

Exploring the  
Conditions of the  
**NEW YORK  
SOLAR  
WORKFORCE**

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The Climate Jobs Institute (CJI) at Cornell University's ILR School is guiding New York's and the nation's transition to a strong, equitable, and resilient clean energy economy by pursuing four aims: to tackle the climate crisis; to create high-quality jobs; confront race and gender inequality; and to build a diverse, inclusive workforce.

Through cutting-edge policy studies, deep relationships with on-the-ground partners, and innovative training and education programs, CJI provides information that policymakers, the labor and environmental movements, industry leaders, and others need to navigate this historic transition to a zero-carbon economy.

## Core Objectives and Activities

CJI delivers high-quality research, innovative policy solutions, and top-notch educational programming that connects key stakeholders to design and implement climate plans.

### *CJI's main areas of work include:*

**Applied Research and Policy Development for Legislators and Labor, Environmental, and Industry Leaders.** CJI crafts equity- and worker-oriented climate policies and analyses indicating how states can address climate change while maximizing high-quality job creation and economic development. The Institute's research and policy efforts result in reports, case studies, policy briefs, and visual tools and maps meant to guide the nation's transition to a clean, equitable economy.

**Technical Assistance.** CJI provides rapid response data and policy analysis on the labor, employment, and economic impacts of climate and clean energy issues. The Institute's technical assistance work offers legislators, policymakers, and others real-time support. This work also generates legislative briefings, policy briefs, blog posts, op-eds, and other written materials targeting legislators, local government officials, and leaders in labor, environmental movements, and industry.

**Training and Education.** CJI organizes a variety of educational convenings that strengthen stakeholders' knowledge, confidence, and motivation to tackle climate change and to build a large, equitable clean energy economy with high-quality jobs. Programs include the Institute's annual Climate Jobs Summit; the design and delivery of member trainings; legislative briefings; educational delegations for legislators, labor leaders, and others; and an online Climate Jobs certificate.

**Workforce Development.** CJI provides a critical link between the future clean energy workforce we need and workforce development programs that meet these needs. The Institute also provides a pipeline from frontline Black, indigenous, and people of color communities to paid on-the-job training and high-quality careers.

**Student Engagement.** CJI enriches the ILR and Cornell student experience by engaging undergraduate and graduate students in important aspects of the Institute's core work through fellowships, research assistantships, hands-on clinical experiences, internships, labor-climate undergraduate and graduate courses, and more.

[www.ilr.cornell.edu/climate-jobs-institute](http://www.ilr.cornell.edu/climate-jobs-institute)



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### **This study was conducted in Partnership with SSRS**

SSRS is a full-service market and survey research firm with a dedicated team of critical thinkers who approach each endeavor with genuine enthusiasm and a shared goal to connect people through research. SSRS solutions are fit for purpose, and the firm is known for its experience with multimodal data collection and innovative study design and implementation. The team provides accountability-driven thoughtfulness and confidence in the reliability of data rooted in best practices and high quality. They conduct research in the US and more than 40 countries worldwide. Learn more at [www.ssrs.com](http://www.ssrs.com).

On behalf of the Cornell ILR's Climate Jobs Institute, the Solar Workforce Study was conducted by SSRS. SSRS managed the overall sample design and data collection, as well as contributed to the statistical analysis of the study findings. The SSRS team was led by Jania Marshall, Research Director, Julia Dalagan, Project Director, Kristen Conrad, Vice President, and Cameron McPhee, Chief Methodologist.

### **Disclaimer:**

This study was done to the best of abilities and current available knowledge. Authors take full responsibility for this study and are open to continued conversations about how to improve and extend this study to better understand working conditions in the solar industry. The findings presented in this report are a first-cut, based on limited data which lightly support the preliminary conclusions. This report should be followed by further studies.

## **ACKNOWLEDGEMENTS**

Thank you to the many workers, industry, government and labor experts who gave crucial insights that led to the creation and design of the study. Thank you to all the organizations who helped distribute the survey. Thank you to all the union organizers and union leaders diligently working to improve pay, benefits, and working conditions at solar job sites. Lastly, thank you to the many workers who shared their on the ground perspectives with us. We appreciate your time and opportunity to uplift your experience as we work together towards an equitable clean energy future.

# KEY FINDINGS

## Understanding the Solar Workforce

1. National and state level job estimates based on industry-side data of solar workers may be inaccurate as solar installation and maintenance workers work for multiple employers
2. Solar installation and maintenance workers who work in New York State (NYS), do not all reside in the state; work across multiple states; and have often relocated for their solar work sites in New York
3. Throughout the state, projects are being installed and maintained by large national companies. This level of consolidation may present the opportunity for workers to organize.

## Job Quality: Pay, Benefits, Retention, Safety and Training

4. The majority of the workers in our sample — a sample that is made up of almost exclusively non-union, full time workers, directly employed by solar companies — reported that they did not receive benefits
5. Over 30% of our sample indicated they were paid per panel installed
6. Solar installation workers for utility-scale projects were the least likely to be paid an annual salary and were less likely to report longer tenures with their main employer
7. White workers were more likely to report longer tenure with their employers
8. More than 50% of workers surveyed reported that they agreed stimulant use on their solar worksites in NYS was a problem

## Racial Disparities in Solar Construction Work

9. White workers paid an annual salary made nearly twice the median rate of their Black and Hispanic counterparts
10. Black workers were more likely to report they received payment in the form of cash compared to other workers
11. Black workers were most likely to indicate that they had experienced wage theft while working on a NYS solar project, yet workers of color were least likely to formally report their wage theft
12. Black and Hispanic workers were less likely than white workers to report being paid annually
13. Black and Hispanic workers were more likely than white workers to report that they did not receive employer benefits
14. Black workers were more likely to indicate they had self paid for their certifications such as OSHA certifications



# WHY WE DID THIS

To address the impending climate crisis, reduce global emissions, and meet the demands of decarbonization, solar energy must rapidly grow in the next two decades. The United States is projected to need 1,118 gigawatts (GW) of solar energy by 2050 under a high-electricity demand scenario (Gagnon et al., 2024; National Renewable Energy Laboratory, 2024), with over 60 GW to be installed in NYS alone (New York State Climate Action Council, 2022). In the past decade, NYS has increased its solar installations by over 2,000%; yet by the end of 2023, only 5.56 GW of solar capacity had been installed in the state (New York Independent System Operator, 2014; New York State Energy Research and Development Authority, 2024a; Solar Energy Industries Association, 2024) which may be due to the infancy of the industry. With solar installations critical growth in New York, and the United States as a whole, comes the question: will these construction projects create the high-quality jobs with family-sustaining wages American communities need?

Because employees in industries similar to solar work, such as construction, often work for multiple-employers (Becker & Schneider, 2019), there is a need to build employment estimates based on data collected directly from workers. Currently, the major data sources, such as IREC's Solar Census (2023 c), and the Bureau of Labor Statistics' Occupational Employment and Wage Statistics data (2023a), come from surveys of employers. Furthermore, much of what is known about the conditions of work in the solar industry comes not from research on the solar industry itself, but from data on adjacent industries, such as construction or energy efficiency (Gadzanku et al., 2023). Based on the small body of literature that is available on solar PV installers and research on adjacent industries, researchers have several ideas about the kinds of issues solar workers may face. These issues could include barriers to labor organizing, problematic contracting mechanisms, wage and benefit issues, and occupational hazards (Gadzanku et al., 2023). Falls from elevated working surfaces, electrical hazards, musculoskeletal disorders, and heat-related health complications have all been identified as potential occupational hazards for solar installers (Samaniego-Rascon et al., 2019; Duroha et al., 2020; Duroha & Macht, 2021; Duroha & Macht 2023). Overall, little research is available on the working conditions and experiences specific to solar workers (Gadzanku, 2023). This exploratory study aims to bridge the gap between information self-reported from the industry with information directly from workers on the ground. As the need for solar power grows, many new jobs will be created in the sector. It is essential to make sure that these jobs are not the kind of low-wage, low-quality employment that can exacerbate inequality. Workers' perspectives are integral to the creation of public policy and programs that protect and uplift the working class of both NYS and the country, and will help ensure that the climate transition is just and equitable.

# NYS SOLAR ECOSYSTEM

## How many solar construction workers are there actually?

There is a substantial amount of variation in publicly reported information on the solar construction workforce at both the national and state levels. Major differences in existing data sources indicate that more research on the solar workforce may be needed. One major example of the discrepancies between sources is observed in reports on the number of solar workers: the Bureau of Labor Statistics (BLS) May 2022 Occupational Employment and Wage Statistics data, which provides an employment estimate of 27,760 solar photovoltaic installers nationally (BLS, 2023a) while the Interstate Renewable Energy Council's (IREC, 2023c) estimate of the total number of solar sector jobs was 171,558 jobs nationwide in 2022. IREC's (2023c) higher estimate, which is based on data collected for the United States Energy & Employment Report (USEER) may come from the fact that USEER aggregates job estimates across different types of employment in the solar industry beyond installation alone, including sales or professional services (Office of Policy, 2023). Notably, the USEER (Office of Policy, 2023) points to the fact that the BLS does not collect employment-level data on individual energy technologies across business segments as a major issue, suggesting that this presents an obstacle to fully understanding employment trends in the solar industry. While IREC's data may be more detailed, both the BLS data and IREC data were collected from employers.

Estimating New York's solar workforce presents similar challenges between available datasets. The 2023 USEER report estimates that in 2022 there were over 14,000 solar workers in NYS (USEER, 2023). This includes not only construction jobs, but also jobs in utilities, manufacturing, trade, professional services, and other services. Comparatively, the IREC 2022 solar census, which is based on the sample from the 2022 USEER report, estimates over 11,500 solar jobs in New York, with a 9.4% growth in solar jobs between 2021-2022 (IREC, 2023a). As work categories are not consistently defined across sources, it is therefore important to consider points where inaccuracies in data collection may arise. One scenario to consider, which our data would indicate may be likely, is that the actual universe of solar employment may be difficult to estimate with employer-side data alone. Many respondents in the sample collected for this study reported working for multiple different employers for solar work. When considering phenomena like this, reliance on employer-side data for installation or even sector-wide employment estimates could interfere with accurate counting of solar workers. This is because workers with multiple employers could potentially be counted more than once in employment estimates from different companies. Additionally, workers may be primarily employed in the construction sector or other adjacent sectors while also conducting solar work, making it difficult to understand how those individuals would be included in these estimates.

The lack of available employee-side data specific to solar work presents an obstacle in comparing sample demographics from this study to the demographics in the solar construction workforce more generally. Because of this challenge, the demographics in our sample will be compared to percentages calculated based on the BLS' (2023b) Geographic Profile of Employment and Unemployment, 2022 - specifically, the NYS level construction and extraction worker annual estimates- as this is the category which includes solar PV installers. The annual estimates used by the BLS (2023b) are derived from the Current Population Survey (CPS) — a nationally representative survey administered monthly to households directly (McAnaw Gallagher, 2022). The benefit of using the CPS is that data come directly from labor force participants rather than industry intermediaries. This limits the risk of double counting workers that work under multiple employers. One drawback of comparing the



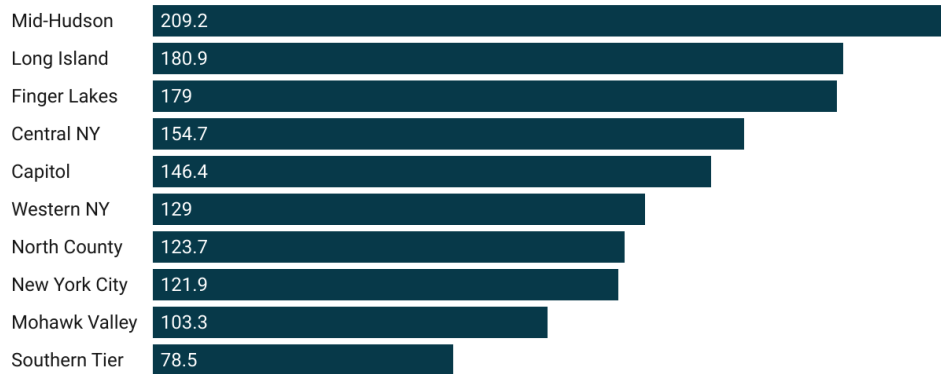
demographic percentages from this survey to the annual estimates from the BLS is that there may be errors due to rounding in the demographic percentage estimates. However, these comparisons are made with the understanding that more accurate, solar industry-specific, estimates may be available in the future.

## Renewable energy capacity installed during survey period

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### Total Installed Solar Capacity By New York Region (MW)

From December 16, 2021 through September 30, 2023



*Capacity data for residential, community, and utility scale solar in MW(ac). Data for projects over 5 MW(ac) in capacity were retrieved from S&P Capital IQ Pro (S&P Global Market Intelligence, 2023).*

*Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Statewide Distributed Solar Projects: Beginning 2000 (New York State Energy Research and Development Authority, 2024b) and S&P Capital IQ Pro (S&P Global Market Intelligence, 2023). • Created with Datawrapper*

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This study collected data from workers employed on New York solar sites from December 16, 2021 to September 30, 2023. The graphic above captures the installed capacity by region during this timeline. During this time period, Mid-Hudson had the highest installation of solar capacity (209.2 megawatts [MW]), followed by Long Island (180.9 MW), Finger Lakes (179 MW), and Central NY (154.7 MW).

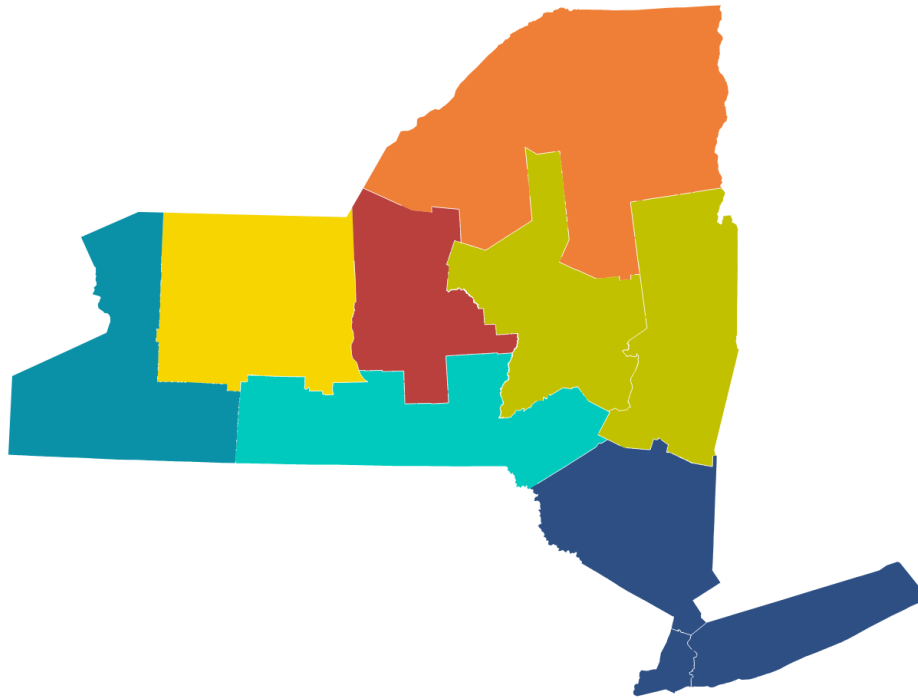
It is important to note that both the total installed capacity of each region, but also the type of capacity installed (i.e. utility-scale, or rooftop) may impact the number of solar installers by region. Additionally, because many workers were employed across multiple regions, we cannot make definitive assumptions on the number of estimated solar installation and maintenance workers in each region.

## Regional clustering of distributed solar developers

### Top Distributed Solar Developers by New York Region

"Top developers" were determined based on number of projects in each region. From December 16, 2021 through September 30, 2023

3rdRocSolar   CIR Electrical Construction Corp   Intelligent Green Solutions   Kasselmann Solar  
Nickels Energy Solutions   PlugPV   Sunrun Inc



Map: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: New York State Energy Research and Development Authority • Created with Datawrapper

Top distributed developers were analyzed regionally by the total number of projects installed during the sample of the study period. Employers of construction workers for utility scale and large-scale community solar projects over 5 MW were not included in the analysis due to the lack of transparency in developer names of this data (S&P Global Market Intelligence, 2023). For distributed scale projects Sunrun Inc was the top installer across New York City Region (3,351 Projects), Long Island Region (3,418 Projects), and Mid-Hudson Region (1,792 Projects). Kasselmann Solar was the top developer across the Mohawk Region (74 projects), and Capital Region (531 Projects). The clustering of these distributed solar developers regionally demonstrates large employers holding a large proportion of the work in NYS. For example, Sunrun is a national publicly traded solar installation company with \$5 billion in net earning assets and completed over 8,500 projects in NYS from December 16, 2021 to September 30th 2023 (New York State Energy Research and Development Authority, 2024b; Sunrun, 2024).

## Federal and state prevailing wage requirements

Respondents to the survey were required to have worked on a NYS solar site between December 16, 2021 and September 30, 2023. In order to contextualize the study results, it is first important to build an understanding of the laws that may have impacted the wages at worksites investigated through this survey. Under Davis-Bacon and Related Acts, certain projects receiving federal funds or assistance over \$2,000 are required to pay laborers and mechanics the prevailing rate for wages and benefits (40 U.S.C. § 3142). Additionally, during the studied time period, three other relevant laws were implemented. The Inflation Reduction act of 2022- Pub. L., 117-169, increased tax benefits for clean energy projects that met prevailing wage and apprenticeship standards, including through use of Project Labor Agreements (PLAs). Large solar developments that sold renewable energy credits to a public entity in New York would likely have been covered by statewide prevailing wage requirements (N.Y. Lab. Law § 224-d, 2024). When first implemented in 2021, N.Y. Lab. Law §224-d was only applicable to projects 5 MW or greater involving the procurement of renewable energy credits by a public entity, but it was amended in 2022 to the threshold to projects 1 MW or greater entered after July 5, 2022, meaning that the change may have applied to some of the workers in our sample, if the projects they worked on met the aforementioned requirements (McCready, 2023).





# HOW WE DID THIS

## **Target population:**

The target population for this exploratory study was solar industry workers over the age of 18 that had worked on at least one solar panel installation or maintenance project in NYS between December 16, 2021 to September 30, 2023.

## **Questionnaire:**

The survey included questions focused on working conditions, compensation, and other experiences related to working in the solar industry. The survey instrument was available in both English and Spanish, and was administered to respondents in the language of their choice. Screener questions were implemented to verify whether or not respondents had met the criteria of our targeted population as identified above.

## **Recruitment, incentives, and quality control methods:**

The survey was conducted virtually from December 16, 2022 to September 30, 2023 and yielded a total of 264 responses. Recruitment methods included online advertisement through private online workforce group pages, email invitations to trainers to distribute the survey to their trainees/students, and virtual flyers for groups/institutions to distribute to their members. Eight different organizations, including relevant unions, training centers, academic partners, and non-profit organizations, distributed the survey to their membership. Respondents who provided valid responses received a \$20 incentive upon completion. To incentivize snowball sampling, respondents that provided at least one valid referral to another worker were given an additional \$10 incentive.

In order to ensure respondent authenticity, quality control measures were put in place both before and after the completion of all surveys. These measures included: (1) trap and honeypot questions designed to remove bots, and (2) relevant ID technology monitoring, which automatically removed responses that were deemed inauthentic. Surveys that were not automatically removed were subject to additional quality control measures including the removal of responses with duplicate IP addresses or identical responses. Finally, other factors such as illogical responses, suspicious email addresses, elapsed time to survey completion, and contact numbers were also used in tandem to make subjective determinations about response authenticity.

## **Analysis:**

After an initial round of chi-squared testing to identify significant relationships, four separate logistic regression models were run. With one regression model looking at demographics, and three additional regression models which included indicators of industry type, certification type, and NYS regions respectively. The latter three models were run separately due to collinearity between the three variables tested.

# OUR SAMPLE

## UNION STATUS

The vast majority of our sample responses come from nonunion solar workers, with only 1 respondent out of the 264 sample respondents belonging to a union. The 2022 IREC National Solar Job Census (IREC, 2023b) estimates that 10.5% of all solar workers are unionized, which is similar to the 12.7% estimate for all construction workers in 2020 shared by the BLS (McAnaw Gallagher, 2022). However, these are national averages, and may not be reflective of union density within the solar industry in NYS (IREC, 2023b). More research must be conducted to understand union density and the prevalence of the use of union contractors in the solar industry of NYS. Low response rates from union solar workers may be due to the level of incentive, additional research and planning should be done to increase reach to the union workforce.

## RACE AND ETHNICITY

### Sample Description by Race and Ethnicity



Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Race and Ethnicity were collected together, and respondents were able to select all categories that applied. The majority (about 83%) of respondents identified as either Black/African American or white, with 109 respondents in each respective group. This may have been an undersample of white respondents, who made up roughly 84% of New York's construction and extraction workers based on the BLS' 2022 annual estimates (2023b). It is possible that this study may have yielded an oversample of Black and African American respondents, who made up only about 10% of NYS construction and extraction workers based on the same annual estimate (BLS, 2023b). This survey likely also undersampled Hispanic respondents, who comprised only 11.6% of this sample but made up approximately 34% of NYS construction and extraction workers more generally (BLS, 2023b). Future research should examine demographic breakdown across different types of solar work more clearly. It is possible that different proportions of people of color may work in the residential and commercial industry.

## AGE

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### Sample Description by Age

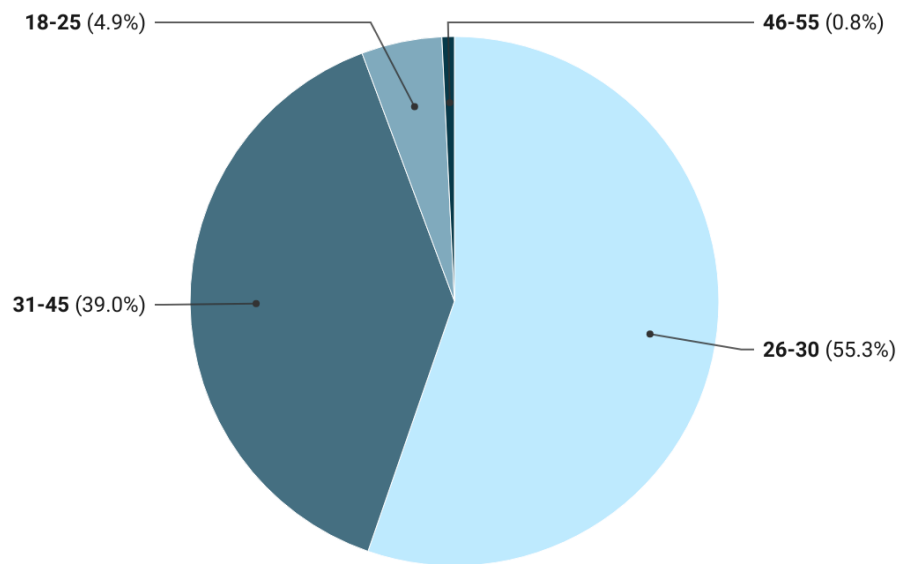


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

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The vast majority of our respondents (about 94%) were between the ages of 26 and 45, with two respondents reporting that they were older than this age range and 13 respondents reporting that they were younger. Using the CPS, the BLS (2024a) has recently released annual estimates for 2023 age data specific to solar PV installers on the national level. The ages represented in the sample of this study differ from the national estimates provided by the BLS (2024a) for 2023. In 2023, the BLS estimated that there was an average of about 20,000 solar PV installers nationally in 2023, and that about 2,000 of them (or about 10%) were between 16 and 19. In order for NYS solar workers to be eligible for this study, there was a requirement that respondents be at least 18 years of age which may have skewed age demographics. For other age ranges, the sample collected in this survey differed substantially from the 2023 BLS estimates for solar PV installers. For example, in the BLS (2024a) data, an estimation of about 10% of solar PV workers were between the ages of 45 and 54, while only 0.8% of this sample was made up of workers in the 46-55 age range. Around 55% of the BLS (2024a) solar PV installers were between 25 and 44, while 94% of survey respondents were between 26 and 45 in this sample. Finally, about 5% of solar PV installers from the BLS (2024a) were between 55 and 64, while this sample had no respondents over the age of 55. Given the findings that will be discussed in the retention section, it is also important to note that the national percentage of construction workers over 55 nearly doubled between 2003 and 2020 (McAnaw Gallagher, 2022).

# GENDER

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## Sample Description by Gender

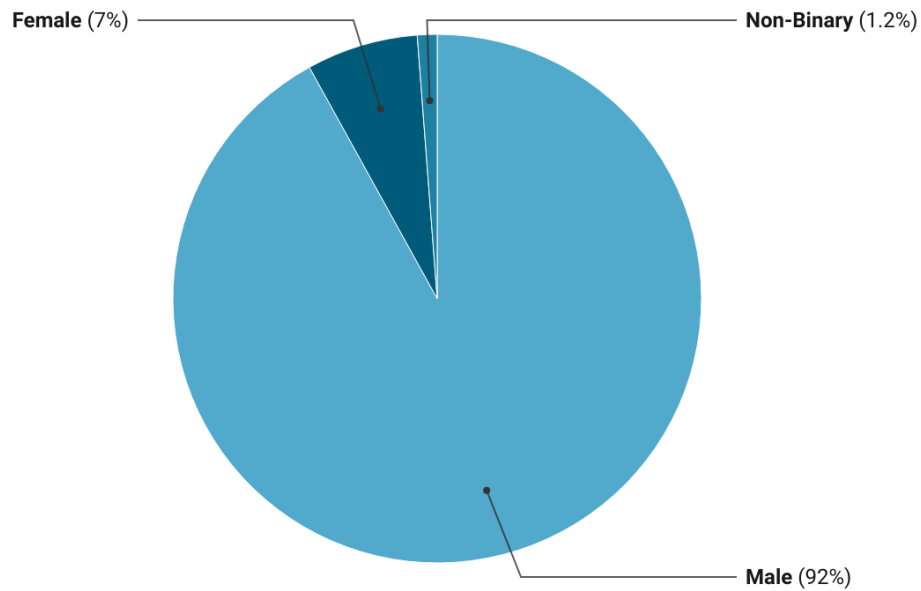


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

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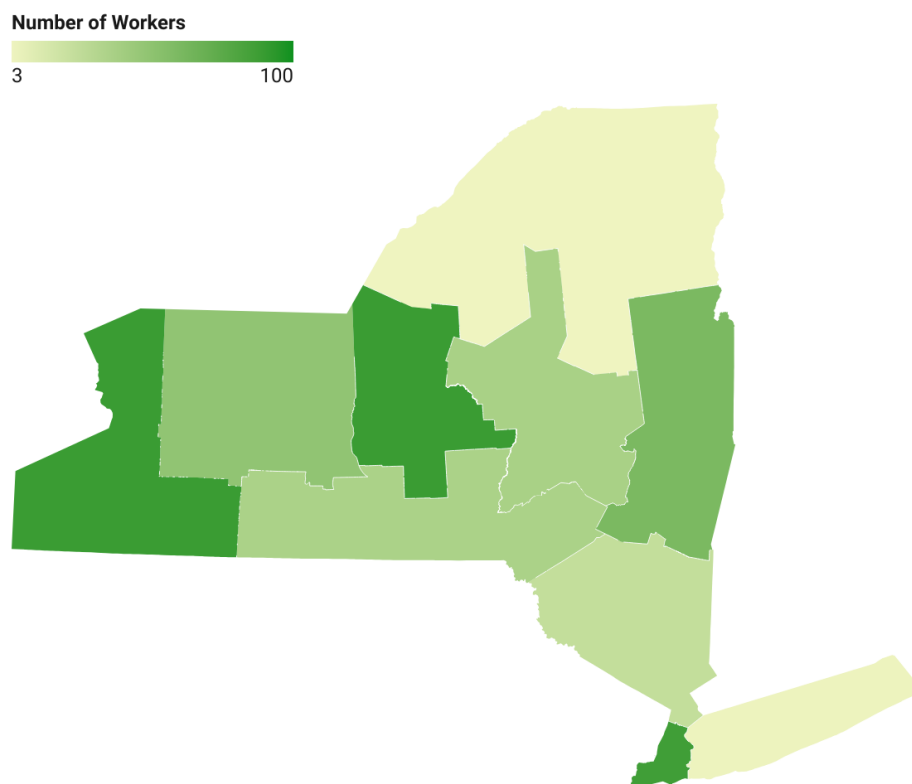
The majority of our survey respondents identified as male. Of the remaining 8.2% of survey respondents, 17 identified as female and 3 identified as non-binary. Based on the annual BLS (2023b) estimates for 2022, which indicate that construction and extraction workers predominantly (approximately 97%) identify as male, this study still may have yielded an oversample of female respondents. However, data on the gender of construction and extraction workers from the BLS may be skewed due to the lack of nonbinary and trans classifications in the CPS data used.



## LOCATIONS OF SOLAR PROJECTS

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### Which New York State Region Have You Completed Solar Work In?



Map: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

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Responses were collected from all NYS regions. However certain areas yielded a higher number of respondents than others. The highest number of responses came from Western New York, Central New York, and New York City, followed by the Capital Region, Finger Lakes, Mohawk Valley, Southern Tier, Mid-Hudson, Long Island and North Country. Based on installation data from the period of the study there was a potential undersampling of workers who completed work on Long Island. Further research should be conducted to understand the specific working conditions workers face in each region.

## PROJECT TYPE

In the survey, respondents were asked what kind of work best describes their experience in the solar industry. 257 respondents selected that they had worked on installation or maintenance of solar for residential or commercial projects and 194 respondents indicated that they had worked on installation or maintenance on utility-scale projects. Respondents were then asked to further specify the subtype of projects in the state they had worked on. For example, if a respondent had worked on rooftop solar, they were asked to specify if they had worked on rooftop solar on public buildings, commercial buildings, or private homes. Further investigation on the actual language used by workers on jobs sites to describe different project types and project subtypes must be conducted, as this may not directly align with industry language used by solar companies.



# EMPLOYMENT TYPE

## Which of the Following Best Describes Your Type of Work?

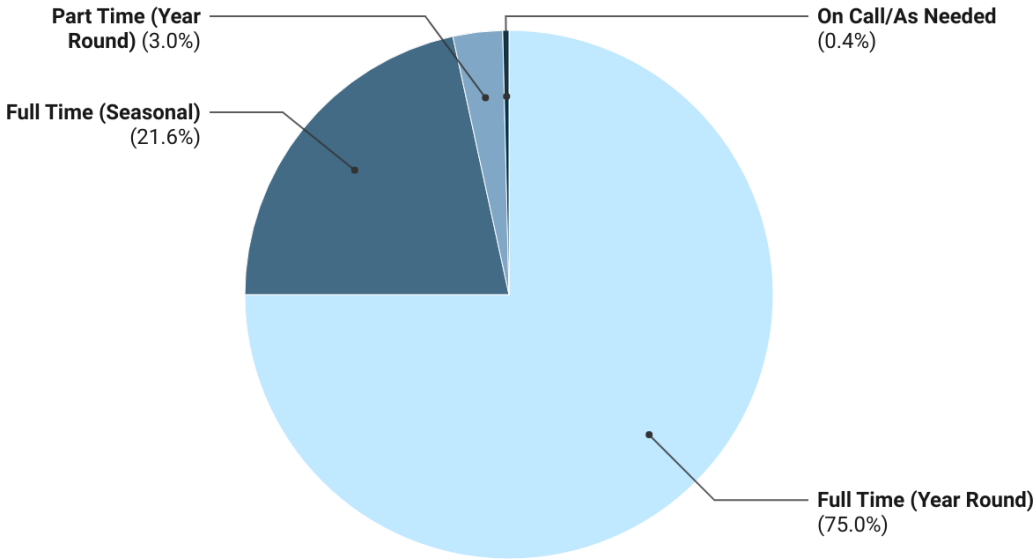


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

The majority of survey respondents (75%) indicated that they were employed year round, followed by seasonally employed (21.6%), part-time (3.0%), and on-call as needed (0.4%). Although a majority of the sample reported year-round employment, this did not indicate that their full-time employment was under the same employer, nor was their employment guaranteed to have the same benefits as traditional full time employment based on our survey findings (see page 23 on benefits).

## Which of the Following Best Describes Your Solar Employment? Please Select All that Apply.

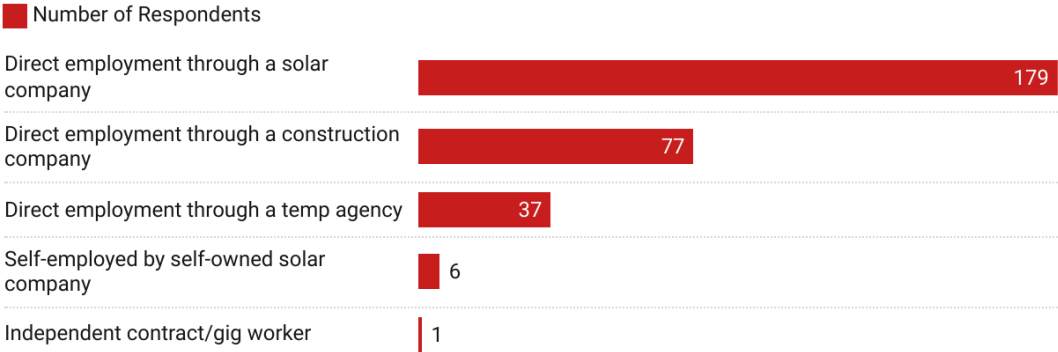


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

The majority of our sample (almost 68%) indicated that they were directly employed by solar companies, and over 40% of respondents also indicated that they work for more than one employer.

## For Your Solar Work, How Many Employers do You Work For?

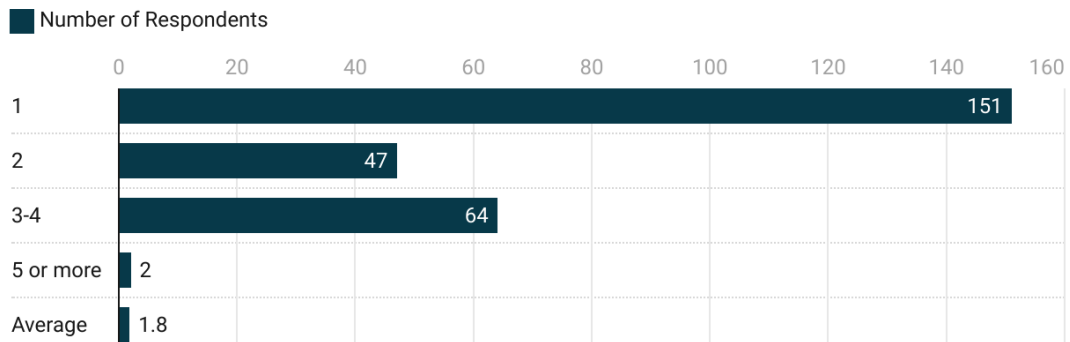


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper



# RESULTS

## PAY PATTERNS

### Prevalence of pay per panel

#### How Do You Typically Get Paid?

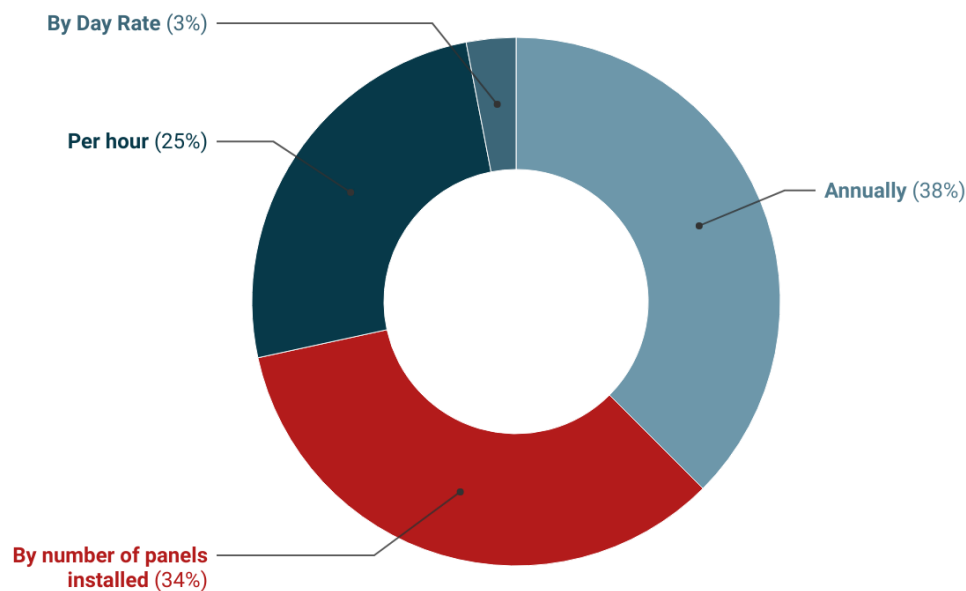


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

38% of survey respondents indicated that they were paid an annual salary, 25% were paid by an hourly rate, and 3% were paid by day rate, while 34% indicated they were paid by number of panels installed. Previous literature has identified potential links between piece rate pay— which would include pay by panel— and adverse outcomes for workers (Davis & Hoyt, 2020). The legality of piece rate pay, minimum wages, and transience across the solar sector must be analyzed further. Future research should examine how fixed rate pay may differ from pay per panel in terms of its impacts on solar workers as payment per panel is dependent on workers onsite productivity.

Our analysis additionally revealed a statistically significant relationship that solar construction installers that worked on utility-scale projects were the least likely to be paid an annual salary and installers of commercial and residential projects were more likely to be paid hourly.

## Racial disparities in payment type

Our sample showed a statistically significant relationship between race and payment types. Black and Hispanic workers were less likely than white workers to report being paid annually. Additionally, Hispanic workers were more likely to report being paid per panel and Black workers were more likely to report being paid per hour.

Given the prevalence of the payment per panel within the sample and significant racial disparities for Black and Hispanic workers, the impact of payment type, productivity, and occupational health and safety should be investigated further.

## Racial differences in annual and hourly rates

### Median Rate for Respondents Paid Hourly



Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

### Median Salary for Respondents Paid Annually



*Only Black, Hispanic/Latinx, and White respondents noted they were paid annually.*

Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

In 2023, the national median annual wage of construction trade workers was \$52,000, while the national median annual wage for solar photovoltaic installers was \$48,230, and \$23.46 per hour (BLS, 2024b). Not all survey respondents provided their hourly or annual rates in their responses. Of those that did, most respondents reported pay rates higher than the median national average for both annual and hourly rates regardless of their race or ethnicity, with the notable exception of Hispanic solar construction workers. Digging deeper into the data revealed further pay discrepancies by race: white solar construction workers reported the highest median estimated salary regardless of whether they were paid an hourly or an annual rate. Moreover, white solar construction workers were paid an annual salary made 1.9 to 2 times that of their Black and Hispanic counterparts on average.

## Prevalence of cash payment by race and ethnicity

### How Do You Receive Your Compensation?

By number of respondents

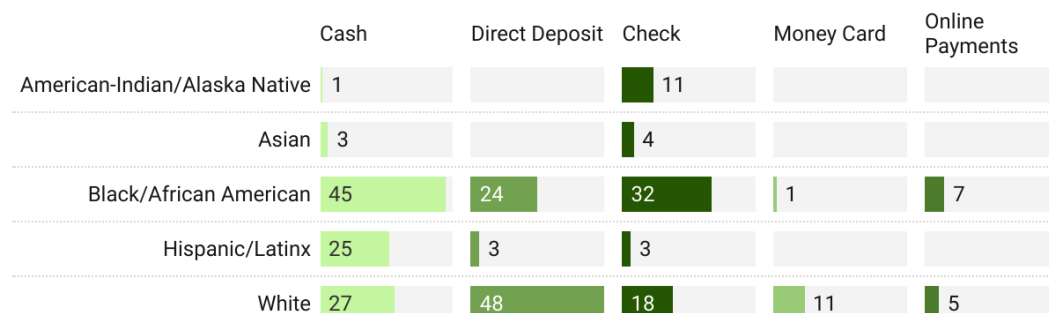


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Of the sample size, 37% of total respondents reported they received their compensation in the form of cash, while 54% of respondents reported their compensation from direct deposit or check. Black workers were more likely to report that they received payment in the form of cash compared to workers of other races and ethnicities. Future research should examine how cash payment discrepancies by race influence discrepancies in access to benefits.

## Prevalence of wage theft and racial disparities

### Have You Ever Been a Victim of Wage Theft (Whether in Hours or Actual Wages) While Working on a Solar Project in New York State?

■ Yes (Net) 
 ■ Yes, once 
 ■ Yes, more than once 
 ■ Never

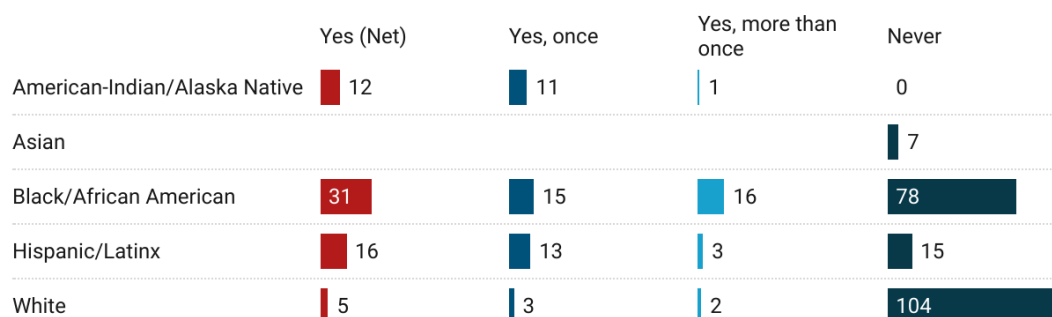


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Black workers were most likely to indicate that they had experienced wage theft while working on a NYS solar project: 31 Black workers indicated they have experienced wage theft, and more than half of those 31 had experienced wage theft more than once on their NYS solar worksites. This finding is consistent with other literature— as Clemens and Strain (2023) also uncovered evidence that the burden of underpayment falls disproportionately on young African American workers and Hispanic workers across age groups. While the relationship between race and experiencing wage theft became nonsignificant when other metrics (industry type, certification type, and region) were included, the nature of this relationship should still be examined in future research. More concerning was the contrast in who formally reported wage theft by race. All five of the white workers who indicated they experienced wage theft formally reported it. Conversely, of the Black workers who experienced wage theft, only 19 out of the 31 formally reported it, of Hispanic workers, only 1 out of the 16 Hispanic workers formally reported this theft, and of American-Indian workers, only 1 out of the 12 formally reported this theft.

## HOURS

### Race and the prevalence of 12+ Hour Shifts

#### Have You Ever Worked for More than 12 Hours on One Shift on a Solar Project in New York State?

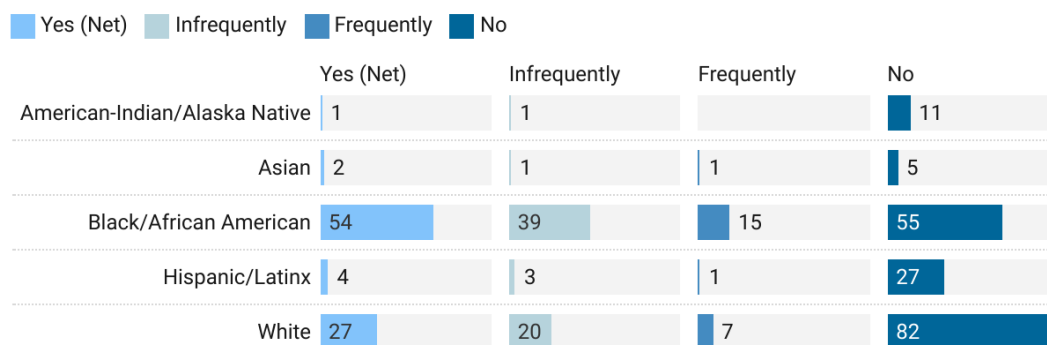


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Black workers were more likely than white workers to report working more than 12 hours on a solar shift in NYS. However, the impact of race disappeared when controlling for industry type (i.e. residential, commercial, utility), indicating that this effect is likely moderated by the types of projects installed. Installers of commercial and residential projects in our sample were more likely to report working on shifts for more than 12 hours, and were also more likely to be Black. More research and analysis should be done to understand the interaction between race, types of project (utility, commercial, and residential), and the prevalence of long shifts.

## BENEFITS

### Majority of workers reported not receiving benefits

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#### Do You Receive any Benefits Besides Pay from Your Employer(s)?

■ No ■ Yes

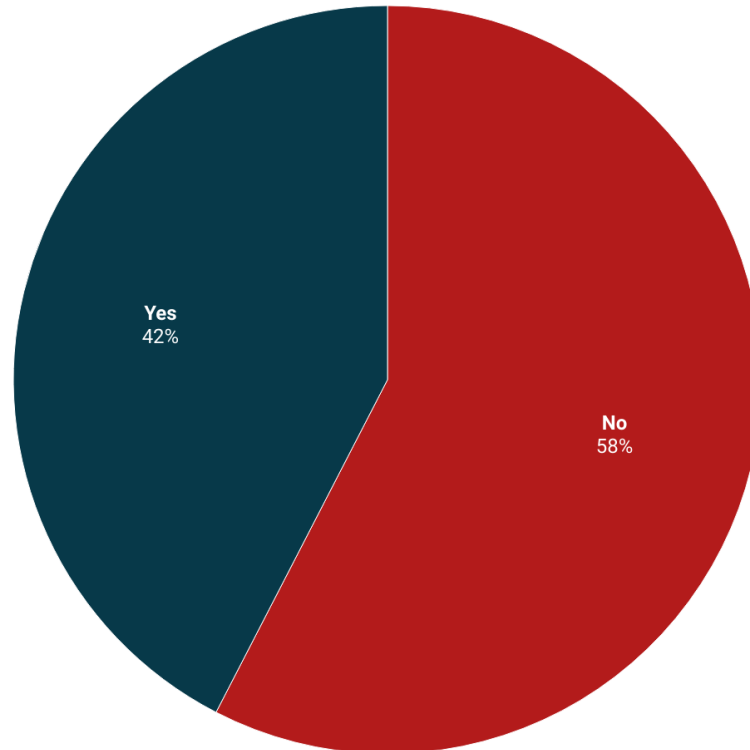


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

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Non-wage compensation, or benefits, has long been understood as a key indicator of job quality across industries (Congdon et al., 2020). Recently, the U.S. Department of Labor added benefits to its list of Good Jobs Principles, specifically highlighting health insurance, retirement plans, workers' compensation benefits, and work-family benefits as part of the foundation for an equitable economy (U.S. Department of Labor, n.d.). Previous literature on solar workers' non-wage compensation has been limited, with a focus on projects that typically used union labor (Gadzanku et al., 2023). The majority (58%) of the workers in our sample — a sample that is made up of almost exclusively non-union, full time workers, directly employed by solar companies — reported that they did not receive benefits. Beyond the link between benefits and job quality, benefits may be especially protective for solar industry workers specifically. Based on several reviews of the literature on both solar-specific work and work that is similar to that which is performed on solar worksites, there is substantial evidence pointing to solar installers facing increased risk of various different occupational hazards. Some of these occupational hazards include falls from elevated working surfaces, electrical hazards, and musculoskeletal disorders - hazards that make benefits like health insurance and paid time off especially crucial for solar workers (Duroha et al., 2020; Duroha & Macht, 2021; Duroha & Macht 2023).

## Racial disparities in benefit access regardless of industry type or certifications

### Do You Receive any Benefits Besides Pay from Your Employer(s)?

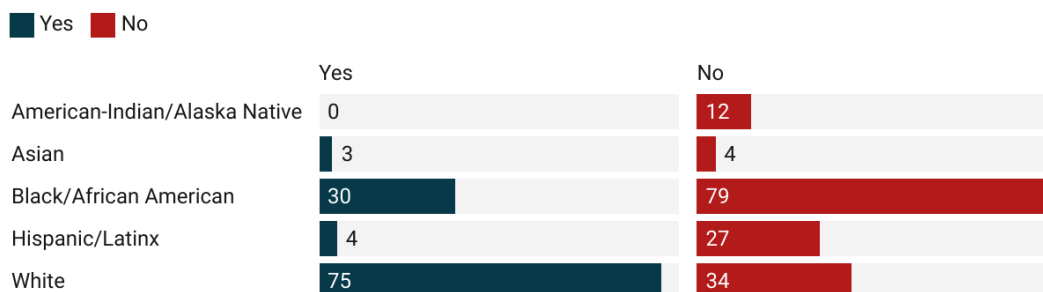


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Significant disparities in access to benefits were noted for both Hispanic workers and Black workers, with Hispanic and Black workers being more likely than white workers to report that they did not receive employer benefits. Some of the racial disparities in benefit access can be explained by other variables, such as industry type or certification. For Hispanic workers, controlling for industry type or certification made the lower likelihood of benefit access statistically non significant. However, Black workers were still less likely to receive benefits when controlling for industry type and certification. The persistence of disparities in access to benefits for Black workers in particular indicates that other factors, such as tenure with current employers or even direct discrimination, could be contributing to Black workers' lower likelihood of accessing benefits.

### Regional disparities in access to benefits

Access to benefits also varied based on region. Survey respondents that had conducted solar work across multiple NYS regions were more likely to receive benefits. Additionally, there were statistically significant positive associations between benefit receipt and having reported working in the following regions: Western NY, Central NY, the Southern Tier, and the Mid-Hudson. Conversely, significant negative associations were noted between receiving benefits and having worked in either the Finger Lakes or Capital regions. For other regions, no statistically significant relationships between region and benefits were noted.



# RETENTION

## Challenges of multi-employer work

The solar workers in this sample were not always individuals with longstanding tenure under one core employer. On the contrary, over 40% of the workers in this sample had more than one solar employer, and nearly one quarter worked for three or four employers at the time of this survey. Becker & Schneider (2019) note that there are many issues associated with multi-employer work, such as challenges in addressing health and safety risks. However, they also note that this is an issue that unions are well positioned to address. The lack of unionization but high rate of multi-employer work within our sample is particularly concerning when considering Becker & Schneider's (2019) work.

## Length of employment

The plurality of workers sampled had worked for their main employer for less than a year. For the solar workers in this sample, the average amount of time worked under their main employer was 20 months, or under two years. Additionally, 30% of the survey respondents indicated that in the year prior to completing the survey, they had changed employers 1-4 times for their solar work.

### How Long Have You Worked for Your Main Employer?

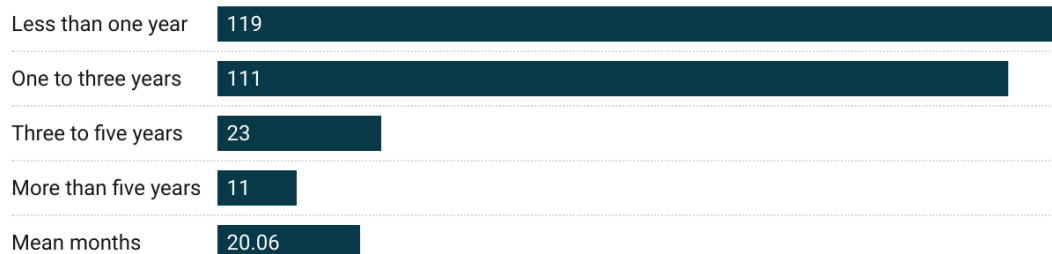


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Certifications were not found to explain variability in the amount of time workers in this sample had worked for their main employer. Additionally, with the exception of a slightly higher likelihood of reporting shorter tenure in the Finger Lakes region, few regional differences were noted when examining tenure lengths. With regard to industry type, however, there were differences in length of time with a respondent's main employer based on the type of projects a respondent had worked on. Respondents that reported working on utility scale installation were less likely to report longer tenures with their main employer.

## Impact of race on retention

### How Long Have You Worked for Your Main Employer?

Average Tenure in Months By Race

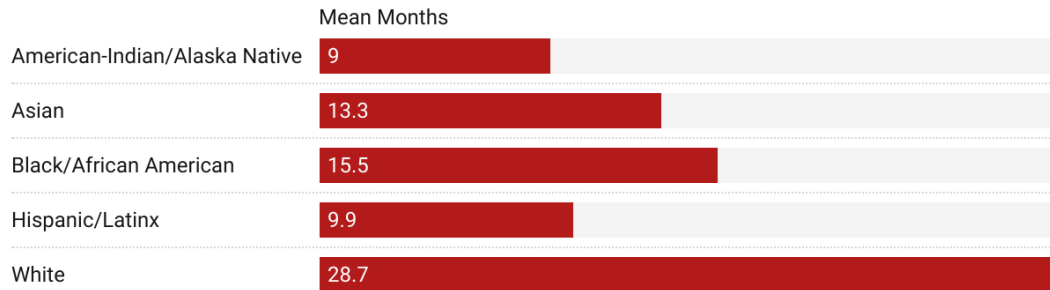


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Retention issues for this sample of the solar workforce were also particularly pronounced for workers of color. For workers of color the average amount of time worked under one's main employer ranged from 9-15.5 months. In contrast, white workers in this sample had worked for their main employers for an average of almost 29 months-nearly 2 and a half years and almost double that of their non-white peers. More concerning still is the fact that retention issues persisted for both Black and Hispanic workers even when controlling for industry type. This disparity should also be investigated in future research.

## CERTIFICATIONS

### Majority of respondents held standard construction certifications

#### What Certifications do You Have?

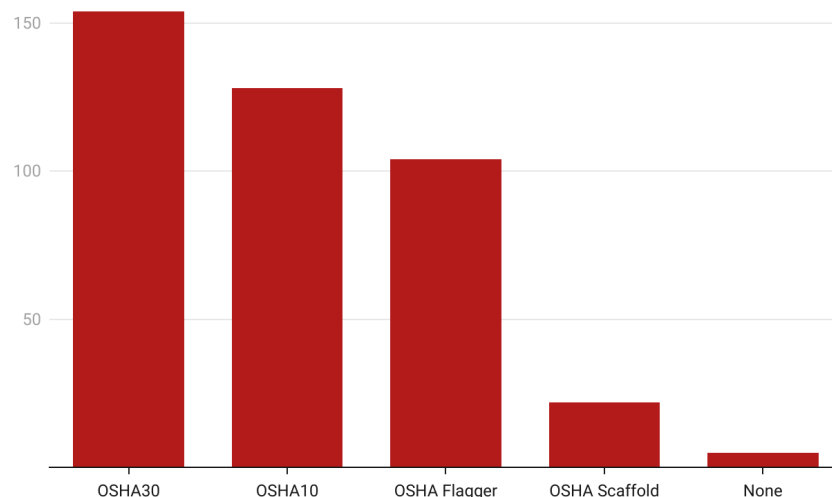


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

The majority of survey respondents indicated they held some level of OSHA certification. 58% of the sample had an OSHA30 certification, 48% of the sample had an OSHA 10 certification, 39% of the sample had an OSHA Flagger certification, and 8% of sample had an OSHA scaffold certification. Only 2% of the sample indicated that they held no OSHA certifications. It is important to note that in 2017, New York City passed Local Law No. 196, which requires workers on certain commercial building sites to receive 30 hours of site safety training by December 1, 2019, and an additional 10 hours of training by March 31, 2021 (Local Law No. 196, 1 RCNY 3301-03, 2017). Thus, some of the workers surveyed may have been required to receive 40 hours of training. More research should be done on the prevalence of certification on solar job sites and enforcement mechanisms by site.

## Black workers more likely to pay for their own certifications

### Who Paid for Your Certifications?

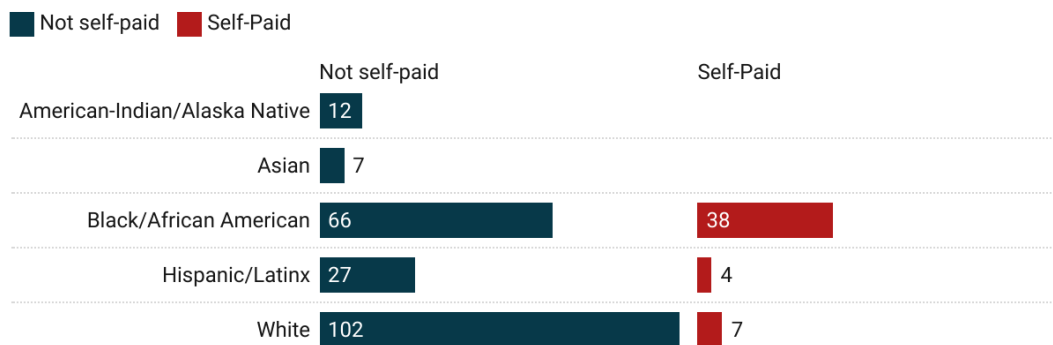


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Workers could select between the following categories for who paid for their certifications, including: self, employer, temp agencies, non-profit or workforce development centers, or unions. White workers were more likely to indicate that their certifications were paid for by someone other than themselves; and 93% of white workers who held certifications indicated their employers paid for their certifications. By contrast, only 60% of Black workers who held certifications indicated their employers paid for their certification, and Black workers were more likely to indicate they had self paid for their certifications. The cost of obtaining certifications required on solar sites may lead to barriers to entry within this field of work. The role of employers in obtaining certifications and how workers qualified to receive paid certification from employers, temp agencies, non-profit or workforce development centers, or unions must be investigated further.

## Uncertainty in transfer of certifications across worksites

### If You Left Your Current Employer or Worksite, Would Your Certifications Transfer to Your Next Project or Job?

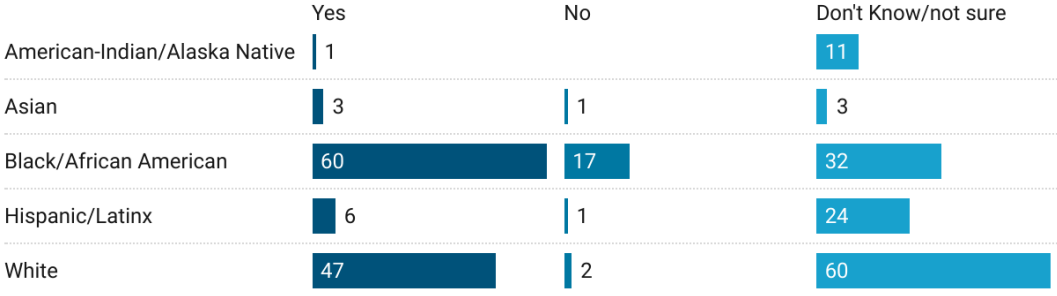


Chart: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

Across all races, workers indicated a level of uncertainty if their current certifications would transfer to their next job or project. This trend in responses could be a result of respondents being unsure what their next job will be, but could also indicate that workers in this sample lacked an understanding of their rights in maintaining and transferring certifications across projects. Future research should examine the reason respondents answered in this way to understand whether more training and education is required for should occur so workers to understand their rights around certifications.

Future research could examine whether unionizing New York’s solar industry could fill this gap through providing education on the rules of certification transferring and maintenance.

## STIMULANT USE

### Majority of respondents indicated stimulant use issues on solar worksites

#### Using Stimulants Such as Methamphetamine to Stay Awake is a Problem on My Solar Worksites in New York State.

Strongly Agree/Agree Disagree/Strongly Disagree Neither Agree nor Disagree

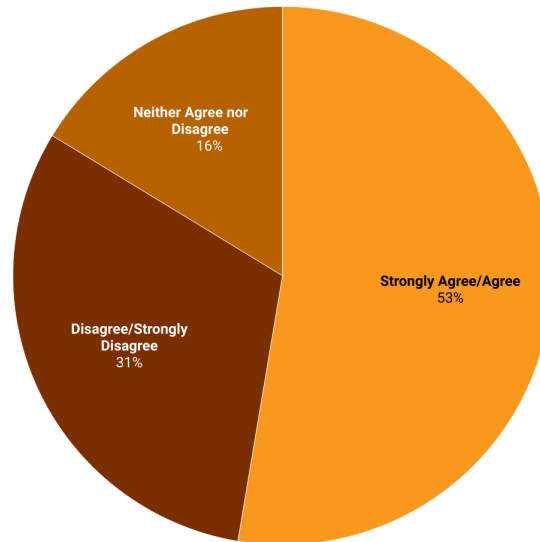


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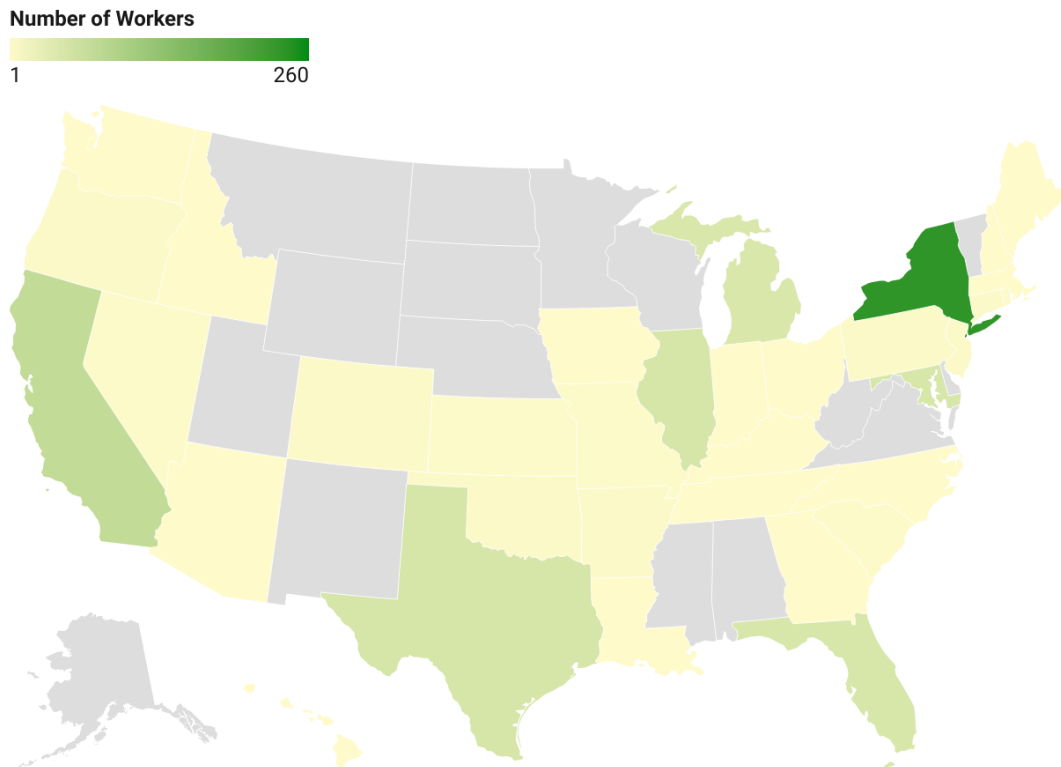
More than 50% of workers surveyed reported that they agreed stimulant use on their solar worksites in NYS was a problem. The use of stimulants and other substances on worksites is an issue in the construction industry at large; for example, one study by Ompad et al. (2019) identified that 1.8% of construction trade and extraction workers versus 0.8% of other workers in the sample reported having used cocaine in the past month. Another study by Flannery et al. (2019) found that alcohol and substance misuse in the construction industry was likely caused or exacerbated by a variety of factors, including working site conditions along with several other industry-related issues. Finally, the dangers of amphetamine or methamphetamine use specifically on worksites is another issue discussed in the energy industry literature more broadly. A study by Ramirez-Cardenas et al. (2023) found that, of worksite deaths related to substance use on U.S. oil and gas extraction sites between 2014-2019, the most common substances were methamphetamines or amphetamines.

Sample respondents working in the Finger Lakes or Capital Region were more likely than other respondents to report stimulant use as an issue on their sites. Additionally, when demographics were isolated in the regression analysis, pay per panel was associated with an increased likelihood to report stimulant use as an issue on solar worksites. However, the significant association between pay per panel and stimulant use disappeared when controlling for industry type, certification, or regions worked. Further analysis should be conducted to understand how pay per panel and stimulant use relate to each other across all these factors. Respondents who indicated they had OSHA certifications 10, 30 or scaffolding were oppositely less likely to report stimulant use as an issue on their worksites. More research must be conducted on why stimulant use is prevalent and how it can be mitigated on sites.

# TRANSIENCE

## Solar workers in NYS have worked across the country

### What States Have You Performed Solar Work in the Past Year?



Map: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

To be eligible to complete the survey, respondents must have worked on a solar installation or maintenance project in NYS within at least one year before receiving the survey. Through data collected from the survey, it is clear that workers who worked on projects in NYS have also worked on projects across the United States: 74 respondents indicated that they had also worked on solar projects in California, 50 in Texas, 49 in Illinois, 48 in Florida and Maryland, and 46 in Michigan.

## Prevalence of relocation to work on solar sites

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### Did You Personally Move or Relocate to Work at a New York State Solar Worksite?

■ Yes ■ No

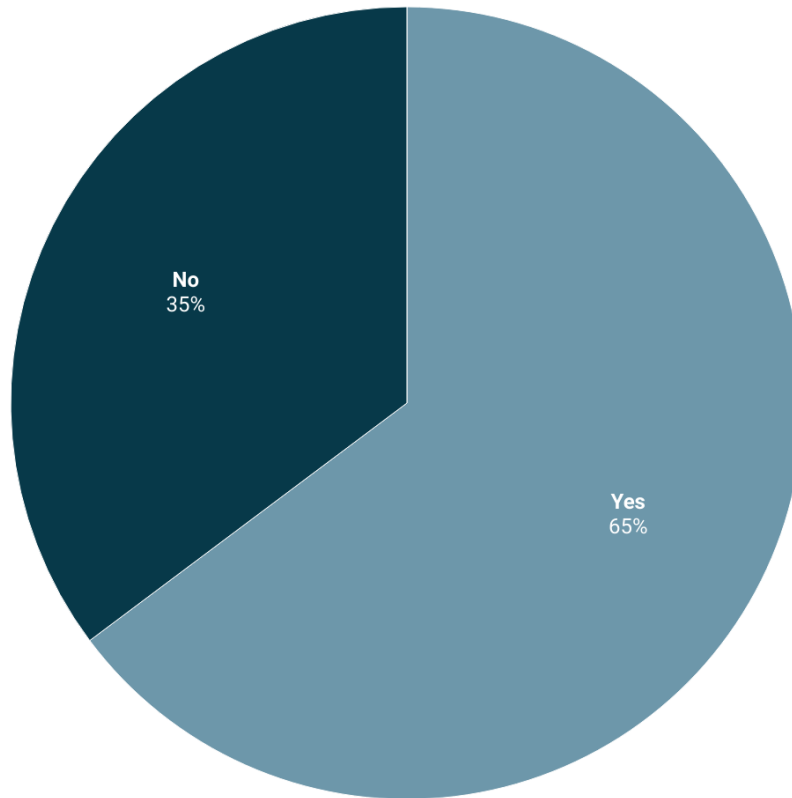


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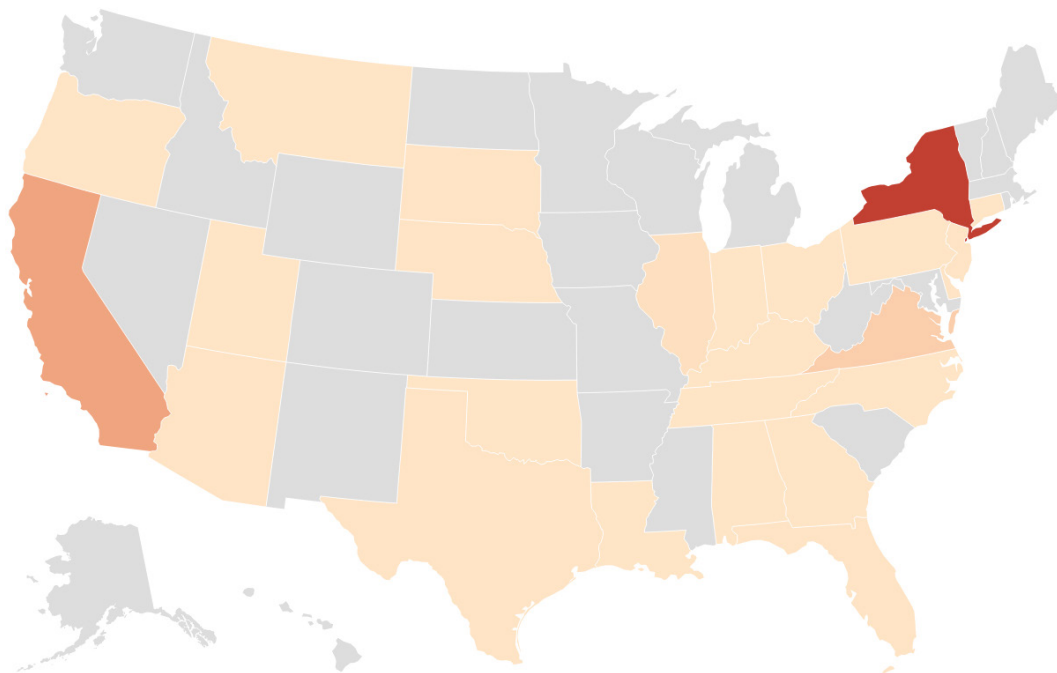
Of the sample, 65% of respondents reported that they relocated to work at their NYS solar worksite. 9% of respondents reported that they had experienced housing insecurity, and 3.8% of respondents reported that they had experienced homelessness while traveling for solar employment. The impact of transience on worker access to safe, affordable housing should be researched further.

## Non New York residents performing solar work in NYS

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### In What State do You Currently Reside?

Number of Workers



Map: Exploring the Conditions of the New York Solar Workforce (April 2024), Climate Jobs Institute • Source: Climate Jobs Institute, Cornell ILR School • Created with Datawrapper

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Our survey results also show that even if a worker had completed a solar installation or maintenance project within a year of receiving the survey, that did not guarantee they resided in NYS. Of our survey respondents, 53 indicated that they reside in California, 20 in Virginia, with additional workers residing across 21 more states.

Prior research has outlined the issues associated with the construction workforce's high rate of transience. For example, in a study conducted by Haupt and Whiteman (2004), 74% of respondents noted that the transient nature of the construction workforce restricted the implementation of a more systematic approach to quality control. Additional research should be conducted to understand the transience of this workforce and the impact of transience on local communities and localized economies. With massive investments into clean energy across the country, we must work to ensure that NYS funded projects support job creation for New York communities, and that the benefits of these investments go directly to local frontline communities.



# CONCLUSION

With the rapid onset of solar energy deployment in the United States and New York, it is critical that workers are centered in the transition to the clean energy economy. This exploratory study found significant issues for NYS solar construction workers in the sample which was 99.6% non-union. These issues included the prevalence of payment per panel installed, lack of access to benefits, stimulant usage, and transience. Additionally, this study found significant racial disparities across pay, hours worked, benefits and retention.

Given that unionized workers are more likely to earn higher wages, tend to have reduced racial and gender pay gaps, are more likely to be covered by employer-provided benefits, and are more likely to report unsafe working conditions (Bannerjee et al., 2021), it follows that future research should investigate samples of primarily unionized solar workers. In future studies, the Climate Jobs Institute intends to compare working conditions for union and nonunion workers in the solar industry. Research comparing union and nonunion workers in the solar industry may provide a more accurate view of the conditions that currently exist for solar workers, as well as the conditions that workers and policy makers can realistically aspire to achieve.

It is possible that a highly skilled workforce that is treated well may produce higher-quality work that is on-time and on budget, with less turnover. Stakeholders must work together to develop and implement policies at the local, state, and federal levels to ensure that all climate mitigation and adaptation provides good jobs, pathways into the middle class, and the opportunity to organize and have collective voice on the job.

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Established by the New York State Legislature in 1945, the New York State School of Industrial and Labor Relations at Cornell University is the world's leading college of the applied social sciences focusing on work, labor and employment. It is guided by a commitment to social and economic justice and to improving the lives of New York's working people.

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