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Building Good Local Jobs on Utility-Scale Clean Energy Projects in Wisconsin

The Impact of High-Road Labor and Contracting Standards

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Executive Summary

In 2019, the State of Wisconsin established a goal of reaching 100 percent carbon-free electricity by 2050. This will require historic investments in utility-scale clean energy infrastructure as well as policy considerations which can spur economic growth and create jobs while promoting both environmental and public health.

Wisconsin significantly lags neighboring states in clean energy production, but large utility companies have committed to becoming carbon-neutral by 2050.

- Fossil fuel energy currently accounts for 72 percent of Wisconsin's utility-scale net electricity generation.
- Zero-carbon and renewable sources account for just 28 percent of utility-scale electricity generated in Wisconsin compared to 67 percent in Illinois, 61 percent in Iowa, and 53 percent in Minnesota.
- Wisconsin needs to install 8 gigawatts (GW) of additional clean energy to become 100 percent carbon-free, which could create 34,000 jobs and spur $21 billion in economic activity.

The clean energy sector is expected to be a major job creator over the next decade, but Wisconsin may not fully capitalize on these clean energy impacts if a substantial number of wind and solar projects are awarded to developers with nonlocal workers.

- Every $1 billion invested in clean energy creates $1.63 billion in economic activity and $153 million in state and local tax revenues, both more than similar investments in fossil fuels.
- Clean energy workers are more likely to be military veterans, more likely to require construction skills, and more likely to be employed by small businesses than Wisconsin's workforce as a whole.
- Local workers have installed 86 percent of Wisconsin's utility-scale wind and solar capacity.
- A case study of two 150 megawatt (MW) solar projects reveals that the use of out-of-state workers costs Wisconsin's economy $91 million, over 200 construction jobs, and $4 million in lost tax revenues.

In the face of a national labor shortage, utility companies and developers in Wisconsin face strong competition in attracting, developing, and retaining skilled local workers on the path to 100 percent clean energy.

- Joint labor-management apprenticeship programs train 81 percent of all construction apprentices in Wisconsin, who earn average incomes ($67,200 per year) that rival workers with bachelor's degrees.
- In Wisconsin, union worksites are 33 percent less likely to have an Occupational Safety and Health Administration violation and have 59 percent fewer violations per inspection than nonunion worksites.
- Union contractors have been 14 percent less likely to experience difficulty filling craft positions and 21 percent less likely to have project delays due to shortages of workers than nonunion contractors.
- There is little to no cost difference between union projects and nonunion projects, especially after accounting for productivity, training, and safety.

Public policy could play a critical role in meeting Wisconsin's clean energy production, economic, and workforce development goals.

- The clean energy Investment Tax Credit provisions of the Build Back Better Act would boost the labor market competitiveness of clean energy jobs and make union-built projects 24 to 26 percent cheaper than the nonunion alternative if a version of the bill is passed in 2022.
- Project labor agreements would boost hiring and apprenticeship training for local tradespeople.
- Responsible bidder provisions would increase the chances that clean energy projects would be built by contractors with proven track records that invest in apprenticeship training, which is critical to meeting the clean energy sector's long-term labor supply needs.

Wisconsin requires bold investments to become 100 percent carbon-free by 2050. To attract, develop, and retain the skilled local labor force that will be needed to realize these ambitious goals, utility companies should strongly consider implementing high-road labor and contracting standards and promote public policies that demonstrably improve job quality, deliver broad-based economic prosperity, and control costs for ratepayers and consumers.

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Introduction

A thriving and sustainable economy is dependent upon affordable energy. As public initiatives and private investments in the United States have moved towards cleaner alternatives, solar power and wind power have become the primary sources of renewable energy. Historic investments in clean energy infrastructure in Wisconsin can be an efficient way to spur economic growth because, over the past decade, the cost of developing wind power projects has dropped by 69 percent and the cost of developing solar power projects has dropped by more than 85 percent (Lazard, 2018).

Wisconsin trails neighboring states in clean energy production, but future investments are planned. While there are currently 10 utility-scale wind farms and 20 utility-scale solar farms operating in Wisconsin, wind energy accounts for less than 3 percent of electricity produced and solar power contributes less than 0.3 percent to the state's net generation (EIA, 2020a). However, Wisconsin has nearly 5.8 gigawatts (GW) of solar power and 1.2 GW of wind power under development (RENEW Wisconsin, 2020).

Clean energy production across Wisconsin is expected to grow over the next decade. Governor Tony Evers signed an Executive Order in 2019 for Wisconsin to reach 100 percent carbon-free electricity by 2050 and the state's largest utility companies have committed to bold investments on the path to becoming carbon-neutral by 2050 (Morehouse, 2019). For example, WEC Energy Group, the state's largest utility, will retire 1.8 GW of coal and natural gas generation as part of its effort to become carbon neutral by 2050 (Kaeding, 2020). Madison-based Alliant Energy Corporation also announced 6 solar power projects in May 2020 that will produce enough solar energy to power 260,000 homes. WEC budgeted a five-year capital improvement plan in solar, wind, and battery storage totaling $16 billion, while Alliant Energy budgeted $2.2 billion over a five-year period towards smarter and greener energy infrastructure (Bollier, 2021).

The transition to renewable energy sources and away from fossil fuels will have important implications for employment and the state's economy. Mitigating the economic hardships faced by workers in traditional energy sectors and creating good family-supporting careers in the clean energy sector will be vital to a successful transition. Improving job quality through labor protections that uphold local living standards and bolster registered apprenticeship programs are necessary to ensure that investments in utility-scale clean energy infrastructure promote broad-based economic opportunity in Wisconsin.

Background on Energy Production in Wisconsin

Wisconsin has slowly become less dependent on coal-fired power plants. For the first time in more than three decades, coal was responsible for less than half of Wisconsin's utility-scale net electricity generation in 2019, accounting for 42 percent of the state's net generation (EIA, 2020b). In 2020, coal-fired energy provided 40 percent of the state's utility-scale net electricity generation (Figure 1). As coal has declined, it has largely been replaced by a transition to cheaper natural gas electric power. Natural gas electricity generation now accounts for 32 percent of the state's total utility-scale net electricity generation.

At 40 percent of utility-scale net electricity production, Wisconsin uses more coal than the national average of 23 percent (Figure 1). Wisconsin also produces less electricity from zero-carbon sources than the national average. Only about 10 percent of the state's utility-scale net electricity generation comes from renewables compared to almost 20 percent of the nation's utility-scale net electricity generation. Similarly, a smaller share of electricity generation is attributable to nuclear power in Wisconsin (18 percent) than the national average (20 percent). Put simply, most of Wisconsin's electricity production still comes from fossil fuels.

Figure 1: Utility-Scale Net Electricity Generation in Wisconsin, December 2020

Utility-Scale Net Electricity Generation (Share of Total) in December 2020		
Energy Source	**Wisconsin**	**United States**
Petroleum-Fired	-	0.3%
Coal-Fired	40.0%	22.8%
Natural Gas-Fired	31.7%	36.4%
Nuclear	17.8%	20.3%
Solar, Wind, and Other Renewables	10.3%	19.5%

Source(s): U.S. Energy Information Administration's "Selected State Comparison" (2021a).

According to the U.S. Energy Information Administration, "Wisconsin consumes almost six times as much energy as it produces" (EIA, 2021a). In 2019, the state produced about 330 trillion British thermal units (Btu) in energy, ranking 28th in the nation for energy production per capita (Figure 2). The state consumed 1,886 trillion Btu in energy, ranking 22nd in the nation for energy consumption per capita (Figure 2). This consumption data includes spending on transportation, which includes items like motor fuel that are generally imported from other states and other countries.

Figure 2: Total Energy Production and Consumption, and Per Capita Metrics, 2019

Total Energy Production, Total Population, and Per Capita (2019)		
Energy or Population Metric	**Wisconsin**	**United States**
Total Population	5,800,000	329,500,000
Total Energy Production (Btu)	330 trillion	95,692 trillion
Energy Production Per Capita (Btu)	56.9 million	290.4 million
Per Capita Production State Rank	28th	-
Total Energy Consumption (Btu)	1,886 trillion	101,084 trillion
Energy Consumption Per Capita (Btu)	325.2 million	306.8 million
Per Capita Consumption State Rank	22nd	-

Source(s): U.S. Energy Information Administration's "Selected State Comparison" (2021a).

According to the Public Service Commission (PSC) of Wisconsin, the state's electricity providers import energy supplies from neighboring states through an interconnected electric grid by the Midcontinent Independent System Operator, Inc. (MISO). In 2020, Wisconsin's electricity providers transferred a net of 1.2 MW in from the local resource zone and another 0.4 MW in net imports from other states and areas. Thus, 1.6 MW of supply was imported to Wisconsin out of 15.6 MW of total net capacity, resulting in a little more than 10 percent of energy imported from out-of-state (PSC, 2020).

Compared with neighboring states, Wisconsin is significantly more reliant on fossil fuel energy production (Figure 3). Fossil fuels account for 72 percent of Wisconsin's total utility-scale net electricity generation. In Michigan – the second most reliant on fossil fuel energy – 57 percent of the utility-scale net electricity generation comes from fossil fuels. While Wisconsin and Michigan produce over 50 percent of their utility-scale net electricity generation from fossil fuel energy, Minnesota, Iowa, and Illinois are less dependent on fossil fuels. These energy sources account for just 46 percent of utility-scale net generation in Minnesota, 39 percent in Iowa, and 33 percent in Illinois.

Wisconsin is behind its neighbors in clean energy production (Figure 3). The state ranks 34th nationally in wind, solar, and energy storage operations and 25th in the share of electricity production that comes from wind and solar (ACP, 2021). In Wisconsin, clean energy accounts for a 13 percent smaller share of total energy produced by utilities than in Michigan and a 39 percent smaller share than in Illinois. One reason for this discrepancy is that Wisconsin has less nuclear power. Electricity from nuclear power plants accounts for larger shares of utility-scale net electricity generation in Illinois (56 percent), Michigan (31 percent), and Minnesota (25 percent) than in Wisconsin (18 percent). However, Iowa produces no nuclear energy and still has a larger share of the state's utility-scale energy portfolio coming from clean energy sources (61 percent) than Wisconsin (28 percent). Iowa's last nuclear power plant, which closed in 2020, will be turned into a solar farm, replacing one zero-carbon energy source with another (Lewis, 2021).

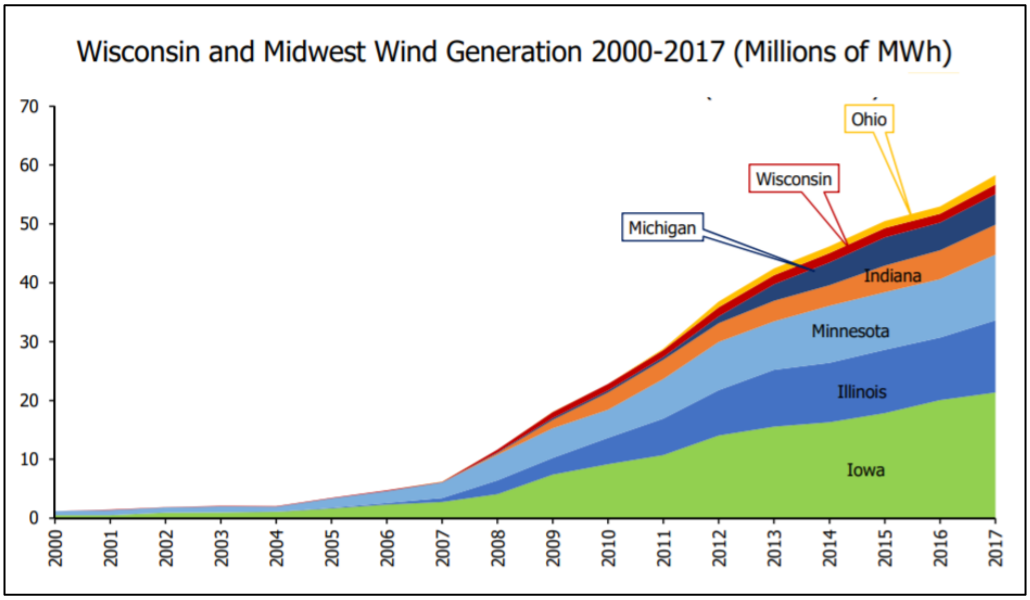
Figure 3: Utility-Scale Net Electricity Generation in Midwest, December 2020

Utility-Scale Net Electricity Generation (Share of Total) in December 2020					
Energy Source	**Wisconsin**	**Iowa**	**Illinois**	**Michigan**	**Minnesota**
Petroleum-Fired	N/A	0.1%	N/A	0.1%	0.1%
Coal-Fired	40.0%	27.9%	22.5%	31.3%	30.5%
Natural Gas-Fired	31.7%	11.2%	10.5%	25.3%	15.8%
Nuclear	17.8%	N/A	55.5%	30.9%	25.0%
Solar, Wind, and Other Renewables	10.3%	60.7%	11.1%	10.6%	28.1%
Percent Fossil Fuel Energy	71.7%	39.2%	33.0%	56.7%	46.4%
Percent Clean Energy*	28.1%	60.7%	66.6%	41.5%	53.1%

*Source(s): U.S. Energy Information Administration's "Selected State Comparison" (2021a). Totals do not add up to 100 percent; the remainder is other or unknown sources. *Nuclear energy is a zero-emission energy source and is included with renewables.*

Finally, Figure 4 graphically illustrates Wisconsin's delay in clean energy production relative to other Midwest states. Wind energy generation ramped up in 2008 in the Midwest and has increased every year since. The growth of wind energy in Wisconsin, however, has still lagged behind states with similar populations, like Minnesota, Indiana, and Iowa.

Figure 4: Wind Generation in the Midwest, 2000-2017



Source(s): Public Service Commission (PSC) of Wisconsin "Wisconsin Energy Statistics: 2020" (2020).

Transitioning to 100 Percent Clean Energy by 2050

According to the U.S. Energy Information Administration (EIA), Wisconsin has about 16 GW of installed capacity (Figure 5). Capacity is the maximum output that generating equipment can supply to system load at a given time (EIA, 2021b). Over the five-year period between 2015 and 2019, Wisconsin had an average capacity of 6.5 GW from coal, 6.7 GW from natural gas, and 0.7 GW from petroleum – amounting to 13.9 GW from fossil fuel-based sources that would need to be replaced in a transition to 100 percent clean energy. Wisconsin also has 1.2 GW derived from nuclear power, 0.4 GW from hydroelectric power, 0.4 GW from wind power, and a marginal amount from solar power.

Figure 5: Average Installed Capacity in Wisconsin by Energy Source, 2015-2019

Installed Capacity (in GW)	2015-2019 Average	Share of Total	Annual Capacity in GW				
			2015	2016	2017	2018	2019
Total Capacity	**16.26 GW**	**100.0%**	**16.67**	**16.84**	**16.97**	**15.52**	**15.31**
Fossil Fuel-Based Sources							
Natural Gas	6.67 GW	41.0%	6.32	6.72	6.73	6.81	6.78
Coal	6.54 GW	40.2%	7.37	7.12	7.13	5.55	5.54
Petroleum	0.67 GW	4.1%	0.66	0.68	0.66	0.69	0.64
Other	0.40 GW	2.5%	0.38	0.28	0.41	0.53	0.41
Clean Energy and Renewables							
Nuclear	1.20 GW	7.4%	1.20	1.19	1.19	1.20	1.20
Hydroelectric	0.39 GW	2.4%	0.38	0.39	0.39	0.39	0.41
Wind	0.37 GW	2.3%	0.32	0.44	0.43	0.33	0.33
Solar	0.02 GW	0.1%	0.04	0.02	0.02	0.00	0.00

Source(s): U.S. Energy Information Administration's "Wisconsin Electricity Profile 2019" (2021b). Totals may not add up perfectly due to rounding.

If planned developments are built and replace the fossil fuel-based sources, clean energy sources will soon account for over 50 percent of Wisconsin's installed capacity (Figure 6). According to RENEW Wisconsin, the state has 5.8 GW of solar power and 1.2 GW of wind power under development (RENEW Wisconsin, 2020). This would bring Wisconsin's wind, solar, nuclear, and hydroelectric capacity up to 8.9 GW, accounting for 55 percent of Wisconsin's capacity of 16.2 GW. However, Wisconsin would still need to install about 8 GW of clean energy to become 100 percent carbon-free by 2050, holding all else constant.

Figure 6: Impact of Planned Wind and Solar Developments on Installed Capacity in Wisconsin by 2035

Installed Capacity (in GW)	2015-2019 Average	Current Share	Potential Change Due to Developments	Potential Share
Total Capacity	**16.26 GW**	**100.0%**	**16.26 GW**	**100.0%**
Fossil Fuel-Based Sources	14.28 GW	87.8%	7.33 GW	45.1%
Nuclear	1.20 GW	7.4%	1.20 GW	7.4%
Hydroelectric	0.39 GW	2.4%	0.39 GW	2.4%
Wind	0.37 GW	2.3%	1.56 GW	9.6%
Solar	0.02 GW	0.1%	5.77 GW	35.5%

Source(s): U.S. Energy Information Administration's "Wisconsin Electricity Profile 2019" (2021b), and RENEW Wisconsin's Large Scale Solar & Wind Deployment for Wisconsin *(2020). Totals may not add up perfectly due to rounding.*

Figure 7 provides an illustrative example to demonstrate how Wisconsin could add to planned developments and become 100 percent carbon-free by installing 8 GW of new wind and solar power. The analysis assumes that 50 percent, or 4 GW, of new capacity would come from utility-scale wind farms and 50 percent, or 4 GW, would come from different categories of solar power. Of the solar power, half (2 GW) would come from utility-scale solar facilities, one-quarter (1 GW) would come from commercial systems, and one-quarter (1 GW) would come from "distributed" or residential arrays.

In general, utility-scale systems are more cost-effective than commercial and residential systems. The levelized cost of energy (LCOE) is $43 to $53 per megawatt-hour for utility-scale solar projects compared with a megawatt-hour cost of $76 to $150 for community projects and $187 to $319 for residential projects (Lazard, 2017). Utility-scale wind projects are even cheaper, at $30 to $60 per megawatt-hour. Moreover, utility-scale solar and utility-scale wind projects both compare favorably to new carbon-based projects, with levelized costs of energy of $60 to $143 per megawatt-hour for coal projects and $68 to $106 for natural gas projects (Lazard, 2017).

According to research from the National Renewable Energy Laboratory (NREL) at the U.S. Department of Energy, the average cost to install one watt DC of utility-scale wind power is $1.47 (Stehly & Beiter, 2020). For solar power, the average cost to install at utility-scale is $1.13 per watt, on commercial projects is $1.83 per watt, and on residential homes is $2.70 per watt (Fu et al., 2018). Using these estimates, the total cost to install 8 GW of wind and solar power would cost an estimated $12.7 billion (in current dollars) in Wisconsin. However, federal tax credits significantly reduce this cost estimate. The Investment Tax Credit (ITC), for example, has reduced the cost of solar projects by 32 percent and the production tax credit reduces the cost of wind power by 13 percent, on average (Kirshenberg et al., 2018). After accounting for federal tax credits, the cost to Wisconsin consumers and taxpayers would amount to $9.8 billion over 25 years, or $390 million per year, in current dollars (Figure 7).

Figure 7: Hypothetical Path to 100 by 2050 with Total Costs and Annual Costs over 25 Years

Hypothetical Path to 100 Percent by 2050 Example	Price to Install Per Watt DC	Example GW Installed	Estimates in Billions			Cost to State Per Year (in Millions)
			Total Cost	Federal Credits	Cost to State	
Utility-Scale Wind	$1.47	4	$5.88	$0.77	$5.11	$204.4
Utility-Scale Solar	$1.13	2	$2.26	$0.72	$1.54	$61.6
Commercial Solar	$1.83	1	$1.83	$0.58	$1.25	$50.0
Residential Solar	$2.70	1	$2.70	$0.86	$1.84	$73.6
Total Wind and Solar	**$1.58**	**8**	**$12.67**	**$2.92**	**$9.75**	**$390.0**

Source(s): Author's analysis using data from Fu et al.'s U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018 *(2018), Stehly and Beiter's* 2018 Cost of Wind Energy Review *(2020), Kirshenberg et al.'s* Examination of Federal Financial Assistance in the Renewable Energy Market *(2018), and the U.S. Energy Information Administration's "Wisconsin Electricity Profile 2019" (2021c) with planned developments according to RENEW Wisconsin's* Large Scale Solar & Wind Deployment for Wisconsin *(2020) also incorporated. Totals may not add up perfectly due to rounding.*

What would this mean for the average household's utility bill? In 2019, residences spent $5.0 billion on energy while commercial and industrial business establishments spent a combined $7.4 billion (EIA, 2021a). This means that households accounted for 40 percent of the $12.6 billion in total non-transportation electricity costs (Figure 8). A $390 million annual increase would represent a 3 percent rise in total costs, or less than $4 per month for the average household (EIA, 2021b). Wisconsin would go from having the 10th-cheapest average utility bills at $99.42 per month to 12th-cheapest at $102.40 per month. Average utility bills in Wisconsin would remain on par with Minnesota ($102.11 per month) and would remain below Iowa ($107.78 per month), Michigan ($109.86 per month), and the national average ($117.46 per month) – all while transitioning to 100 percent renewable energy (EIA, 2021b).[1]

Figure 8: Share of Total Energy Expenditures (Excluding Transportation) in Wisconsin, 2019

Consumption by End-Use Sector	Total Expenditures	Share of Expenditures
Residential	$4,952,000,000	40.1%
Commercial	$3,408,000,000	27.6%
Industrial	$3,983,000,000	32.3%
Total	**$12,343,000,000**	**100.0%**
Potential Annual Increase	**+$390,000,000**	**+3.2%**

Source(s): U.S. Energy Information Administration (2021a), "Selected State Comparison." Totals may not add up perfectly due to rounding.

This analysis uses IMPLAN, an industry-standard economic modeling software that inputs U.S. Census Bureau data, accounts for the interrelationship between households and businesses, and follows dollars as they cycle throughout the economy (IMPLAN, 2021). In total, this hypothetical example of a path to 100 percent renewable energy would save or create about 1,400 jobs per year (Figure 9). This is based on a $507 million investment per year, of which $390 million would be covered by consumers and taxpayers in Wisconsin. Over 25 years, Wisconsin would save or create 34,000 total job-years. The transition to 100 percent renewable energy would boost Wisconsin's economy by $824 million per year ($20.6 billion in total over 25 years) and increase state and local tax revenues by $77 million per year ($1.9 billion in over 25 years), further offsetting initial costs.

Figure 9: Economic and Tax Impacts of the Hypothetical Path to 100 Over 25 Years, Annual and Total

Economic Impacts of Installing 8 GW of Clean Energy in Wisconsin	Total Jobs Created	Direct Jobs Created	Economic Activity (in GDP)	State and Local Tax Revenues
Annual Impact Per Year	+1,358	+202	+$824,000,000	+$77,000,000
Full Impacts over 20 Years	**+33,961**	**+5,048**	**+$20,592,000,000**	**+$1,933,000,000**

Source(s): Author's analysis using IMPLAN (2021). All estimates are in constant 2021 dollars and all inputs come from Fu et al.'s U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018 *(2018), Stehly and Beiter's* 2018 Cost of Wind Energy Review *(2020), Kirshenberg et al.'s* Examination of Federal Financial Assistance in the Renewable Energy Market *(2018), the U.S. Energy Information Administration's "Wisconsin Electricity Profile 2019" (2021b), and RENEW Wisconsin's* Large Scale Solar & Wind Deployment for Wisconsin *(2020). Totals may not add up perfectly due to rounding.*

The Economic Impact of the Clean Energy Sector

The clean energy sector is expected to be a major job creator in the future. Globally, research has found that doubling the share of renewable energy by 2030 would create about 24 million total jobs (ILO, 2018). Nationally, a study by the Political Economy Research Institute at the University of Massachusetts found that investments in clean energy create three times as many jobs, on average, as fossil fuel energy (Cohen, 2019). Another report found that clean energy investment creates more jobs for every $1 billion invested than the fossil-fuel industry (Pollin et al., 2009).

[1] Currently, Utah, New Mexico, Colorado, Illinois, Idaho, Washington, Maine, Montana, and Wyoming have cheaper average monthly bills. With a 25-year plan to transition to clean energy sources, Minnesota and Oregon would also be cheaper (EIA, 2020b).

A 2021 analysis using IMPLAN finds that clean energy investments can deliver superior economic value for Wisconsin communities (Figure 10). For every $1 billion invested in wind and solar power generation in Wisconsin, nearly 2,700 total jobs are created – including about 400 direct construction and operations jobs. For every $1 billion invested in fossil fuel power generation, about 3,100 total jobs are created, including about 650 direct jobs. However, as of 2021, wind and solar power investments produce a larger multiplier effect on the rest of the economy than investing in fossil fuel energy. Every $1 billion invested in wind and solar energy boosts the state's gross domestic product (GDP) by $1.63 billion and increases state and local tax revenues by $153 million. By contrast, every $1 billion invested in fossil fuel energy generates a return of $1.61 billion and $134 million in state and local tax revenues (IMPLAN, 2021).

Figure 10: Impact of $1 Billion Energy Investment in Wisconsin, 2022

Electric Power Generation	Total Jobs	Direct Jobs	Output Multiplier	State and Local Tax Revenues
Wind and Solar Power	**2,680**	**398**	**$1.63**	**$152.6 million**
Fossil Fuels Power	3,069	651	$1.61	$133.8 million

Source: IMPLAN (2021). All estimates in 2022 dollars.

Clean energy is a significant and fast-growing sector of employment in Wisconsin. Prior to the COVID-19 pandemic, there were about 76,000 jobs in clean energy-related occupations in the state (Clean Jobs Midwest, 2021). Most clean energy industry jobs are those in energy efficiency, renewable energy generation, advanced transportation, advanced energy grid, and clean fuels. Clean energy jobs are often broken down by the type of job in the value chain, such as manufacturing, trade, utilities, and construction. When broken down, construction makes up just over 51 percent of the jobs in Wisconsin's clean energy sector, while manufacturing represents 25 percent (Clean Jobs Midwest, 2021). Combined, the Counties of Milwaukee, Dane, and Waukesha totaled more than 29,500 clean energy-related jobs. There were another 20,200 clean energy-related jobs in Wisconsin's rural counties. Additionally, small businesses employing fewer than 20 employees made up 69 percent of the state's clean energy sector and about 12 percent of workers in the sector were veterans – twice the representation of veterans in Wisconsin's overall workforce (RENEW Wisconsin, 2018; Clean Jobs Midwest, 2020).

It is also worth noting that clean energy investments positively impact the economy by protecting the environment. Clean energy investments are associated with reductions in climate-related hazards (e.g., floods) and fewer health risks (e.g., pollution) that can negatively impact workers. The result is fewer days off from work and higher levels of overall worker productivity (ILO, 2018).

Research on the Impact of High-Road Labor and Contracting Standards

One industry that has consistently offered pathways into the middle class for blue-collar workers is construction. This is particularly true for skilled trades workers who complete registered apprenticeship programs. In Wisconsin, experienced-level journeyworkers earn an average of $67,200 per year in annual income, on par with the $69,500 average income from wages and salaries for full-time Wisconsin workers with bachelor's degrees (Manzo et al., 2021). However, joint labor-management apprenticeship programs affiliated with building trades unions are, by far, the largest players in Wisconsin's construction industry. The union apprenticeship programs account for 81 percent of all registered apprentices in construction – including 89 percent of all Black and African American apprentices, 85 percent of all women, and 85 percent of all military veterans (Figure 11).

Figure 11: Demographics of Construction Apprentices in Wisconsin, by Type of Program, 2018

Enrollment of Construction Apprentices in Wisconsin, 2018	Joint Labor-Management (Union) Programs	Employer-Only (Nonunion) Programs	Enrollment Totals for All Programs	Joint (Union) Share
Total (All Apprentices)	7,487	1,775	9,262	**80.8%**
Gender: Male	7,282	1,761	9,043	**80.5%**
Gender: Female	205	14	219	**84.6%**
Race: White	6,706	1,655	7,910	**80.2%**
Race: Black or African American	328	40	368	**89.1%**
Race: Hispanic or Latinx	349	57	406	**85.6%**
Status: Military Veteran	427	78	505	**84.6%**

Source(s): 2018 active apprenticeship data by committee by the Wisconsin Department of Workforce Development (DWD, 2020b).

Prevailing wage standards promote the hiring, development, and retention of skilled workers by encouraging investment in apprenticeship programs. A "prevailing wage" is a minimum wage for different types of skilled construction work on taxpayer-funded and ratepayer-funded construction projects that is based on local market standards of compensation and craftsmanship by institutionalizing "cents-per-hour-worked" contributions to worker training. As of January 2022, 28 states and the District of Columbia have state-level prevailing wage laws (WHD, 2022). Apprenticeship enrollments are up to 8 percent higher and apprentices complete their on-the-job and classroom training at a faster rate in these 28 states (Bilginsoy, 2005). The result is that workers are higher skilled and more productive, with productivity per construction worker between 14 percent and 33 percent higher in states with prevailing wage standards (Philips, 2014). Higher levels of productivity translate into good middle-class incomes for skilled construction workers (Philips, 2014). Blue-collar construction worker earnings were 6 percent higher and employer-provided health insurance coverage was 4 percent higher when Wisconsin had prevailing wage standards on public works projects (Manzo et al., 2020).

Economic research has found that local contractors are awarded more projects in states with prevailing wage laws. Data from the *Economic Census of Construction* reveals that states with prevailing wage laws have 2 percent more of the total value of construction work completed by in-state contractors (Census, 2017). Impacts are even larger in certain areas and on certain projects. In Iowa, state highway projects are 8 percent more likely to be awarded to in-state contractors when they are covered by federal Davis-Bacon prevailing wage standards (Manzo, 2022). In Minnesota, local contractors account for a 10 percent higher market share when prevailing wages are paid on public school projects (Manzo & Duncan, 2018). Conversely, the share of Wisconsin Department of Transportation projects that were awarded to out-of-state contractors increased from 9 percent to 14 percent after the state repealed its prevailing wage law in 2017, an increase that was driven almost entirely by contractors from Iowa, Michigan, and Florida – three states without prevailing wage laws (Manzo et al., 2020).

There have been 19 studies on the impact of prevailing wage laws on the cost of school construction, highway construction, and municipal building projects that have been published in academic journals since 2000 (Figure 12). Peer review is the process of establishing credibility by submitting research to a group of anonymous, independent experts who critically evaluate methodologies and conclusions before being accepted for publication. In total, 16 of these peer-reviewed studies (84 percent) find that prevailing wage laws have no effect on the total construction costs. Prevailing wage standards have no impact on construction costs because labor costs are a low share of total costs in the construction industry, because contractors utilize more capital equipment and hire skilled workers when wages rise in construction, and because workers are more productive – offsetting any effect of paying prevailing wages on total costs (Duncan & Ormiston, 2018; Balistreri et al., 2003; Blankenau & Cassou, 2011; Philips, 2014).

Figure 12: Research on the Impact of Prevailing Wage on the Cost of Public Works Projects Since 2000

Study	Authors	Year	Project Focus	Projects	Geography	Effect
1	Manzo	2022	Highways	1,206	Iowa	No effect
2	Onsarigo, Duncan, & Atalah	2020	School construction	113	Ohio	No effect
3	Duncan & Waddoups	2020	School construction	77	Nevada	No effect
4	Duncan	2015	Highways	132	Colorado	No effect
5	Duncan	2015	Highways	91	Colorado	No effect
6	Duncan, Philips, & Prus	2014	School construction	498	Canada	No effect
7	Kaboub & Kelsay	2014	Public buildings	3,120	12 states*	No effect
8	Atalah	2013	School construction	1,496	Ohio	No effect
9	Atalah	2013	School construction	1,496	Ohio	No effect
10	Duncan, Philips, & Prus	2012	School construction	723	Canada	No effect
11	Kim, Kuo-Liang, & Philips	2012	Municipal projects	141	California	No effect
12	Vincent & Monkkonen	2010	School construction	2,645	United States	13%
13	Duncan, Philips, & Prus	2009	School construction	438	Canada	No effect
14	Duncan, Philips, & Prus	2006	School construction	528	Canada	No effect
15	Azari-Rad, Philips, & Prus	2003	School construction	4,653	United States	No effect
16	Azari-Rad, Philips, & Prus	2002	School construction	4,974	United States	No effect
17	Vitaliano	2002	Highways	50**	United States	8%
18	Keller & Hartman	2001	School construction	25***	Pennsylvania	2%
19	Bilginsoy & Philips	2000	School construction	54	Canada	No effect

*Nebraska, South Dakota, North Dakota, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio.
**The 50 observations are DOT expenditures for all 50 states, and do not account for the amount of new highway construction ordered, which is an important determinant of project costs.
***The analysis did not analyze *actual* projects, but rather conducted hypothetical "wage differentials" for 25 arbitrary projects. Wage differential studies are flawed compared to regression analyses (Duncan & Ormiston, 2018).

Source(s): Individual studies listed in table.

Project labor agreements (PLAs) are local pre-hire agreements covering all crafts on large and complex construction projects that establish comprehensive employment terms and conditions for construction projects. A PLA "operates as a 'job-site constitution,' establishing safe working conditions and rules, project execution and accountability on the job, and protocols for resolving labor disputes without resorting to strikes and lockouts" (Waheed & Herrera, 2014). The principal aim of a PLA is to promote stability and productivity while managing large projects (Kotler, 2009). For project owners (such as utility companies), PLAs include provisions for eliminating strikes and lockouts during construction, providing access to pools of skilled labor, and instituting uniform work rules and consistent shift work to improve efficiency.

Responsible bidder provisions establish objective criteria and verifiable standards for contractors bidding on public infrastructure projects. These provisions typically require proof of participation in apprenticeship training programs, proof of certificates of insurance, prequalification surveys, and compliance with all local, state, and federal laws. As a result, these provisions often serve as a sort of "insurance policy" for project owners, ensuring that projects are built by professional, competent contractors with proven track records – minimizing the risk of additional reconstruction later on. In fact, case studies from across the country have found that responsible bidder provisions promote higher quality and more reliable services, increased competition, and reduced back-end reconstruction and litigation costs (Sonn & Gebreselassie, 2010).

The most recent research on responsible bidder provisions reviewed public projects in Illinois, Indiana, and Ohio. This research finds that these provisions encourage 8 percent more bid competition – including more bids from contractors with proven track records who are most likely to contribute to apprenticeship training programs. Responsible bidder provisions have no statistical impact on total construction costs (Manzo, 2020). After accounting for geographic location, responsible bidder provisions have "no discernible statistical impact on construction bid costs" (Waddoups & May, 2014).

Creating Good Jobs and Retaining Skilled Workers in the Clean Energy Sector

Wisconsin may not fully capitalize on these clean energy jobs if a substantial number of wind and solar projects are awarded to out-of-state developers and built using out-of-state workers. One recent study found that North Dakota's economy loses an estimated $62 million per year to out-of-state contractors on wind energy infrastructure projects alone, and nonlocal workers account for approximately 86 percent of the construction workforce on North Dakota's wind projects (Schramm, 2019). In neighboring Minnesota, the Red Pine Wind Farm, constructed in 2017, recently employed out-of-state workers (Hatt & Franco, 2018).

Figure 13: Utility-Scale Wind and Solar Projects in Wisconsin with Known Resident Status, 2001-2021

Year in Service	Majority of Workers	Contractor Status	Power Plant	Type	County	Capacity (MW)
2001	Local	Union	Montfort Wind Energy Center	Wind	Iowa	30.0
2008	Local	Union	Blue Sky Green Field Wind	Wind	Fond du Lac	145.2
2008	Local	Union	Cedar Ridge Wind	Wind	Fond du Lac	67.7
2008	Local	Union	Forward Energy Center	Wind	Fond du Lac	44.6
2009	Local	Union	Butler Ridge	Wind	Dodge	54.0
2012	Local	Union	Galactic Wind Project	Wind	Dane	9.9
2017	Local	Union	Quilt Block Wind Farm	Wind	Lafayette	98.0
2020	Local	Mix	Two Creeks Solar Project	Solar	Manitowoc And Kewaunee	150.0
2021	Local	Union	O'Brien Solar Fields	Solar	Dane	20.0
2021	Local	Mix	Point Beach Solar Energy Center	Solar	Manitowoc	100.0
2021	Nonlocal	Nonunion	Badger Hollow Solar Farm	Solar	Iowa	150.0
Total	**Local and Union (62.3%)**					**661.4**
Total	**Local and a Mix of Union and Nonunion (23.6%)**					**251.0**
Total	**Nonlocal and Nonunion (14.1%)**					**150.0**

Source: Authors' analysis of application documents submitted by Alliant Energy Corporation to the Public Service Commission (PSC) of Wisconsin (2021a). Authors could determine whether a local construction manager or out-of-state construction manager was awarded a project and whether the construction manager used union or nonunion labor on these 11 projects.

Since 2001, there have been 11 utility-scale solar and wind projects built in Wisconsin for which information was available on whether the project was constructed using either local workers or out-of-state workers (Figure 13). The total capacity of these 11 projects equals 1,062 MW, or over 1 GW. In-state workers have installed 912 MW (86 percent) of the state's wind and solar capacity, including 661 MW (62 percent) by local union construction workers and 251 MW (24 percent) by local crews involving a mix of union and nonunion employees. The remaining 150 MW (14 percent) has been installed by nonunion workers, a majority of whom were out-of-state residents.

The use of nonunion, nonlocal labor has negative consequences for Wisconsin's economy. The use of nonlocal workers results in a leakage of economic activity out-of-state because the workers take most of their income back home with them upon project completion. Wages earned by in-state construction workers are re-circulated in the economy, creating additional jobs at local businesses. Conversely, out-of-state workers tend to limit spending to a small portion of their disposable income while working, saving major purchases like cars, clothing, furniture, dining, and medical care for businesses in their home states (Hatt & Franco, 2018). The result is a loss of aggregate consumer demand for the state where the project is being built.

Figure 14 provides a case study on the impact of using nonlocal workers. According to estimates from WEC Energy Group, the 150 MW of capacity from Phase I of the Badger Hollow Solar Farm that was built in Iowa County by nonunion, mostly nonlocal labor cost $195 million, or $1.299 per watt. In documents submitted to the Public Service Commission, WEC Energy Group estimated that only 25 percent of the workers were local workers (PSC, 2021a). The entire project Badger Hollow Solar Farm will generate 300 MW of capacity and will save or create 500 jobs, according to an economic impact analysis (Loomis, 2018). Assuming that half of the direct construction and related jobs occurred during Phase I, an estimated 250 jobs were created or saved on this project, but local workers only accounted for 63 of these jobs. Phase I of this project boosted Wisconsin's economy by an estimated $240 million, created about 200 local jobs, and increased state and local tax revenues by $27 million (Figure 14).

By contrast, Alliant Energy is planning to build a similarly-sized solar project a little more than 100 miles north in Wood County. A union construction manager has been selected to carry out the project, which will have an installed capacity of just under 150 MW upon completion. Despite an expectation that the project will employ local workers, Alliant Energy estimates that the Wood County Solar Project will cost the same amount to install per kW as WEC Energy Group's Badger Hollow Solar Farm. The project is projected to employ 300 workers at peak construction according to application documents submitted to the Public Service Commission by Alliant Energy (PSC, 2021a). By using local union labor, however, the project will boost Wisconsin's economy by an estimated $331 million, save or create nearly 600 total jobs, and generate $31 million in state and local tax revenues (Figure 14).

Figure 14 demonstrates that using a nonlocal workforce on utility-scale clean energy projects would result in less economic output, fewer jobs, and reduced tax revenues in Wisconsin. The nonunion project employed 237 fewer local workers in construction and related sectors than the union project is expected to employ, causing less money to circulate in the local economy. A total of 128 fewer "induced jobs" were created on the nonunion project due to this drop in aggregate consumer demand than will be created on the union project. The result is a $91 million difference in economic output, with a multiplier effect that is 28 percent smaller, on the project using nonunion and mostly out-of-state labor. State and local governments also collected about $4 million less than in tax revenues than they would have had the project been built entirely by local workers. While the use of nonunion, out-of-state workers did not save the utility company any money on Phase I of the Badger Hollow Solar Farm project, it cost Wisconsin residents $91 million in economic activity, $4 million in state and local tax revenues, over 200 local construction jobs, and more than 100 local jobs in other sectors of the economy (Figure 14). Phase II of the Badger Hollow Solar Farm project may produce dramatically different results if the workforce is composed of local Wisconsin residents.

Figure 14: Case Study on the Use of Out-of-State Labor vs. Local Workers on Utility-Scale Solar Projects

Wisconsin Case Study: Two Utility-Scale Solar Projects	Badger Hollow Solar Farm Phase I Only (2021)	Wood County Solar Project (Planned)	Impact of Using Nonlocal Workers
Location	Iowa County	Wood County	--
Capacity	150 MW	149.8 MW	+0.1%
Estimated Cost	$195 million	$194 million	+0.1%
Construction Manager Status	Nonunion	Union	--
Construction Workforce Status	75% nonlocal	100% local	+75.0% nonlocal
Estimated Cost per kW	$1,299	$1,299	±0.0%
Direct Construction and Related Jobs	250	300	-50
Direct Jobs for In-State Workers	**63**	**300**	**-237**
Total Compensation of In-State Workers	$5.0 million	$23.2 million	-$18.2 million
Total Local Jobs Created	**218**	**582**	**-364**
• Due to Project Itself	• 78	• 77	• +1
• Due to Local Construction Workers	• 63	• 300	• -237
• Due to Workers' Consumer Demand	• 77	• 205	• -128
Total Economic Output (Business Sales)	**$239.9 million**	**$331.2 million**	**-$91.3 million**
• Due to Project Itself	• $195.0 million	• $194.0 million	• +$1.0 million
• Due to Local Construction Workers	• $23.4 million	• $107.5 million	• -$84.1 million
• Due to Workers' Consumer Demand	• $21.5 million	• $29.7 million	• -$8.2 million
Economic Multiplier Per Dollar Invested	$1.23	$1.71	-28.0%
Total State and Local Tax Revenues	**$26.5 million**	**$30.6 million**	**-$4.1 million**

Source: Authors' analysis application documents submitted by Alliant Energy Corporation to the Public Service Commission (PSC) of Wisconsin (2021a) using IMPLAN (2021). All estimates in 2021 dollars.

As a cautionary tale, estimates from Figure 14 could be extrapolated to show the hypothetical difference between hiring local workers and nonlocal workers to install 8 GW of wind, solar, and other renewable infrastructure in Wisconsin on the path to 100 percent clean energy. The impact of using a nonlocal workforce on similarly-sized 150 MW projects is 364 fewer jobs for local workers, $91 million less in economic output, and $4 million lost in tax revenues. Based on these findings, the hypothetical worst-case scenario equates to 12,640 fewer local jobs, $4.9 billion less in economic output, and $219 million in lost tax revenues over 25 years if the 8 GW is completed by a largely nonlocal workforce.

While some developers and utilities may claim that using local workers who earn high wages and fringe benefits is cost-prohibitive, there is little evidence to support this claim (Jones, 2020). Intuitive "back-of-the-envelope" calculations demonstrate that the payment of market-competitive wages and benefits has little to no effect on total costs on utility-scale solar projects (Figure 15). According to the National Renewable Energy Laboratory, labor installation costs on a 10-MW utility-scale solar system generating power that is fed into an electrical grid averaged just 11 cents per watt (Fu et al., 2018). This represented just 9 percent of the total benchmark installation cost of $1.25 per watt in 2018. With labor install costs averaging 9 percent of total project costs, increasing total compensation by 19 percent in order to compete with the fossil fuel electrical power generation and natural gas distribution sectors would only increase total costs on clean energy projects by 2 percent. Similarly, with high-road labor standards on Wisconsin's clean energy projects, blue-collar construction workers would earn approximately 6 percent more (Manzo et al., 2020). This increase would only affect labor costs, meaning that it would increase the total cost to install utility-scale solar projects by less than 1 percent. These "back-of-the-envelope" calculations, however, fail to account for any improvements in labor productivity, apprenticeship training, and other cost efficiencies that tend to occur when wages rise in construction and can fully offset the change in labor costs (Manzo & Duncan, 2018).

Figure 15: Hypothetical Change in 10-MW Utility-Scale Solar Fixed-Tilt Project Costs Due to Higher Pay

"Wage Differential" Approach: Labor Cost x Increase in Labor Rate	Wage Increase to Compete with Fossil Fuels	Wage Increase with High-Road Labor Standards
Total System Cost Per Watt	$1.25	$1.25
Install Labor Cost Per Watt	$0.11	$0.11
Labor Share of Total Cost	*8.8%*	*8.8%*
Increase in Worker Earnings	*+19.0%*	*+6.4%*
Hypothetical Impact on Total Costs	**+1.7%**	**+0.6%**

Source(s): Author's analysis using Fu et al.'s U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018 *(2018) and the U.S. Census Bureau's 2018 County Business Patterns (2021).*

Given the physical demands and inherent gangers of construction work, it is also important to note that safety outcomes in Wisconsin's union construction industry are far superior to the nonunion segment of the industry (Figure 16). In 2019, the Occupational Safety and Health Administration (OSHA) conducted 582 inspections at construction worksites in Wisconsin – including 66 at union jobsites and 516 at nonunion jobsites (OSHA, 2021). Union worksites experienced at least one violation 38 percent of the time and averaged 0.6 violations per inspection while nonunion worksites were cited with a violation 71 percent of the time and averaged 1.4 violations per inspection. Union worksites are thus 33 percent less likely to have an OSHA violation and have 59 percent fewer violations per inspection in Wisconsin. Union construction worksites are safer than nonunion construction worksites in part because the union construction industry trains its workforce to be both productive and safe in rigorous joint labor-management apprenticeship programs and in part because union workers are more aware of and more empowered to exercise their labor rights to promote safer workplaces.

Figure 16: OSHA Inspections and Violations at Construction Jobsites by Union States in Wisconsin, 2019

"Wage Differential" Approach: Labor Cost x Increase in Labor Rate	Union Worksites	Nonunion Worksites	Union Impact on Violations
Total Count	66	516	--
Violations Rate	37.9%	70.7%	**-32.9%**
Average Violations Per Inspection	0.59	1.44	**-59.0%**

Source(s): Authors' analysis of Occupational Safety and Health Administration (OSHA) inspection data at establishments with construction industry NAICS codes (230000 to 239999) in 2019 (2021).

The cost to produce utility-scale clean energy projects can change dramatically based on external market forces. Take, for example, recent Certificate of Authority documents submitted by Alliant Energy. Project cost estimates for six upcoming solar projects that will install a total of 414 MW of solar capacity increased from $1.29 per watt – similar to the national benchmark of $1.25 per watt – up to $1.39 per watt (Fu et al., 2018; PSC, 2021b). Alliant attributed these price increases to "unusual and unexpected market shifts and increased logistical issues, caused at least in part by the COVID-19 pandemic" that "have impacted not just the electric power sector, but other industries as well" (PSC, 2021b). In fact, according to a national survey of construction firms by the Associated General Contractors (AGC) of America, approximately eight-in-ten construction firms said that they are experiencing delays in project completion due to shortages of materials (AGC, 2021).

However, the same survey revealed that union contractors have been better able to staff up and make adjustments in the face of a national labor shortage (Figure 17). A total of 46 percent of union contractors have added workers in the past 12 months, compared to just 38 percent of nonunion contractors. While 72 percent of union contractors have job openings for craft workers and are having a hard time filling those positions, the share of nonunion contractors reporting difficulty finding workers is 86 percent. Furthermore, only 47 percent of union contractors reported that they are experiencing delays in project completion times due to shortages of workers compared to 68 percent of nonunion contractors. Because they have access to local hiring halls and because their training investments are institutionalized in well-funded joint labor-management apprenticeship programs, union contractors have been 8 percent more likely to add workers, 14 percent less likely to experience difficulty filling craft positions, and 21 percent less likely to have project delays than nonunion firms over the past 12 months. This access to a stable supply of skilled, safe construction workers helps more projects get completed on time, which can offset any upfront cost differential between using union workers and nonunion workers.

Figure 17: National Survey of Construction Firms, Responses to Labor Questions, by Union Status, 2021

Firms in the Construction Industry	Union	Nonunion	Union Difference
Added workers in past 12 months	46%	38%	**+8%**
Has open craft positions *and* is having a hard time filling some or all positions	72%	86%	**-14%**
Experiencing delays in project completion times due to shortages of workers	47%	68%	**-21%**
Experiencing delays in project completion times due to shortages of materials	78%	80%	**-2%**

Source(s): Associated General Contractors (AGC) of America's "2021 Workforce Survey Results," based on responses from 2,136 construction firms. The sample size for "open-shop" (nonunion) firms was 899 and the sample size for union firms was 385 (AGC, 2021).

Finally, public policy could significantly incentivize the use of skilled local workers who earn market-competitive wages and fringe benefits (Figure 18). The Build Back Better Act, a budget reconciliation bill proposed by Congress, would extend the Investment Tax Credit (ITC) to solar and wind electric generating facilities exceeding 1 MW. The tax credit would cover 30 percent of total project costs if the project owner pays Davis-Bacon prevailing wages and meets an apprenticeship ratio of 10 percent in 2023 and 15 percent by 2024. The tax credit would only cover 6 percent of total project costs if the owner does not pay prevailing wages or does not meet the apprenticeship ratios (Moran et al., 2021; House Rules Committee, 2021). Because union contractors often offer compensation packages that meet or exceed Davis-Bacon prevailing wage rates and fund joint labor-management training programs that train 81 percent of the state's construction apprentices, they would meet the requirements for the larger tax credit. In contrast, nonunion contractors may have difficulty meeting both requirements. As a result, these changes to the Investment Tax Credit would reduce Alliant's cost on union-built projects to $0.97 per watt based on updated project estimates, down from $1.39 per watt. Alliant's cost on projects completed by nonunion firms would be decreased to between $1.28 per watt and $1.30 per watt, depending on assumptions about the cost, productivity, safety, and quality differences between union and nonunion contractors. Ultimately, if a version of the Build Back Better Act is passed in 2022 with these clean energy provisions, union-built solar and wind projects will become 24 to 26 percent cheaper from the utility's perspective than comparable nonunion-built projects.

As Wisconsin rebounds from the COVID-19 pandemic, ratepayer-funded and taxpayer-subsidized investments in clean energy projects will be critical to promoting economic development. However, other expenditures in roads and bridges, water and sewer systems, broadband connectivity, and vital infrastructure projects spurred by the federal Infrastructure Investment and Jobs Act will require qualified craft workers as well (Biden White House, 2021). Wisconsin's utility companies can attract, develop, and retain skilled and safe tradespeople through high-road labor and contracting standards.

Figure 18: Updated Costs of Alliant Energy Projects, with and without Build Back Better Act

12 Alliant Projects by Contractor Status	If Union Projects are No More Costly		If Union Projects are 1.7% More Costly	
	Cost Per kW	Cost Per kW with BBB Act	Cost Per kW	Cost Per kW with BBB Act
Union Projects	$1.39	$0.97	$1.39	$0.97
Nonunion Projects	$1.39	$1.30	$1.36	$1.28
Union Difference	**+0.0%**	**-25.5%**	**+1.7%**	**-24.3%**

Source: Authors' analysis of revised application documents submitted by Alliant Energy Corporation to the Public Service Commission (PSC) of Wisconsin (2021b). Estimated costs to Alliant for union projects are multiplied by 70 percent if a modified version of the Build Back Better Act is passed, with the federal government covering 30 percent of the cost through the Investment Tax Credit. Estimated costs to Alliant for nonunion projects are multiplied by 94 percent if a modified version of the Build Back Better Act is passed, with the federal government covering 6 percent of the cost (Moran et al., 2021).

Implementing project labor agreements (PLAs) would create jobs for local tradespeople in Wisconsin while introducing apprenticeship ratios, targeted hire goals, and disadvantaged business procurement policies to help diversify the workforce (Manzo & Bruno, 2015). Responsible bidder provisions would increase the chances that clean energy projects would be built by contractors who are significantly more likely to invest in apprenticeship training and have proven track records of success (Manzo, 2020). Labor neutrality agreements would ensure further that the utility companies will not take a position in an organizing drive, allowing construction workers in the clean energy space the ability to choose whether or not to form or join a union – which can pay dividends in the form of "a more harmonious productive workforce and better relations with the public" (Freeman et al., 2016). Numerous studies have shown that these market standards in the construction industry have not raised costs because productivity improvements make up for higher wages and benefits (Zabin, 2020).

Without these high-road labor and contracting standards, the only other ways to develop skilled workers in the clean energy sector are by investments in apprenticeship readiness programs and retraining programs. Wisconsin can increase funding and staffing efforts among developers, utilities, contractors, unions, nonprofits, and community development agencies to actively recruit young workers, people of color, women, and other people from disadvantaged communities into apprenticeship readiness programs for lifelong careers in clean energy and construction. The State of Wisconsin could also partner with existing programs to transition and retrain workers who become displaced from jobs with high wages and family-sustaining benefits in traditional energy sectors.

Conclusion

Wisconsin lags neighboring states in clean energy production and requires bold investments to become 100 percent carbon-free by 2050. Nevertheless, Wisconsin has recently reduced its reliance on coal-fired power plants and clean energy is expected to be a major job creator in the future, with wind and solar infrastructure now having a greater return on investment than fossil fuel-based projects. Led by utility companies, the path to 100 percent zero-carbon and renewable energy can create 34,000 jobs and $21 billion in economic activity over 25 years in Wisconsin. Economic impacts would be significantly reduced if large shares of clean energy projects are built by out-of-state firms with lower-paid, less-skilled workers. To attract, develop, and retain skilled, productive, and safe local workers for clean energy careers, utility companies should implement high-road labor and contracting standards and promote public policies that improve job quality and deliver broad-based economic prosperity. These include using union contractors who are less likely to experience project delays due to workforce shortages, utilizing project labor agreements, applying responsible bidder provisions, and expanding apprenticeship readiness programs and developing worker retraining programs. Wisconsin's utility companies can attract, develop, and retain skilled, productive, and safe workers through high-road labor and contracting standards – all at little to no additional cost to ratepayers and consumers.

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