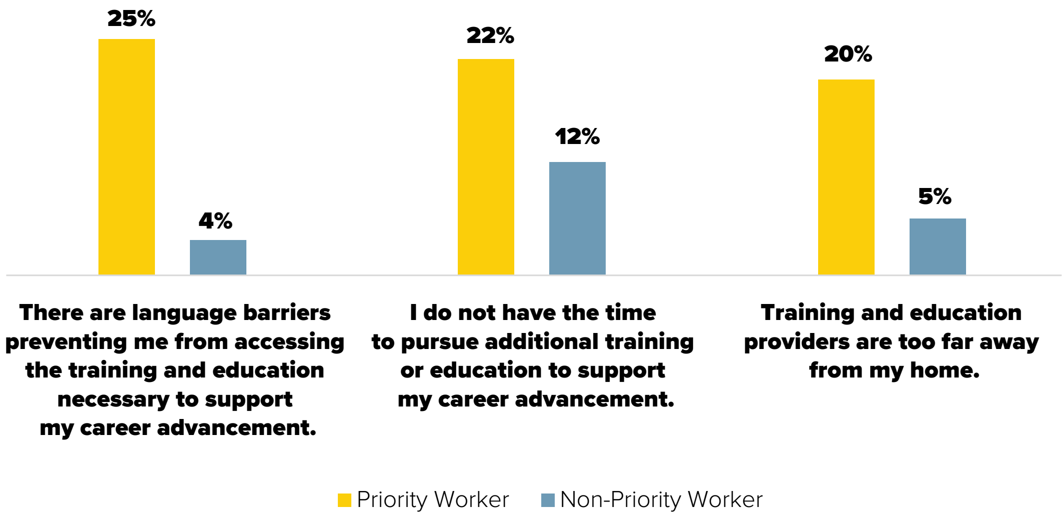
Figure 44. Obstacles in Advancing [A Respondent's] Clean Energy Career



Respondents from priority populations are facing some career advancement challenges more acutely than respondents not in priority populations.

A quarter (25%) of respondents in priority populations strongly agree that language barriers present a challenge to career advancement, while only 4% of respondents not from priority populations face identify this issue as "strong." Other notable differences include having the free time to support additional training or education, along with training and education providers being too far from home (Figure 45).

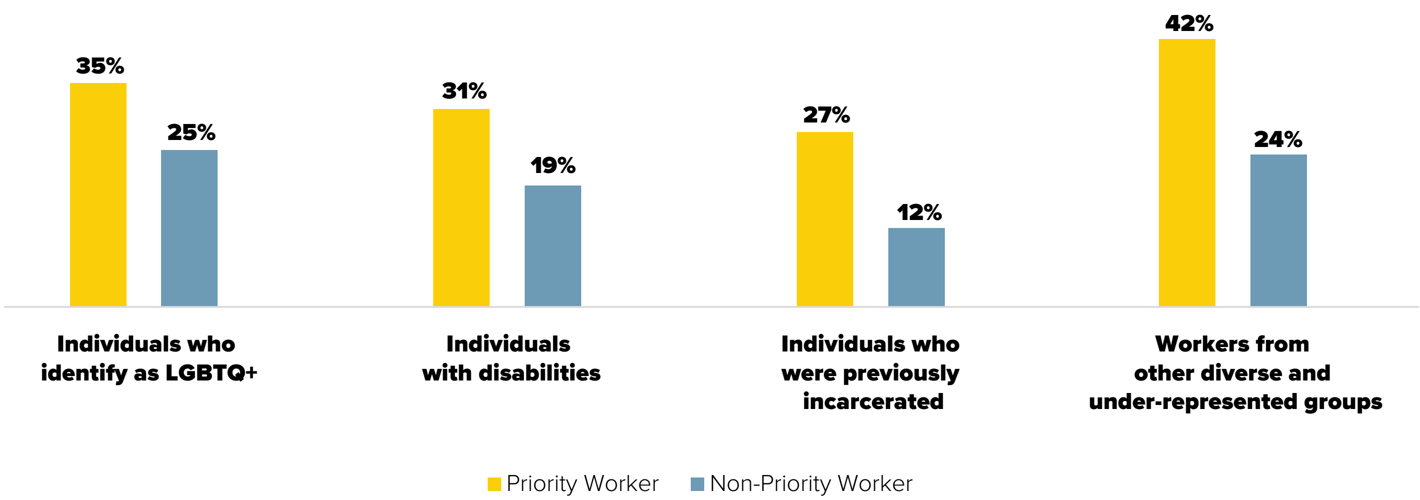
Figure 45. "Strongly Agree" with regards to these statements about career advancement at your company.



Diversity, Equity, and Inclusion

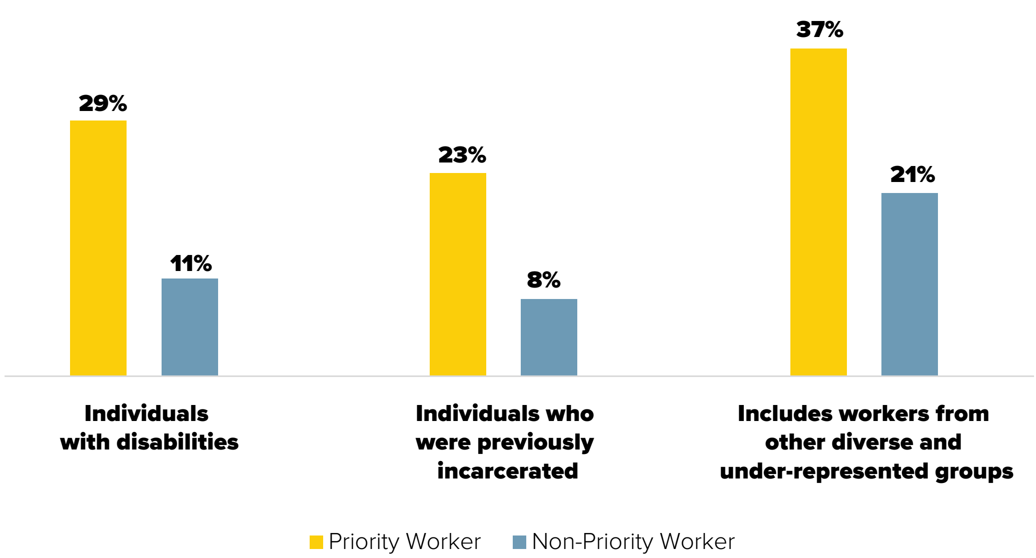
Four in ten (42%) respondents in priority populations strongly agree that their company actively recruits, hires, and promotes workers from diverse and under-represented groups generally, as opposed to 24% of respondents not in priority populations. Respondents in priority populations also see higher rates of strong agreement for their company's inclusion of the LGBTQ+, disabled population, and those previously incarcerated (Figure 46).

Figure 46. Strong agreement that my company actively recruits, hires, and promotes...



Similarly, respondents in priority population report higher rates of disadvantaged groups participating in their company's management and executive leadership. Respondents from priority populations strongly agree that their company's management includes works from diverse and underrepresented groups at 37%, compared to those not in priority populations at 21% (Figure 47).

Figure 47. Strong agreement that my company's management and executive leadership includes...

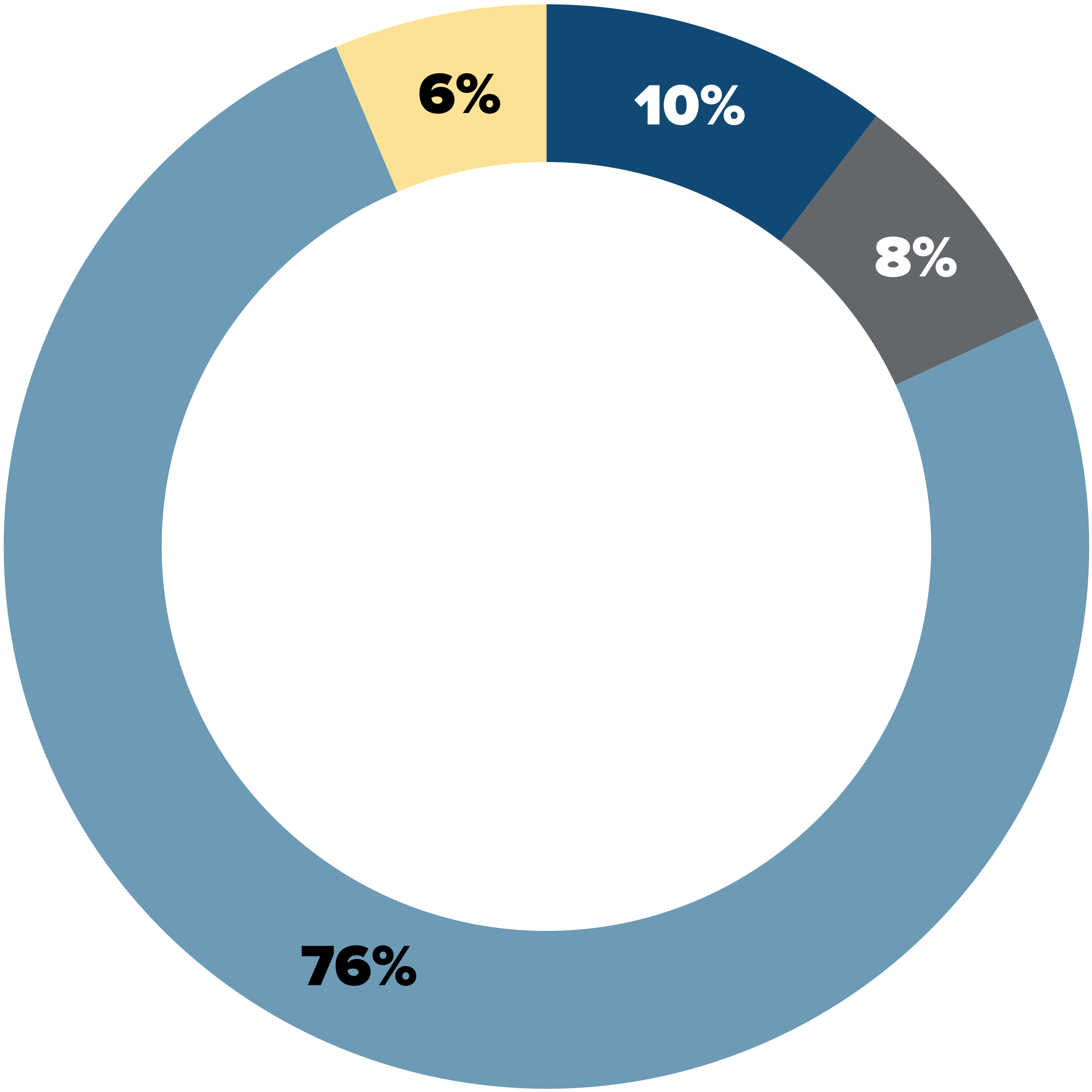


Prospective Clean Energy Workers

This section presents insights from current workers and job seekers who are not currently employed in the clean energy sector. By exploring their interests, perceptions, and perceived obstacles, the findings can inform more strategic and focused approaches to attracting new talent into the industry.

Of those not currently employed in the clean energy industry, 10% of workers have considered working in clean energy, but never actually searched, while 8% have actively searched for work in the field (Figure 48).

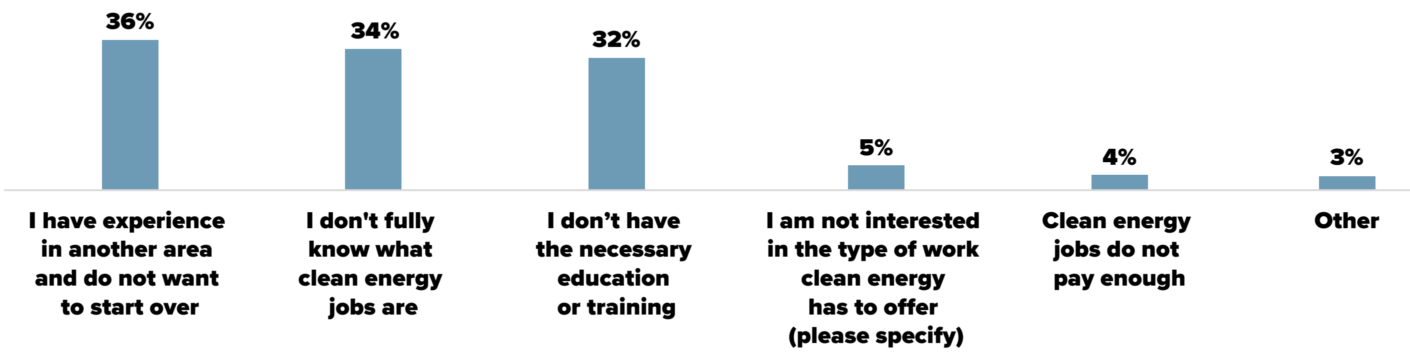
Figure 48. Have you considered and/or looked for employment in the clean energy industry?



The most reported reason for not considering or searching for employment in the clean energy industry is not wanting to start in a new area given experience elsewhere, with 36% of respondents identifying this reason.

Other prominent reasons include not knowing what clean energy jobs are, along with not having the necessary education or experience (Figure 49).

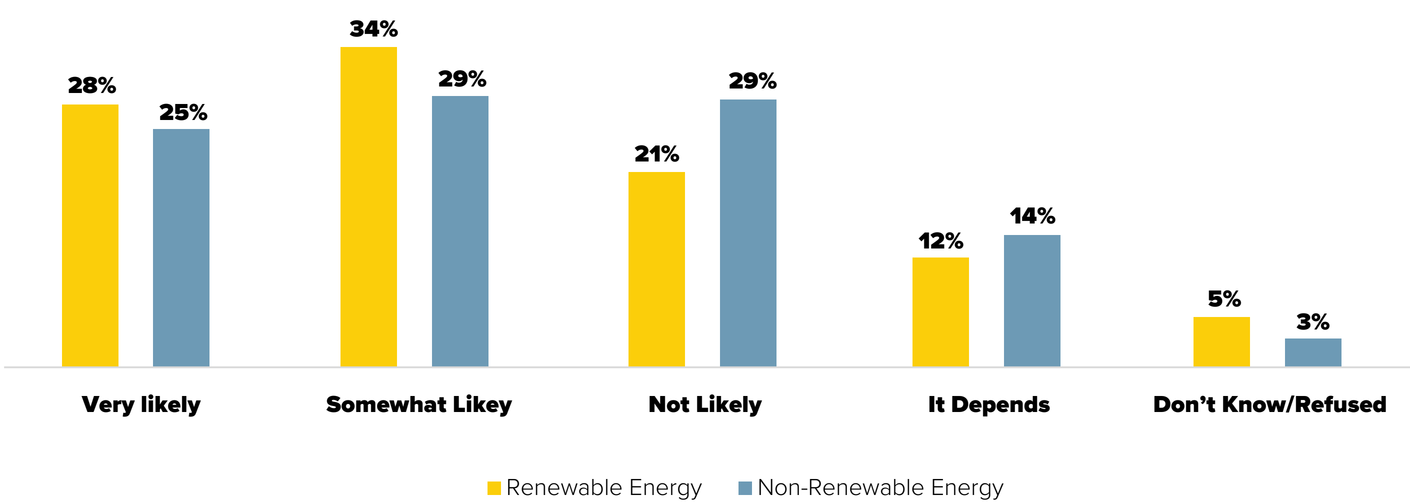
Figure 49. Why have you not considered or actively searched for employment in the clean energy industry?



Among those who have not worked in clean energy, workers show a stronger inclination toward employment in renewable energy than in non-renewable energy.

Sixty-two percent indicated they would likely apply for a job in renewable energy, 28% of whom said they would be very likely, while 54% expressed interest in non-renewable energy positions, with 25% very likely to apply (Figure 50).

Figure 50. If you were looking for a new employment opportunity and you saw a position in the ____ industry, how likely are you to apply for it?



Clean Energy Investments

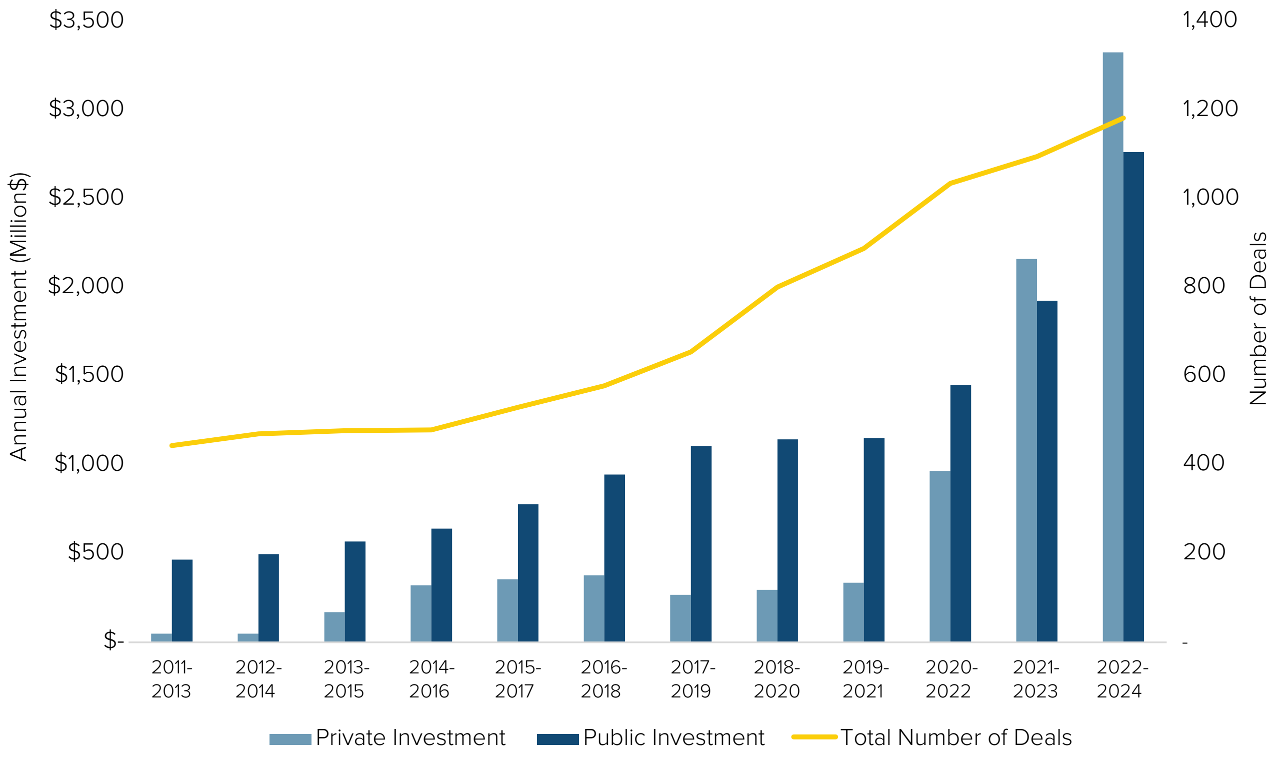
The following section utilizes investment and expenditure data compiled from multiple sources, including the Department of Energy's SunShot Initiative, the Advanced Research Projects Agency–Energy (ARPA-E), the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, the New York State Office of Science, NYSERDA's expenditure records, and Crunchbase, a proprietary platform aggregating funding and investment data on both public and private companies.

Total Investments

Clean energy investments in New York State continue to accelerate, marking the largest increase since tracking began in 2011.

The three-year average rose from $4.1 billion between 2021–2023 to $6.1 billion between 2022–2024. Between the initial and most recent three-year averages spanning 2011 to 2024, total investment in clean energy surged by 1,082%, accompanied by a 166% increase in number of deals. Altogether, clean energy attracted $22.26 billion in investment through 9,061 individual deals over this 13-year period (Figure 51).

Figure 51. Clean Energy Investments (Millions), 2011–2024 Three-Year Averages



2011 to 2024

1,082%

increase in total investment in clean energy

166%

increase in number of deals

$22.26 B

investment attracted by clean energy

9,061

individual deals

INVESTMENT GROWTH WHEN COMPARING ITS FIRST AND LAST THREE-YEAR AVERAGES

33,383%
renewable fuels

1,234%
grid modernization & energy storage

Since tracking began in 2011, every clean energy technology sector experienced significant growth in investment.

Renewable electric power generation led in terms of total dollar growth, while renewable fuels posted the most dramatic percentage increase.

Specifically, investment in renewable fuels skyrocketed by 38,383% when comparing its first and last three-year averages. Grid modernization and energy storage also saw substantial gains, with a 1,234% increase over the same period.

The most recent three-year average includes six extremely large-scale investments, ranging from $500 million to $1.73 billion each.

4 investments

in renewable electric power generation

1 investment

in clean & alternative transportation

1 investment

in renewable fuels

Four of these investments are in renewable electric power generation, while there is one in clean and alternative transportation and another in renewable fuels.

$1.73 billion
utility-scale onshore wind, solar, & battery storage markets

The largest investment was in 2024, a $1.73 billion stake in D. E. Shaw Renewable Investments (DESRI) by Macquarie Group, aimed at strengthening its presence in the domestic utility-scale onshore wind, solar, and battery storage markets.[44] New York is home to DESRI's operations, highlighting the State's attractiveness for institutional capital.

$1.67 billion
clean hydrogen production facilities

Also in 2024, the U.S. Department of Energy issued a $1.67 billion loan guarantee to Plug Power to support the construction of clean hydrogen production facilities powered by the company's proprietary electrolyzer technology, which are based in Rochester.[45]

$1.2 billion
renewable energy & underground transmission line

The next four largest investments occurred in 2023, led by $1.2 billion in private equity raised by energyRe. EnergyRe is a core partner in Clean Path NY, helping drive the development of 3,800 megawatts of renewable energy and a 1,300 MW, 175-mile underground transmission line, one of the most ambitious clean infrastructure efforts in New York State.[46]

$700 million
wind farms

Additionally, following its IPO, Brookfield Corporation raised $700 million in debt financing this year, which helped support the repowering of three New York State wind farms: the 35-megawatt Steel Winds I and II facilities in Lackawanna and Hamburg, and the 125-megawatt Cohocton Wind Farm. These projects involved replacing original turbines with state-of-the-art blade and turbine technology.[47]

$500 million
renewable natural gas projects

$500 million
solar & storage development

The remaining two high-level investments are $500 million each, belonging to OPAL Fuels to use for the construction of renewable natural gas projects, and CleanCapital to fund both solar and storage development.[48]

While these major investments have significantly contributed to New York State's clean energy investment growth, the overall trend remains strong even without them.

Excluding these large deals, clean energy investment in the State has still increased by 676% since 2011 and has consistently grown across every subsequent three-year average.

Renewable Electric Power Generation

1,888% growth in investment since 2011

Building Decarbonization and Energy Efficiency

288% growth in investment since 2011

Clean and Alternative Transportation

290% growth in investment since 2011

Renewable electric power generation, the largest investment category, accounting for 49% of all clean energy funding since 2011, experienced a 1,888% rise in investment, translating to an increase of $2.9 billion. The building decarbonization and energy efficiency sector, which represents roughly 32% of total investment, grew by 288%. Meanwhile, the clean and alternative transportation sector recorded a 290% growth in investment.

Four-out-of-five clean energy technology sectors saw increased investment in the most recent three-year average (2022–2024) compared to the prior period (2021–2023).

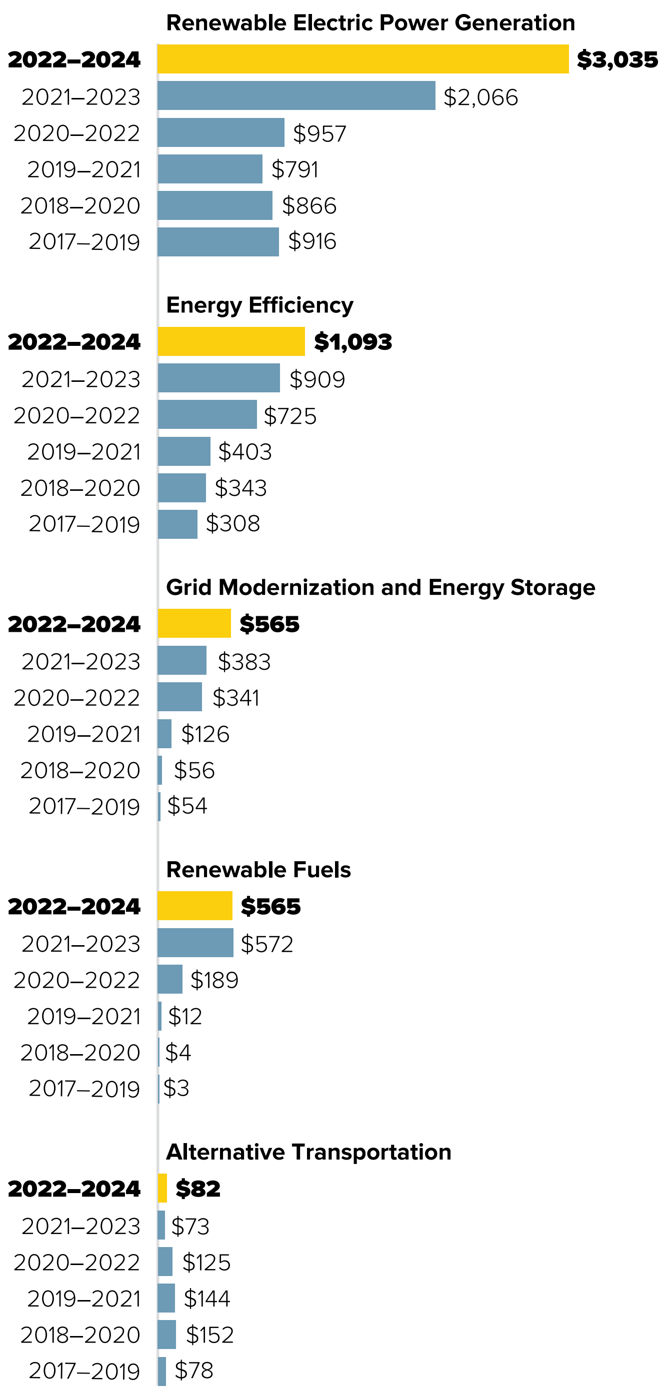
The largest percentage increase occurred in grid modernization and energy storage, which rose by 48%, adding $182.5 million in new investment.

Renewable electric power generation experienced a nearly equivalent gain of 47%, translating to a $969 million increase. This growth was led by the previously mentioned investment in D. E. Shaw Renewable Investments.

Energy efficiency and clean and alternative transportation saw more moderate growth, with investments rising by 20% and 11%, respectively.

Renewable fuel was the only technology to experience a slight decline, with investment falling by just 1% compared to the previous three-year average. However, the sector remains strong. The 2021–2023 average reached $572 million, marking a 203% increase over the 2020–2022 period—an exceptional year-over-year gain of 86 percentage points. In the most recent three-year average, investment remained relatively steady at $565.3 million (Figure 52).

Figure 52. Total Clean Energy Investments by Technology (Millions), 2017–2024 Three-Year Averages[49]



Public Sector | **Private Sector**

2011 – 2024

Public Sector	Private Sector
456% *investment increase*	**6,742%** *investment increase*
$17 B *total investment*	**$13 B** *total investment*
9,962 *total deals*	**268** *total deals*

2022 – 2024 3-year average

Public Sector	Private Sector
$2.8 B *total investment*	**$3.3 B** *total investment*
1,150 *total deals*	**33** *total deals*
45% *total clean energy funding*	**55%** *total clean energy funding*

From 2011 to 2021, the public sector was the primary driver of clean energy investment in New York State, contributing 57% of total funding into the State from 2011 to today.

This shifted in 2022, with private investment contributing more investment into clean energy, however, through less deals.

Public investment in the State's clean energy industry has grown steadily since 2011, rising by 456% based on three-year averages (Figure 54). While public investment maintained a consistent upward trend, private investment expanded at a significantly faster pace. From 2011 to 2024, private-sector funding increased by 6,742% across the same three-year averages (Figure 53), with growth accelerating year over year.

In the 2011 to 2013 three-year average, public sources accounted for 91% of all clean energy investment, with private sources contributing just 9%. By the most recent 2022–2024 period, the balance had shifted markedly: public investment now represents 45% of total funding, indicating a substantial rise in private-sector participation.

Over the full 2011 to 2024 period, public investments totaled $17 billion across 9,962 deals, while private investments reached $13 billion across 268 deals.

In the 2022-2024 three-year average, public investments totaled $2.8 billion across 1,150 deals, while private investments reached $3.3 billion across significantly less deals than public investments, at 33.

This reflects not only the historical dominance of public funding but also the growing scale and influence of private capital in New York State's clean energy economy.

Figure 53. Total Private Clean Energy Funding (Millions), 2017–2024 Three-Year Averages

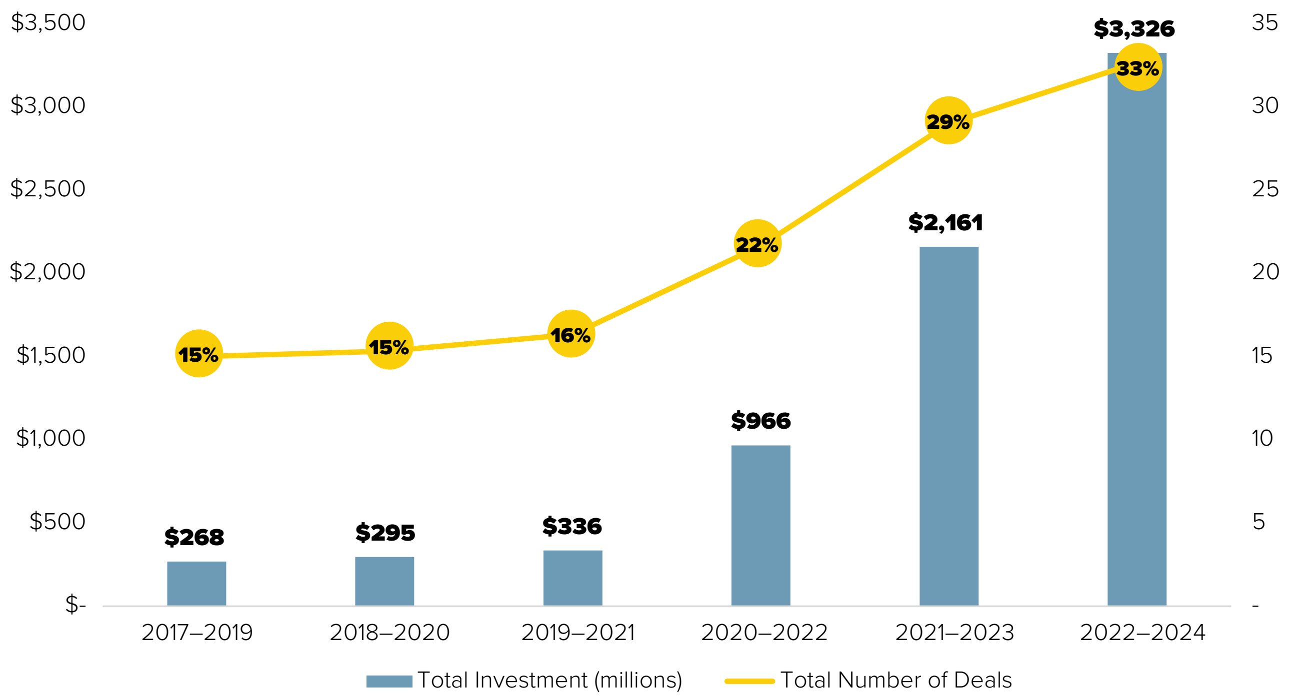
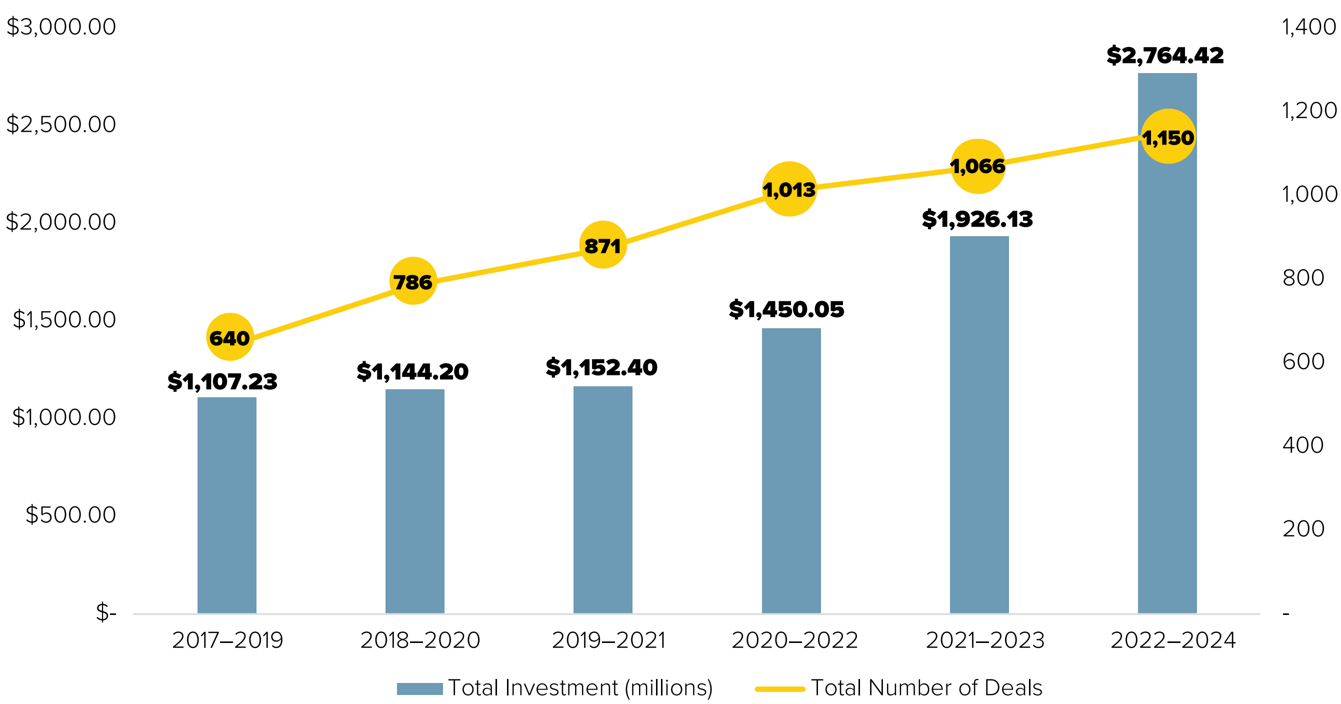


Figure 54. Total Public Clean Energy Funding (Millions), 2017–2024 Three-Year Averages



Investments by Innovation Phase

The following section outlines investment data segmented by the three primary stages of innovation funding. It is important to note that some investments and expenditures could not be assigned to a specific innovation phase due to limited data availability related to particular abstracts, projects, or investment deals. Consequently, the totals shown by innovation phase will not fully align with the overall investment figures presented in Figure 55.

Figure 55. The Stages of Innovation

PHASE I: RESEARCH AND PROTOTYPING

> Ideation

> Theoretical research

> Prototype development

> Lab testing

PHASE II: DEMONSTRATION AND ACCELERATION

> Product testing

> System evaluation

> Market research

PHASE III: COMMERCIALIZATION AND GROWTH

> Expand manufacturing capacity

> Identify early customers

Phase I: Research and Prototyping

This initial phase begins with fundamental research and concept development, typically conducted within universities and public research laboratories. It encompasses activities up to and including bench-scale prototype testing.

Funding at this stage is predominantly from public sources, though it may also include angel or seed capital, as well as private university funding. Additional indicators of activity in this phase include the volume of academic publications and levels of patent activity.

Phase II: Demonstration and Acceleration

At this stage, innovation progresses through technology refinement and the push toward commercial readiness, often led by startup companies.

Funding is partially sourced from private capital—particularly seed investment—and is frequently supported by public grant programs targeting economic development.

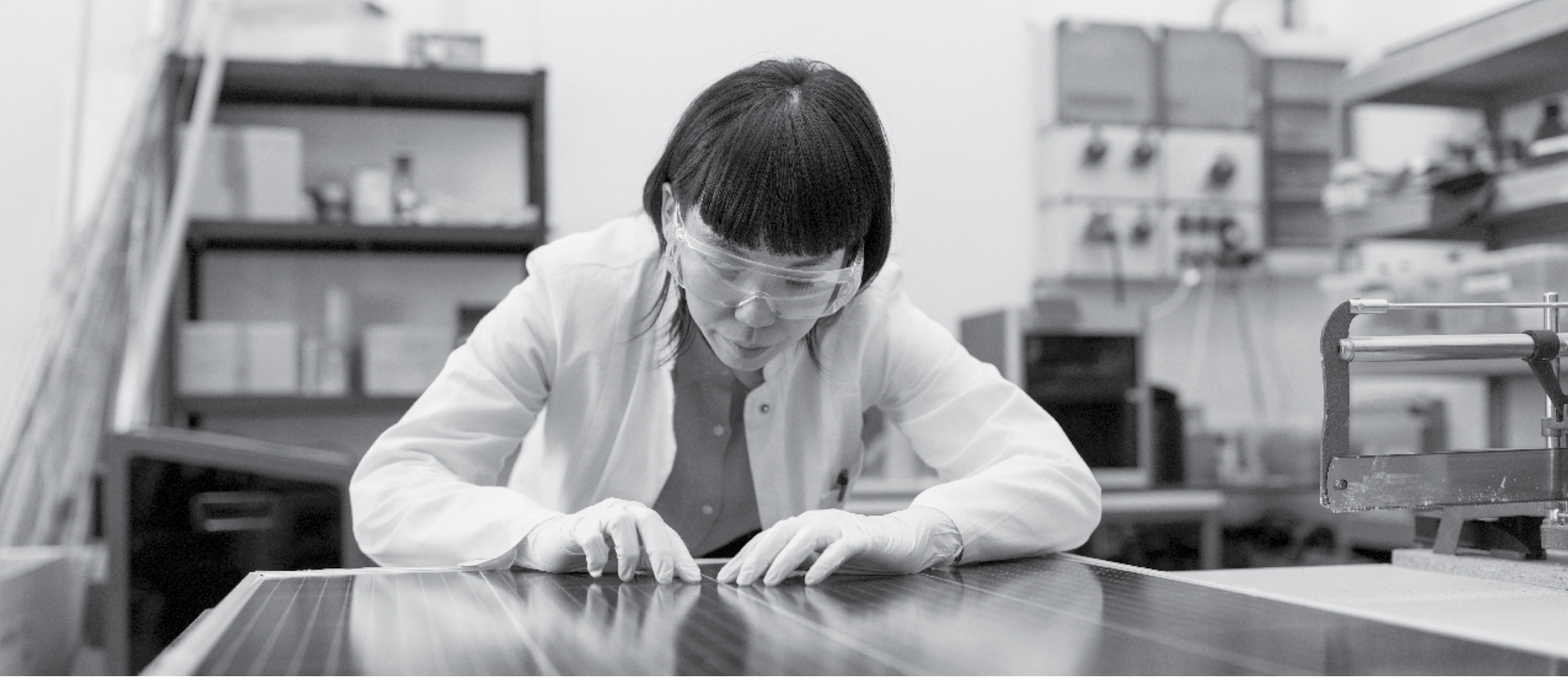
Indicators that help capture the scope of this phase include the number of physical incubators and accelerator spaces, the presence of venture capital investors, early-stage venture investment volumes, demonstration facilities, and technology transfer agreements.

Phase III: Commercialization and Growth

In the final stage, companies scale their innovations into the market, making fully developed technologies widely available for commercial use.

Key metrics for this phase include levels of venture capital and project finance, along with economic development grants and tax incentive utilization.

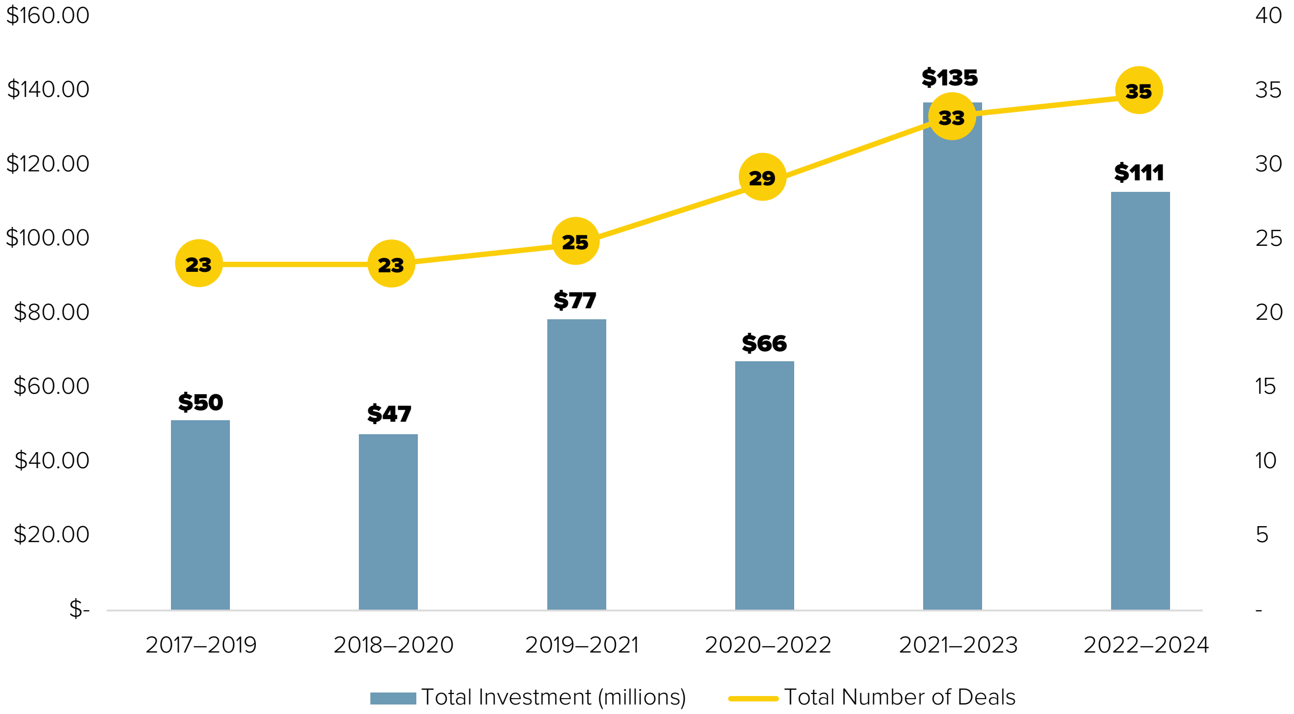
These factors reflect the transition from pilot efforts to sustained market presence and business expansion.



Phase I: Research and Prototyping

Following a significant rise in Phase-I investments between the 2020–2022 and 2021–2023 periods, funding for this early-stage innovation phase declined in the 2022–2024 period. This fluctuation reflects a broader cyclical pattern within New York State's clean energy funding landscape. Since the 2017–2019 period, Phase-I investment has tended to increase during one three-year average, then dip slightly in the next, before rising again. In the most recent 2022-to-2024 average, Phase-I investments totaled $111.3 million, representing 2% of all clean energy investment during that timeframe (Figure 56).

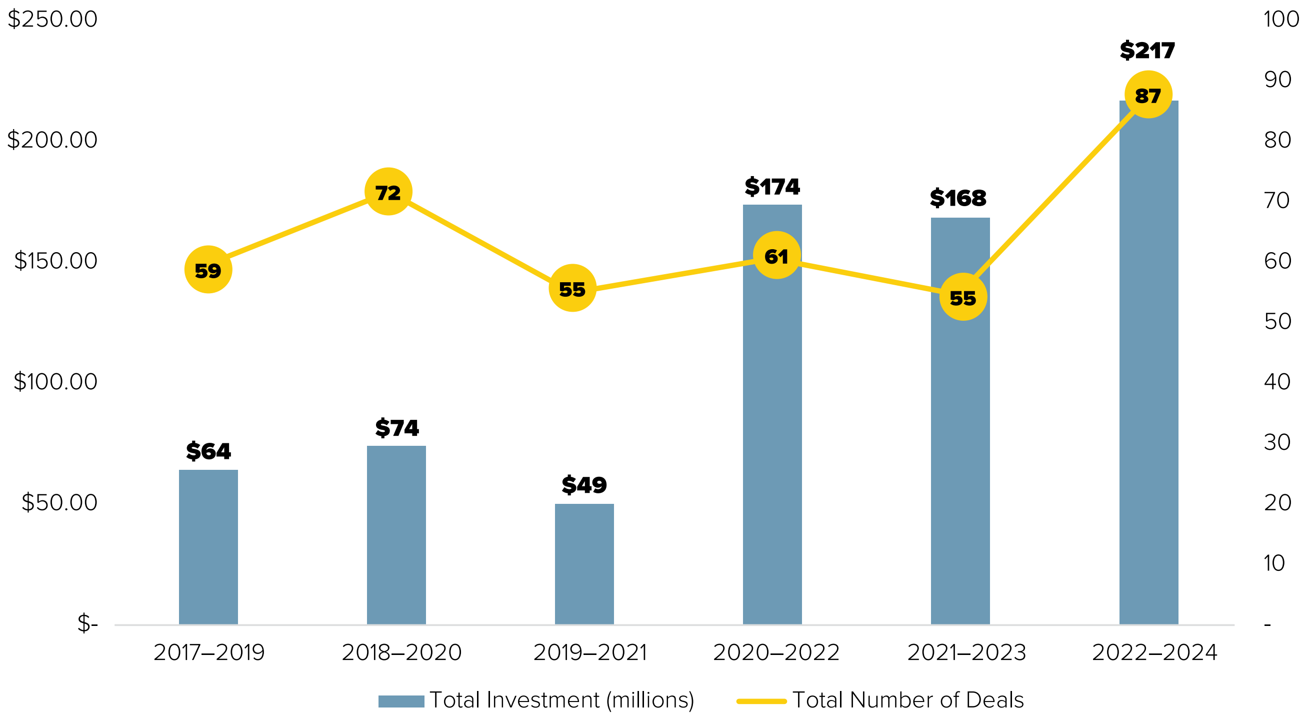
Figure 56. Phase-I Investments (Million), 2017–2024 Three-Year Averages



Phase II: Demonstration and Acceleration

The 2022 to 2024 average timeframe experienced the greatest number of deals since tracking began, with 87 deals, adding $217 million into the clean energy economy. This is a substantial increase in both dollars invested and number of deals from the previous 2021-2023 period, with investment increasing by 29% and the number of deals at 60. Phase-II investments represent 4% of the 2022 to 2024 average funding (Figure 57).

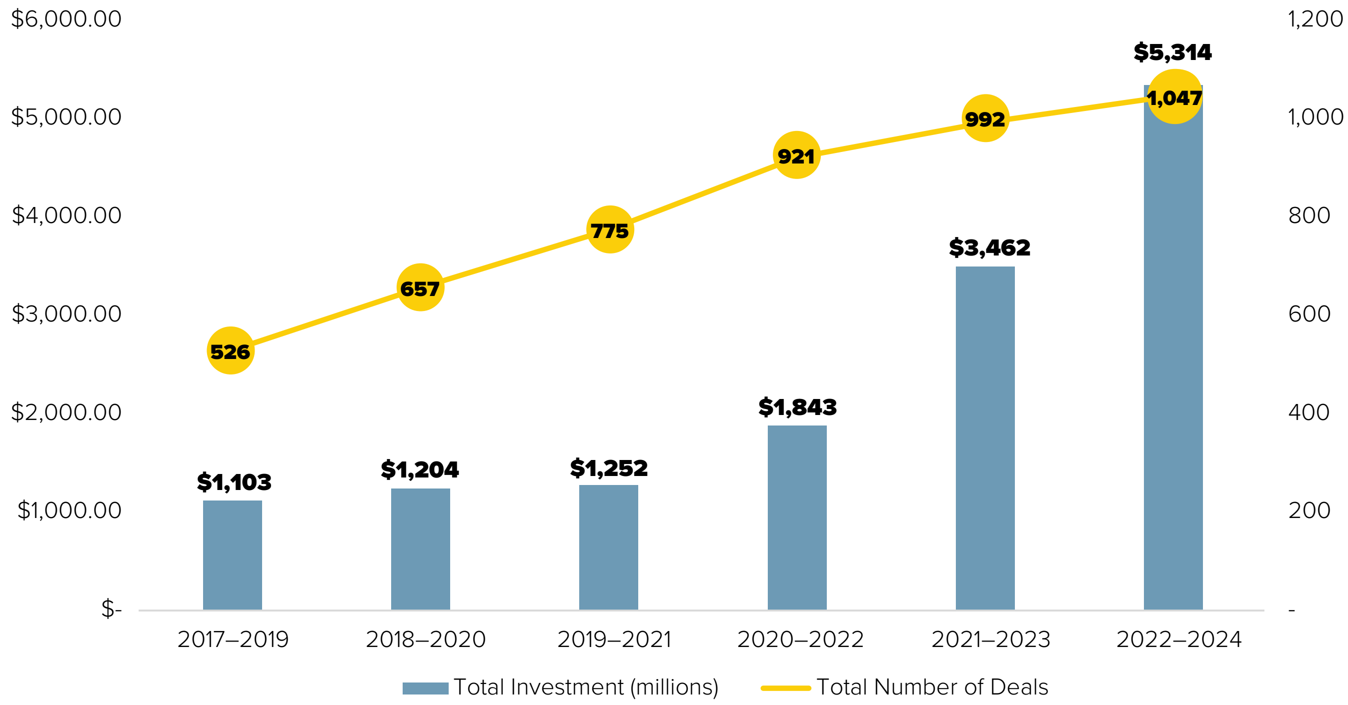
Figure 57. Phase-II Investments (Million), 2017–2024 Three-Year Averages



Phase III: Commercialization and Growth

Phase-III investments saw the most growth in dollars invested from the previous three-year average, growing 54% from $3.5 billion in the 2021 to 2023 three-year average to $5.3 billion in the 2022 to 2024 three-year average (Figure 58). Phase-III investment makes up most of New York State's clean energy investment at 87%. Phase-III investments in 2024 were led by the previously mentioned investment in D. E. Shaw Renewable Investments, along with the investment into Plug Power by the U.S. Department of Energy.

Figure 58. Phase-III Investments (Million), 2017–2024 Three-Year Averages



Economic Impact Analysis

9,499

net increase in jobs spurred by new clean energy activity in 2024

5,985	**1,038**	**2,476**	**$1.3+ B**	**$897 M**
direct jobs	*indirect jobs*	*induced jobs*	*gross State product (GSP)*	*labor income*

In 2024 there was a net increase of 6,088 jobs across New York State's clean energy industries. New clean energy jobs can spur "indirect" job growth in other related industries that indirectly support clean energy projects via supply chains, or spur "induced" job growth in unrelated industries as a result of higher demand for products and services from newly "directly" employed clean energy workers.

An economic impact analysis of these effects finds that net increase of 9,499 jobs spurred by new clean energy activity in 2024. Of the jobs gained, 5,985 were direct jobs, 1,038 were indirect jobs, and 2,476 were induced jobs.[50] These jobs were responsible for over $1.3 billion in gross State product (GSP) and about $897 million in labor income (Table 13).

The industries with the largest employment growth during this time were maintenance and repair construction of residential structures, other durable goods merchant wholesalers, other financial investment activities, construction of new single-family residential structures, and wholesale machinery, equipment, and supplies.[51]

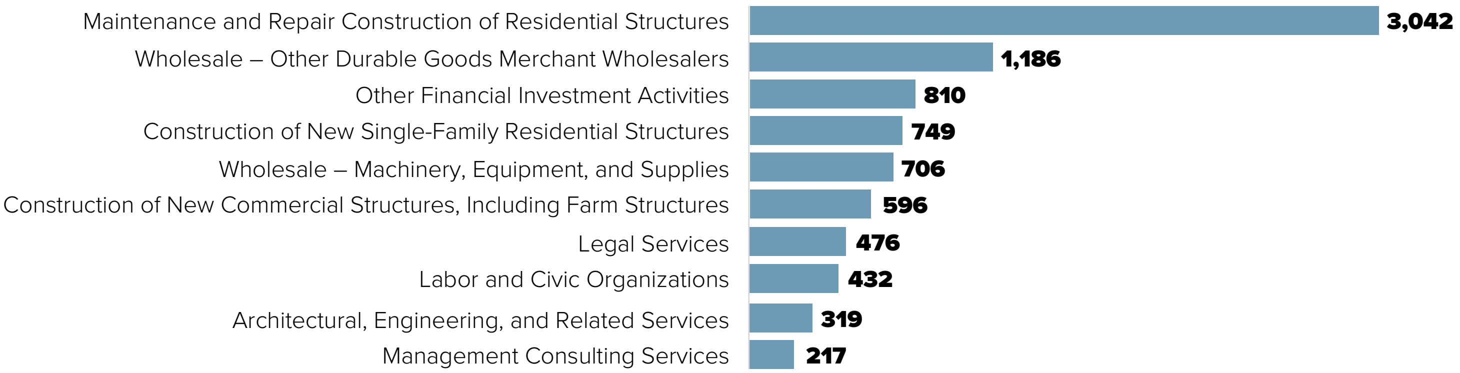
Table 13. Total Economic Impact of the Net Change in Clean Energy Jobs in New York State, 2024

Impact Type	Employment	Employment Share	Value Added	Labor Income
Direct Effect	5,985	63%	$808,332,431	$622,981,251
Indirect Effect	1,038	11%	$187,527,031	$81,687,198
Induced Effect	2,476	26%	$344,852,957	$191,992,192
Total Effect	**9,499**	**100%**	**$1,340,712,418**	**$896,660,641**

Direct Industries

The clean energy industries with the largest direct job gains include maintenance and repair construction of residential structures, other durable goods merchant wholesalers, other financial investment activities, construction of new single-family residential structures, and wholesale machinery, equipment, and supplies (Figure 59).

Figure 59. Top 10 Clean Energy Direct Industries in New York State by Employment Gains, 2024



Indirect Industries

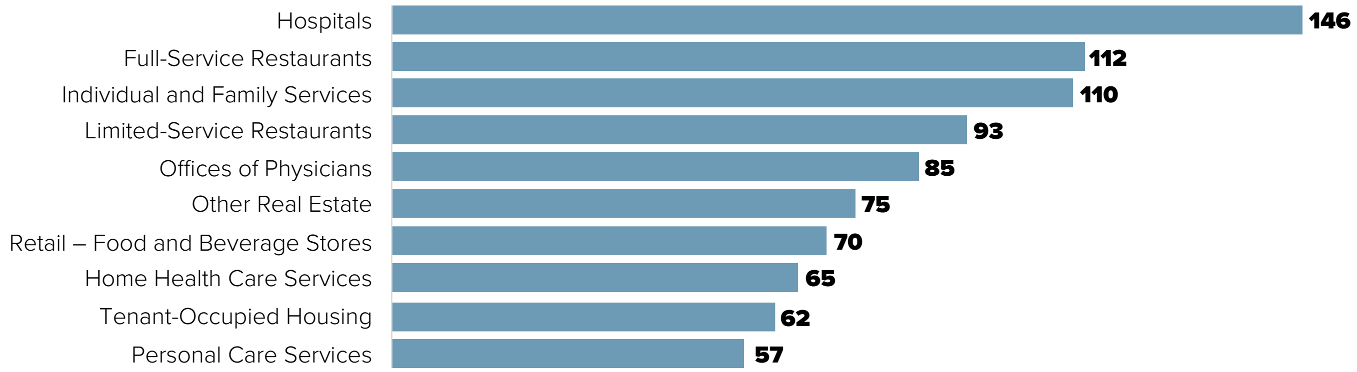
Among the industries that make up the supply chain for New York State's clean energy sector, those that saw the largest job growth from 2023 to 2024 were building material and garden equipment and supplies retail stores, real estate, architectural, engineering, and related services, other durable goods merchant wholesalers, and securities and commodity contracts intermediation and brokerage (Figure 60).

Figure 60. Top 10 Supply Chain (Indirect) Industries in New York State by Employment Gains, 2024

Induced Industries

Whereas clean energy supply chain industries feel the effects of clean energy firms' increased investments and spending, other industries feel the ("induced") effects of more clean energy workers' spending of their wages in the State. These effects have the largest impact in hospitals, restaurants, individual and family services, physicians' offices, real estate, and supermarkets (Figure 61). Recognizing the job increase induced by clean energy worker spending, along with direct and indirect job growth, provides a holistic view of the impacts New York clean energy jobs have in the State.

Figure 61. Top 10 Induced Industries in New York State by Employment Gains, 2024



Fiscal Impacts

New York State's clean energy economy makes meaningful annual contributions to federal, State, and local government revenues through taxes on production and imports.[52] New York's clean energy jobs are responsible for $163 million in State and local taxes on production and imports and roughly $212 million in federal taxes (Table 14).

Table 14. Impact of New York Clean Energy Jobs on Taxes on Production and Imports, 2024

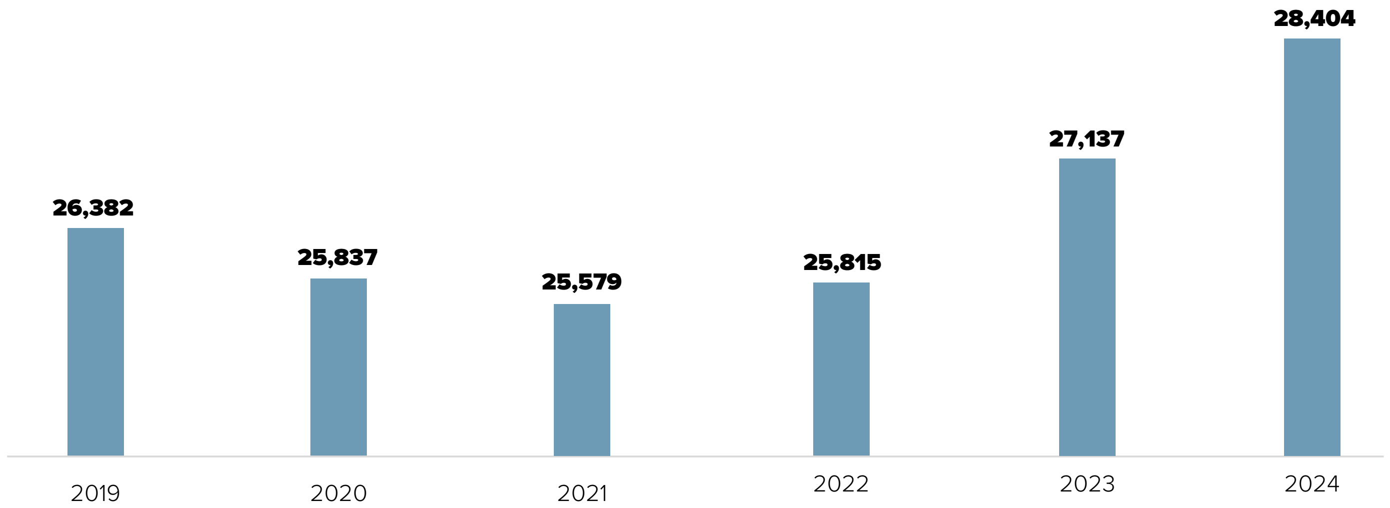
Taxes	Impact on Taxes
Local Taxes	$90,861,858
State Taxes	$72,422,401
Federal Taxes	$211,535,583

Transmission and Distribution Employment

Employment in electric transmission and distribution has continued to rise since 2021, rising in 2024 by over 1,200 jobs, growing by 4.7% from the previous year (Figure 62).

This report highlights transmission and distribution given that this is an area expected future investment and subsequent growth. In particular, electric distribution employment will play an important role in supporting increased electrification of transportation, new and existing homes, and some commercial and industrial applications.

Figure 62. Electric Transmission and Distribution Employment in New York, 2019–2024

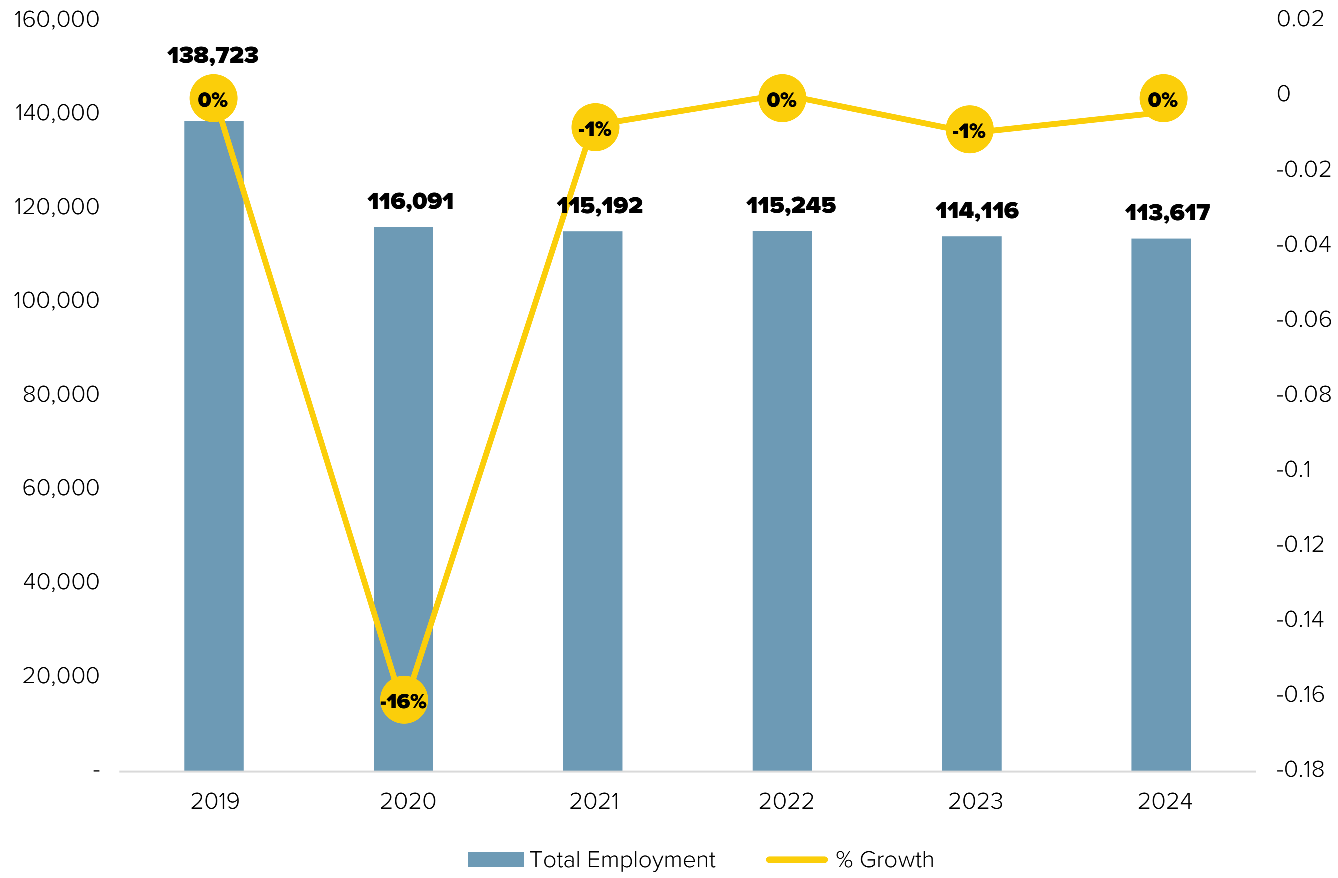


Traditional Energy Employment

This section presents data on traditional energy employment in New York, based on the latest United States Energy and Employment Report (USEER). In the context of the 2024 New York Clean Energy Industry Report, "traditional energy" refers to fossil fuel-based energy sources and other technologies not included in the five, core, clean energy technology categories outlined earlier.[54]

Traditional energy employment in New York State remained stagnant from 2023 to 2024, compared to the 3% increase for clean energy employment (Figure 63).

Figure 63. New York Traditional Energy Employment, 2019–2024



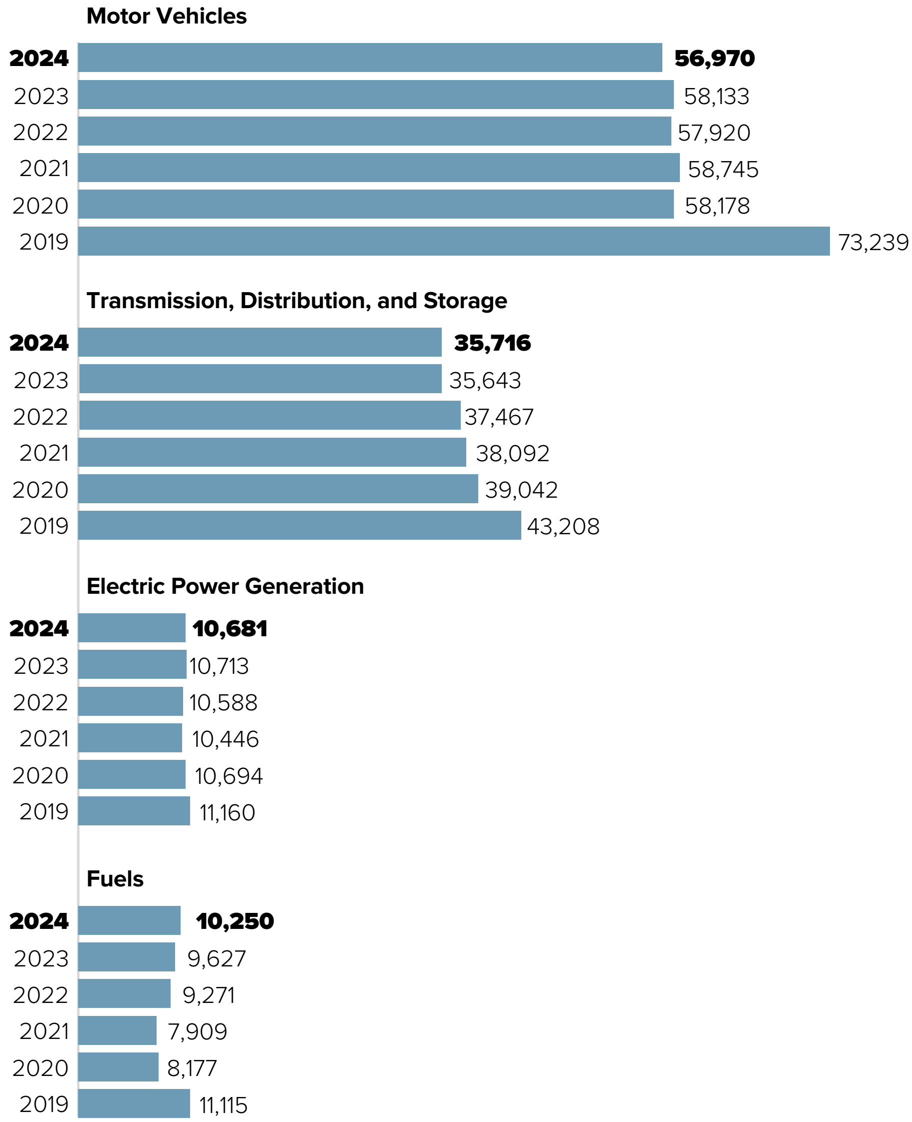
Workers in motor vehicles make up the most of traditional energy employment, representing 71% of traditional energy jobs.

This sector saw the most losses, losing over 1,100 jobs at a rate of 2%.

The fuels sector had the highest growth rate from 2023 to 2024 at 6%, increasing by 623 jobs.

Additionally, the electric power generation remained relatively stagnant (Figure 64).

Figure 64. New York State Traditional Energy Employment by Technology, 2019–2024[53]



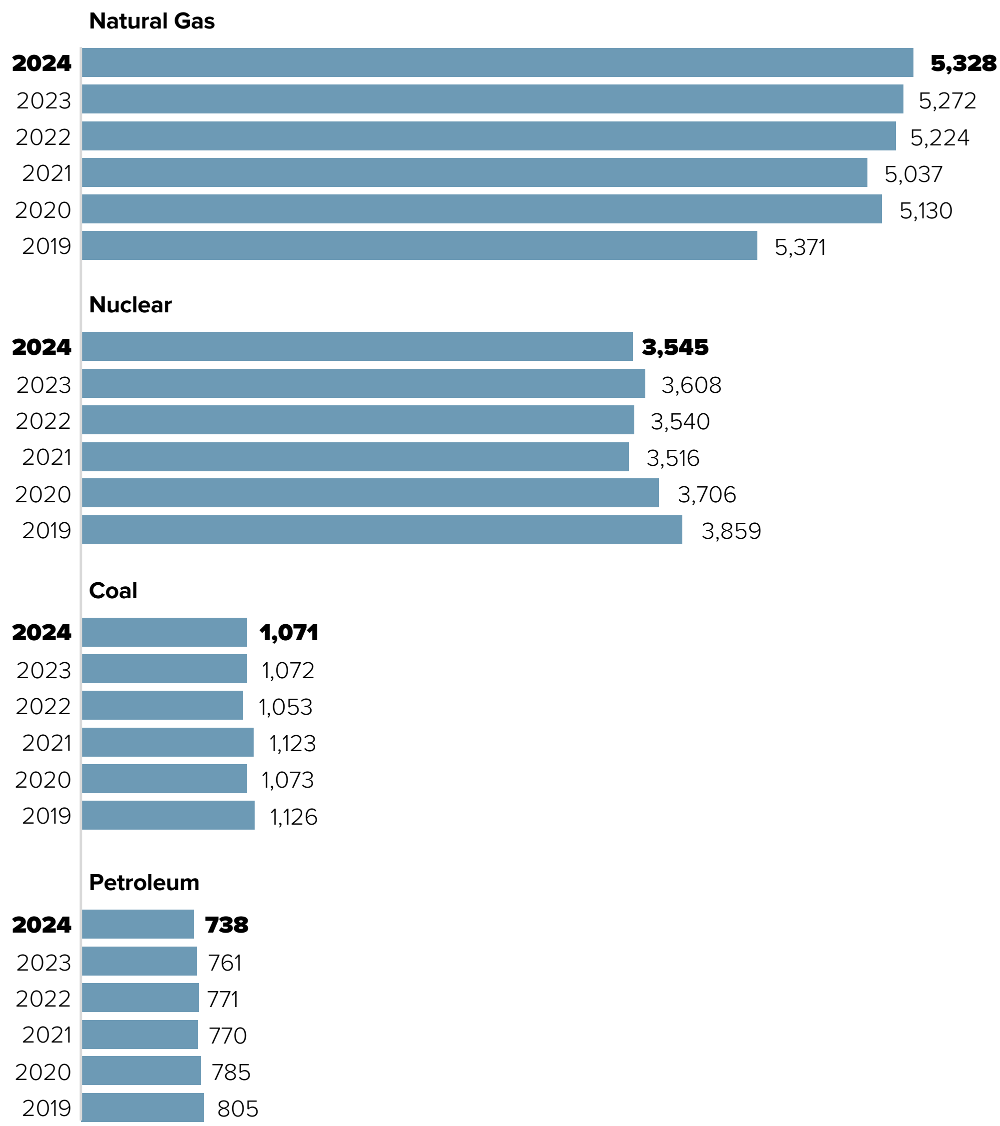
All subsectors in traditional electric power generation have declined since 2019.

Jobs in petroleum and nuclear power have seen the greatest percent losses, at 8% each, while natural gas only declined by 1%.

From 2023 to 2024, jobs in petroleum and nuclear have declined at rates of 3% and 2%, respectively.

Jobs in coal remained unchanged over the last year, while natural gas employment rose by 1% (Figure 65).

Figure 65. Traditional Electrical Power Generation by Subsectors, 2019–2024

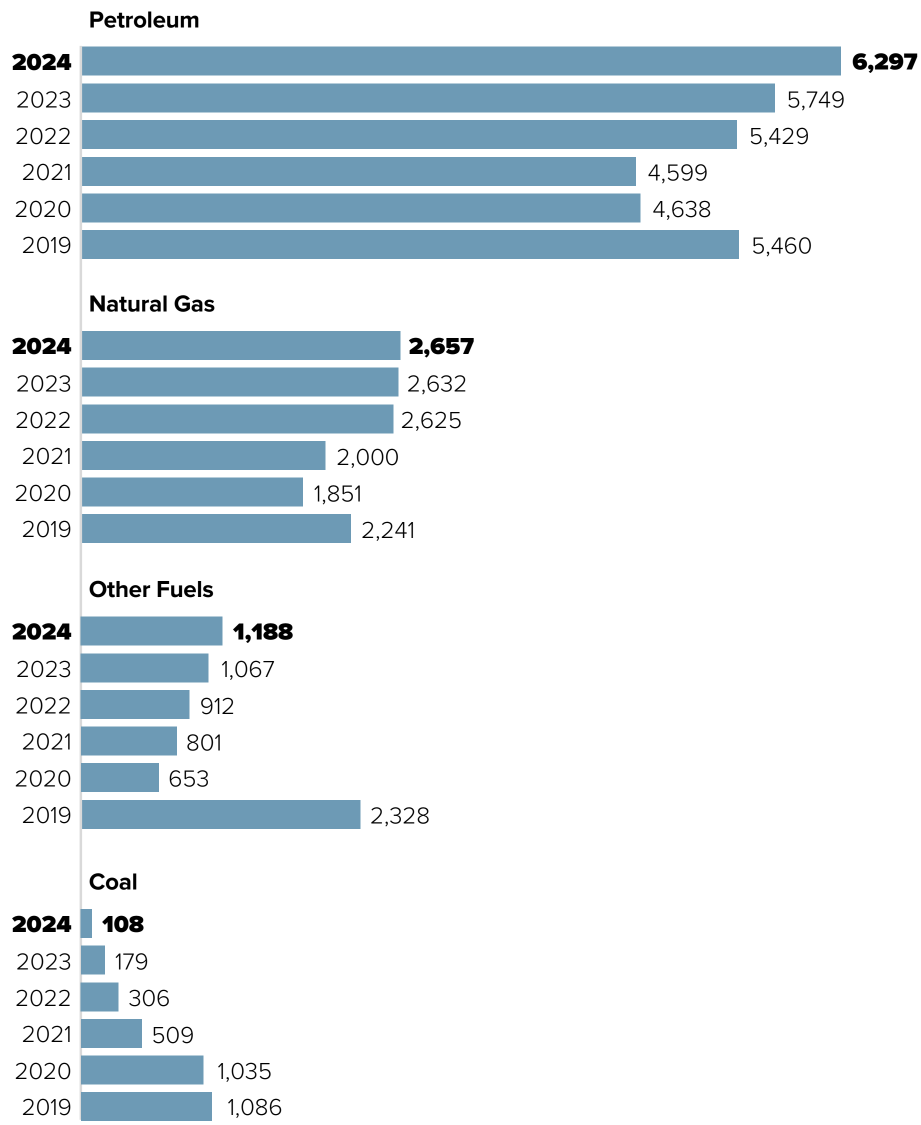


The largest subsector in traditional fuels is petroleum, which has seen steady job increases since 2020, growing by 10% from 2023 to 2024 (Figure 66).

Natural gas jobs have remained relatively constant since 2022, at a level roughly 20% higher than in 2019.

Coal has seen the most significant job decline within traditional fuels over the past year as well as since 2019.

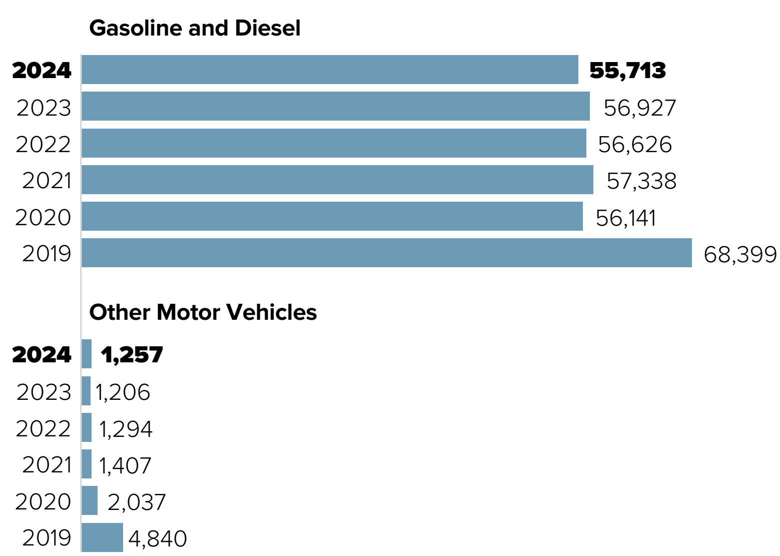
Figure 66. Traditional Fuels by Subsector, 2019–2024



Employment in traditional motor vehicles, largely driven by the gasoline and diesel subsector, has been unable to recover from 2020 employment loss.

Since 2019, jobs in gasoline and diesel motor vehicles have declined by 19%, and from 2023 to 2024 employment declined by 2% (Figure 67).

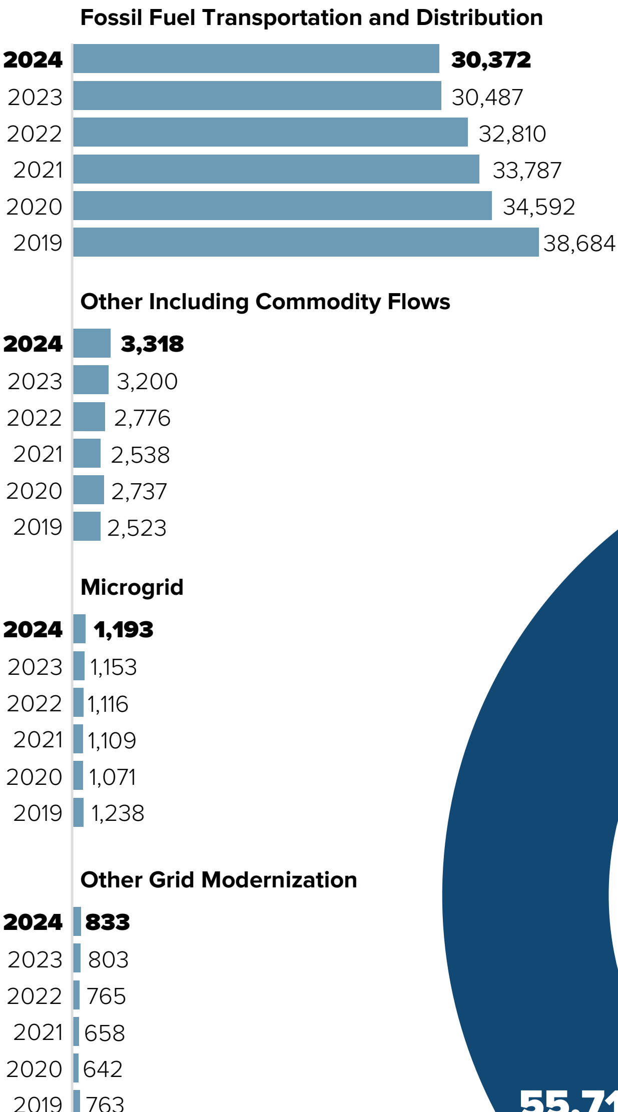
Figure 67. Traditional Motor Vehicles by Subsector, 2019–2024



Employment in traditional transmission, distribution, and storage has declined by 17% since 2019, particularly in fossil fuel transportation and distribution and “other,” including commodity flows.[55]

On the other hand, employment in microgrid technologies grew 3% from 2023, while other grid modernization activities grew by 4% (Figure 68).

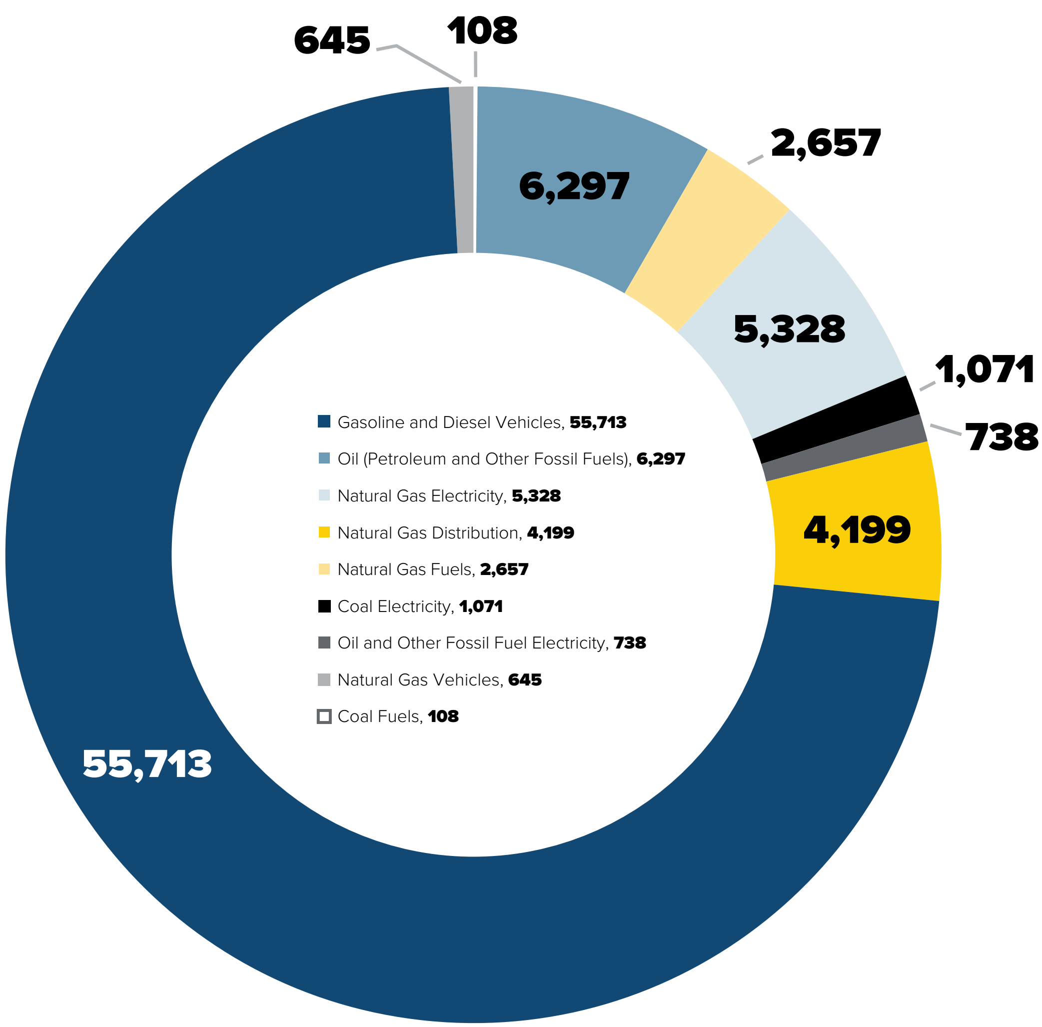
Figure 68. Traditional Transmission, Distribution and Storage Employment by Sector, 2019–2024[56]



There are an estimated 76,755 workers within fossil fuel industries throughout New York State.

About 55,700 (73%) of those workers are within the gasoline and diesel vehicles industry (Figure 69).[57]

Figure 69. Fossil Fuel Employment



Appendices

Appendix A: Clean Energy Technology List

A clean energy job is defined as any worker who is directly involved with the research, development, production, manufacture, distribution, sales, implementation, installation, or repair of components, goods, or services related to the following sectors of the clean energy economy: renewable electric power generation; grid modernization and energy storage; building decarbonization and energy efficiency; renewable fuels; and clean and alternative fuels transportation. These jobs also include supporting services such as consulting, finance, tax, and legal services related to energy.

Renewable Electric Power Generation

- Solar Photovoltaic Electric Generation
- Concentrated Solar Electric Generation
- Wind Generation
- Geothermal Generation
- Bioenergy/Biomass Generation, including Combined Heat and Power
- Low-Impact Hydroelectric Generation, including Wave/Kinetic Generation
- Traditional Hydroelectric Generation

Grid Modernization and Energy Storage

Electric Power Transmission and Distribution

- Smart Grid

Energy Storage

- Pumped Hydropower Storage
- Battery Storage, including Battery Storage for Solar Generation
    - Lithium Batteries
    - Lead-Based Batteries
    - Other Solid-Electrode Batteries
    - Vanadium Redox Flow Batteries
    - Other Flow Batteries
- Mechanical Storage, including Flywheels, Compressed Air Energy Storage, etc.
- Thermal Storage

Building Decarbonization and Energy Efficiency

- Traditional HVAC Goods, Control Systems, and Services
- High Efficiency HVAC and Renewable Heating and Cooling
  - ENERGY STAR®-Certified Heating Ventilation and Air Conditioning (HVAC), including Boilers and Furnaces with an Annual Fuel Utilization Efficiency (AFUE) rating of 90 or greater and Air and Central Air Conditioning Units of 15 Seasonal Energy Efficiency Ratio (SEER) or greater
  - Solar Thermal Water Heating and Cooling
  - Other Renewable Heating and Cooling (Geothermal, Biomass, Heat Pumps, etc.)
- ENERGY STAR and Efficient Lighting
  - ENERGY STAR-Certified Appliances, excluding HVAC
  - ENERGY STAR-Certified Electronics (TVs, Telephones, Audio/Video, etc.)
  - ENERGY STAR-Certified Windows and Doors
  - ENERGY STAR-Certified Roofing
  - ENERGY STAR-Certified Seal and Insulation
  - ENERGY STAR-Certified Commercial Food Service Equipment
  - ENERGY STAR-Certified Data Center Equipment
  - ENERGY STAR-Certified LED Lighting
  - Other LED, CFL, and Efficient Lighting
- Advanced Building Materials/Insulation
- Other Energy Efficiency
  - Recycled Building Materials
  - Reduced Water Consumption Products and Appliances

Renewable Fuels

- Woody Biomass
- Other Ethanol and Non-Woody Biomass, including Biodiesel

Clean and Alternative Fuels Transportation

- Plug-In Hybrid Vehicles
- Electric Vehicles
- Hybrid Electric Vehicles
- Natural Gas Vehicles
- Hydrogen and Fuel Cell Vehicles

Appendix B: Research Methodology

Employment Data

Data for the 2025 New York Clean Energy Industry Report is taken from data collection for the U.S. Energy and Employment Report (USEER). The full methodology can be found at www.energy.gov/policy/us-energy-employment-jobs-report-useer.

The survey was administered by phone and web. The phone survey was conducted by ReconMR, and the web instrument was programmed internally. Each respondent was required to use a unique ID in order to prevent duplication.

The 2024 USEER survey in New York resulted in more than 32,400 calls and more than 4,800 emails. Approximately 1,670 business establishments participated in the survey. These responses were used to develop incidence rates among industries as well as to apportion employment across various industry categories in ways currently not provided by State and federal labor market information agencies. The margin of error is +/-2.39% at a 95% confidence level.

Intensity-adjusted Clean Energy Employment

Intensity-adjusted clean energy employment was extrapolated using State employment thresholds by technology weighted on census division and previous year's data. Employment thresholds are survey data from questions asking what percentage of a firm's employment spends at least 50% of its time working on energy-related activities and what percentage spends all of its time. Using the adjusted thresholds, employment by State is then split into three groups, those that spend all (100%) of their time on energy-related activities, those that spend a majority (50 to 99%) of their time, and those that spend less than a majority (0 to 49%) of their time. These employment groups are weighted 0.25 on the less than a majority group, 0.75 on the majority group, and 1 on the 100% group. Intensity-adjusted employment estimates are sum of these products.

Disadvantaged Community Analysis

BW Research developed a novel dataset of place of employment and place of residence estimates for clean energy workers. Using county-level value chain clean energy employment from the 2024 US Energy and Employment Report, the research team proportioned census-tract level data on place of employment and place of residence data by value chain from the U.S. Census Bureau's LEHD Origin-Destination Employment Statistics (LODES)[58] Workplace Area Characteristics and Residence Area Characteristics, respectively. This census-tract-level data allowed the research team to develop estimates for census-tract defined Disadvantaged Communities.[59] Existing census-tract-level data from the Technical Documentation Appendix: Communities Indicator Workbook was used for population estimates.[60] While the estimates generated through this exercise are imprecise estimates given the geographic granularity of census tracts, the data generated provide useful information into clean energy-related economic activity, opportunity, and worker patterns.

New York Employer and Wage Survey

BW Research conducted employer interviews with clean energy organizations throughout New York State. The survey sample included a compilation of known clean energy firms in New York that BW Research has curated for the last decade and an online panel through a third-party of relevant businesses (firms in utilities, construction, manufacturing, wholesale trade, engineering, maintenance and repair, etc.). Known New York State clean energy firms from BW Research's sample were recontacted as part of the research effort. Samples were de-duplicated before fielding the employer survey and contact information was checked upon completion of data collection to ensure that duplicate responses were removed. The survey instrument was programmed internally by BW Research and each respondent was assigned a unique ID to prevent duplication.

In order to be considered a clean energy business, respondents had to answer a number of screener questions, including:

“Is your organization involved, in whole or in part, with an activity related to clean energy, including building electrification and energy efficiency and clean and alternative transportation? We define this as being directly involved in the research and development, manufacture, sales, installation, repair, and maintenance of goods and/or services related to energy technologies, including renewable energy and grid modernization, electric vehicles and other alternative transportation, and energy efficiency in buildings.”

The employer survey was fielded between May 8th and May 26th, 2024,and resulted in 258 total completes by firm. The average survey duration was 10.9 minutes.

New York Worker Survey

BW Research conducted a survey of individuals in the New York State that were of working age, including those that were currently employed and those that were currently unemployed but looking for work. Respondents were recruited from a panel of individuals active in the workforce that lived in the state of New York. The survey further split current workers into those currently employed in a clean energy field and those that were not. In order to be considered a clean energy worker, respondents had to answer a number of screener questions, including;

“Do/did you work in a clean energy or clean energy-related field, including building electrification and energy efficiency and clean and alternative transportation?

We define this as being directly involved in the research and development, manufacture, sales, installation, repair, and maintenance of goods and/or services related to energy technologies, including renewable energy and grid modernization, electric vehicles and other clean and alternative transportation, and energy efficiency in buildings.”

The worker survey was fielded between May 29th and July 21st, 2025 and resulted in 240 total completes by workers. The average survey duration was 11.5 minutes.

New York State Contractor Survey

BW Research conducted employer interviews with firms involved with building decarbonization throughout New York State. The survey sample included a compilation of known building decarbonization firms in New York State that BW Research has curated for the several years and online panel through a third party of relevant businesses (firms in utilities, construction, manufacturing, wholesale trade, engineering, maintenance and repair, etc.). Samples were de-duplicated before fielding the employer survey and contact information was checked upon completion of data collection to ensure that duplicate responses were removed. The survey was administered by phone and web. The phone survey was conducted by ReconMR, and the web instrument was programmed internally, and each respondent was assigned a unique ID to prevent duplication.

In order to be considered a building decarbonization business, respondents had to answer a number of screener questions, including;

“Is your firm involved with building decarbonization activities?”

This includes energy auditing and monitoring, or the installation or maintenance of building envelope and shell (such as insulation, efficient building exterior, weatherization), efficient HVAC-R equipment (such as heat pump space heating and cooling systems), heat pump water heaters, replacement of gas or propane devices with electrified devices, electrical upgrades (such as efficiency lighting, panel upgrades, or other electrical work to support energy efficiency or electrification), or other energy efficiency measures?”

The building decarbonization employer survey was fielded between August 5th and August 18th, 2025, and resulted in 225 total completes by firm. The average survey duration was 19.0 minutes. To more accurately reflect New York’s building equipment contractor industry (NAICS 2382), the industry where most HVAC/R mechanics, installers, technicians, electricians, plumbers, pipefitters, and steamfitters are employed, survey responses were weighted by employer size. Prior to weighting, the maximum margin of error for questions answered by all respondents was +/- 6.48% at a 95% confidence level. After applying weights, the margin of error increased to ±9.06%, also at a 95% confidence level.

Economic Impact Analysis

BW Research used IMPLAN, an input-output model that traces spending and infrastructural developments through the economy to determine the economic impact of the change in clean energy jobs in 2023 to the State of New York. The cumulative effects of the initial job change are quantified, and the results are categorized into direct, indirect, and induced effects. Direct effects show the change in the economy associated with the initial job creation (or loss), or how the industry experiences the change. Indirect effects include all the backward linkages, or the supply chain responses as a result of the initial job change. Induced effects refer to household spending and are the result of workers who are responsible for the direct and indirect effects spending their wages.

Model Input

To develop the economic model in IMPLAN, BW Research identified the clean energy job net change in the State of New York disaggregated by NAICS code between 2022 and 2023, as calculated for the 2024 NYCEIR (i.e., in-scope jobs). These NAICS codes are then translated to IMPLAN industry code through an IMPLAN provided crosswalk. All job changes from 2022 to 2023, whether positive or negative, were added as input to IMPLAN by IMPLAN industry code. The study area was set as the State of New York and the event year was set to 2022.

Model Output

Results from the economic impact analysis included employment[61] (full- and part-time jobs), labor income, taxes, and value added. Value added is the total output minus the cost of inputs from outside the firm; it is a measure of the contribution to the Gross State Product made by the companies or industries. Labor income include all forms of employment income, such as employee compensation (wages and benefits) and proprietor income (i.e., payments received by self-employed individuals and unincorporated business owners).

Addressing Supply and Value Chain Double Counting

One important step in the analysis was to ensure the IMPLAN model, by quantifying direct and indirect jobs, would not double-count the in-scope jobs (i.e., jobs from the NYCEIR data). Since NYCEIR data includes value chain jobs and IMPLAN also calculates the supply chain employment in the indirect impacts, there could be some double counting. When using jobs as an input (as we do in our analysis) compared to sales or expenditures, there is the additional challenge of determining whether the jobs should be considered direct or indirect jobs, i.e., part of the supply chain economic activity. For example, new construction jobs entered in IMPLAN have an impact through the entire value chain (e.g., purchasing ENERGY STAR boilers). So, if the supply chain jobs are entered in IMPLAN as direct jobs and the model also accounts for them as an indirect impact of the new construction jobs, then there is double-counting, and the impacts will be inflated.

The challenge faced by using jobs as the economic model input was to determine the number of in-scope energy jobs that should be counted in IMPLAN as direct or indirect jobs, without eliminating activity that was not in initially included in the NYCEIR data. While this seems simple in theory, it is more difficult in practice. Thus, to address the double-counting challenge, the research team adopted the following methodology.

Step 1: Run detailed, individual models for each in-scope industry by IMPLAN code

The research team ran detailed models for each in-scope industry by IMPLAN code and analyzed the indirect jobs created (or lost) by each in-scope industry. By creating individual models for each IMPLAN code, the team gained a better understanding of the jobs created (or lost) in different indirect industries by each in-scope industry.

Step 2: Compare the number of direct + indirect jobs by industry estimated in IMPLAN with the initial in-scope jobs

This step included looking at the number of direct + indirect jobs by industry and comparing with the initial in-scope jobs by industry. By doing this, the team analyzed the supply chain jobs that are created (or lost) by each in-scope industry, which helped adjust the in-scope jobs based on the number of direct and indirect jobs created (or lost) in IMPLAN.

Step 3: Adjust the initial in-scope jobs based on the direct + indirect jobs calculated in the IMPLAN model

This step included adjusting the in-scope jobs based on the direct + indirect jobs that IMPLAN estimated. For example, if, based on the construction in-scope jobs, IMPLAN calculated that x number of indirect jobs were created in wholesale trade, we excluded that x number from the initial in-scope jobs in wholesale trade since they were already accounted for as indirect jobs of construction.

This important step addresses the fundamental challenge of this study which is determining the proportion of in-scope jobs that should be considered direct or indirect (supply-chain) jobs. By following this methodology, we avoided double-counting the in-scope jobs that would occur if all of them would be considered direct jobs.

Step 4: Re-run the IMPLAN model with the "adjusted" in-scope jobs by industry

After running several individual and collective models, the last step was to re-run the IMPLAN model one more time with the adjusted number of in-scope jobs by industry.

Final Output

- Direct = "adjusted" in-scope industry jobs by sector to account for the indirect jobs IMPLAN calculates.
- Indirect = indirect jobs produced by the model which include in- and out-of-scope industries
- Induced = all induced jobs calculated in IMPLAN

Appendix C: Building Decarbonization and Energy Efficiency Contractor Survey Questionnaire

Introduction

BW Research is working with the New York State Energy Research and Development Authority (NYSERDA) to better understand the building decarbonization workforce. This survey will inquire about familiarity and frequency of use of technologies, workforce challenges, and opportunities to improve policies that promote building decarbonization. The information gathered through this survey will only be reported anonymously and in aggregate, and no personally identifiable information will be shared. Please complete this survey to help NYSERDA better support building decarbonization contractors.

[IF NEEDED]: This survey has been commissioned by the New York State Energy Research and Development Authority (NYSERDA)

[IF NEEDED]: The survey is being conducted by BW Research, an independent research organization, and should take approximately 10 to 15 minutes of your time.

[IF NEEDED]: Your individual responses will not be published; only aggregate information will be used in the reporting of the survey results.

Screener Questions

INTRODUCTION

Please describe what your firm does for work.____________

A. Is your firm involved with building decarbonization activities? This includes energy auditing and monitoring, or the installation or maintenance of building envelope and shell (such as insulation, efficient building exterior, weatherization), efficient HVAC/R equipment (such as heat pump space heating and cooling systems), heat pump water heaters, replacement of gas or propane devices with electrified devices, electrical upgrades (such as efficiency lighting, panel upgrades, or other electrical work to support energy efficiency or electrification), or other energy efficiency measures? [Select all that apply.]

1. Yes, energy auditing and/or monitoring
2. Yes, efficient HVAC-R equipment (such as heat pumps)
3. Yes, heat pump water heaters
4. Yes, building envelope and shell (including air sealing)
5. Yes, replacement of gas or propane devices with electrified devices
6. Yes, electrical upgrades (such as lighting, panel upgrades, or other work to support energy efficiency or electrification)
7. Yes, other energy efficiency measures
8. No, none of the above [TERMINATE]
9. Don't know/ Refused [TERMINATE]

B. In which state(s) does your firm operate? [RANDOMIZE]

1. New York [TERMINATE IF NOT SELECTED]
2. Pennsylvania
3. Vermont
4. Connecticut
5. New Jersey
6. Delaware
7. Don't know/ Refused [TERMINATE]

C. Please enter the ZIP code of your primary location. Record ZIP code: _ _ _ _ _

D. Which types of buildings does your business work on? [SELECT ALL THAT APPLY]

a. Single-Family Residential Buildings
b. Multifamily Low-Rise Residential Buildings
c. Multifamily High-Rise Residential Buildings
d. Commercial Low-Rise Non-Residential Properties
e. Commercial High-Rise Non-Residential Properties
f. Manufactured Homes
g. Other (please specify) ____________

[IF SD > 1 SELECTED, ASK SE, OTHERWISE SKIP]

E. Please select which type of properties your business works on most frequently: [Pipe in selected responses]

F. Please indicate which of the following occupations (or their assistants or apprentices) are employed at your location. [SELECT ALL THAT APPLY]

RANDOMIZE

1. HVAC/R Mechanic, Installers, and Technicians (including smart thermostats and other energy monitoring equipment)[62]
2. Electricians[63]
3. Plumbers, Pipefitters, and Steamfitters[64]
4. Insulation Workers (including air sealing)[65]
5. Window Installers/Glaziers
6. Energy Auditor, Advisor, or Inspector (such as HERS Rater)[66]
7. Bookkeepers and General Office Administrators
8. Cost Estimators and Salespeople
9. None of the above (TERMINATE)

[IF None are selected, TERMINATE]

G. Please tell us which type(s) of technology your company works most closely with [SELECT ALL THAT APPLY]

[RANDOMIZE]:

1. Air source heat pumps for HVAC
2. Ground source or geothermal heat pumps for HVAC
3. Heat pump water heaters
4. General electrical upgrades (including upgrades to panels, wiring, circuit breakers, and other electrical componentry)
5. Building insulation or envelope sealing
6. Blower doors, infrared cameras, furnace efficiency meters, and surface thermometers
7. Hybrid heat pumps (i.e. heat pump with fossil fuel backup)
8. Hybrid heat pump water heaters (i.e. heat pump water heater with electric resistance backup)
9. Fossil fuel heating systems (including furnaces or boilers)
10. Fossil fuel or electric resistance water heaters
11. Integrated heating system controls
12. Other (please specify) ________

Please rank the appliances below in order of which your company most frequently installs or repairs these devices [Pipe in selected technologies from G]

Section 1: Employment

1. Including all full-time and part-time employees, how many permanent (non-contract or temporary) employees work at your current location? Please include any employees working remotely who report out of this location.
   [DO NOT ACCEPT 0 AS A RESPONSE]

   Record # of employees _________

   [IF REFUSED, OFFER INTERVALS FOR EACH]

   1. 1 to 4 employees
   2. 5 to 9 employees
   3. 10 to 24 employees
   4. 25 to 99 employees
   5. 100 or more employees

2. Of all permanent employees working at your current location, how many workers predominantly work in the office or in the field?

   Office workers (Record # of employees) ________________________

   Field workers (Record # of employees) ________________________

3. Which counties does your location most frequently provide services?

   a. Drop down menu of all counties with five drop down slots

Section 2. Occupation Composition & Hiring Profile

[PIPE IN ALL OCCUPATIONS SELECTED AT SF]

4. Record # of employees _________

   [IF UNABLE TO PROVIDE NUMBER, OFFER INTERVALS]

   1. Fewer than 5
   2. Between 5 and 9
   3. Between 10 and 24
   4. Between 25 and 49
   5. Between 50 and 99
   6. 100 or more
   7. Don't know/ Refused [DON'T READ]

5. Of your (INSERT Q4#) [PIPE IN SF OCCUPATIONS SELECTED], how many are represented by a union or covered under a collective bargaining agreement or project labor agreement? [MULTIPLE RESPONSES PERMITTED]

   1. OCC #1
   2. OCC #2
   3. OCC #3
   4. ....

6. If you currently have [INSERT Q4#] [PIPE IN SF OCCUPATIONS SELECTED] at your location, how many of these workers did you have 12 months ago?

   1. OCC #1
   2. OCC #2
   3. OCC #3
   4. ....

7. If you currently have [INSERT Q4#] [PIPE IN SF OCCUPATIONS SELECTED] at your location, how employees do you expect to have at your location three years from now?

1. OCC #1
2. OCC #2
3. OCC #3
4. ....

8. Please indicate your level of difficulty hiring qualified workers for the following occupation(s):

[PIPE IN ALL OCCUPATIONS SELECTED AT SF]

	Little to No Difficulty	**Some Difficulty**	**Great Difficulty**	**Don't Know/ Refused**
HVAC Mechanic, Installers, and Technicians	1	2	3	4
Electricians	1	2	3	4
Plumbers	1	2	3	4
Etc.				

[IF Q8 = 2 OR 3, ASK Q9 FOR EACH OCCUPATION, OTHERWISE SKIP]

9. Please indicate your level of agreement with each of the following statements:

[PIPE IN ALL OCCUPATIONS SELECTED AT SF]

RANDOMIZE

	Strongly Agree	**Somewhat Agree**	**Neither Agree Nor Disagree**	**Somewhat Disagree**	**Strongly Disagree**	**Don't Know/ Refused [DON'T READ]**
A. There are not enough applicants for my firm's open [INSERT OCCUPATION] positions	1	2	3	4	5	6
B. There are enough [INSERT OCCUPATION] applicants, but they do not have the training or education needed for the job	1	2	3	4	5	6
C. There are enough [INSERT OCCUPATION] applicants, but they do not have the prior work experience needed for the job	1	2	3	4	5	6
D. There are enough [INSERT OCCUPATION] applicants, but they are unwilling to work for the wages we pay	1	2	3	4	5	6

IF Q9 "STRONGLY AGREE" COUNT IS GREATER THAN 1 ASK Q10

10. What is the most significant reason for the reported hiring difficulty for [INSERT OCCUPATION]?

PIPE IN "STRONGLY AGREE" SELECTED IN Q9

A. There are not enough applicants for my firm's open [INSERT OCCUPATION] positions.

B. There are enough [INSERT OCCUPATION] applicants, but they do not have the training or education needed for the job.

C. There are enough [INSERT OCCUPATION] applicants, but they do not have the prior work experience needed for the job.

D. There are enough [INSERT OCCUPATION] applicants, but they are unwilling to work for the wages we pay.

Section 3. Skill & Education Profile (Occupation-Specific)

11. Are specific certifications or license requirements required to install heat pump systems within buildings?

a. Yes. (Please tell us the name(s) of the certifications or licenses required.)

b. No, no certifications are needed.

c. We do not do this kind of work.

d. Don't know/refused.

12. Where do your employees go to earn the required and preferred certifications you previously listed? (SELECT ALL THAT APPLY)

a. Air Conditioning Contractors of America (ACCA)

b. Wholesaler and distributor training programs

c. Union training centers

d. Online/Webinars

e. Building Performance Association (BPA)

f. Building Performance Institute (BPI)

g. North American Technician Excellence (NATE)

h. Other (please specify):______

13. Please indicate the minimum required level of prior work experience you expect entry-level [INSERT OCCUPATION] applicants to possess?

[PIPE IN ALL OCCUPATIONS SELECTED AT SF]

	No formal work experience in comparable positions required	**Pre-apprenticeship or other short term job training**	**Up to 12 months in a comparable position**	**One to three years in a comparable position**	**More than three years in a comparable position**	**Don't know/ refused**
HVAC mechanics, installers, and technicians	1	2	3	4	5	6
Electricians	1	2	3	4	5	6
Plumbers	1	2	3	4	5	6
Etc.						

14. Are there any skills that applicants coming from community colleges, apprenticeships, or other job training programs are typically missing or deficient in?

a) Yes (please specify) _______________

b) No

c) Don't know/ Refused

Section 4. Contractor Characteristics

15. In the past six months has your company turned away new work because of limited staffing capacity?

a. Yes, but fewer than one potential customer a month.

b. Yes, we turn away several potential customers every month.

c. Yes, we turn away several potential customers every week.

d. No, we have not turned away new work because of limited staffing capacity.

e. Don't know/Refused.

16. Would any of the following resources or incentives make your company more willing to take on additional staff? [SELECT ALL THAT APPLY]

a. More access to trained talent

b. Assistance with human resources and other administrative duties

c. Additional financial incentives for decarbonization projects

d. On the job training funding

e. Access to business mentoring resources

f. Peer to peer mentoring opportunities

g. Other (please specify)

h. None, my company is happy to remain the size that it currently is [exclusive}

i. Don't know/Refused

17. Please tell us which types of incentives/rebates you have used for at least one project

a. Federal incentives/rebates

b. State (such as NYSERDA) incentives/rebates

c. City or regional government incentives/rebates

d. Utility incentives/rebates

e. Manufacturer incentives/rebates

f. Other (please specify) ______________________

g. None

18. Please tell us how often you utilize each of the incentive types:

	Use incentives/rebates for all or most projects (75%-100% of the time)	Use incentives/rebates for some projects (25-74% of the time)	Use incentives/rebates for few projects (24% of the time or less)	Don't know/Refused
Pipe in selected Q17 responses				

[ASK Q20 IF Q19 = g, OTHERWISE SKIP]

19. Why does your company not participate in incentive programs?

   a. Qualification standards are too difficult to achieve.

   b. Unclear or too complicated application requirements.

   c. Not financially viable for my company.

   d. Too busy/ already have enough work orders.

   e. Not familiar with these programs.

   f. Other (please specify) ______________

   g. Don’t know/Refused

20. Does your company participate in any state or local direct installation or subsidized energy efficiency programs (including EmPower+, Comfort Home, National Grid’s Direct Install program, etc.)

   a. Yes

   b. No

   c. Don’t know

   d. Refused

[IF Q20 = ‘NO’ ASK Q21, OTHERWISE SKIP]

21. Why does your company not participate in state or local direct installation programs?

   a. Qualification standards are too difficult to achieve

   b. Unclear application requirements

   c. Not financially viable for my company

   d. Too busy/ already have enough work orders

   e. Not familiar with these programs

   f. Other (please specify) ______________

   g. Don’t know/Refused

Thank you for completing the survey. We would like to verify your contact information.

- First and Last Name of Respondent ________________________
- Position of Respondent _________________________________
- Phone of Respondent ________________
- Email of Respondent _________________
- Name of Company ________________________
- Company Address (including City) ________________________

Those are all the questions I have. Thank you very much for your time.

Appendix D: Economic Impact Analysis

Out-of-Scope Industries

IMPLAN identifies job changes in industries that are affected by the clean energy industry but are not part of the clean energy economy. Identifying job change in these "out-of-scope" industries provides a better idea of the overall size of New York State's clean energy economy and helps to improve estimates of in-scope industries in future years.

Table 15 provides a list of New York State's Clean Energy supply-chain industries that were not included in the original dataset (by NAICS code).

Table 15. New York State's Clean Energy Out-of-Scope Indirect Industries

Description	Indirect Jobs
Retail — Building material and garden equipment and supplies stores	534
Other real estate	117
Securities and commodity contracts intermediation and brokerage	42
Truck transportation	33
All other crop farming	27
Transit and ground passenger transportation	21
All other food and drinking places	19
Retail — Miscellaneous store retailers	19
Retail — Motor vehicle and parts dealers	18
Retail — Non-store retailers	18
Retail — Building material and garden equipment and supplies stores	534

End Notes

1 JobsEQ 2022 Q3.

2 Establishments are specific locations. A single company can have multiple establishments.

3 These categories correspond with the following delineations: 0 to 49 percent of labor hours, 50 to 99 percent of labor hours, and 100 percent of labor hours. For a full description of this methodology, please refer to Appendix A.

4 Figure 6 is an illustrative example of how intensity-adjustment may be used to count clean energy workers. For the methodology behind the intensity-adjusted clean energy employment quantified in Figure 7, please see the section Intensity-adjusted Clean Energy Employment located in Appendix B.

5 The "Other Support Services" value chain segment includes Administrative and Support and Waste Management and Remediation Services (NAICS 56) and industries classified under NAICS 81. The "Other" value chain segment includes Agriculture, Forestry, Fishing and Hunting (NAICS 11), Transportation and Warehousing (NAICS 48-49), Management of Companies and Enterprises (NAICS 55), and other establishments as identified by employers. Visit https://www.naics.com/search/ for more information on NAICS codes.

6 Data is from the US Energy and Employment Report which uses responses from clean energy employers. Value chain is determined by asking which category the organization is predominantly oriented towards. Therefore one business location with multiple business lines (manufacturing and distribution, for example) would only count as the part of the value chain in which it is primarily focused on.

7 The building decarbonization and energy efficiency sector was previously labeled as the energy efficiency sector in past editions of the New York Clean Energy Industry Report and has been updated to more holistically describe the set of activities included. The value chain segments included within this category remain consistent with prior years.

8 Other building decarbonization and energy efficiency technologies include variable speed motors, other design services not specific to a sub-technology, software not specific to a sub-technology, energy auditing, rating, monitoring, metering, and leak detection, energy efficiency policy not specific to a sub-technology, LEED certification, consulting not specific to a sub-technology, and phase-change materials.

9 The wind energy employment estimate represents both land-based and offshore wind energy.

10 "EValuateNY," Atlas Public Policy, https://atlaspolicy.com/evaluateny/.

11 A smart grid is an electricity supply network that uses digital communications technology to detect and react to local changes in usage.

12 Other ethanol/ non-woody biomass includes fuel made from other materials such as straw, manure, vegetable oil, or animal fats.

13 "Governor Hochul Announces More Than 100 New Electric Vehicle Fast Chargers to be Built in New York City," Governor's Press Office, March 28, 2024, https://www.governor.ny.gov/news/governor-hochul-announces-more-100-new-electric-vehicle-fast-chargers-be-built-new-york-city.

14 "FOTW #1334, March 18, 2024: By 2030, the US Will Need 28 million EV Charging Ports to Support 33 million EVs," Office of Energy Efficiency & Renewable Energy, March 18, 2024, https://www.energy.gov/eere/vehicles/articles/fotw-1334-march-18-2024-2030-us-will-need-28-million-ev-charging-ports#:~:text=National%20Renewable%20Energy%20Laboratory%20estimates,and%20less%-20common%20long%20trips.

15 New York State Climate Action Council. 2022. "New York State Climate Action Council Scoping Plan." https://climate.ny.gov/resources/scoping-plan/.

16 "Electric Vehicle (EV) Charging Station Make-Ready Requirements," Office of Energy Efficiency & Renewable Energy, https://afdc.energy.gov/laws/13379.

17 "In Advance of Climate Week 2021, Governor Hochul Announces New Actions to Make New York's Transportation Sector Greener, Reduce Climate-Altering Emissions," Governor's Press Office, September 28, 2021, https://www.governor.ny.gov/news/advance-climate-week-2021-governor-hochul-announces-new-actions-make-new-yorks-transportation.

18 The EV charging survey categorizes workers in a different manner than that of the United States Energy and Employment Report (USEER), where most data throughout the other sections of this report is derived from including Figure 19 of this deep dive on EV charging. This survey asks about any involvement with EV charging, while USEER classifies workers into their most dominant category. For example, all employees at a parts manufacturer that supplies parts to both electric vehicles and EV charging stations would be included as EV charging workers in these survey responses. However, in the USEER data these workers would likely show up as EV employees only, assuming that EVs comprised a larger share of the business than EV charging stations.

19 For more information about survey methodology, please see Appendix B.

20 Data is from the 2024 United States Energy and Employment Report. These value chain segments will not match the value chain segments derived from the supplemental NYS EV charging employer survey, as that survey instrument that was specific to EV charging manufacturers and uses a more granular and industry-specific set of value chain categories.

21 Manufacturing and Other Services value chain segments did not have enough data available to include in this analysis.

22 "FOTW #1334, March 18, 2024: By 2030, the US Will Need 28 million EV Charging Ports to Support 33 million EVs," U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, March 18, 2024, https://www.energy.gov/eere/vehicles/articles/fotw-1334-march-18-2024-2030-us-will-need-28-million-ev-charging-ports#:~:text=National%20Renewable%20Energy%20Laboratory%20estimates,and%20less%-20common%20long%20trips.

23 These business sectors are different than the value chain categories defined in USEER, and which form the basis for employment estimates. This is because BW Research conducted a supplemental survey specifically targeted to firms involved in EV charging and only asking questions related to EV Charging. This more targeted effort allowed for greater granularity into EV charging business sector characteristics.

24 There were many other training programs oriented towards electric vehicles but did not expressly include any charging components.

25 Some training programs are marketed to be accessible for multiple occupations.

26 "SAE International Electric Vehicle Supply Equipment (EVSE) Technician Certification," SAE International, https://www.sae.org/learn/professional-development/electric-vehicle-supply-equipment-technician-certification.

27 "Union Members – 2023," U.S. Bureau of Labor Statistics, January 23, 2024, https://www.bls.gov/news.release/pdf/union2.pdf.

28 This is the rate at which workers are dues-paying members of labor unions.

29 This is the rate at which workers are covered under labor union contracts. After a 2018 Supreme Court ruling, workers were no longer required to pay union fees to receive benefits and be "covered" under union contracts.

30 "Workers of the same occupational category" is inclusive of clean energy workers.

31 These occupations were selected because many appear on NYSERDA's Clean Energy Career Maps ("Clean Energy Career Maps," NYSERDA, https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Workforce-Development-and-Training/Resources/Clean-Energy-Career-Maps.) and are expected to see some of the highest growth rates via the clean energy transition outlined in the 2021 Just Transition Working Group Jobs Study ("2021 Jobs Study," BW Research, March 2023, https://climate.ny.gov/-/media/Project/Climate/Files/JTWG-Jobs-Report-Update.pdf.).

32 "May 2023 State Occupational and Employment Wage Estimates," US Bureau of Labor Statistics, https://www.bls.gov/oes/current/oes_ny.htm.

33 The "poverty line" is a federal measure of economic insecurity, but this federal measure fails to account for state and region-level differences in cost of living due to rent, insurance, taxes, and other regionally-specific factors. A "living wage" provides a more regionally-specific metric of economic security. A living wage is a locally-specific metric that designates the wage rate that a full-time worker requires to cover the costs of them and their family's basic needs

34 Living wage for a single adult with no children is $26.86 per hour. "Living Wage Calculation for New York," Massachusetts Institute of Technology, https://livingwage.mit.edu/states/36.

35 Minimum Wage in 2023 was $15.00 for New York City, Long Island, and Westchester and $14.20 for the remainder of New York State. "New York's Minimum Wage Overview," Department of Labor, https://dol.ny.gov/minimum-wage-0.

36 The information provided is access to employer-sponsored benefits, which is different from take-up rates of benefits, which is lower. Take-up rates of benefits are lower than access rates because employees may not need benefits (typically because they are eligible under another family member's benefits), or they are unaware or uninterested in the benefit.

37 "Table 2. Medical care benefits: Access, participation, and take-up rates," U.S. Bureau of Labor Statistics, September 21, 2023, https://www.bls.gov/news.release/ebs2.t02.htm.

38 "Public Work" generally includes projects involving construction, alteration or demolition work that is done on behalf of public agency or entity.

39 "Bureau of Public Work and Prevailing Wage Enforcement," Department of Labor, https://dol.ny.gov/bureau-public-work.

40 Wages represent all projects, including but not limited to clean energy.

41 Because prevailing wages are set at various local levels that are not consistent across occupations, median prevailing wages were utilized.

42 Bureau of Labor Statistics. Quarterly Census of Employment and Wages. Series ID ENU3600040010. August 2024.

43 Comparison data from 2023Q4, Bureau of Labor Statistics Occupational Employment and Wage Statistics (OEWS) from JobsEQ.

44 Ibid.

45 The demographic estimation for additional sectors cannot be provided due to low sample sizes.

46 "Disadvantaged Communities Criteria," New York State, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria.

47 County-level employment data is proportioned to the census-tract level data by value chain using the U.S. Census Bureau's Longitudinal Employer-Household Dynamics Origin-Destination Employment Origin-Destination Employment Statistics (LODES) Workplace Area Characteristics and Residence Area Characteristics. "Longitudinal Employer-Household Dynamics," U.S. Census Bureau, https://lehd.ces.census.gov/data/.

48 The U.S. Census Bureau does not currently have an agreed upon measure of accuracy for LODES data used in this analysis. However, a working paper that reviewed the data accuracy found the data to be reliable: Kevin L. McKinney et al., "Total Error and Variability Measures with Integrated Disclosure Limitation for Quarterly Workforce Indicators and LEHD Origin Destination Employment Statistics in OnTheMap," Center for Economic Studies, December, 2017, https://www2.census.gov/ces/wp/2017/CES-WP-17-71.pdf.

49 While this may suggest a slightly disproportionate share of clean energy jobs are located in disadvantaged communities relative to their share of the total population, this difference may not be statistically significant.

50 "Disadvantaged Communities Criteria," New York State, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria.

51 Grey regions do not contain disadvantaged communities or do not have data available.

52 Grey regions do not contain disadvantaged communities or do not have data available.

53 Priority populations include veterans, individuals with disabilities, low-income individuals, incumbent or unemployed fossil fuel workers, previously incarcerated individuals, 16- to 24-year-olds that are enrolled in or have completed a comprehensive work preparedness training program, homeless individuals, or single parents. "Definitions," NYSERDA, https://www.nyserda.ny.gov/All-Programs/Clean-Energy-Workforce-Development-and-Training/Resources/Definitions.

54 These results are significant at the 95% confidence interval.

55 Not all investments are able to be classified under or assigned to a single technology sector because some investments are more general in nature (i.e., innovation competitions, research labs, etc.) and cannot be 100 percent dedicated or directed towards a specific technology area. As such, totals will not sum to Figure 67.

56 Totals will not sum to Figure 67 because not all investments could be categorized as public or private due to lack of information.

57 Totals will not sum to Figure 67 because not all investments could be categorized as public or private due to lack of information.

58 Based on the New York Clean Energy Industry Report custom IMPLAN codes.

59 This number is different than the initial net change since some of the NYCEIR jobs were distributed into direct and indirect jobs as part of the methodology to avoid double counting. The difference between the additional overall employment added in 2023 (7,653) and direct jobs (6,926) is indirect jobs that are counted in the initial NYCEIR employment as part of the value chain, accounting for 727 jobs. For additional detail, see Appendix B: Economic Impact Analysis.

60 This definition of Traditional Energy differs from its use in the US Energy and Employment Reports. However, it characterizes the full spectrum of the energy sector in New York State, which includes clean and traditional energy alike.

61 "Longitudinal Employer-Household Dynamics - Data," U.S. Census Bureau, 2024, https://lehd.ces.census.gov/data/.

62 "Disadvantaged Communities Criteria," New York Climate Act Website, https://climate.ny.gov/Resources/Disadvantaged-Communities-Criteria.

63 "Technical Documentation Appendix: Communities Indicator Workbook," New York Climate Act Website, https://climate.ny.gov/-/media/Project/Climate/Files/Disadvantaged-Communities-Criteria/Technical-Documentation-Appendix-Final-Disadvantaged-Communities-Indicator-Workbook.xlsx.

64 Employment refers to the annual average of monthly jobs (same definition used by QCEW, BLS, and BEA, nationally) and it includes both full- and part-time jobs.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

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