



Maine Climate Jobs Report

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Acknowledgments

In early 2020, the Worker Institute's Labor Leading on Climate Initiative, in partnership with the Climate Jobs National Resource Center and the Maine AFL-CIO, began a comprehensive research, educational and policy process to develop a vision and framework for simultaneously addressing the crises of climate change and inequality in Maine through high-impact job creation strategies. Over the past year, Dr. Lara Skinner has conducted outreach to numerous leaders of the labor and environmental movements, as well as policymakers and experts in the climate, energy and labor fields, to better understand the challenges and opportunities that climate change and climate protection efforts present to Maine's workers and unions.

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Table of Contents

Climate Jobs Recommendations	5
Introduction	6
Climate Change in Maine	9
Inequality in Maine	11
Transportation	13
Carbon-Free Healthy Schools	21
Buildings	23
Energy	28
Just Transition	32
Ensuring High-Quality, Union Jobs	35
Infrastructure Bill Investment	37
Important State Legislation	38
Key Local Reports	39
Total Job Creation	40
Total Annual Emissions Reduction	42
Methodology	43
Endnotes	47
About	58

Climate Jobs Recommendations

Transportation

- Install 25,000 Public EV Charging Stations by 2030
- Transition 50% of Maine’s School Bus Fleet to Zero-Emission Electric Vehicles by 2025 and 100% by 2030
- Double and Electrify City Bus Operations by 2030
- Construct High-Speed Rail to Bangor, Maine

Carbon-Free Healthy Schools

- Retrofit and Install Solar on All K-12 Public Schools by 2035

Buildings

- Net-Zero Emissions for New Construction by 2030
- Retrofit 50% of Residential Units by 2040
- Build 19,000 Affordable Units by 2040

Energy

- Provide 100% Renewable Electricity By 2035

Just Transition

- Plan and Fund a Just Transition

Labor

- Ensure High-Quality, Union Jobs in Maine
-

Introduction

Three major, intersecting crises currently impact working families in Maine – the COVID-19 global health pandemic and related economic crisis, deepening inequality of income and wealth especially in terms of race, and an accelerating climate crisis that threatens Maine’s jobs, economy, public health and treasured natural environment. These crises both expose and deepen existing inequalities, disproportionately impacting working families, frontline communities of color, and the most vulnerable in our society.

Maine has a unique opportunity to respond to the current moment by putting people to work in high-quality, family and community-sustaining careers, building the climate-safe economy Mainers need. Indeed, in order to avoid the worst impacts of the climate crisis, it is essential that our economic recovery focus on building the 21st century infrastructure we need to tackle the climate crisis and drastically reduce greenhouse gas emissions and pollution. Moreover, there are tremendous jobs and economic development opportunities related to building a clean energy economy. One study shows that 25 million jobs will be created in the U.S. over the next three decades by making our homes and buildings highly-efficient, electrifying our building and transportation sectors, improving and expanding public transit, manufacturing electric vehicles and other low-carbon products, building an extensive electric vehicle charging infrastructure, expanding renewable and low-carbon energy generation, upgrading the electrical grid to accommodate more renewable energy, and much more.²

On the other hand, a clean, low-carbon economy built with low-wage, low-quality jobs will only exacerbate our current crisis of inequality and delay the transition to the robust, equitable clean energy economy Maine needs. The new clean energy economy can support good jobs with good benefits and a pipeline for historically disadvantaged

communities to high-quality, paid on-the-job training programs that lead to career advancement. Currently, the vast majority of energy efficiency, solar and wind work is non-union, and the work is typically low-wage, low-quality, even as the safety requirements of solar electrical systems, for example, necessitate well-trained, highly-skilled workers.³

A well-funded, comprehensive “just transition” is important, too. To address climate change, Maine will need to transition from a high-carbon to a low-carbon economy over the next three decades. This transition, however, should not come at the expense of the workers and communities who have worked in high-carbon industries and who have been at the center of powering Maine’s economy for decades. These workers and communities need to be protected and supported throughout this transition. This means workers are transitioned to jobs with equal or better pay and benefits and communities are provided with tax base replacement funds and the support they need to develop new economic activities. Similarly, Maine’s investments in the new clean energy economy should prioritize frontline workers and people of color who have suffered most from the negative impacts of climate change, pollution and historic inequities.

This report outlines these intersecting crises and then offers a series of “climate jobs” recommendations for Maine – a set of bold, science-based recommendations that will reduce greenhouse gas emissions and pollution at scale, create thousands of high-quality jobs, and build more resilient, equitable communities in Maine. Considering Maine’s current labor and employment landscape, as well as its climate and energy profile, these recommendations identify very concrete, jobs-driven strategies that can put Maine on the path to building an equitable, clean energy economy that will tackle the climate crisis and improve working and living conditions for all Mainers. Importantly, these recommendations can be tested at the city and county level and then scaled to the state

level based on their demonstrated effectiveness.

These recommendations also build on the important steps Maine has taken over the past three years to build an equitable clean energy economy. In 2019, Maine was the first state in the country to pass Green New Deal legislation, including a registered apprenticeship utilization requirement. Maine's Green New Deal helps ensure that new clean energy projects over two megawatts will be required to utilize a growing number of registered apprentices, highly-skilled and trained workers, who can complete projects safely and efficiently.⁴ The Maine state government also has implemented a plan to "Lead by Example," and begun transitioning to clean energy and transportation.

Tackling the Intersecting Crises of COVID-19, Inequality and Climate Change

The COVID-19 pandemic has both exposed and worsened the inequality that already has seriously impacted working families in Maine. According to the Maine Center for Economic Policy, prior to the pandemic, 17% of Maine adults could not afford a \$400 emergency, and 19% could not afford their monthly bills. In the height of the immediate economic shocks in July of 2020, 30% of Maine adults could not afford their monthly bills. As of January 2022, 171,525 Maine residents have contracted COVID-19 and 1,728 have died from the virus. The impacts of COVID-19 and ensuing economic crisis have deepened racial disparity in the state as well. Deeply distressing, more than 20% of Black Mainers have tested positive for COVID-19, twice the rate of white Mainers.⁵

The inequality crisis in Maine has been driven over the past few decades by two main factors: 1) wages in Maine, adjusted for inflation, have hardly grown and haven't kept pace with the rising costs of housing, transportation, education, and more; and

2) the unionization rate has fallen sharply since its height of 24% of the workforce in the 1960s. Today, only 12% of Maine's workforce belong to unions, significantly undermining workers' ability to organize for better working conditions, wages and benefits, or a collective and democratic voice on the job.⁶

While inequality worsens in Maine, so does the climate crisis. 2020 was the hottest year on record, and climate scientists now warn that the U.S. must make major reductions in its greenhouse gas emissions and pollution by 2030 to avoid the catastrophic impacts of a warming world. The 2020 hurricane season was the worst on record with twelve hurricanes slamming the Atlantic Coast.⁷

Maine has an important role to play in addressing climate change because some of its most important economic sectors, like coastal industries, commercial fishing, forest-related industries, and tourism, are deeply affected by the impacts of climate change. Recent studies have shown that the Gulf of Maine is warming faster than 99% of the world's oceans, posing a serious threat to Maine's commercial fishing industry and the tens of thousands of people who work in it.⁸

Ocean warming and heat waves allow invasive species to proliferate, harming native species that are vital to Maine's ecosystem and economy.⁹ Ocean warming and sea level rise also change precipitation patterns, ocean acidity, storm patterns, and the geographic distribution of species.¹⁰ Of course, these changes add to existing concerns about how water pollution and overfishing are affecting the Gulf of Maine's water quality and its commercial fishing industry. Over 30,000 people were employed in Maine's commercial fishing industry in 2018, and its estimated economic contribution is \$788.2 million a year.¹¹ Moreover, many of Maine's coastal towns and communities are intimately linked to and dependent on the commercial fishing industry. Studies from

Maine's recently convened Climate Council estimate that sea level rise could cost \$17 billion in damages and 21,000 jobs over the next 30 years.¹²

While Maine's workers, communities and economy are especially vulnerable to the impacts of climate change, Maine also has the potential to develop significant onshore and offshore renewable energy sources that can power Maine, as well as other parts of the U.S. As many U.S. east coast states commit to building large offshore wind projects and prioritize U.S. manufactured components, Maine could utilize its many ports and manufacturing expertise to center itself as a leader of offshore wind manufacturing and assembly operations. Maine already is positioning itself as a leader in the development of floating wind technology. With only one floating offshore wind project in operation globally, Maine could lead the way, nationally and globally, in the development, manufacture, and installation of floating wind turbines. This same technology will be used by U.S. west coast states as they turn to harnessing offshore wind power to meet their renewable energy and climate goals.

Of course, Maine is uniquely challenged with how the growth of renewable power, such as offshore wind power generation, will affect the Gulf of Maine and the many towns, businesses and workers who are intimately linked to it. Maine has an important role to play in lowering its greenhouse gas emissions, slowing the warming of the Gulf of the Maine, and determining how to develop offshore wind power and other renewable sources in a way that protects and supports its historic and important commercial fishing and coastal industries. Deep, meaningful engagement with Maine's fishermen and women and coastal communities will be essential to carefully examining how Maine can seize the climate, jobs and economic benefits of offshore wind and address the needs and interests of Maine's existing, highly-valued fishing and coastal workers and communities.

It's also important to mention that half of Maine's greenhouse gas emissions and pollution come from its transportation sector – 49%.¹³ Building an electric vehicle charging infrastructure that can support the transition to electric vehicles will be essential to lowering Maine's transportation emissions. Constructing this infrastructure also can create many high-quality jobs installing electric vehicle chargers, upgrading utility lines to accommodate the electrification of Maine's vehicle fleet, and installing new renewable power projects that can support this increase in energy demand.

Expanding and improving Maine's transportation systems also is important to lowering greenhouse gas emissions and pollution. It is also a key equity issue as many of Maine's working families need a high-quality, affordable transit system to access jobs and other essentials. Like electric vehicles, significantly upgrading Maine's transit systems can create high-quality construction jobs as well as long-term operations, maintenance and repair jobs.

These opportunities hint at Maine's potential to advance a "climate jobs" program that can have significant, positive impacts. Maine can respond to the ongoing COVID-19 crisis with a bold recovery plan that will tackle the climate crisis, reduce emissions and pollution, and create high-quality jobs that will help build stronger, more equitable communities throughout Maine. Building this low-carbon, equitable economy will require major shifts but it can be done in a way that centers the needs and interests of working families in Maine and maximizes the major economic development opportunities associated with the new clean energy economy. This report outlines a set of recommendations that can start Maine down this path.

Climate Change in Maine

Climate change in Maine will exacerbate current inequalities and expose Maine residents to severe economic and health impacts. Already, temperatures in Maine have risen by 3.2°F. Absent aggressive action, temperatures will continue to increase an additional 2°F to 4°F by 2050 and up to 10°F by 2100.¹⁴ Days with temperatures over 95 degrees will increase dramatically across the state, with Portland seeing at least an additional 9 days each year.¹⁵ Increases in temperature harm those who labor outdoors. Energy, utility, agricultural, and construction workers will endure lost wages and negative health impacts.¹⁶ Maine also has experienced shorter winters. Maine's winter season has decreased by about two weeks with temperatures increasing by 5.1°F. One study found twenty fewer days of snow cover in the northern United States and Canada in the last century.¹⁷ Winter industries such as skiing will likely be impacted by these changes.¹⁸ Across the United States, ski resorts face tens of millions of lost visits by 2050 due to climate change, although areas of Maine may be able to adapt to changes with increased snowmaking.¹⁹

Annual precipitation in Maine has increased by 6 inches since 1895.²⁰ Under a high emission scenario (RCP8.5), precipitation may increase in the northeastern United States by 1 inch in every month from December through April by the end of the century.²¹ Maine may be especially at-risk from the impacts of extreme weather events. Maine has experienced an increase in heavy precipitation events and storms each year. During a storm in October of 2017, 500,000 Maine residents lost power. The storm cost Central Maine Power \$69 million, but much of the burden was passed onto Maine ratepayers.²² This trend of damaging storms will continue.

Over the last century, Maine's sea level has risen by about 0.6 feet per century. However, in the past few decades, this has accelerated to over 1 foot per century.²³ Under an intermediate to high

emissions scenario with a base year of 2000, sea levels may rise by 2.2 feet in 2030 and 3.5 feet in 2070 in Maine.²⁴ Under a worst case scenario, sea level rise could increase by as much of 11 feet in the northeastern United States by the end of the century.²⁵ Sea level rise in Maine will increase flooding on the coast. Between 2005 and 2017, researchers found that Maine lost \$70 million in property value due to tidal flooding from sea-level rise.²⁶ Flooding in Maine also will increase beach erosion, threaten coastal infrastructure, and lead to intrusion of groundwater.²⁷

Ocean acidification and warming ocean temperatures present a large threat to the Gulf of Maine. Ocean acidification is occurring at a rate 100 times faster than in the last 200,000 years and has increased by 30% since the 19th century. Scientists predict this likely will continue in the Gulf of Maine and harm scallops, clams and mussels.²⁸ Lobsters also face threats due to the warming of the ocean in Maine. Although lobsters have seen increased populations in recent years, some scientific studies predict a significant decline in lobster abundance by 2050.²⁹ Increasing temperatures also contribute to shell diseases in lobsters and other types of shellfish, which further population declines.³⁰

Climate change may contribute to other types of harmful health impacts in Maine. Increasing temperatures have expanded the range and frequency of vector-borne illnesses, such as Lyme disease and West Nile Virus, across the northeast. Under a high emissions scenario, the northeast could see almost three hundred additional deaths from West Nile Virus. Periods of time with the greatest infection risk for Lyme disease could also expand by one to three weeks in the northeast.³¹ In 2017, Maine recorded 1,424 infections of Lyme disease, a state record.³² Workers and residents in Maine face real threats from impacts of climate change. Maine must work to address these and craft solutions that address inequality and create high-quality jobs.

Maine Law Aims for an 80% Reduction

in Emissions by 2050

**In 2018, Maine emitted
15.3 million
metric tons of CO₂ from
fossil fuels.³³**

Inequality in Maine

Inequality in Maine has grown over the past decades, widening the income inequality gap. The top 1% earn 15.4 times as much as the bottom 99% of wage workers in the state.³⁴ Wages in Maine have remained low over the past decades. Median real wages only grew \$2300 from 2001 to 2018, a rate of 6.6% over a period of 19 years.³⁵ This has contributed to the large number of workers laboring in Maine in the low-wage economy. According to a report from 2016, almost half of workers, 46.0%, earn less than \$15 per hour in the state.³⁶ Sustained low wages and

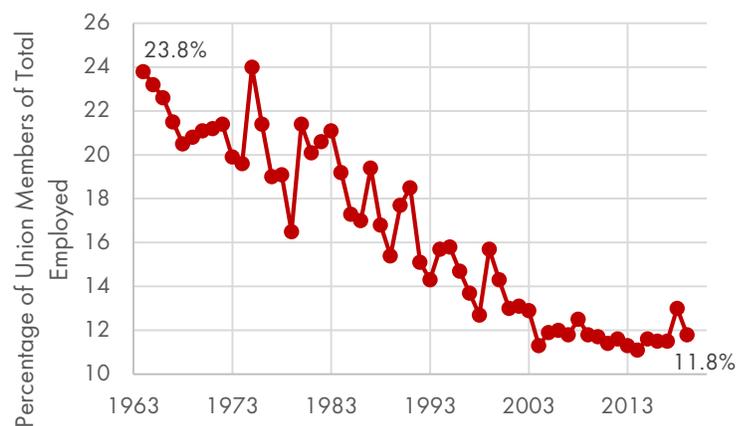
In 1963, 23.8% of workers in Maine belonged to a union; this has declined to 11.8% in 2019.³⁹

Large inequalities across race and gender also persist in Maine. Latina women in Maine earn 66 cents for every dollar a man makes within the state.⁴⁰ While White workers earned an average wage of \$44,827 in 2019, Hispanic workers earned \$40,213, Black workers earned \$26,590, and Asian workers earned \$34,778.⁴¹ Similar inequalities exist in other aspects of Maine's economy. The "State of Working Maine:

Real Annual Median Wage in Maine from 2001 to 2018 (\$ in 2018)



Unionization Rate of Maine from 1964 to 2018



rising inequality have contributed to poverty within the state. Approximately 10.9% of Maine residents lived in poverty in 2019, including 13.8% of all children.³⁷ Many Maine residents have minimal savings and cannot meet their basic needs. 16.0% of residents could not meet their needs if they lost their job for three months, and 40% of residents have no emergency savings.³⁸

2020" report found that Maine residents of Color are more likely to face food insecurity and have trouble paying for healthcare.⁴² Unemployment rates for Hispanic, Black and Indigenous workers are more than twice as high as those of white workers.⁴³

A decline in the unionization rate in Maine also has contributed to inequality and a lack of necessary protections for workers. Unions raise the wages of workers through collective bargaining and provide workers with a necessary voice in the workplace.

MAINE AT A GLANCE

Covid-19, Inequality, and Climate Change in Maine



30% ADULTS UNABLE TO PAY MONTHLY BILLS

and more than 110,000 cannot afford basic food expenses since Covid-19



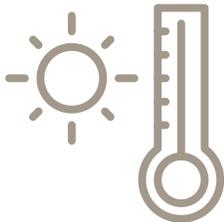
THE 2020 HURRICANE SEASON WAS THE WORST ON RECORD

12%

of Maine's workforce is unionized



The Atlantic Coast was hit with 12 Hurricanes.



2020 WAS THE HOTTEST YEAR ON RECORD



WAGES HAVE HARDLY GROWN IN DECADES

Low-paying jobs are not keeping up with the cost of living.



THE GULF OF MAINE IS WARMING FASTER THAN 99% OF THE WORLDS OCEANS

This is affecting the survivability of native species and allowing invasive species to proliferate.

\$17

BILLION

IN POTENTIAL DAMAGES FROM SEA LEVEL RISE



1 IN 5

Black Mainers have tested positive for Covid-19

2X THE RATE OF WHITE MAINERS



Transportation

Electrifying transportation and expanding and improving public transit is crucial to decarbonizing the transportation sector. Shifting to electric vehicles will reduce greenhouse gas emissions and pollution, and lower the cost of maintaining and operating a vehicle, which is a major expense for many households. Developing expansive, high-quality, affordable, and efficient public transit systems will provide families with an attractive alternative to driving. Shifting people from cars to public transit is essential to lowering emissions from the transportation sector. It's also important to improving public health, reducing motor vehicle accident fatalities, and providing transit-dependent families the ability to access jobs and other essential services.

In Maine, the transportation sector is the largest and fastest growing source of fossil fuel emissions in the state – 49.2%. Maine needs a 21st century transportation system that makes travel safer, healthier and more affordable.

As one of the largest east coast states, Maine will need to employ a two-pronged strategy to reduce greenhouse gas emissions and pollution in its transportation sector: 1) convert its growing vehicle fleet to zero-emissions electric as quickly as possible; and 2) significantly improve and expand public transit in and between Maine's largest cities.

In order to convert to zero-emissions electric vehicles, Maine will need to build a dense, extensive electric vehicle charging infrastructure. Like the 1950s buildout of the federal highway system, a comprehensive electric vehicle charging infrastructure will allow Mainers to take advantage of the rapidly expanding electric vehicle market and quickly and easily travel throughout the state, including the most rural regions. In addition to lowering Maine's transportation emissions, building this system can create thousands of high-quality jobs installing vehicle chargers and upgrading utility lines to accommodate increased electricity demand. Maine

can make a strategic start in expanding the use of electric vehicles by converting government vehicles, school buses and public transit fleets to electric first, reducing pollution for Maine's school children and others as well as reducing the cost for taxpayers through lower fuel bills. Maine has already taken some significant steps, such as investing \$27 million in public EV charging, setting a goal to reduce vehicle miles travelled by 20% by 2030, developing a transportation roadmap, spending more on public transport, and putting 219,000 EVs on the road by 2030, but needs more investment to meet its objectives.⁴⁴

Significantly improving and expanding public transit systems also is crucial to reducing Maine's greenhouse gas emissions and pollution and building more resilient and equitable communities. Many of the most vulnerable in Maine are transit-dependent, utilizing public transportation to access jobs, school and other essential needs. Providing the high-quality transit service that Mainers need, such as expanding routes, lowering fares, increasing frequency, and ensuring that systems run on time, will help shift Mainers from private vehicles to public transit. Improving the quality of Maine's transit service also includes converting bus and van fleets to electric to reduce their contribution to climate change and local pollution which has significant public health impacts.

Like expanding electric vehicles and electric vehicle charging infrastructure, improving and expanding public transit has tremendous jobs and economic development potential. Investment in public transit creates more jobs per million invested than most other sectors, has higher levels of family and community sustaining union jobs, and often employs a high number of women and people of color.⁴⁵ Investment in electric vehicles and public transit, including appropriate wage and labor standards, can create thousands of high-quality jobs in manufacturing, construction, operations, and maintenance.

Public EV Infrastructure



Recommendation: Install 25,000 New Public EV Chargers by 2030.

Install over 25,000 new public EV chargers with the state supporting public chargers in local jurisdictions on town, county, and city public roads with a project labor agreement and prioritizing manufacturers in New England, especially those in Maine.

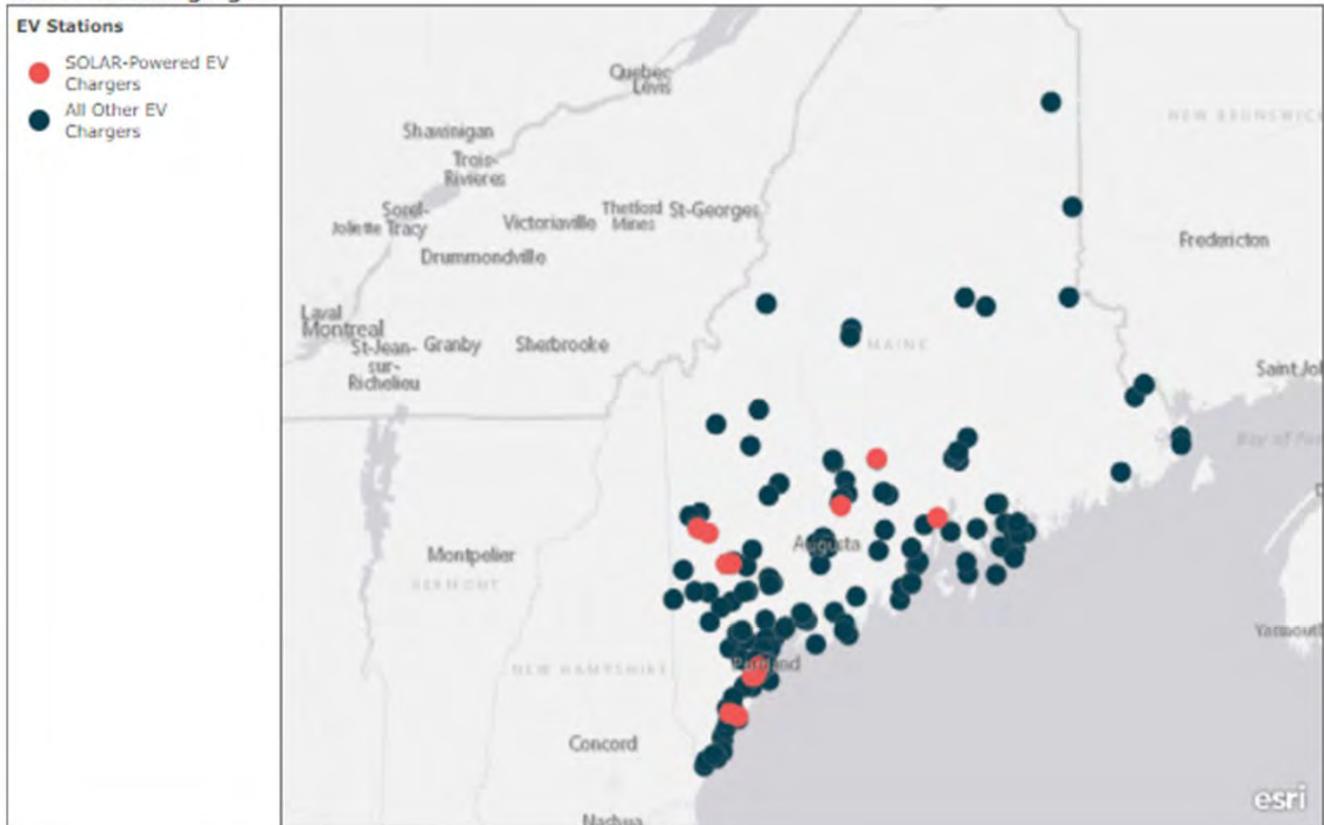
Already, the state of Maine has committed to spend nearly \$27 million for EV electrification efforts and set an ambitious goal of 219,000 electric vehicles on the road by 2030, while committing to a fully EV state fleet.⁴⁶ Building on these positive first steps will allow the state to fully achieve a renewable transportation network. Installing public EV chargers across all areas of the state will ensure that all Maine residents have access to affordable charging options for their vehicles, while creating hundreds of utility and installation jobs. Maine will require more than 25,000 additional public charging stations to meet this goal, and the state should work with towns, counties, and cities to install chargers on public roads in these jurisdictions. One study found that drivers could typically see a savings of \$7,758 in fuel cost for the 15-year lifespan of an electric vehicle.⁴⁷

Economic Impact: Installing over 25,000 EV chargers by 2030 will create 67 direct jobs per year.

High-Quality Job Creation: Maine can use the opportunity to build a zero-carbon transportation system to create good, family and community sustaining jobs for Mainers. The state should require a project Labor agreement for the construction of the EV charging infrastructure and prioritize manufacturers who will produce the chargers in Maine with high-quality jobs. Any work on building chargers or electrifying the state fleet, such as that already proposed by the Maine Climate Council, should occur under these strong labor protections.

EV Infrastructure in Maine

Maine EV Charging



Esri, HERE, Garmin, USGS, EPA, NPS, NRCan | Esri, HERE, NPS

There are currently 288 public EV charging station locations (with mostly Level-2, 240 V chargers) in Maine. Data from DOE Alternative Fuels Data Center, January 2022.

School Bus Electrification



Recommendation: Electrify School Bus Fleet by 2030

Transition 50% of Maine’s school bus fleet to zero-emission electric vehicles by 2025 and 100% by 2030, using a project labor agreement to construct the over 3000 school bus EV charging stations that will be needed to support this conversion. Maine also should explore utilizing the U.S. Employment Plan to prioritize electric bus manufacturers who will produce buses locally.

Maine has more than 3,000 school buses that travel 31 million miles per year.⁴⁸ Converting this fleet to electric will reduce emissions to tackle the climate crisis, save taxpayers money, and protect Maine’s school children from the harmful pollutants produced by diesel buses.

Carbon and Economic Impact: Converting Maine’s school bus fleet to electric will reduce diesel fuel consumption by 4.75 million gallons per year and save Maine taxpayers \$20 million a year in maintenance and fuel costs.⁴⁹ This transition also will cut CO₂ emissions by more than 50,000 metric tons per year. The conversion will create over 37 direct jobs per year in work on electric charging infrastructure.

High-Quality Job Creation: Maine can use the opportunity to build a clean and healthy school bus fleet to create many good, family and community sustaining jobs. To do this, the state should require a project labor agreement for the construction of solar-powered EV charging infrastructure and prioritize manufacturers who will produce the vehicles locally, especially in Maine, with high-quality jobs by following the U.S Employment Plan or implementing a “Buy Maine” provision in any legislation that requires materials and services to be procured from local suppliers.

Expand and Electrify City Buses



Recommendation: Expand, Improve and Electrify 100% of Maine's City Buses

Double bus routes and increase service frequency and reliability across the state and convert Maine's bus fleets to zero-emissions electric by 2035.

To address Maine's rising transportation emissions, a high-quality, low-carbon transit option is essential. Drivers, passengers and local communities also will benefit from the conversion of diesel and liquid natural gas buses to zero-emissions electric buses. While electric buses cost more up front, they save money in the long run with low fuel and maintenance costs. Maine's Volkswagen settlement money is available for purchasing electric buses. To address climate change, inequality and job creation and access goals, Maine could set a goal of doubling its bus transit capacity – including bus drivers and buses – by 2030. Maine also should focus on creating routes between rural areas and cities to expand equitable access to transit across the state.

Economic and Carbon Impact: Doubling bus and van operations and installing EV bus chargers would create 86 direct jobs per year over thirteen years. Converting to electric buses and vans would replace 257,711 CO₂ emissions per year, and doubling operations would displace even more cars off the road, further reducing emissions.

High-Quality Job Creation and Economic Impact: Investment in public transit creates more permanent operations and maintenance jobs than investments in almost any other sector. Public transit also employs a proportionately higher number of women and people of color, providing high-quality job options for disadvantaged communities. Expanding and improving bus service also is a key job equity issue – expanding bus service is closely linked to giving passengers access to more jobs. Expanding and improving Maine's bus and van service would create new operations and maintenance jobs as well as jobs for electricians and utility workers to install the electric vehicle charging infrastructure that will be needed to power the electric bus fleet.

If Maine doubles its bus operations:



25

Additional electric buses in
Bangor



9

Additional electric buses in
Lewiston-Auburn



18

Additional electric buses in
York County



7

Additional electric buses in
South Portland

High-Speed Rail



Recommendation: Extend High-Speed Rail to Maine

Construct an efficient, climate-friendly, high-speed rail line from Richmond, VA, to Bangor, ME, utilizing prevailing wage and project labor or community workforce agreements on the construction work and labor peace and neutrality agreements on the permanent operations, maintenance and manufacturing work.

The U.S. is long overdue in building a 21st century transportation system that provides convenient, affordable, safe and low-carbon travel options. With nearly 50% of Maine's greenhouse gas emissions coming from the transportation sector, Maine can do its part by advocating for the construction of the Northern New England high-speed rail corridor. Demand for rail travel has continually increased over the last twenty years – Amtrak ridership from Boston, MA, to Brunswick, ME, hit record high ridership levels in 2019.⁵⁰ Boston, MA, to Auburn, ME, is one of ten federally designated 110-mph high-speed rail corridors in the U.S., making it eligible for federal funding. Constructing this line can create many good jobs, reduce emissions, pollution, and congestion on Maine's turnpike, and provide a clean, safe and fast transportation option for both Mainers and visitors.

High-speed rail is the most efficient and lowest carbon emitting mode of transportation.⁵¹ It reduces pollution, congestion and greenhouse gas emissions, especially if powered by renewable energy. High-speed rail is particularly effective at replacing short-haul flights (trips under 500 miles), as the technology is faster and much more climate-friendly than short air travel. High-speed rail will be particularly effective when combined with extensive, efficient bus service and extended local rail lines that will get passengers from central train stations to local stations quickly and easily.

Amtrak has currently proposed a high-speed rail route that would reach from Richmond to Boston, cost \$110 billion (in 2011 dollars), and create 352,000 jobs over 13 years.⁵² Maine should be included in this type of plan

and any high-speed route should extend to Bangor. This would bring the benefits of investments and construction and transportation jobs to Maine, while ensuring the state remains connected to the East Coast.

High-Quality Job Creation: The American Rescue Plan has designated significant amounts of recovery funds for state transportation needs and the Infrastructure Bill includes \$234 million for public transit in the state.⁵³ Maine can use these federal funds to jumpstart its economy by building a high-speed rail system that will finally connect a large part of Maine by rail service. Any high-speed rail project that extends across the country should be built with project labor agreements, include community workforce agreements that prioritize local hiring and work for marginalized communities, meet prevailing wage requirements, and guarantee labor peace and neutrality agreements on the permanent operations, maintenance and manufacturing work.





Carbon-Free Healthy Schools

Electrifying and transitioning schools and school transportation systems to be carbon free will create safer and more efficient spaces for our children while creating good jobs for our communities including:

(1) Construction Laborers and Managers, Operating Engineers; (2) Painters; (3) Electricians, Electrical Power Line Installers and Repairers; (4) Roofers; (5) Insulation Workers, HVAC installers; and (6) Welders, Glaziers, and Structural Iron and Steel Workers

Carbon-Free Healthy Schools



Recommendation: Retrofit and Install Solar on All K-12 Schools

Retrofit and install solar panels on all public K-12 schools in the state of Maine, with prevailing wage mandate and project labor agreement by 2035.

This initiative will provide renewable energy to all of Maine's 600 public schools, reduce carbon emissions and improve air quality.⁵⁴ Schools should seek to reduce energy use intensity by 50% through retrofits and stop on-site fuel combustion, utilize low global warming refrigerants, and decrease the use and impacts of high embodied carbon materials. This work will ensure long-term energy savings for schools and town budgets, particularly in rural areas where energy costs remain high. Solar panel installation and meaningful retrofits of buildings will serve as a source of job creation throughout the state for high-quality employment.

Economic and Carbon Impact: Installing 267 MW of distributed solar (enough to replace 50% of energy use) on public schools and retrofitting all school buildings will create 1,484 direct jobs per year. This would save 115,431 tons of CO₂ emissions per year.

High-Quality Job Creation: All construction and installation projects on public schools should include a prevailing wage mandate. Solar installation and retrofit work at public schools should also require a project labor agreement to ensure safety and fair working conditions.

Buildings

Energy efficiency is crucial to decarbonizing the energy sector. Reducing energy use meaningfully reduces greenhouse gas emissions and improves electrical grid stability, as overall energy demand is lowered. In Maine, energy use in buildings accounts for more than 32% of the state's total emissions, much of this emerging from home heating.⁵⁵ Making buildings energy efficient not only puts the state on the path to net zero emissions, but investing in energy efficiency and weatherization also has the added benefit of making Mainers' homes more comfortable while reducing energy cost. Air leakage and poor insulation of walls and ceilings account for 72% of heat loss in Maine homes.⁵⁶ Over half of the residential homes in Maine were built before 1980, indicating a need statewide for energy efficiency measures.⁵⁷ Public and commercial buildings in Maine are also in need of wide-scale energy efficiency retrofits.

Energy use and emissions can be further reduced in Maine buildings by including on-site solar, wind, or geothermal generation along with battery storage. Moreover, as is the trend in the buildings sector generally, building codes can be amended to include net zero emissions requirements. Building code amendments for new construction provide a uniform way to extend efficiency and renewable energy generation requirements to all new buildings. The Maine Climate Council already has recommended adopting new energy efficient codes by 2035 and made IECC 2015 the required baseline energy code.⁵⁸

Finally, energy efficiency measures create jobs statewide because there is a need for more efficient buildings in every part of the state. Including appropriate wage and labor standards when using public funds ensures the jobs created will be good, high-road jobs.



Net-Zero New Construction



Recommendation: Net-Zero Emissions for New Construction by 2030

Net-zero emissions for all new construction, including solar or geothermal installed on all new municipal, residential and commercial construction by 2030 with prevailing wage mandate and prioritizing local hiring of labor.

Mandating solar or geothermal installation on new construction, along with other energy efficiency upgrades such as low-carbon materials, will put Maine on the path for long-term carbon neutrality. Requiring renewable energy on new construction also reduces costs, as incorporating solar or geothermal in the construction process is easier than changing electricity sources after construction is complete. These changes can be made through amending the state's building code.

Carbon and Economic Impact: Building net-zero single-family residential homes (including renewable energy) would create 839 direct jobs per year and reduce carbon emissions by 16,770 metric tons per year.

High-Quality Job Creation: Any construction built with public funding should include a project labor agreement to ensure state dollars support high-quality, safe and efficient work. A prevailing wage should be mandated for all projects to guarantee proper compensation for workers. When building residential installations, a priority should be made to hire laborers from the local area.

Residential Retrofits



Recommendation: Retrofit 50% of Residential Units by 2040

Provide funds for 50% of residential units built before year 2000 to be retrofitted by 2040, with a prevailing wage requirement while prioritizing hiring local workers.

Residential buildings produce 20% of all emissions in the state.⁵⁹ Air leakage is the single greatest source of heat loss in single family homes and together, air leakage, walls, and ceilings account for 72% of all heat loss in homes. Retrofitting all units would save money for residents, create good jobs, and substantially reduce emissions.⁶⁰ According to the Maine Climate Council, Maine has already set a goal of “weatherizing 35,000 homes and businesses, with at least 10,000 of such weatherization projects completed in low-income households” by 2030.⁶¹ Maine should expand on this objective by providing 50% of homeowners (or landlords who own units built before the year 2000) with funds through grants and vouchers to perform deep retrofits.

Carbon and Economic Impact: Retrofitting 50% of homes built before year 2000 would create 6,854 direct jobs per year. This initiative would reduce carbon emission by 1,389,142 metric tons of CO₂ per year.

High-Quality Job Creation: A prevailing wage should be required for all residential retrofit projects to guarantee proper compensation for workers. Provisions should be included in legislation with any public funding to highly encourage the hiring of local workers and purchasing materials from local suppliers.

Air leakage and poorly insulated walls and ceilings account for **72% of all heat loss in Maine homes.**

Deep retrofits have the potential to reduce a building's energy use by more than **50%**

Net-Zero Affordable Housing



Recommendation: Build 19,000 Units of Affordable Public Housing by 2040

Construct 19,000 units of net-zero, public affordable housing by 2040 in Maine with a project labor agreement and labor peace and neutrality agreement on supply chain work.

Maine has a deficit of over 19,000 affordable homes.⁶² The state already has committed \$50 million to reach this goal and all units built using these funds or built in the future should be net-zero.⁶³ Net-zero public affordable housing will help to achieve Maine’s emissions goals and improve the quality of life of residents. In order to supply enough housing for all Maine residents, the state should construct 19,000 net-zero housing units in multi-dwelling units. Net-zero housing will reduce the energy burden of low-income individuals, while also providing residents with affordable housing that helps to reduce the residential emissions of the state. Building units of affordable housing also will create thousands of construction jobs across in Maine.

Carbon and Economic Impact: Building 19,000 units of affordable public housing would create 1,984 direct jobs per year.

High-Quality Job Creation: The state should ensure decent working conditions, by requiring a project labor agreement on all affordable housing construction and labor peace and neutrality agreement on supply chain and manufacturing work.

Energy

Maine produces a significant amount of carbon emissions from fossil fuels. In 2018, the state generated 15.3 million metric tons of CO₂.⁶⁴ Maine's transportation sector emits the largest share of emissions, producing 49.2% of all fossil fuel emissions in the state. Gasoline consumption may partially explain the high levels of transportation emissions, as net motor fuel use expanded by 370% between 1950 and 2018 in the state.⁶⁵ The buildings sector in Maine

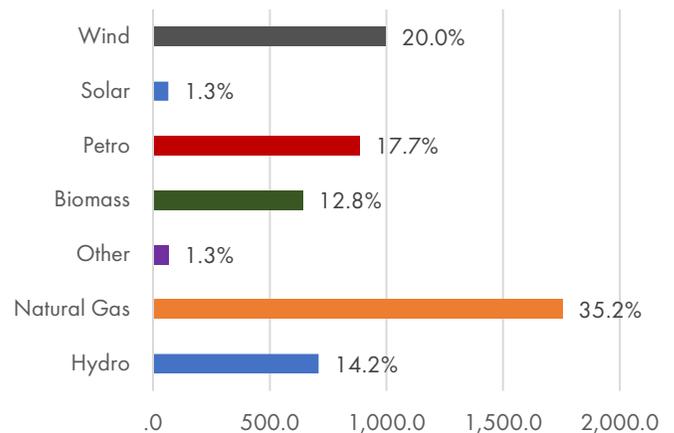
Sector	MMTCO ₂	Percentage of Total
Commercial	1.74	11.4%
Industrial	1.89	12.4%
Residential	3.11	20.3%
Transportation	7.52	49.2%
Electric Power	1.06	6.9%

also contributes to fossil fuel emissions with 20.3% of emissions from the residential sector and 11.4% of emissions from commercial buildings. The industrial sector produced approximately 12.4% of emissions. The electric power sector generated 6.9% of emissions in 2018 and Maine generated 46.6% of its electricity in 2018 from carbon emitting sources such as biomass, coal, natural gas, and petroleum.⁶⁶ As of 2020, Maine's fossil fuel sector employs 994 workers.⁶⁷

Fossil fuel plants generate much of Maine's electricity. Total natural gas and petroleum generators consisted of 2.6 GW in 2020 and biomass plants have a total nameplate capacity 640 MW.⁶⁸ Maine also possesses a considerable amount of renewable energy, including 709 MW of hydroelectric power and 19 utility-scale wind farms with a nameplate capacity of 971 MW in 2019. Maine possesses only 65 MW of utility-scale solar, but total solar energy in the state, including distributed solar, was 298 MW.⁶⁹ The potential for a significant amount of renewable energy exists in Maine. According to a study from NREL, Maine contains 661 GW of potential utility-

scale solar, 11 GW of utility-scale onshore wind, and 147 GW of offshore wind power.⁷⁰ Maine also has a small but growing amount of employment in renewable energy. In 2019, Maine had 11,000 workers in the clean energy industry including workers who held service, construction, utility, professional, and management jobs.⁷¹

Maine Generating Plants by Nameplate Capacity in 2020 (MW)



In recent years, the state has passed legislation and enacted numerous programs to promote renewable energy. Efficiency Maine operates many of the state's energy efficiency and renewable energy programs by offering investments, funding, and rebates for residential and commercial energy reduction and clean energy projects.⁷² Maine passed numerous pieces of legislation in 2019 to begin its clean energy transition. LD 1679 created the Maine Climate Council with a goal of reducing emissions by 80% by 2050. LD 1474 increased Maine's renewable energy portfolio to 100% by 2050 and LD 1711 approved procurements for at least 375 MW of distributed energy, most of which is expected to be solar.⁷³

In December of 2020, the state released its climate plan from the Maine Climate Council. Goals in this plan include weatherizing 35,000 homes by 2030,

leading by example in public buildings, implementing 80% renewable electricity by 2030, and installing 100,000 heat pumps by 2025. This reports parallels or exceeds the goals of the Maine Climate Council.⁷⁴

In 2021, Maine continued to build programs and pass legislation to meet its new goals and enshrine them into law. LD 936 sets a goal of 750 MW of distributed renewable energy. LD 336 gave permission for the New England Aqua Ventus floating offshore wind research array to supply energy of up to 144 MW (although the project currently will produce 11 MW).

LD 1659 creates the Maine Clean Energy and Sustainability Accelerator which will provide financing to scale up current renewable projects and improve clean energy technology. These pieces of legislation, along with many others, have been passed to push Maine's energy transition forward. The state has committed to spending hundreds of millions in federal and state funds for the buildings, resiliency, energy, and transportation sectors to ensure this occurs.⁷⁵



Renewable Energy



Recommendation: 100% Renewable Energy in Maine by 2035

Install enough capacity to provide 100% renewable energy by 2035 with prevailing wage and project labor agreements, labor peace and neutrality agreements on non-construction work, and policies that prioritize contracts that use regionally or locally manufactured goods. Grid modernization and transmission upgrades must also be implemented.

Converting to 100% renewable energy by 2035 will address climate change and improve air quality. In addition, building new utility-scale renewable energy will serve as a source of job creation for high-quality employment throughout the state. For example, utility-scale solar and onshore wind are some of the least costly forms of energy, typically with a lower levelized cost of energy than natural gas, coal, or nuclear.⁷⁶ Maine ratepayers could eventually save up to \$3,200 a year in energy costs with clean energy.⁷⁷ Maine possesses vast space for renewable energy projects with the potential for 661 GW of solar energy production, 11 GW of onshore wind production, 147 GW of offshore wind production, and 48 GW of geothermal production.⁷⁸ A mix of wind, solar, and geothermal energy would provide the most efficient sources for powering Maine.

Economic and Carbon Impact: Each type of energy alone would provide 100% of Maine’s capacity:

Technology	Megawatts of Energy to Meet 100% of Maine’s Need	Direct Jobs Per Year
Onshore Wind	2,300 MW	705
Offshore Wind	2,300 MW	2,380
Utility-Scale Solar	4,600 MW	2,881
Geothermal	1,500 MW	2,567

The state can also expect significant carbon emissions reductions of approximately of 2.8 million metric tons of CO₂ per year if only using onshore wind, 4.6 million metric tons of CO₂ if offshore wind, and 4.5 million metric tons of CO₂ if using utility-scale solar. Further modeling is needed to calculate geothermal emissions.⁷⁹

With the addition of thousands of megawatts of clean energy to the grid, both grid modernization and transmission upgrades will be needed. Maine must sustain a safe and reliable electricity system, as evidenced by the 2017 ice storm where over 500,000 residents lost power.⁸⁰ The Maine Public Utilities Commission already has begun a process for grid modernization. Stakeholders have made recommendations including a larger grid planning process, EV fast charger deployment, data sharing, and developing more transmission in Northern Maine.⁸¹ Modernization plans may include updated metering and monitoring of renewable resources, improved breakers and capacitors, and enhanced IT infrastructure and networks. Transmission upgrades may require improvements in lines, towers, substations, reactive compensation, and new facilities.⁸² Transmission planning also must occur on a regional level, especially for offshore wind. Coordination is key across states to ensure that resources and space are utilized adequately to plan in the most efficient way possible.

High-Quality Job Creation: Utility-scale renewable energy projects should include a project labor agreement requirement to ensure that state dollars support high-quality, safe and efficient work and a prevailing wage requirement to support proper compensation for workers. Maine renewable energy jobs must maintain at least the same wages and benefits as those jobs currently in the fossil fuel industry. Maine should also mandate labor peace and neutrality agreements from companies with regard to union organization on supply chain and manufacturing projects, including project services such as janitorial, maintenance, and security.

Renewable Energy and Fisheries Protection: Commercial fishing is central to Maine's legacy and is a vital part of Maine's economy, employing over 30,000 people and making an economic contribution of \$788.2 million a year. As Maine explores the development of floating offshore wind power, it is crucial that it is done in a way that protects Maine's fishing communities. Offshore wind projects should include fishery protection plans that are developed with local fishermen and women to ensure Maine's vital marine ecosystems are not harmed by offshore wind. Projects should address siting and maximum distance from the shore, best placement of turbines and incoming cables in relation to fishing grounds, community benefit agreements with fishing communities and organizations, and directly involve fishermen and women in decision making processes to ensure Maine's vital marine ecosystems are not harmed by offshore wind.

If Maine is able to develop offshore wind in a way that protects Maine's fishing industry, Maine is uniquely positioned to lead the way nationally in the development and installation of floating offshore wind technology. In addition to meeting Maine's climate and renewable energy goals, offshore wind could offer significant job creation and economic development benefits for Mainers. With Maine's extensive port infrastructure, historic expertise in marine manufacturing, and proximity to other East Coast states' skyrocketing demand for offshore wind, Maine could become a major center for offshore wind manufacturing and assembly work. The manufacturing of offshore wind turbine component parts produces twice as many jobs as the construction of the turbines, making an investment in offshore wind port infrastructure and manufacturing a significant job creation and economic development opportunity for the state. If Maine embarks on further offshore wind projects, it should set a goal for 50% local suppliers on offshore wind projects in order to keep investment within the state.

Just Transition

While necessary to stop the worst impacts of climate change, decreasing fossil fuel use will have an impact on workers and communities across the state, and some industries may face temporary disruption. The burden of any energy transition should not be borne by workers and communities.

Considering and building policy around the economic impacts from transitioning away from fossil fuels is often referred to as “just transition.” This emerges from Labor Leader Tony Mazzocchi, who argued that some industries were too dangerous for society, and the workers in those industries should be supported as they transition away from this work. As a term, just transition can be contentious and used as an indicator of imminent job loss. This concern is understandable, as previous economic transitions left workers and communities largely unsupported. This history is widely felt in Maine, which saw the loss of several industries, including textiles, manufacturing, and paper mills. In

addition Just Transitions should address the needs of frontline communities such as those most impacted by climate change, people of Color, LGBTQIA+ individuals and the formerly incarcerated.⁸³

There is no reason an economic transition must be unjust. Workers can, and must, be supported through wage and benefits support, opportunities to retrain, and whatever other supports are needed to thrive. Moreover, there must be something for workers to transition into. Training programs must lead to jobs that pay family-sustaining wages, provide benefits, and career pathways. Communities must have support to both mitigate the loss of fossil fuel revenue and have capital for investment in new industries. We can learn from previous industrial transitions and stop the pattern of unjust transitions. In Maine, adequate funding and planning must be given to support a truly just transition.



Just Transition



Plan and Fund a Just Transition

Maine workers must not bear the burden of the energy transition. The state should implement programs and direct financial resources to center the needs of fossil fuel workers and frontline communities and ensure that all can thrive in a clean energy economy. A number of steps should be taken to directly provide for these workers including the following recommendations:

1. Just Transition Fund

Maine should create a dedicated just transition fund with robust funding to provide wage and benefit support for up to five years and/or as a bridge support to retirement for displaced workers. The fund also should support worker re-training, participation in apprenticeship programs, and wage support for workers in training. This fund must include significant investment directed at both the long-term and short-term aid of working people most impacted by the energy transition with an emphasis on equity.

2. Office of Just Transition

Maine should form a dedicated Office of Just Transition to coordinate training and re-training efforts, oversee financial resources, and provide a “one-stop” administrative agency for workers and communities. Similar to the Colorado model, the Office of Just Transition should convene a Just Transition Advisory Committee composed of representatives from labor, environmental and environmental justice, and state officials to advise and shape the work of the office.⁸⁴ The office should address the needs of workers in high carbon emitting industries and aim to ensure that anyone who may lose employment opportunities is placed in a job with the same or better wages and working conditions than their previous work without having to uproot their lives.

3. Plant Closure Notification

Require companies to provide state officials, workers, and the surrounding community at least five years' notice prior to closing an energy plant. This notice will allow workers and communities to develop and implement transition plans in advance of closures to help ensure a just transition. Companies also must contribute to the transition of their workers to a clean energy economy.



Ensuring Climate Jobs are High-Quality, Union Jobs



Creating High-Quality and Union Jobs in Maine

Already, workers and labor organizations in Maine have fought to ensure that climate projects in the state will create high-quality union jobs for Maine workers. The Maine Aqua Ventus offshore wind initiative will require a project labor agreement on all construction work for the 11 MW project. Affordable housing projects funded under the Maine Jobs & Recovery Plan also will require project labor agreements. The Maine “Green New Deal” law requires all renewable generation or construction work of at least 2MW to utilize a percentage of registered apprentices on each project.⁸⁵ However, Maine can build on these victories and enact stronger legislation that protects the rights of all Maine residents. The following recommendations will improve the lives of workers across the state:

1. Enact Legislation to Include Project Labor Agreements (PLAs), Prevailing Wage, Labor Peace and Build Maine and Buy America Provisions on All Renewable Energy Project of a Significant Size.

Many of today’s renewable energy jobs are not covered by union contracts, allowing for poor conditions on the worksite and low pay. Project labor agreements ensure that all work on a project will be completed by union workers in a safe environment, while prevailing wage legislation guarantees that all worker on utility-scale projects will earn a fair, living wage. Maine should apply these types of labor protection to all projects larger than 400kW to capture the full scope of the energy industry. For those workers who are not covered by these provisions, labor peace and neutrality agreements throughout the supply chain and in service work ensure that all workers have the right to a voice within the workplace and can take part in collective bargaining. In addition, a “Buy Maine” provision, which requires a certain amount of materials or services to be purchased by local suppliers, and an expanded Buy America provision, that ensures purchases of construction materials such as iron and steel in the U.S., will help to maintain fair labor conditions across the country. The Maine state government should purchase materials in bulk for energy and transportation projects to ensure local suppliers are utilized

and that labor standards are properly followed. Finally, state apprenticeships and unions also must prioritize the hiring of people of Color and those from local communities to ensure that frontline communities do not lack renewable energy work. Registered apprenticeship and pre-apprenticeship programs are vital to creating a pipeline for workers and ensuring that labor remains union.

2. Enact Legislation for a Wage Board to Require a Minimum Wage for the Clean Energy Industry.

Workers in non-union jobs on small renewable energy installations often labor in unstable or unsafe positions with little pay. A wage board would set a defined minimum wage and terms of employment in a certain industry, raising the pay for all employees regardless of their union status or the size of the project. Several states such as New York State's fast food wage board have already implemented similar orders. Maine should enact wage binding wage board legislation for the renewable energy industry that includes representation of labor and worker justice organizations on the board.⁸⁶

3. Enact Legislation that Ensures Representation of Labor at All Climate and Energy Decision Making Bodies

Although committees and agencies in Maine have done extensive work on energy, transportation, and climate policy in the state in recent years, these decisions and planning processes often have lacked the voice of labor and may have ignored the role of working people in the economy. Any bodies tasked with deciding climate policy should include labor representatives to ensure a just transition and enact policies that prioritize the need of working people. Similar legislation should also guarantee representation of marginalized groups and frontline communities.

4. Create a Labor-Climate Institute at a Maine Public University.

Maine should create a Labor-Climate Institute at a public university in the state in order to collect high-quality information about decarbonizing the energy economy in an equitable fashion. This Institute will aid the state in undertaking research and education on the climate crisis from a perspective that emphasizes the needs of working people and frontline communities. Creating such an Institute would allow the state to decarbonize in a way that ensures a Just Transition and puts the need of Maine residents first.

Maine workers already have shown a propensity for asserting their collective voices. In recent years, nurses, education workers, museum workers, bus drivers, non-profit workers and many others have organized unions. In October of 2020, twenty bus drivers at Kennebec Valley Community Action Partners in Waterville formed a union with the International Association of Machinists. One driver stated, "After years of having no power in the workplace, we realized that the only way we could have any influence in company decisions was to form a union."⁸⁷



Infrastructure Bill Investment in Maine

\$1.3 billion for federal-aid highway programs

\$225 million for bridge replacement

\$234 million for public transportation

\$19 million for EV charging, with possibility to compete for a \$2.5 billion grant

\$100 million for expanded broadband coverage

\$390 million for water infrastructure

\$74 million for improved airports

In addition to funding for weatherization and other infrastructure projects

Important State Climate Legislation

L.D. 1733, "An Act To Provide Allocations for the Distribution of State Fiscal Recovery Funds." July 19, 2021 http://www.mainelegislature.org/legis/bills/display_ps.asp?id=1733&PID=1456&snum=130

L.D. 936. "An Act To Amend State Laws Relating to Net Energy Billing and the Procurement of Distributed Generation." July 1, 2021. https://legislature.maine.gov/legis/bills/display_ps.asp?LD=936&snum=130

L.D. 1659. "An Act To Create the Maine Clean Energy and Sustainability Accelerator." June 23, 2021. https://legislature.maine.gov/legis/bills/display_ps.asp?LD=1659&snum=130

L.D. 336, "An Act To Encourage Research To Support the Maine Offshore Wind Industry." June 22, 2021, http://www.mainelegislature.org/legis/bills/display_ps.asp?id=336&PID=1456&snum=130

L.D. 528. "An Act To Advance Energy Storage in Maine." June 21, 2021. http://www.mainelegislature.org/legis/bills/display_ps.asp?id=528&PID=1456&snum=130

L.D. 1572. "Resolve, To Analyze the Impact of Sea Level Rise." June 16, 2021. http://www.mainelegislature.org/legis/bills/display_ps.asp?id=1572&PID=1456&snum=130

L.D. 385, "An Act To Resolve Conflicts in and Make Other Changes to the Laws Governing the Efficiency Maine Trust." June 15, 2021. https://legislature.maine.gov/legis/bills/display_ps.asp?LD=385&snum=130

L.D. 340 "An Act To Allow for the Establishment of Commercial Property Assessed Clean Energy Programs." June 10, 2021. https://legislature.maine.gov/legis/bills/display_ps.asp?LD=340&snum=130

L.D. 722. "Resolve, To Study the Establishment of the Maine Climate Corps." June 8, 2021. http://www.mainelegislature.org/legis/bills/display_ps.asp?id=722&PID=1456&snum=130&sec3

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L.D. 1494. "An Act To Reform Maine's Renewable Portfolio Standard." June 26, 2019. https://legislature.maine.gov/legis/bills/display_ps.asp?paper=SP0457&PID=undefined&snum=129

L.D. 1711. "An Act To Promote Solar Energy Projects and Distributed Generation Resources in Maine." June 26, 2019. https://www.mainelegislature.org/legis/bills/display_ps.asp?LD=1711&snum=129

L.D. 1282 "An Act To Establish a Green New Deal for Maine." June 17, 2019, <https://legislature.maine.gov/legis/bills/getPDF.asp?paper=HP0924&item=5&snum=129>

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Governor's Office of Policy Innovation and the Future and Governor's Office of Energy. "State of Maine Lead by Example Report." 2021. https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/Lead%20By%20Example_2021.pdf

Great Plains Institute and the Nature Conservancy Maine. "Maine Utility/Regulatory Reform and Decarbonization Initiative." April 2021. <https://www.betterenergy.org/wp-content/uploads/2021/04/MURRDI-Stakeholder-Process-Summary.pdf>

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Total Job Creation

Recommendation	Years for Job Creation	Direct Jobs	Indirect Jobs ⁸⁸	Induced Jobs ⁸⁹	Direct Jobs Per Year
Install Over 25,000 Public EV Chargers	8	538	1,421	170	67
Electrify the School Bus Fleet	8	292	773	731	37
Electrify and Double City Bus Operations	13	1,120	412	630	169
Net-Zero New Single-Family Residential Construction	n/a	839 (per year)	732 (per year)	931 (per year)	839
Retrofit 50% of Residential Homes Built Before Year 2000	18	123,370	71,425	60,603	6,854
Build 19,000 Units of Affordable Public Housing	18	35,719	31,173	39,615	1,984
100% Renewable Energy (Onshore Wind)	13	9,160	3,664	4,397	705
100% Renewable Energy (Offshore Wind)	13	30,944	11,253	15,003	2,380
100% Renewable Energy (Utility-Scale Solar)	13	37,448	16,383	18,724	2,881
100% Renewable Energy (Geothermal)	13	33,375	11,625	15,375	2,567

Job Types

Industry	Recommendations	Common Occupation Classifications
Solar Energy	100% Renewable Energy by 2035; Install 267 MW of Solar on Maine Public Schools	Construction Laborers, Operating Engineers, Construction Managers, Welders, Glaziers, Structural Iron and Steel Workers, Electricians, Lineworkers, Electrical and Electronics Repairers, Power Plant Operators, Roofers, Coating and Painting Machine Setters, Computer-Controlled Machine Tool Operators, Electrical and Electronic Equipment Assemblers, Scientists, and Engineers. ⁹⁰
Wind Energy	100% Renewable Energy by 2035	Construction Laborers, Operating Engineers, Crane and Tower Operators, Electricians, Lineworkers, Machinists, Team Assemblers, Welders, Engineers, Scientists, Computer-Controlled Machine Tool Operators, Industrial Production Managers. ⁹¹
EV Charging	Install 25,000 Public EV Chargers	Urban and Regional Planners, Lineworkers, and Electricians. ⁹²
EV Manufacturing	In-state EV Manufacturing	Electrical and Electronic Equipment Assemblers, Engine and Machine Assemblers, Team Assemblers, Computer-Controlled Machine Tool Operators, Machinists, Industrial Production Managers, Scientists, Engineers, Drafters, and Industrial Designers. ⁹³
Building Retrofits	Retrofit all K-12 Public Schools; Retrofit 50% of Residential homes in Maine Built Before Year 2000	Construction Laborers, Construction Managers, Operating Engineers, Electricians, HVAC Installers, Plumbers and Pipefitters, Insulation Workers, Painters, Roofers, Glaziers, Architects, and Engineers. ⁹⁴
Transmission	Upgrade Transmission and Grid Modernization for Renewable Energy	Lineworkers, Power Plant Operators, Other Installation and Repair, Electrical and Electronics Engineers, and Electrical and Electronic Equipment Mechanics and Repairers. ⁹⁵
High-Speed Rail	High-Speed Rail	Construction Laborers, Operating Engineers, Construction Carpenters, Cement Masons, Rail Car Repairers, Iron and Steel Workers, Cleaners of Vehicles and Equipment, Railroad Conductors and Yardmasters, Mining Machine Operators, Crane and Tower Operators, Engineering Managers, and Electricians. ⁹⁶

Total Annual Emissions Reduction

Recommendation	Potential emissions reduction in metric tons of CO ₂ or CO ₂ e	Number of equivalent passenger vehicles driven in one year ⁹⁷	Number of equivalent homes' energy use for one year
Deep Retrofits on 50% of All Maine Housing Built Before Year 2000	1,389,142	302,110	167,285
Net-Zero New Housing by 2030 (Single Family Homes Only)	16,770	3,647	2,019
Deep Retrofits on K-12 Public Schools and Install 267 MW of Solar (Carbon Free Healthy Schools)	115,431	25,104	13,901
Double and Electrify City Buses and Vans	257,711	56,047	31,034
Electrify School Buses	50,414	10,964	6,071
100% Renewable Energy (2,300 MW Onshore Wind)	2,814,800	612,162	338,967
100% Renewable Energy (2,300 MW of Offshore Wind)	4,620,500	1,004,866	556,415
100% Renewable Energy (4,600 MW of Solar)	4,545,000	988,446	547,323

Transportation Methodology

Job Creation Methodology: Install 25,018 New Public EV Chargers	Assuming 1,224,600 electric vehicles on the road would require 33,363 Workplace Level 2 Charging plugs, 21,772 Public Level 2 Charging plugs and 3,246 Public DC Fast Chargers. This calculation assumes 100% of drivers have access to home charging and a vehicle mix of 50% plug-in hybrid and 50% EV (AFDC). Charging infrastructure and associated costs for an L2 charger is \$5,440 (for 2019-2025) and for DCFC is \$81,818 (for 2019-2025) (Nicholas, 2019) per charger. ⁹⁸
Jobs Created Per Million: Install 25,018 New Public EV Chargers	1.4 direct jobs per million dollars invested, 3.7 indirect jobs per million dollars invested, 3.5 induced jobs per million dollars invested. (Pollin et al., March 2021). ⁹⁹
Job Creation Methodology: Electrify the School Bus Fleet	There are 3,116 school buses in Maine (FTA, December 2021). The cost of an electric bus is \$887,308, and the cost for a charger and installation is \$67,050 (Johnson et al, 2020). ¹⁰⁰
Jobs Created Per Million: Electrify the School Bus Fleet	1.4 direct jobs per dollars million invested, 3.7 indirect jobs per dollars million invested, 3.5 induced jobs per dollars million invested (Pollin et al., March 2021). ¹⁰¹
Emissions Methodology: Electrify the School Bus Fleet	Total annual mileage for Maine buses was 31,430,000 miles (School Bus Fleet, 2019). Use of FTA's Transit Greenhouse Gas Emissions Estimator v2.0 to calculate emissions replaced based on only using clean energy. ¹⁰²
Job Creation Methodology: Electrify and Double Operations of Maine's City Bus and Van Fleet	Public, tribal and non-profit transit agencies in Maine operate 191 buses, 66 vans, 110 cutaways, and 77 minivans in Maine (FTA, 2020) with a total operating cost of \$93,139,518 per year. The cost of an electric bus is \$887,308, and the cost for a charger and installation is \$67,050 (Johnson et al., 2020). The average cost of a class 3 van is \$54,083 (Mulholland, 2022) and an L2 charger is \$5,440 (Nicholas, 2019). ¹⁰³
Jobs Created Per Million: Electrify and Double Operations of Maine's City Bus and Van Fleet	For EV Infrastructure: 1.4 direct jobs per million dollars invested, 3.7 indirect jobs per million dollars invested, 3.5 induced jobs per million dollars invested. (Pollin et al., March 2021). For Bus Operation: 11.6 direct jobs per million dollars invested, 3.3 indirect jobs per million dollars invested, 5.7 induced jobs per million dollars invested. (Pollin et al., March 2021). ¹⁰⁴
Emissions Methodology: Electrify and Double Operations of Maine's City Bus and Van Fleet	Maine had a total of 84,191,735 in transit route vehicle revenue miles in 2020 (FTA, 2020), excluding rail. Use of FTA's Transit Greenhouse Gas Emissions Estimator v2.0 to calculate emissions replaced based on only using clean energy. ¹⁰⁵

CFHS Methodology

<p>Job Creation Methodology: Deep Retrofits of All Maine Public Schools Buildings and Install 267 MW of Solar in Maine Schools</p>	<p>There are 34 million square feet of schools in Maine (New Buildings Institute, 2021). Education buildings in New England expend an average of 69.7 thousand BTU/square foot (EIA, May 2016), for a total of 2,369,800,000,000 BTUs or 694,519 MWh. This is approximately 267 MW of solar energy installed, assuming that deep retrofits eliminate half of school energy use. Deep retrofits cost \$88/sq. foot (RMI, 2012) and we assume each renewable installation on schools would be under 5 MW and cost \$2,614 per kW of capacity installed (EIA , 2021).¹⁰⁶</p>
<p>Jobs Created Per Million: Deep Retrofits of All Maine Public Schools Buildings and Install 267 MW of Solar in Maine Schools</p>	<p>Solar: 3.2 direct jobs per million dollars invested, 1.4 indirect jobs per million dollars invested, 1.6 induced jobs per million dollars invested (Pollin et al., August 2020).</p> <p>Retrofits: 5.7 direct jobs per million dollars invested, 3.3 jobs indirect jobs per million dollars invested, 2.8 induced jobs per million dollars invested (Pollin et al., August 2020).¹⁰⁷</p>
<p>Emissions Methodology: Deep Retrofits of All Maine Public Schools Buildings and Install 267 MW of Solar in Maine Schools</p>	<p>Assuming transition to 100% renewable energy, reduced based on NBI, 2021.¹⁰⁸</p>

Buildings Methodology

Job Creation Methodology: Net-Zero New Single Family Home Construction by 2030	There were 4,180 new family single homes built in 2020 (U.S. Census Bureau, 2021). The incremental cost of a Zero-Emissions home in Duluth, MT, same longitude as Maine is \$36,508 (Petersen et al, 2019). ¹⁰⁹
Jobs Created Per Million: Net-Zero New Single Family Home Construction by 2030	5.5 direct jobs per million dollars invested, 4.8 jobs indirect jobs per million dollars invested, 6.1 induced jobs per million dollars invested (Bivens, January 2019). ¹¹⁰
Emissions Methodology: Net-Zero New Single Family Home Construction by 2030	In 2017, Maine’s residential sector emitted 2.98 million metric tons of emissions (Maine DEP, 2020). According to the ACS in 2017, there were 742,644 housing units in 2017. Average of 4.012 MTCO ₂ per home. ¹¹¹
Job Creation Methodology: Retrofit 50% of Homes in Maine Built Before Year 2000 by 2040	There are 577,168 units built in Maine before the year 2000 (ACS, 2019). The average cost of a home retrofit is between \$50,000 and \$100,000 (Murphy and Weiss, 2020). ¹¹²
Jobs Created Per Million: Retrofit 50% of Homes in Maine Built Before Year 2000 by 2040	5.7 direct jobs per million dollars invested, 3.3 jobs indirect jobs per million dollars invested, 2.8 induced jobs per million dollars invested (Pollin et al., August 2020). ¹¹³
Emissions Methodology: Retrofit 50% of Homes in Maine Built Before Year 2000 by 2040	In a study of deep retrofits in California it was estimated a reduction of 59.5% CO ₂ eq per sqft and estimates a CO ₂ emissions reduction of 0.001369849 MT tons per sqft (Less et al, 2012). Homes in similar state of Massachusetts have an average square footage of 1,757 sqft (U.S. Census Bureau, 2022). ¹¹⁴
Job Creation Methodology: Build 19,000 Units of Net-Zero Housing by 2040	There is a deficit of 19,031 homes in Maine (Aurand et al., 2021). For a single multifamily dwelling in the northeast, the average square footage in 2020 was 1,050 sqft from U.S. Census (U.S. Census Bureau, 2022). Average cost of constructing a zero-emission multi-family dwelling is \$325.00 per square foot (US Green Building Council, September 2019). ¹¹⁵
Jobs Created Per Million: Build 19,000 Units of Net-Zero Housing by 2040	5.5 direct jobs per million dollars invested, 4.8 jobs indirect jobs per million dollars invested, 6.1 induced jobs per million dollars invested (Bivens, 2019). ¹¹⁶

Energy Methodology

100% Renewable Energy Capacities	Projections from ISO-NE are the total energy capacity of Maine in 2030 accounting for solar PV, energy efficiency upgrades, transportation electrification, and heating. Researchers also accounted for hydroelectric and wind power. Using this information, the total capacity for onshore wind, offshore wind, solar, and geothermal was calculated using capacity factors from the EIA. All data are estimates and exact subject to change based on policy outcomes and grid decisions. ¹¹⁷
Job Creation Methodology: Install 2300 MW of Offshore Wind by 2035	Cost of installation of a offshore wind generator in 2019 in the United States was \$4,077/kW (Stehly, December 2020). ¹¹⁸
Jobs Created Per Million: Install 2300 MW of Offshore Wind by 2035	3.3 direct jobs per million dollars invested, 1.2 indirect jobs per million dollars invested, 1.6 induced jobs per million dollars invested (Pollin et al., August 2020). ¹¹⁹
Job Creation Methodology: Install 2300 MW of Onshore Wind by 2035	Cost of installation of an onshore wind generator in the Midwest/Northeast in 2019 was \$ 1,593/kW (EIA, July 2021). ¹²⁰
Jobs Created Per Million: Install 2300 MW of Onshore Wind by 2035	2.5 direct jobs per million dollars invested, 1.0 indirect jobs per million dollars invested, 1.2 induced jobs per million dollars invested (Pollin et al., August 2020) ¹²¹
Job Creation Methodology: Install 4600 MW of Solar PV by 2035	Cost of installation of a solar generator in the Northeast in 2019 was \$2,544/kW (EIA, July 2021). ¹²²
Jobs Created Per Million: Install 4600 MW of Solar PV by 2035	3.2 direct jobs per million dollars invested, 1.4 indirect jobs per million dollars invested, 1.6 induced jobs per million dollars invested (Pollin et al., August 2020). ¹²³
Job Creation Methodology: Install 1500 MW of Geothermal Energy by 2035	Cost of installation of a geothermal plant is \$2500/kW (DOE, 2022). ¹²⁴
Jobs Created Per Million: Install 1500 MW of Geothermal Energy by 2035	8.9 direct jobs per million dollars invested, 3.1 indirect jobs per million dollars invested, 4.1 induced jobs per million dollars invested (Pollin et al., August 2020). ¹²⁵
Emissions Methodology: Energy by 2035	CO2 emission reduction were calculated with the EPA AVERT Model, using total reductions for the New England Region. ¹²⁶

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About



The Worker Institute at Cornell engages in research and education on contemporary labor issues, to generate innovative thinking and solutions to problems related to work, economy and society. The institute brings together researchers, educators and students with practitioners in labor, business and policymaking to confront growing economic and social inequalities, in the interests of working people and their families. A core value of the Worker Institute is that collective representation and workers' rights are vital to a fair economy, robust democracy and just society.

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