INCLUSIVE ECONOMICS

The National Tri-Trade Solar Agreement:

A Winning Deal for Solar Development

Joe Peck and Betony Jones, June 2026

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TABLE OF CONTENTS

INTRODUCTION

The National Tri-Trade Solar Agreement (NTTSA, or 'tri trade') is a multi-union agreement tailored to large-scale solar developments. By signing the agreement, contractors and developers gain a streamlined, flexible pathway to work with the three core trade unions needed for the efficient construction of solar projects: the International Brotherhood of Electrical Workers (IBEW), the Laborers' International Union of North America (LIUNA), and the International Union of Operating Engineers (IUOE).

With skilled and reliable labor comes other benefits. Partnering with the unions representing these craft workers can provide meaningful community and political support, helping projects move more efficiently through permitting and local approval processes. The agreement also provides a clear compliance pathway for prevailing wage and apprenticeship (PWA) incentives under the Inflation Reduction Act (IRA), helping protect full tax credit eligibility for projects that are safe harbored.[1] Together, these factors have the potential to reduce execution risk, improve underwriting confidence, lower financing costs, and expand access to institutional capital.[2]

The agreement was intentionally designed to make the construction of solar facilities as efficient as possible in multiple ways. First, it helps project developers access the skilled labor needed for their projects. Second, it aligns with the IRA's sizable tax credits by dovetailing with prevailing wage and apprenticeship requirements. Third, it facilitates cooperation among the unions, eliminating the potential for worksite disputes, which can stall

[1] While the One Big Beautiful Bill (OBBB) restricted tax credits for solar projects, the underlying PWA incentives remained intact with bipartisan support. Future changes to reinstate the IRA tax credits for solar would likely still include the PWA incentive.

[2] Under the IRA, projects that meet PWA requirements can access up to five times the base tax credit. The NTTSA provides a clear compliance pathway—protecting credit value, reducing recapture risk, and improving underwriting, which translates directly into lower financing costs. In addition, PLA-backed projects are more investable for labor-aligned and pension capital, unlocking longer-term, lower-cost financing by aligning workforce stability with fiduciary risk management.

projects. And fourth, it gives companies the flexibility to work with union labor on projects without broader or longer-term commitments.

Although a substantial body of literature evaluates the costs and benefits of Project Labor Agreements (PLAs) on various types of construction projects,[3] a comprehensive economic analysis of PLAs—or of the NTTSA specifically—on utility-scale solar projects has not yet been conducted. However, data from the National Renewable Energy Laboratory (NREL) indicate no discernible differences in solar project costs or deployment outcomes between states with high PLA prevalence and higher labor costs versus states with lower labor costs and less frequent PLA use.[4] One possible explanation is that prevailing wage laws are associated with worksite productivity gains estimated at 14–33 percent, potentially offsetting higher labor costs.[5]

As a precursor to a quantitative assessment of the NTTSA, this paper instead examines how contractors and developers are utilizing the agreement on solar projects across the country and what they perceive as its primary benefits and drawbacks. These findings reflect the experiences of firms directly responsible for permitting and constructing solar projects and therefore provide useful insight into how the tri-trade agreement functions in practice.

The analysis draws on interviews with contractors and developers involved in solar project development and construction regarding their experiences implementing the agreement. These results show that the principles of the tri-trade agreement are working in practice, and employers are overwhelmingly positive about its provisions. This paper details some of the ways the NTTSA has helped the construction of solar projects, presenting

[3] National Alliance of Fair Contracting, "Prevailing Wage & Fair Contracting Studies & Reports," https://faircontracting.org/studiesandreports/, accessed May 12, 2026.
[4] Betony Jones, 2020, "Prevailing wage in solar can deliver good jobs while keeping growth on track," UC Berkeley Labor Center, https://laborcenter.berkeley.edu/prevailing-wage-in-solar-can-deliver-good-jobs-while-keeping-growth-on-track/.
[5] Ibid.

examples of the three trades alleviating workforce problems, improving permitting success, and helping project implementation.

BACKGROUND

The number of solar projects in the United States has expanded rapidly over the last decade. Between 2015 and 2025, utility-scale solar installation increased tenfold: from 16,400 megawatts (MW) to 165,000 MW per year.[6] The increase in solar project construction has intensified, driven in part by the IRA's tax incentives, in part by rising demand for electricity, and in part because solar has become the lowest cost source of new electricity.[7]

[6] Solar Energy Industries Association, 2026, "Solar Market Insight Report," https://seia.org/research-resources/us-solar-market-insight/, accessed April 11, 2026.
[7] Low Carbon Energy, 2026, "Solar is now the cheapest form of energy in history, says IEA," https://lowcarbonenergy.co/news/solar-is-now-the-cheapest-form-of-energy-in-history-says-iea/, accessed April 16, 2026. And US Energy Information Administration, 2026, "Solar power generation drives electricity generation growth over the next two years, accessed April 16, 2026.

To meet the growing demand for solar energy, the number of workers employed by the solar industry has nearly tripled since 2010,[8] leaving many companies struggling to find the workers needed to construct their solar projects. Unions have historically played an important role in training apprentices and dispatching skilled workers for construction projects. Collectively, the building and construction trades unions invest roughly $2 billion annually in training.[9] Recent decades have brought a decline in the share of workers in construction covered by a union contract (from 20% in 2000 to 13% today), mirroring broader trends across the workforce.[10] For those working in solar electric power generation (of whom about half work in construction), only 12% are union-represented.[11]

This decline in union density generally does more than reduce representation; it also weakens the primary system for financing and delivering workforce training and undermines workforce stability in an already seasonal and cyclical industry, by increasing turnover, skill mismatches, attrition, and project-to-project labor uncertainty. The NTTSA helps reverse these trends, by helping unionized labor work on a growing share of solar projects.

[8] Solar Energy Industries Association, 2026, "Solar Market Insight Report," https://seia.org/research-resources/us-solar-market-insight/, accessed April 11, 2026.
[9] North America's Building Trades Unions, 2026, "About Us," https://nabtu.org/about-nabtu/, accessed April 16, 2026.
[10] Barry T. Hirsch, David A. Macpherson, and William E. Even, 2026, "Union Membership, Coverage, Density, and Employment: Construction Workers, Union Stats, https://unionstats.com/, accessed April 13, 2026.
[11] US Department of Energy, 2025, "2025 United States Energy and Employment Report," https://www.energy.gov/documents/2025-useer-national-report, accessed April 13, 2026.

Overview Of The National Tri-Trade Solar Agreement

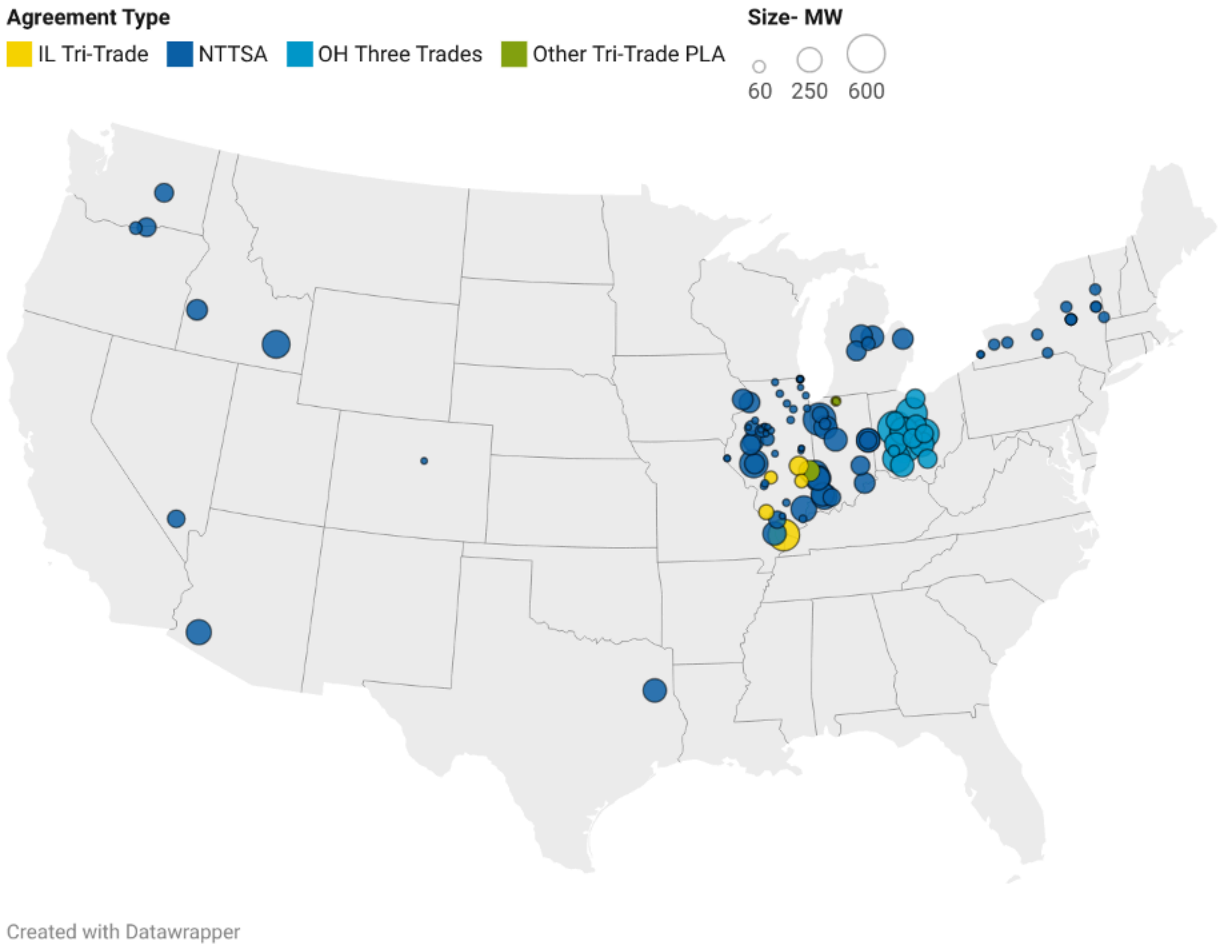
Project Benefits of the NTTSA

1. **Secures Necessary Workers:** Expands the pool of workers that contractors can draw from; reduces bottlenecks in a tight labor market; and eases the challenge of local hire requirements.
2. **Reduces Financial Risk:** Built-in IRA prevailing wage and apprenticeship compliance allows companies to benefit from tax credits, reducing financial risk.
3. **Streamlines Implementation:** Assigns every task on a solar project upfront, enhancing collaboration between the trades and streamlining implementation.
4. **Accelerates Project Approvals:** Fosters good community relations and builds support among policymakers, often accelerating permitting and approvals.
5. **Supports Ease and Flexibility:** Applies only to solar projects and does not require companies to become signatories to a broader union agreement for other projects. When changes are required, adding an amendment is straightforward.

The NTTSA was signed in October of 2023 by IBEW, LIUNA, and IUOE. The trades designed the agreement to provide companies with a simple, flexible way to engage with union labor to construct solar projects.

The agreement lays out management rights, general working conditions, safety provisions, work hours, wage scales and benefits, and the grievance adjudication procedure (Textbox 1). Companies can sign the NTTSA as written or, by mutual agreement with the unions, amend it. The agreement allows flexibility and the option to apply on a project-by-project basis.

Figure 1. Solar Projects that Have Signed Tri-Trade Agreements
Projects either under construction or operational by size



Authors' analysis of IBEW data.

As of March 2026, at least 85 projects have been performed under the NTTSA and an additional 22 projects under a state-specific equivalent (Fig. 1). While the national and state-based tri-trade agreements are separate, the task assignments (discussed in section 3) in the Illinois tri-trade agreement, for example, are functionally the same as those in the NTTSA. The main difference between the agreements is that the Illinois agreement includes language regarding equity-eligible persons and equity on the jobsite (both of which are requirements to receive Illinois renewable energy credits). The tri-trade agreement and its variants have been signed by companies in Arizona, Colorado, Idaho, Illinois, Indiana, Iowa, Michigan, Missouri, Nevada, New York, Ohio, Oregon, Pennsylvania, Texas, and Washington.[12]

DATA AND METHODS

This research is built upon seven semi-structured interviews with executives in the solar industry. Five were engineering, procurement, and construction (EPC) contractors, commonly hired to complete complex private-sector infrastructure projects. Two were developers who managed project development by procuring land, obtaining permits, and securing financing. The vast majority of private-sector signatories to the NTTSA are EPC contractors, sometimes signing it at the developers' behest, and the distribution of our interviewees reflects this.

All of the companies interviewed are party to the NTTSA, with the exception of EDF, a developer, which signs a memorandum of understanding (MOU) or letter of intent (LOI) that commits their EPC or general contractor to engage with the three trades (laborers, electricians, and operators) upon hiring. The

[12] The agreement does not cover California, which already had an established multi-craft agreement for solar projects.

interviews lasted 30 to 45 minutes and were recorded over Zoom between December 2025 and April 2026.

This paper was also informed by discussions with eight union leaders from IBEW, LIUNA, and IUOE, who provided contextual information that helped guide the drafting of the interview questions early in the research process. All interviews used the same interview template written before any interviews were conducted. All interviewees were contacted via one of the three unions, and every company that accepted our invitation was subsequently interviewed.

In addition to the qualitative data collected from these interviews, this paper draws on data from several other sources to add context to solar project implementation. Data on the number of projects that have signed the national tri-trade solar agreement, their locations, and the ultimate MW capacity were provided by the IBEW union and were joined with similar data on the distribution of tri-trade agreements in Ohio provided by the Natural Resources Defense Council (NRDC). Further, data on the number of renewable energy projects facing significant opposition were collated from the Sabin Center for Climate Change Law's June 2025 edition of their opposition to renewable energy facilities report.

EMPLOYER INTERVIEW FINDINGS

1. Secures Necessary Workers

The construction industry is experiencing a historically tight labor market and the availability of workers remains scarce.[13] Across our interviews, contractors' difficulty in finding workers for projects was a common theme. Robert Panatera, vice president of operations at Preferred Electric, acknowledged that "there's somewhat of a labor shortage of electricians, in general, in the industry." This can be particularly intense for solar projects, which require specialist work for which "there's a lot of labor involved." Some electrical workers choose to take on simpler projects. Solar projects also tend to require a large number of workers, making it harder for contractors to find them.

Todd Hansen, vice president of D&D Electric, highlighted the difference between smaller projects and larger ones: "[for smaller projects], I'm talking a total workforce of five or six people, so we send two, and then we pull two or three, and we're able to get these smaller jobs done. But solar, because of the size of the workforce required, is a pain point."

Part of the reason workers have become hard to find for these projects is that the volume of solar projects—and other major construction projects they are competing with—has increased. Doug Herling found this at Open Road Renewables, which operates throughout the United States*:* "I think a lot of people in the industry saw that the volume of projects that needed to get built in the U.S. was rapidly outpacing the ability of EPCs to handle that work—and to have enough trained folks to do that work." These solar projects can also come with time constraints, either because these projects "have a power purchase agreement, which means they have to get it turned on

[13] The unemployment rate in the construction sector averaged 4.6% in 2025, a near-record low. See US Bureau of Labor Statistics, "Unemployment Rate, Construction Industry, Private Wage and Salary Workers," Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/LNU04032231, April 11, 2026.

sooner… or tax implications: if they get it turned on before the end of the year, then they get a tax credit" said Tyler Thomas, who works for JF Edwards. To complete the work more quickly, these contractors have to find more workers:

> "If the project dragged out over 18 months, obviously, you can build it with fewer people because you have more time to do it. But if the project is nine months long, you have to double your workforce. And I think with solar farms, you're seeing that with these schedules and the amount of solar farms going up, it is putting a strain on all the labor halls."

Alleviates Workforce Shortages

Partnerships with unions help alleviate these workforce bottlenecks, allowing contractors to essentially outsource this HR function to their union partners. This process is simple and direct. In response to an inquiry about how they staff up on projects, Bobby Panatera said, "I just coordinate with the local unions… we give them a call and tell them how many guys we need, and they are really, really great to work with."

Rob Rieke, a project manager at Zeller Electric, appreciated the benefits of having a ready pool of qualified individuals ready to work on projects. Todd Hansen also reported on the benefits of working with the unions: "We call the Locals when we're bidding. They help figure out the labor needs on the project, including specialized skills. We submit the bid when the Locals can man our project." For their part, the unions can ramp up apprentice recruitment and training to meet growing demand for workers. In many regions, apprenticeship programs have queues of qualified individuals seeking admission. Increased demand from employers enables unions to train more people.

Relationships with local unions also help ensure these projects hire local people. When workers aren't local, Hansen said, "you're going to have to pay each of your journey workers an additional $75 to get them to come. From a bidding standpoint, that's an unknown [cost]… so we really need help in that regard." Union partnerships that facilitate local hiring don't just reduce execution costs—they also reduce the uncertainty, which may also save money.[14]

Further, by having these union relationships, businesses can help retain workers—and their skills—from project to project. Construction unions help stabilize the construction workforce in an industry defined by temporary projects and affected by seasonality and economic cycles, in several ways: providing predictable and higher wages to help workers weather downturns, building a pipeline of continuous projects through pre-hire PLAs, and managing portable benefits, including family health insurance and pension plans that move with the worker from project to project. This stability offers real value and efficiencies to the firms that work with unions. "We like to get to a point where we're moving the same group of people, project to project to project. We get them trained in our work methods and the particular [project] owner's work methods. And that investment in time upfront pays off in more efficiency."

Expands the Pool of Available Workers

Companies commented that the tri-trade offers an easy, systematized way to maintain relationships with the unions required for solar projects. Where local unions can help supply projects with the workers they need, the

[14] Further, union partnerships help companies hire the local workers required to meet state-level requirements for certain tax exemptions, helping make projects financially viable. For example, Ohio's qualified energy project tax exemption requires 70% of full-time equivalent construction employees to be domiciled in the state. See Ohio Department of Development, "Qualified Energy Project Tax Exemption," https://development.ohio.gov/business/state-incentives/qualified-energy-project-tax-exemption, accessed May 11, 2026. CO, IL, NY, WA, MI, NM, and ME also have policies that tie tax credits or other incentives to local hiring, prevailing wage, and/or registered apprenticeship standards. Involving union labor in projects can therefore help secure these credits.

tri-trade agreement expands the pool of workers projects can pull from. Gabe LeFave, a director at Cupertino Electric, said that the tri-trade "greatly reduced [their] reliance on a sole source of labor." Previously, the bulk of their manpower for electrical projects came via IBEW. As an approximation, "55% or 60% of the work was covered by IBEW," but when the three trades got together, Cupertino could look to the laborers for support with racking while IBEW focused on panels. Instead of IBEW supplying only 55% of the work, they could supply 40% while the laborers filled out 40% of the work and the operators the final 20%. This allowed projects to proceed more seamlessly and efficiently.

Preferred Electric had the same experience: "We were able to access a larger workforce. When you're limited to just electricians, it's harder to man the jobs because again, there's a lot of the work out there for electricians." The company found that the increase in the number of data centers has increased the competition for electricians. Adam Sokolski of EDF agreed and laid out some of the reasons why:

> "There's a lot of business being done… solar projects and data center projects pull very heavily on labor, and in particular very, very heavily on IBEW and electricians… A data center might be offering another $10 an hour, they might be offering a higher per diem, they might be offering indoor work with lunch provided, and we'll have to compete with that project that might be four or five miles away."

Being able to draw workers from other trades, therefore, helps ensure the project is not delayed by a shortage of workers in a single trade.

If workforce constraints are a problem at a given time, they can be even worse in certain locations. This was a major reason why Cupertino wanted to diversify its pool beyond IBEW. The tri-trade gave the contractor an easy way to do that: "As we move around the country, some areas are flush with the electricians, and some are flush with laborers. So it helps out there."

Certain states also have local workforce requirements, which can further complicate workforce supply:

> "In some places, a certain percentage of the workforce must be local, for instance, in Ohio it's 70%.[15] As I said, with [the unions] being able to staff these jobs locally, we are meeting that requirement. A lot of their [state] permits require them to maintain a 75%, 80%, or sometimes 90% local workforce. With the tri-trades banding together, that really helps out… and that's really good for developers."

At the same time that it expands the pool of workers available to companies, the tri-trade agreement also offers developers greater flexibility in how they use those workers. So if, for instance, IBEW cannot supply the labor needed to install solar panels, then the laborers can help to supply that labor. This is partly down to the agreement "leveling the percentage of man-hours per craft on the job, rather than just reducing or increasing the percentage of man-hours *per craft* on the job," meaning that "there is little resistance to [the trades] supporting each other and sharing labor." The agreement is highly responsive to contractors' needs in this regard.

While the tri-trade agreement helps contractors hire local workers to meet permitting requirements and control costs, it also allows companies to bring in non-local labor when needed. D&D Electric, for example, occasionally needs travelers to complete specialist work on projects. This is true of the inventory controllers they hire, who are "trained to D&D's work processes and workflows" and know how to "accept inventory, to carry inventory, to retire inventory, to transfer inventory specific to D&D's work processes." Hiring straight from local union halls can therefore be tough for the company. Post driving is another example:

[15] Gilbert Michaud, Farzaneh Khayat, and Claire Bonham, 2024, "Impact Analysis of the Ohio Pilot Program," Chambers for Innovation and Clean Energy, https://www.chambersforinnovation.com/impact-oh-pilot.

> "That is a really high-risk activity. It must be correct, or it blows a project up. We're talking about a piece of equipment that's specific to D&D. There's much less risk, and it's much more productive if we can move one of our guys to each project that's running this expensive piece of machinery. Even when the tri-trade has supplied 90% of the workforce, there are some ways to take our trained talent to different localities and plug these guys in."

While moving workers is not without its challenges, it can be necessary for specific types of work. This has been possible under the tri-trade: "if I can keep projects lined up ahead of these [specialized] folks and then move them around from project to project, it only helps all of us."

Companies listed their ability to draw on a larger pool of workers as a top benefit of the tri-trade agreement. Thomas said that, with the tri-trade, "you get an opportunity to pull from two more different [hiring] halls than I normally would… and you have more access to manpower when you can pull from all three trades." The agreement can help projects find the local workers they need, alleviating project delays, costs, and risk. By increasing your overall labor pool, "the tri-trade puts less stress on your corporate team and site teams to secure the labor."

2. Reduces Financial Risk

The financial benefits to companies that fulfill the IRA's PWA requirements are meaningful, but complying with the requisite obligations in order to obtain those benefits can be difficult.[16] D&D Electric and JF Edwards found

[16] Companies can claim 30% tax credits (well above the 6% baseline) by ensuring that registered apprentices perform at least 15 percent of labor hours on projects and workers are paid prevailing wages. See Betony Jones and Joe Peck, 2026, "The Receipts: The Untold and Underappreciated Outcomes of Biden's Clean Energy Strategy," New York, NY: Roosevelt Institute.

that bringing sufficient apprentices onto projects to maintain the PWA-required ratio can be particularly challenging. Even though Thomas thought it was a great idea to bring younger workers into an industry where they are currently lacking, "It is a struggle for solar projects to find a sufficient number of apprentices, and you need to have the documentation that you tried to get them."

Companies' accounting teams also struggle with the added pressure of tracking how they have been compliant with PWA requirements when applying for the IRA's tax credit bonus. Panatera suggested that his company's relationships with unions help them keep track of which credits they are eligible for: "I don't understand how non-union companies are complying with all the regulations because it's been a big undertaking on our accounting teams… if we weren't union, I don't know how we would accomplish that."

Without having a certain number of apprentices on site and, notably, the ability to track apprentice percentages for potential audits, projects risk losing eligibility for the enhanced PWA tax credit. The tri-trade agreement maximizes the likelihood that projects meet their quotas and earn subsidies. Gabe LeFave spoke of the stakes in clear terms:

> "With some of these open shop contractors, how can we be sure that their apprentices are part of a registered apprenticeship program, and that registered apprenticeship program isn't just a fly-by-night one that's going to fail tomorrow? There's a lot of risk there given all the subsidies that are tied to this. So, securing apprentices through the tri-trades registered apprenticeship program is an assurance that we're going to meet our 15% threshold… there's a 30% subsidy for IRA in general, and 80% of that 30% (so 24% of the project) is based on the apprenticeship requirement. If you don't get that, that's a big number. The tri-trade virtually guarantees that you will meet the apprenticeship and IRA requirements."

And, he added, "the developer loves it." Adam Sokolski of the developer EDF echoed this comment: "Compliance with the PWA requirements is attractive to developers, 100%. When you get into a half-billion or billion-dollar transaction, it's got a lot of eyes on it from all the different parties involved." The more assurance a developer has that a project will be financially viable, the better.

Beyond the financial benefit, companies highlighted other reasons why IRA requirements helped their projects. The IRA's prevailing wage requirements level the playing field between union and non-union workers, as companies cannot easily undermine the local labor market by undercutting the wages of workers. As Doug Herling said, this "puts unions in a much better spot to get the work on projects," as companies can simultaneously make use of the better-trained workers these unions provide while receiving subsidies through the IRA. Further, Rob Reike acknowledged that hiring workers required by the IRA's apprenticeship quotas "brought new individuals who have been great assets" to their solar projects.

3. Streamlines Implementation

Contractors repeatedly indicated that the NTTSA's clear task assignment between the three trades facilitated good relations between the unions and helped the projects run smoothly. For example, IBEW is tasked with installing wiring harnesses, while LIUNA is responsible for placing structural concrete. "Whoever designed the tri-trade agreement," said Robert Panatera, "did a really good job of defining all the different scopes of work, so that there aren't any conflicts on the job of what the laborers can do, what the electricians can do, what the operating engineers can do." Rob Rieke agreed that "having that scope of work pretty well lined-out has created a good environment on the job, where there's no question or ambiguity on who's doing what."

Day-to-day, the clear task assignment helps workers on solar projects pursue and complete tasks in their specialist areas, avoiding any confusion over which trade is responsible for which part of a solar project's operation. Rob Rieke indicated that "basically getting the right person in the right seat is the way I see it, so each individual union can focus on their core work, and we're not necessarily crossing over." Before signing the agreement, Panatera feared that disagreement between the unions could arise and cause a problem for the implementation of the solar project:

> "Before I read the agreement, I was concerned that there'd be conflict amongst the trades of who can do what work, where the lines are drawn—but again, they did a great job with defining the scopes of work."

The agreement defined the project's scope of work so clearly that there was little room for ambiguity or disagreement.

For companies developing larger projects, the agreement's substitution provisions mean that:

> "If operators don't have enough people to drive the posts, the laborers pick up on certain types of equipment… And so you have a situation where, when you come up with a shortage in one trade, another trade comes in to help out. For us, that's really important from a developer's perspective in that it says that these three trades have their ducks in a row and they know how they're going to work the best together, which is really, really attractive (Adam Sokolski)."

Ultimately, the tri-trade helps ensure good relations on-site even while enabling contractors to draw from three unions. Panatera highlighted that this arrangement offers a sweet spot for solar project implementation:

> "We haven't had any union issues or trouble getting manpower, because between the three groups, we definitely are able to support the job … whether it's IBEW, operating engineers, or laborers, they have their county-level discussions, and it was good to see them all working together. Defining that scope of work was a really good job—I think it's key to really helping it succeed. There's not a lot of gray area."

Just as the agreement facilitates the running of projects for contractors, it tells developers that, in the words of Adam Sokolski, "these three trades have their ducks in a row and they know how they're going to work best together"— which he described as "really, really attractive." Its well-defined scope of work is one of many reasons why the tri-trade agreement helps companies implement their solar projects. It is to these other reasons that this paper now turns.

4. Accelerates Project Approvals

The tri-trade agreement facilitates the ease and speed at which a solar project can be built. First, because the agreement allows companies to draw from the three trades and alleviate workforce friction from the outset of their projects. Second, because the agreement (including its well-defined scope of work) provides a clear framework for the three trades to work together, alleviating potential workforce disputes. And third, the tri-trade allows companies to tap unions to help alleviate community concerns, mitigating the problems that increasingly arise from a fractious relationship with the local population. All told, these help with timelines and push projects toward the finish line.

As discussed in section 1, the tri-trade alleviates workforce concerns. Several interviewees noted this as an explicit reason why the tri-trade helps shorten their project's timeline. Gabe LeFave said that the tri-trade "gives you a better opportunity to speed the project up," as it "reduces the risk of schedule

delay due to labor and staffing shortages." Robert Panatera similarly acknowledged that having a larger workforce helped project timelines.

Fosters Strong Union Relations

It is also clear that companies that sign the agreement face distinctly fewer work disputes on their projects. Gabe LeFave credited the clarity of the agreement as the remedy to any potential disagreement:

> "The trades aren't fighting amongst each other over whose work is whose and getting the contractor in the middle of it. It's clearly spelled out and delineated [in the agreement]. They know their swim lanes, and they play well in the sandbox together… There are, I would say, almost zero jurisdictional work disputes."

The agreement is "thorough in scope," ensuring few if any disputes (Rob Reike). Gabe LeFave noted that the benefits of a solar project implementation go beyond simply saving time and help focus minds: "it'll set your managers forward with increasing their ability to pay attention to the work that's going on rather than be disrupted by work disputes and grievances and things of that nature."

For some of our interviewees, the potential to use union labor while limiting disagreements between the trades offered a perfect combination for ensuring project implementation. Rob Rieke said that the tri-trade helps "limit your disputes on the project, limiting downtime, and delivering an excellent product by using union labor in a thought-out and agreed-upon fashion." For these reasons, he would recommend the agreement to any contractor considering it.

Alleviates Community Concerns

Doug Herling described solar development as "a game of whack-a-mole in terms of community concerns." This is a major impediment to project implementation—evidence shows that community opposition to renewable energy is common throughout the United States (Fig. 2). In contrast, unions generally play an important role in helping projects secure support from local communities and officials. By extension, the tri-trade agreement offers contractors and developers an easy way to work with three unions and their community partners, who can address concerns where they appear.

Part of the solution to community concerns lies in creating job opportunities for people in the communities in which projects are being implemented and "making sure local labor is truly local, not just in-state, but as in-region as possible." The tri-trade can help companies hire local workers (as explained in section 1). For Open Road Renewables, a developer, they accept that it is hard to make everyone happy, but:

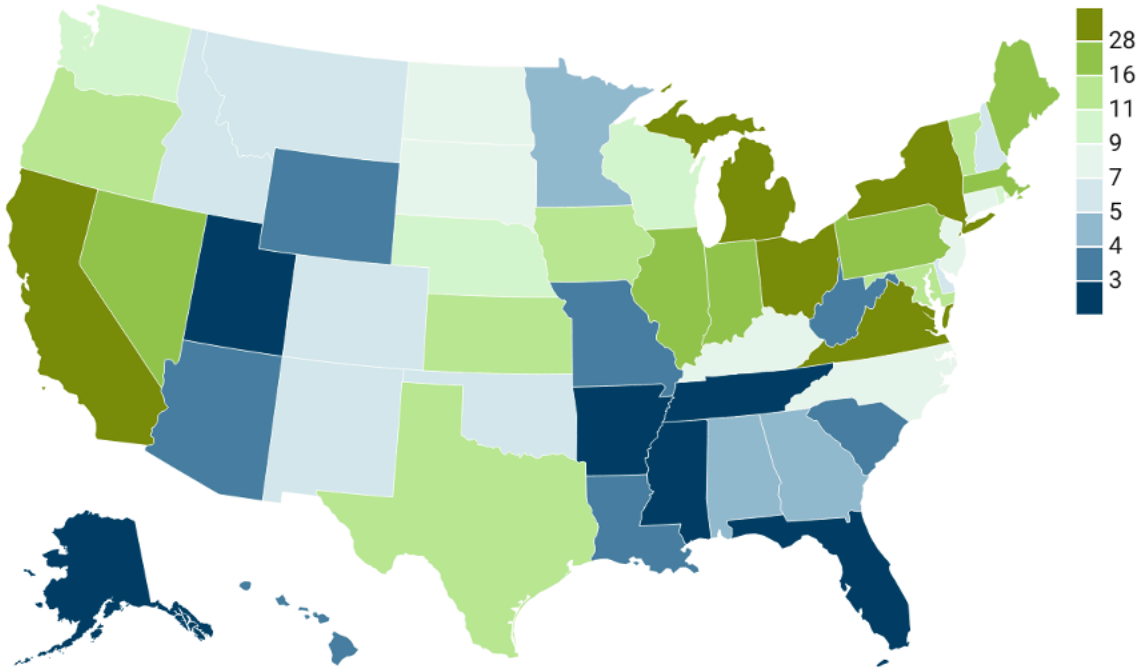
> "We like being able to have those local voices of folks who are likely to be getting the work, who are trained to do that work on the jobs. From the tri-trade, our hope would be that those folks who are looking forward to having work where they can go home at the end of the day, instead of a hotel or apartment somewhere, that those folks will come out and support the project as well. So that's why we sign on to the tri-trade."

The tri-trade can help companies obtain permits, which is particularly important for developers. Adam Sokolski of EDF, which operates throughout the country, told us that "permits are becoming very difficult to obtain, particularly with some local jurisdictions where lots of opposition comes up over a conditional use permit or a state-level permit for a project." Here, EDF's strong relationships with the unions and expectation that the

long-term contractors will sign the tri-trade have allowed them to rely on the unions for community and permitting support:

> "A perfect example is our 220 MW Eastern Cottontail project… we just got a permit from the Ohio Power Setting Board. We have a labor commitment in Ohio that requires our projects to be built with the three trades. The three trades have been instrumental in helping us throughout the permitting process before the Ohio Power Siting Board. They've intervened as one. There are three unions; they use the same attorney, they've coordinated their testimony together, they've done a ton of outreach and got letters and turnout and personal testimony of individual union members at public hearings."

Figure 2. Contested Renewable Energy Projects
Number of projects that faced significant opposition by individuals, community-based groups, or other organizations in 2024 (the most recently available data)



Map produced by authors with data from Matthew Eisenson, Jacob Elkin, Ivonne Norman, Rebecca Coombs, Chadol Kim, Rex Koenig, Suzan Michalski, Eric Quiroz, Josepi Scariano, Ava Teasdale, Victor Tong, & Annabel Williams, "Opposition to Renewable Energy Facilities in the United States: June 2025 Edition," the Sabin Center for Climate Change Law, Available at: https://scholarship.law.columbia.edu/sabin_climate_change/251

Building these relationships with the tri-trades has proved fruitful for developers. Sokolski said the tri-trades have turned up to public hearings, sent letters to public officials, and been involved in the "entire permitting projects because they know that they're going to get the work. And so we have taken that relationship and instead of backloading it in the process, we've put it right up front." Herling, another developer, echoed the importance of union relationships: "We know there are members there; those folks will likely get the word out about project benefits. That really helps make it real for elected officials."

Shortens Project Timelines

All told, the tri-trade agreement can help projects progress—and quickly. Doug Herling acknowledged that "union labor certainly sped up construction and fixed major problems occurring in that process." Asked why this might be the case, he replied: "I think it has to come down to expertise and a degree of accountability as well." Companies can get experienced, well-organized workers on their projects through the tri-trade agreement.

Rob Rieke concurred that, with the NTTSA, "we were able to bring laborers out to do their work early on and get prefabricated things on site per the agreement. That helped us get ahead on things while we were working through civil work and things like that. I think that affected the project timeline in a positive way."

5. Supports Ease and Flexibility

Second only to alleviating workforce concerns, companies cited the flexibility of the tri-trade agreement as a major reason why they were willing to sign it. The NTTSA is easy to sign, does not require companies to negotiate with the three trades independently, and, unlike other forms of collective bargaining agreements, only applies as long as the construction of solar projects does.[17] This makes it a flexible agreement that is more inviting to companies unfamiliar with utilizing union labor.

[17] While the NTTSA governs all solar projects built by the company in that local jurisdiction for a 3-year period, not just one project. However, there is commonly an addendum added to the contract that limits the scope to just one project, providing greater flexibility to companies.

Easy to Sign

Across the interviews, all companies indicated that the tri-trade was easy to sign. Doug Herling, with Open Road Renewables, had not previously signed a PLA. However, the company liked that the tri-trade agreement would help them "get things done" without "negotiating with three separate unions where those unions did not want to work with each other. It just solved a lot of headaches."

To have everyone on board simultaneously was a major plus for the developer: "you don't want to sign up with one union and have another protesting that they're not getting to work." The NTTSA is "an easy way of getting involved with union labor and local labor."

Rob Rieke said that the unions made it easy to sign on: "locally, we really appreciated the union leaders from laborers and operators just sitting down at the beginning. We sat down and went through the agreement, and I expect to continue to work and build together that way." Even when a company was a signatory to a union contract, it would not necessarily be involved with more than one union. This was the case with JF Edwards, who, prior to their signing the tri-trade agreement, had a relationship with IBEW but not IUOE or LIUNA.

Another benefit of signing up early is that companies can begin their projects without negotiations slowing progress. Securing an agreement quickly helps avoid the problem of unions showing up "pretty late in the development process and asking for us to sign a PLA… we can be a lot more collaborative now and make sure that we're really solving a problem with this" (Doug Herling). As Rieke agreed: signing the tri-trade early is all about "getting people in the right seat doing the work which makes things go a lot smoother."

Being easier to sign and having only one agreement between the three trades makes project management easier: LeFave said, “I'll tell you the biggest driver for jumping into it was to reduce the variance in how you have to manage projects.” Previously, every union had a different agreement. “Now,” he said, “we can operate under a consistent standard” around the country (Gabe LeFave). Tyler Thomas similarly argued that: “everything is kind of cut and dry” with the tri-trade. Now, projects know what labor halls they are pulling from.

Flexible Time Frame

A major draw for companies without experience with union labor is that the tri-trade agreement usually, by amendment, lasts only as long as it takes to complete the solar project. For contractors who have historically worked with only one union, their agreements with other trades similarly only last for as long as their projects.

For companies like Cupertino, this mechanism has opened up new opportunities for contractors that historically have been wary of signing long-term union agreements:

> “It really opened up our portfolio of contractors that we could use on our projects, because they are not required to become signatories to the master agreement of each of the trades. That was key… So many more of those shops are now working on our project. So it's really allowed us to diversify and grow the contractor base capable of executing on these projects, which is ultimately good for all. If you grow the contractor base, the developers can build more projects faster” (Gabe LeFave)

For some, the project-only provision and the flexibility it affords to move quickly to other projects post-completion were deciding factors in signing

the tri-trade agreement. Without it, there is a chance these companies would not make use of union labor as they have under the NTTSA. Todd Hansen said that it was "critically important that we be able to sign our workforce up, to meet the local labor standards to help those business agents get their folks on the job, and then be able to finish the site and move off. This is critical to the tri-trade working—we can look at this on a per-project basis." This is particularly true of states like Illinois, for example, where PLAs are required on many public works projects:

> "It allows you the flexibility to move into and complete a project, meet all the legal requirements, and then move on to others that don't. So the flexibility is absolutely worth it. Without the tri-trade, this is going to be incredibly difficult to build all of the projects that owners need built. The tri-trade is a great tool. It's allowed us to grow."

Developers are particularly interested in derisking their projects to ensure that the contractor can build the solar project as smoothly as possible. Doug Herling said that "we historically viewed signing up for a PLA as a risk, because that would be something that would bind the hands of a long-term owner in a negative way." The tri-trade has shifted this view: it has opened an opportunity for developers to work with unions, as they can be confident that the agreement will not add unnecessary risk to contractors.

Easy to Amend

A few of the interviewees raised concerns about the tri-trade agreement. Where companies did note potential improvements, it is possible they could be solved by amendments to the NTTSA, which the unions and contractors described as a simple process.

Several companies highlighted limits to the tri-trade. Certain activities, such as the installation of rooftop solar panels or work in utilities, are outside the

scope of the tri-trade agreement. Panatera argued for an amendment to the tri-trade, which currently "just covers ground mount solar projects." He said he "would love to see something that incorporated rooftop solar projects because, just like the ground projects, there's a lot of labor involved. You have to use cinder blocks, ballast blocks, i.e. concrete blocks. And you're carrying them around the whole roof. It's just a labor-intensive thing. So getting laborers involved in that would be huge. It would be really advantageous because that's part of the work they signed up for as laborers, carrying and moving heavy loads. And electricians are like, I didn't sign up to be an electrician to carry cinder blocks all over the place every day."

Tyler Thomas argued that the tri-trade not covering all associated electrical work (high-voltage transmission lines and infrastructure, distribution lines, substations, switchyards, or ground grids) creates a "scope gap." The tri-trade has been great for coordinating the three trades, but does not help with the coordination of work beyond its scope.

On the whole, very few companies reported problems with the tri-trade agreement, and several noted that any initial hesitation was misplaced. Where problems or friction arise, they can largely be resolved through amendments to the NTTSA. Adam Sokolski, a developer keenly aware of the trials of permitting and local support, said:

> "We also know that there are local conditions that may dictate a slight variation to the form agreement. And so we appreciate and understand that. And if it's a licensure issue in a state, if it's a ratio issue in a state, if it comes down to just local relations, here's how we do things that might be slightly different. We can respect that too. And what we want to see is our contractors working with local labor to iron out those differences and make those agreements prior to building a project. If the tri-trade gets you 99% of the way there, that's fantastic. If there needs to be a 1% little deviation, you basically have 99% of an

> agreement. That's absolutely fantastic, and that 1% allows you to adjust for local conditions."

In the future, Panatera indicated that he would ask for an amendment to the tri-trade to clarify what projects were included (or not) under the scope of work to avoid any confusion among union workers:

> "Our scope of work did not include the fencing around the project. So we were getting calls from a local union that covers the fencing, asking, 'Why aren't our laborers and operators installing this fencing?' So it was a non-union company doing the fencing… but the tri-trade only covers what's in our contract with the customer, within the scope of work. So, there's a little gray area there. In the future, I would just maybe add some type of amendment that says Preferred Electric is only responsible for our scope of work based on our contract… we're only paid to do X, Y, and Z. And that's all we're going to do, but I would be more defined with that and more transparent: specifically, we're not doing fencing. So then everybody understands."

Others also mentioned that the agreement helpfully allows for amendments to account for local requirements. For example, Minnesota has "some substantial state licensing requirements as to what is electrical work, and therefore what is licensed" (Gabe LeFave). In the state, the installation of backing tracker components is considered licensed work. By amending the NTTSA, Cupertino can hand installation over to IBEW, and the laborers (who would normally have that work under the tri-trade) instead handle the material-handling and logistical work associated with these activities. At the same time, there might be regional holidays that workers would expect to observe. Amending the agreement to reflect these ensures that workers are not disincentivized from joining projects, further alleviating potential workforce problems. These amendments are easy to negotiate with the three trades. "I haven't run into a roadblock here… there's no delays" (Gabe LeFave).

CONCLUSION

These results show that companies have largely navigated the national tri-trade solar agreement as the three trades intended. Developers and contractors noted the ability to grow the construction labor pool, automatic IRA compliance, clear task assignment, implementation support, and a level of flexibility that makes it easy for companies to sign on and free to leave the agreement when their project ends. The problems companies mentioned with the agreement are small and—for the most part—remediable.

The National Tri-Trade Solar Agreement is proving to be a strong agreement that offers a quick, simple, and flexible way to partner with organized labor and secure the myriad benefits of those relationships. The biggest question Rob Rieke raised about the agreement was whether the three trades might consider designing an agreement to facilitate the next stage for these solar projects: their maintenance. Given the success of the current agreement,

unions might consider similar models to protect workers across a broader range of industries than before.

As the solar power industry grows, the NTTSA is helping ensure that companies can build projects quickly and cost-effectively. The agreement has enabled contractors and developers to work with union labor, who bring to projects the many benefits listed in this paper, with flexibility and has proved overwhelmingly popular across the solar industry.