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WASHINGTON CLIMATE JOBS ROADMAP:

A Worker-Centered Approach to a Clean Energy Future

ILR Climate Jobs Institute

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ACKNOWLEDGMENTS

Cornell University's Climate Jobs Institute (CJI) would like to thank the Washington unions and labor federations that participated in our state research and convening process. We appreciate their bold leadership and commitment to tackling climate change and inequity in the state.

Amalgamated Transit Union:
Local 587

Association of Western Pulp and Paper Workers

Bricklayers and Allied Craftworkers:
Local 1

International Association of Bridge, Structural, Ornamental & Reinforcing Ironworkers:
Locals 29, 86, and Northwest District Council

International Association of Heat and Frost Insulators and Allied Workers:
Locals 7 and 36

International Association of Machinists and Aerospace Workers:
District 751

International Association of Sheet Metal, Air, Rail, and Transportation Workers:
Locals 16, 55, and 66

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CEWW, Locals 46, 73, 77 and 191

International Brotherhood of Teamsters:
Joint Council 28 and Local 117

International Union of Operating Engineers:
Locals 302 and 612

International Union of Painters and Allied Trades
District 5

Laborers' International Union of North America:
District Council, Locals 238, 242, 252, 292, 335 and 348

Operative Plasterers' & Cement Masons' International Association of the United States and Canada:
Locals 555 and 528

United Association – Union of Plumbers, Fitters, Welders & Service Techs:
Washington State Association, Locals 26 and 32

United Steel Workers:
District 12

United Union of Roofers and Waterproofers & Allied Workers:
Locals 54, 153, and 189

Washington State Building and Construction Trades Council

Washington State Labor Council, AFL-CIO

The Institute would also like to thank the more than 85 leaders from local labor, environmental, and environmental justice movements along with academics, thought leaders, policymakers, and experts across the climate, energy, and labor fields whom we interviewed to help develop recommendations in this report.

The Climate Jobs Institute is the academic and educational partner to the Climate Jobs National Resource Center (CJNRC). CJNRC educates workers and the public about policies that will build a clean energy economy at the scale climate science demands, create good union jobs, and create more equitable communities. CJNRC is a labor-led organization that works to combat climate change and reverse racial and economic inequality by building a worker-centered renewable economy.

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Disclaimer: This report is an evidence-based analysis of best available data and reports at the time of publication.

The authors offer this report for discussion and debate and take full responsibility for any shortcomings.

DIRECTOR'S MESSAGE

In early 2021, Cornell ILR's Climate Jobs Institute, along with our partner the Climate Jobs National Resource Center, began meeting with labor leaders in Washington State to understand how climate change and the transition to a clean energy economy was affecting workers and labor unions in the state. These interviews made it clear to us that workers in Washington know climate change is real, want to take action to address it, and want to make sure Washington's climate efforts reverse inequality by protecting and growing high-quality jobs for all Washington residents.

After several conversations with more than 85 labor, environmental, and industry leaders as well as policymakers, we became convinced that we could collaborate with local unions to design a climate jobs program that would efficiently meet WA's climate, jobs, and equity goals. In addition to completing interviews, we extensively researched WA's labor and employment profile, climate commitments and programs, and how effectively the state has been fulfilling its climate goals while creating high-quality jobs for those who need them most.

After 2 years of a participatory process that included informational interviews, routine educational convenings, and robust qualitative and quantitative research, we are pleased to release this Climate Jobs Program for Washington State. We are inspired by the steadfastness of WA's unions in finding a path forward that simultaneously addresses climate change, reverses inequality, and protects and creates family- and community-sustaining union jobs—especially for frontline communities. We are also impressed by how Washington State has helped lead climate action nationwide. We hope this plan will guide WA's climate work to bring together pragmatic climate action, robust worker protections, and a fair and inclusive economy.

Lara R. Skinner

Dr. Lara Skinner
Executive Director
Climate Jobs Institute

ILR Climate Jobs Institute

ABOUT US

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

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

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Core Activities and Objectives

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

The CJI's main areas of work include:

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

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

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

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

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

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KEY POINTS

2023

Washington State is NOT ADDRESSING THE CLIMATE CRISIS at the pace science demands.

Human-caused emissions in Washington State have been increasing since 1990 but should be declining rapidly. Record-high air pollution, water insecurity, heat waves, and other hazards are causing unprecedented damage, and the state has not implemented wide-scale measures needed to protect vulnerable communities from the worst effects of climate change.

Income, wealth, race, gender and regional INEQUALITY ARE ON THE RISE, and climate change threatens to exacerbate these problems.

Over the past several decades, the income gap between the top 10% and the bottom 60% has increased, home ownership has become out of reach, and many families are facing high energy burdens. WA's gender gap exceeds the national average and has widened, with women making 80 cents to a man's dollar in 2020. Greater investment in WA's coastal and eastern communities is also needed.[1]

Though Washington State is focused on climate action, many of its landmark POLICIES REFLECT BUSINESS AS USUAL.

New climate investments in Washington State have not created a substantial number of union jobs or strong career pathways for frontline communities. Considered one of the most ambitious climate initiatives in the country, WA's cap-and-invest program only addresses 15%–18% of state emissions. Its exemptions could sustain emissions-intensive practices, especially in environmental justice communities.[2] [3] The Clean Energy Transformation Act (CETA), which provides a net-zero pathway for utilities, incentivizes more wind farms to be built out of state and at the loss of high-quality union jobs because it lacks mechanisms to incentivize in-state production.

Washington State must SCALE AND MANDATE climate action.

In 2022, Washington State allocated roughly $626 million towards climate policy and workforce development—an amount equal to 2.5% of the state budget.[4] [5] Like elsewhere in the country, Washington State must set concrete goals around renewable energy installation, the proportion of the clean energy manufacturing supply chain to be developed in-state, the number of buildings to be retrofitted, and the number of electric vehicle charge points to be constructed. Ensuring a pipeline of good jobs translates into more worker recruitment, training, and placement.

Addressing climate change is A MAJOR JOBS AND ECONOMIC OPPORTUNITY for Washington State, especially for the eastern and coastal parts of WA.

By leading the way in implementing effective clean energy programs with a focus on high-quality job creation and economic development, Washington State can be a national leader in building a successful clean energy economy. To date, Washington has been outpaced by its neighboring states in solar and wind development. Washington shouldn't miss the opportunity to lead on climate change while creating a new economy that supports Washington's families and strengthens its economy.

Washington State has an OPPORTUNITY TO BUILD a large clean energy manufacturing sector.

With its highly skilled workforce and history of complex manufacturing, Washington State is well positioned to build out completely new manufacturing industries in offshore wind, renewables recycling, and sustainable aviation fuel.

Washington State has an ACTIVE LABOR MOVEMENT and a CLIMATE-FRIENDLY POLICY ENVIRONMENT, two strengths that can drive meaningful climate action.

Washington State has the country's third highest unionization rate: nearly one in five workers belonged to a union in 2021,[6] with unionization efforts on the rise. Current Governor Jay Inslee was the first presidential candidate to run a completely climate-focused campaign, and the legislature has passed recent climate bills by large margins. Fifty-nine percent of Washingtonians want local officials to do more to address global warming.[7]

There are OPPORTUNITIES TO CREATE THOUSANDS of high-quality climate jobs in new and existing industries.

Full implementation of a worker-centered climate roadmap—guided by input from labor, policymakers, academics, environmental and community groups, and others—can create over 800,000 jobs across the building, transportation, energy, low-carbon manufacturing, resilience, and adaptation sectors in Washington State. The state can thus chart a path forward that marries WA's climate, jobs, and equity goals.

20 EFFECTIVE WAYS
TO CREATE HIGH-QUALITY CLIMATE JOBS IN WASHINGTON STATE

These high-impact recommendations reduce emissions, increase resilience, retain and create good jobs, and help build an equitable, and inclusive clean energy economy and workforce.

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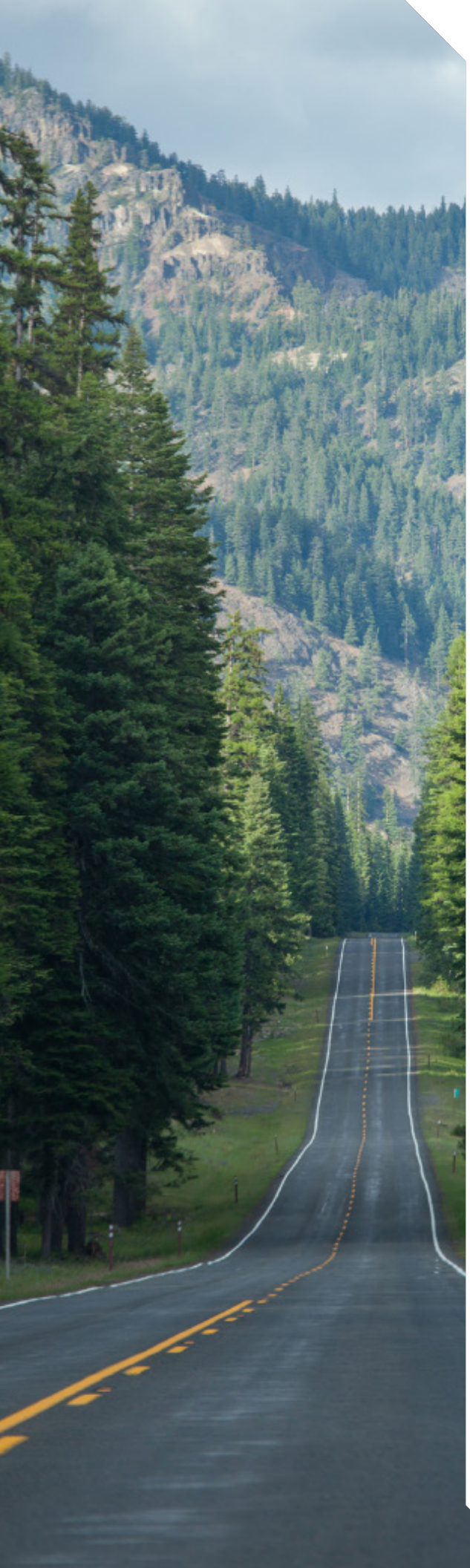


INTRODUCTION

A NEW PATH FORWARD IN WASHINGTON STATE:

Ambitious Climate Action, Retaining and Creating High-Quality Jobs for Residents, and Building a Fair and Inclusive Economy

Washington State is known for its bold actions to address climate change. The state passed the Climate Commitment Act in 2021; the Clean Energy Transformation Act in 2019; and an array of other climate and clean energy regulations, programs, and initiatives in prior years. Three-term Washington Governor Jay Inslee ran on a climate platform for U.S. President in 2019. Yet a comprehensive review of WA's climate programs reveals more to be done: the state needs to expand the scale and pace of its climate work and to ensure that its climate investments maximize high-quality job creation, equity, and economic development in the Evergreen State.

WA's emissions continue to increase, especially in the buildings and transportation sector, and its current investments are not focused on retaining or creating thousands of high-quality local jobs. Inequality of income, wealth, race, and gender is also rising statewide. Addressing climate change and developing a clean energy economy present opportunities to reverse historic inequality and build an economy that is more just, inclusive, and equitable than WA's current one. A narrow focus on climate and reducing emissions will only have adverse effects: heightened inequality; the replacement of high-quality jobs with low-wage, low-quality jobs; and undermined public support for this transition.

Attracting public support for bold climate action is contingent on charting a path that improves Washingtonians' lives by expanding access to jobs for those most in need, prioritizing lifelong careers that sustain families and communities, and making cost-saving activities (e.g., installing solar panels, upgrading and retrofitting homes, and owning an electric vehicle [EV]) available to all households—especially frontline, low-income communities of color. A worker- and equity-centered approach to climate protection is even more important during this period of historic inflation.

Just as Washington State has led on climate in the past, the Evergreen State can chart a new path forward that merges WA's climate, jobs, and equity goals. Such work calls for initiatives that deliver the greatest emission reduction, the most high-quality jobs, and a fair and inclusive economy. The recommendations in this report are designed to meet these aims. The Climate Jobs program described herein demonstrates how Washington State can pursue climate programs that are ambitious, retain and create good jobs for residents, and help build an equitable and inclusive clean energy economy and workforce.

TACKLING WA'S DUAL CRISES: INEQUALITY AND CLIMATE CHANGE

Inequality of Income, Wealth, Race, and Gender is Worsening in Washington State. According to WA's Poverty Reduction Working Group, 26% of Washingtonians cannot meet basic needs like food, safe and stable housing, and reliable transportation.[8] In other words, more than one-quarter of WA's residents live paycheck to paycheck and struggle to make ends meet. WA's economic productivity increased by 54% from 1979 to 2016. Meanwhile, wages only rose by $1 an hour or less for the bottom 60% of workers whereas wages for the top 10% of workers ballooned by nearly $18 per hour.[9] This discrepancy has resulted in stark wage inequality in the state that has worsened over the past four decades, particularly among Native, Black, and Latinx communities.[10] In 1980, the wage differential between the bottom and top 10% of workers was $25–$27 an hour; this figure had grown to $40 an hour by 2019.[11] Prosperity Now found that in Seattle, "white workers make three times as much as Native American residents" and "black workers are three times more likely to be unemployed than white workers."[12] Simply put, Washington State suffers from inequality of income, wealth, race, gender, and opportunity that continues to deteriorate.

While WA's wages have stagnated, the cost of living has climbed dramatically, especially with recent inflation. Seattle ranks as

Frontline worker from Laborers' International Union of North America sanitizing the Washington transit system during the Covid-19 pandemic.

The Rattlesnake Flat Wind Farm was built by Washington union members. The 160-megawatt, 57-turbine project created 250 union construction jobs.

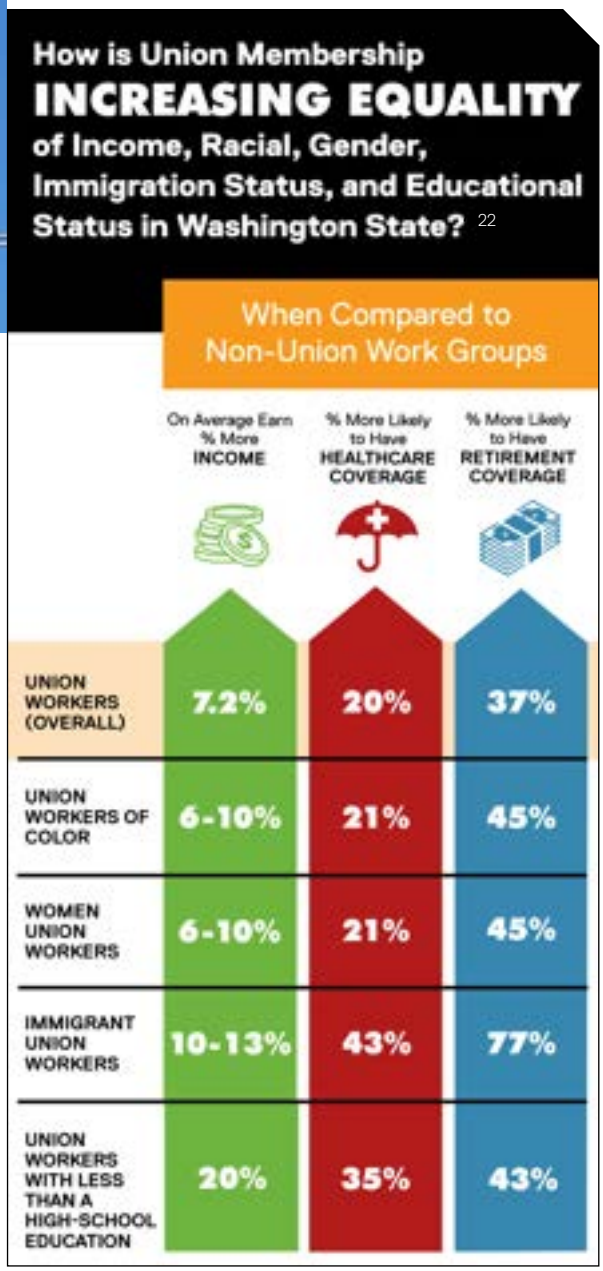
one of the most expensive places to live in the country, with the estimated cost of a new 2,400-square-foot house at $892,000—134% higher than the national median.[13] The cost of food, gas, home rentals, and other basic consumer goods and services have increased sharply in the past year, with the prices of many items rising by as much as 10%–50%.[14]

Washington State tends to have lower electricity rates than other states because it produces a large amount of hydroelectric power. Even so, families struggle to pay their electricity bills. Low-income families face an especially pronounced energy burden. Many low-income households live in energy-inefficient homes that tend to be old, drafty, and poorly insulated. Eleven percent of low-income families in the state faced a high or severe energy burden in 2018. In some areas, such as Ferry County, 37% of low-income households experience this problem.[15]

The COVID-19 pandemic both exposed and deepened WA's inequality crisis. The majority of workers at the highest risk of contracting COVID-19—a large part of the "essential" workforce—were women and workers of color.[16] Death rates from COVID-19 in Washington State were twice as high for Blacks compared with whites, and hospitalization rates were double for Hispanic, Black, and American Indian/Alaskan Natives than for whites.[17]

IMPLEMENTING WORKER- AND EQUITY-ORIENTED CLIMATE POLICY

WA's crisis of inequality demands that all efforts to address climate change include strong mandates to build a fairer, more inclusive, and equitable economy. Research and history have shown that one of the best ways to combat race, gender, and income inequality is by creating high-quality, unionized jobs that pay well and provide important skills and safety training along with healthcare and retirement benefits.[18] In reality, however, much stands to be done to improve current and future jobs in the clean energy sector. The unionization rate in the solar and wind industries is much lower than in traditional energy sectors such as fossil fuel power generation.[19] The residential sector appears particularly susceptible to low-quality solar and energy efficiency jobs: a recent Vox article reported that many solar installers are employed by temp agencies, are not paid well, and do not receive proper safety training.[20]



More than 330,000 workers in Washington State are employed in sectors like construction, utilities, transmission, and aerospace manufacturing which are closely connected to the fossil fuel economy.[21] Finding ways to protect and expand high-quality union jobs by transitioning to a net-zero economy is critical to ensuring the state addresses, rather than aggravates, its crisis of inequality.

Fortunately, with 629,000 union members, Washington State has a strong union tradition: it has the third highest union density and membership in the country, and WA's union membership rate increased to 19% in 2021. Union members nevertheless had to struggle for many decades—since the late 1800s in most cases—to create high-quality, well-paid, and safe jobs with good benefits. In the late 1800s, before the International Brotherhood of Electrical Workers organized utility work, 1 in 2 workers died on the job due to the dangerous nature of this profession.[23]

Washington State cannot afford to wait decades to turn clean energy jobs into high-quality careers that sustain communities and families. We are at a unique moment in history in that we will be shifting to a clean energy economy and establishing low-carbon industries. Strategic interventions to guarantee that new jobs created through this transition are high-quality unionized careers could keep workers from having to wait years for good jobs. The state cannot afford a slow road to a high-quality unionized future; it needs to make sure new jobs are good jobs from their inception. Similarly, it is important to remember that high union density boosts wages and working conditions for all workers, which improves the economy overall.[24] WA's workers already have higher minimum wages, paid sick leave, access to overtime pay, and paid family leave—conditions for which many union members helped advocate.[25]

Building out a new clean energy economy in Washington State offers more than a chance to combat climate change; it is also an opportunity to tackle the crisis of inequality, lift working people across the state, grow the labor movement, and ensure new jobs are good jobs that promote a thriving state. Adopting strong wage, training, and job quality standards will help the climate, too. These standards ensure the work will be done well, on time, and on budget, which can accelerate progress towards WA's major climate goals. Apprenticeship utilization, a prevailing wage, project labor agreements (PLAs), and community workforce agreements are core components of a diverse, inclusive, and equitable clean energy workforce that brings jobs to frontline communities of color. Direct-entry, pre-apprenticeship programs with targeted hiring mandates for women, tribe members, people of color, veterans, justice-involved individuals, and other underserved segments open pathways from these communities to paid on-the-job training programs and lifelong, high-quality careers. PLAs and community workforce agreements have played central roles in diversifying WA's construction workforce. Many training programs do not target underserved populations in the same way as state-recognized pre-apprenticeship programs—nor do most of these programs pay workers for training or guarantee a career as state registered apprenticeships do. Such elements are essential to helping participants complete training and secure solid careers.

THE INTERSECTION OF INEQUALITY AND CLIMATE CHANGE IN WASHINGTON STATE

Wildfire smoke in Seattle, 2020

WA's inequality crisis both contributes to and is intensified by climate change. The state has been ravaged by worsening impacts over the last several years: record-breaking temperatures, severe droughts, a longer fire season with larger fires, and flooding and mudslides. On October 22, 2022, Seattle had the worst air quality in the world due to smoke from wildfires across the Pacific Northwest.[26] In June 2021, parts of the state reached 112 degrees Fahrenheit.[27] This extreme heat buckled sections of Interstate 5, and drawbridges had to be sprayed with water to keep them cool enough to open and close.[28] Declining snowpack and drought have also diminished WA's ability to produce electricity from its main source of power—hydropower—raising concerns about how the state will meet its future electricity needs.[29] Meanwhile, rising sea levels will continue to affect the local coastline, especially the highly populated Puget Sound area. The amount of CO_2 released by wildfires has become a notable source of emissions in the state: in 2015, wildfires produced more greenhouse gas emissions than WA's entire electricity sector.[30]

Of course, the impacts of climate change are not felt equally. Frontline, low-income, BIPOC communities, as well as the elderly and disabled, have fewer resources to withstand, recover, and

adapt to the effects of climate change. The historic heat waves that hit the Pacific Northwest in the last few years hurt those without access to air conditioning or effective cooling the most. Washington State saw 138 heat-related deaths during the 2021 heat wave.[31] Only about half of all homes in the state have air conditioning,[32] and some households cannot afford cooling systems. The growing need for air conditioning will only increase WA's energy consumption and potentially lead to greater greenhouse emissions. These heat waves also warm WA's waters, damaging marine ecosystems. The economic implications of climate change were further underscored in 2021 when one-fifth of WA's cherry crop and millions of shellfish were decimated by extreme heat.[33] Both are important components of WA's agricultural sector.

SCALING WA'S CLIMATE ACTION IS ESSENTIAL TO MEET CLIMATE, JOBS, AND EQUITY GOALS

Although Washington State has been recognized for its focus on climate change, bold action is needed to reduce greenhouse gas emissions and avoid the worst impacts of the climate crisis. Since 2012, WA's emissions have increased by 8% when they should have been leveling off and swiftly declining. Emissions from the transportation and building sectors are particularly problematic: those from the transportation sector are rising and account for 45% of WA's overall emissions.[34] Building sector emissions are increasing as well, generating 23% of WA's emissions.[35] The state's annual emissions total approximately 100 million metric tons. To realize its science-based climate goals, Washington State will need to reduce its emissions to 5 million metric tons per year by 2050.[36]

Compared with many of its neighbors, Washington State is lagging in its installation of utility-scale solar and wind. It has only installed 322 megawatts of solar energy, whereas Oregon has installed four times as much and California has installed more than 100 times as much.[37] The state has made progress in onshore wind installation but could install much more.[38] No mechanisms in the Evergreen State prioritize the development of renewable energy in-state, either—an important policy to help ensure renewable energy projects are built locally, which would create jobs and boost WA's economy.

While California and Oregon have set ambitious goals for offshore wind energy, Washington State has not set any, despite having the manufacturing expertise and workforce to produce many of the components needed for offshore wind turbines. Additionally, the state has not created climate programs that bundle and scale energy efficiency and renewable energy work in public and commercial buildings. Programs that scale climate action in Washington State are key to reducing emissions and creating a substantial number of clean energy jobs. They are also vital for reducing household utility bills, especially in low-income communities. Many other states have set concrete goals for how much

renewable energy and battery storage to build, what percentage of the clean energy manufacturing supply chain must be developed in-state, how many buildings will be retrofitted, and how many EV charge points will be constructed. Many of the same states have passed legislation to require wage, training, and labor standards on clean energy work. Washington State should consider this approach to expedite emission reduction while creating high-quality jobs and meeting equity goals.

With the right methods, tackling climate change can help Washington State prevent devastating impacts while reversing inequality and improving the quality of life for many Washingtonians. Building a large clean energy economy in the state is a historic opportunity to create high-quality jobs, expand access to these jobs, make communities healthier, and render essential services (e.g., heating/cooling homes and transportation) more affordable.

The recommendations in this Climate Jobs program are designed to tackle WA's dual crises of climate change and inequality. Suggestions stress climate investments featuring the greatest emission reduction or resilience potential. Our guidance also focuses on activities that will retain and grow the highest number of high-quality union jobs; drive investments in activities that will most benefit frontline communities of color; and shift from incentive-based, voluntary programs to concrete mandates meant to scale WA's climate work in a way that accelerates emission reduction and job creation while making clean energy programs more accessible to Washingtonians who need them most. These recommendations are also intended to leverage the unprecedented clean energy investments Washington State will receive from the 2021 Infrastructure Investment and Jobs Act (IIJA) and the 2022 Inflation Reduction Act (IRA).

Local 302 Operating Engineers

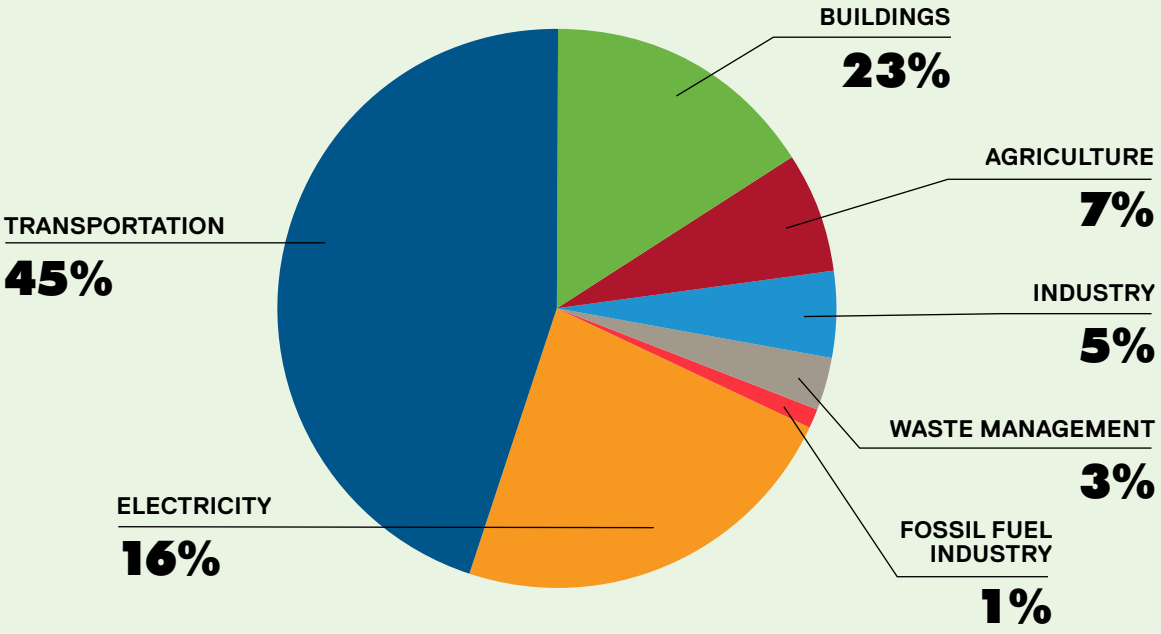
Every recommendation includes detailed estimates of how much it will reduce greenhouse gases and how many jobs it will create. Also outlined are the costs associated with each suggestion; how to pay for it; and what wage, training, and job quality standards need to be instituted to ensure these new jobs are high-quality with expanded access for frontline communities. This concrete, jobs-led climate strategy centers on WA's climate, workforce, and equity goals. Implementing these recommendations will put Washington State firmly on the path of tackling climate change while reversing inequality and building the large, equitable, clean energy workforce and economy the state needs.

ENERGY

The energy sector is an important provider of jobs in Washington State and can create thousands more with the buildout of a clean energy economy. In 2021, the state hosted nearly 110,000 energy workers spanning construction, manufacturing, professional, and trade jobs. This figure includes employees in the renewables sector: nearly 5,000 in solar electric generation, 3,300 in wind electric generation, and 2,400 in hydroelectric generation.[39] According to data from the Department of Labor, the fossil fuel industry employed 6,900 workers in 2021, the majority of whom worked in either petroleum/coal products manufacturing and wholesale or oil/gas production and pipeline distribution.[40] The needs of workers in the fossil fuel industry and in the growing renewables sector should be addressed to ensure decent working conditions for all laborers in Washington State.

In spite of WA's progress in the energy transition, the state remains reliant on fossil fuels and is a significant producer of greenhouse gases. In 2018, Washington State emitted nearly 100 million metric tons of CO_2, and it has higher energy-related per capita emissions than Oregon and California.[41] The largest portion of WA's emissions come from the transportation sector, representing 45% of the total, along with the buildings sector (23%). Both sectors are largely powered through the burning of fossil fuels in cars and home heating. Although hydropower generates most of WA's electricity, the electricity sector (16%) contributes a large share of greenhouse gas emissions from natural gas, coal, and other fossil fuel generation. Agriculture, industrial processes, waste management, and the fossil fuel industry jointly produce a sizeable proportion of greenhouse gases as well, totaling more than 15% of WA's greenhouse gas emissions.[42]

Greenhouse Gas Emissions in Washington in 2018 by Sector



In 2020, about one-half of energy consumed in Washington State was from renewable sources, although the vast majority came from hydroelectric power; wind and solar accounted for less than 4% of energy consumption.[43] Renewable electricity, mostly from hydroelectric dams, produced 73.8% of all electricity generated.[44] The state has passed legislation to address its reliance on fossil fuel energy. The CETA, passed in 2019, would end the use of coal power by 2025 and mandate 100% renewable electricity by 2045.[45] In 2020, the state set new targets for decarbonization, committing to decrease greenhouse gas emissions by 95% below 1990 levels by 2050.[46] The state has also created a cap-and-invest program as part of the Climate Commitment Act to aid in meeting these targets.[47] Although these initiatives are noteworthy, far more work is needed to create a truly renewable energy economy. What's more, few projects have been implemented even with this legislation, and clean energy programs have not consistently led to high-quality jobs.

Recently passed federal climate spending will also facilitate WA's energy transition. By 2030, the IRA will invest $5.3 billion in large-scale renewable generation in Washington State with additional tax credits for companies that pay the prevailing wage. The bill includes 50%–100% rebates on efficient electrical appliances, a 30% tax credit on installing solar panels and community solar, direct-pay tax credits for rural electric cooperatives, tax credits for new and used EVs, and manufacturing investment.[48] These efforts are a fair start. However, greater attention is needed to move from incentive programs to clean mandates that ensure an energy transition occurs with the urgency necessary to address the climate crisis. The following recommendations will accelerate the development of renewable energy in Washington State while creating high-quality in-state jobs and a diverse, inclusive clean energy workforce.

ZERO-CARBON BY 2045

Solar panels installed by apprentices and Journey level electrician at the Puget Sound Electrical Joint Apprenticeship and Training Committee training center

RECOMMENDATION:

Commit to 100% in-state net-zero energy by 2045 and establish an inclusive, expedited siting process

Scale up zero-emission energy production; prioritize domestic job creation by purchasing 30% of Renewable Energy Credits be issued to in-state generators; establish an inclusive, expedited siting process

To meet the goals of reducing greenhouse gas emissions and air pollution while creating a clean energy economy with high-quality jobs and equitable opportunities, Washington State must transition to 100% renewable electricity by 2045 as set out in the CETA. The state should incentivize in-state generation of electricity, siting grid-connected renewable projects within its boundaries, in order to maximize employment opportunities and maintain well-paying jobs with safe working conditions. Doing so may require an overhaul of the Renewable Energy Credit (REC) system and purchasing a minimum number of RECs, such as 30%, from in-state generators. Accomplishing this objective will be no easy feat, as it will require the construction of many energy systems to meet new electricity demand generated via clean energy initiatives such as heating electrification and EVs. Yet this pursuit could create hundreds of thousands of jobs across the state and significantly improve the lives and health of working people.

Floatovoltaic Illustration

New Rooftop Solar - 10 GW

New Utility-Scale Solar* - 10 GW

New Offshore Wind - 6 GW

New Onshore Wind - 6 GW**

Advanced Nuclear - 5 GW

Advanced Technology* - 1.5 GW**

Total - 35.8 GW of New Installations

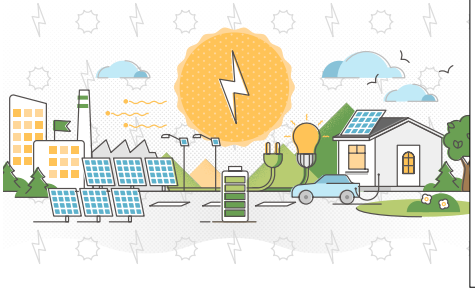
*solar capacity can be achieved on existing WA brownfields and superfund sites
**wind capacity can be achieved on existing WA brownfields and superfund sites
***assumes geothermal electricity

NEW NET-ZERO ENERGY TO BE INSTALLED BY 2045

One way to achieve this aim would be to construct 47 to 57 gigawatts of net-zero energy across the following renewable energy sources: 15 gigawatts of residential solar photovoltaic (PV) energy, 3 gigawatts of utility-scale or floatovoltaics solar energy, 8.5 gigawatts of solar PV on brownfield sites, 11 gigawatts of utility-scale onshore wind on brownfield sites, 6 gigawatts of offshore wind, and between 3.7 and 13 gigawatts of advanced carbon-free technologies. This energy mix could lead to a green energy transition and comes with certain advantages. For instance, utility-scale solar and onshore wind energy are typically cost-competitive or cheaper than fossil fuels such as natural gas or coal energy.[53]

Using brownfields and superfund sites for utility-scale solar and onshore wind could ease siting concerns while offering enormous potential for renewable energy in Washington State. Brownfield

HOW MUCH WORK IS A 1-GIGAWATT (GW) INSTALLATION?*



1 GW = 3,125,000 SOLAR PANELS
*assuming 320 W panels[49]

1 GW = 335 ONSHORE WIND TURBINES
*assuming 3 MW turbines[50]

1 GW = 135 OFFSHORE WIND TURBINES
*assuming 7.4 MW turbines[51]

1 GW = 4 SMALL MODULAR NUCLEAR REACTORS
*assuming 300 MW reactors[52]

and superfund sites are areas where development is limited or challenging because of a substance, pollutant, or contaminant. Reviving this land can improve the environment and resilience while creating remediation and installation jobs. The IRA includes funding for brownfields and superfund sites. Siting solar systems on mounts in the water, also called floatovoltaics, or on solar canopies over canals may also help with siting issues.

The production of floating offshore wind can create thousands of high-quality jobs in construction and across the supply chain. Setting a goal of 6 gigawatts by 2045 will jumpstart this industry in Washington State and lead the state on a path to the assembly and manufacturing of offshore wind parts at WA's ports. A final amount of capacity could be met through advanced carbon-free technologies such as modular nuclear, green hydrogen, geothermal, or wave energy. Albeit early in their development, these technologies represent exciting prospects for transforming the energy system and boosting resilience.

ZERO-CARBON BY 2045

Estimated Job Creation:
Investments in rooftop and utility scale solar, onshore and offshore wind, and advanced technology could create 423,209 direct jobs over 22 years or 19,330 jobs per year.

Ensured High-Quality Jobs:
To create union jobs with safe working conditions, all large-scale renewable projects receiving state funding should involve PLAs. The state should ensure decent pay for workers by mandating that renewable projects pay workers the prevailing wage. Where Washington State is issuing grants, procuring materials or RECs, or doing public work contracts it should institute labor peace and neutrality agreements and priority hiring by targeted zip code. This includes all supply chain and operations and maintenance work such as service, janitorial, and security jobs to guarantee decent working conditions for those who support the clean energy economy.

Estimated Cost:
Installing all recommended net-zero energy will cost $113 billion or $5.1 billion per year (in 2022 dollars) for 22 years.

Carbon Emission Reduction:
Installing the described capacities of rooftop PV and utility-scale solar and wind energy will produce 16,418,800 fewer metric tons of CO2 annually in Washington State by 2045—equivalent to 3,537,746 gasoline cars taken off the road for one year.

“As ironworkers, we build America. I am the fifth person in my family to become a journeyman ironworker and know that this can be a lifelong career. There's no denying that it’s a difficult job with plenty of challenges to keep you on your toes. As union members, we are fortunate enough to go through 4 years of apprenticeship training, studying in and out of the classroom to become journeymen. Truthfully, we all know that there is never a day we stop learning. It is so satisfying to look out at that Washington skyline and know you've had a part in its making. Now through climate work we have a chance to build a new America.”

JULIANA LAVE’
Ironworker, Local 14 Spokane

GREEN HYDROGEN

To complete an energy transition, Washington State will need to find alternative energy for hard-to-decarbonize sectors that cannot rely on traditional renewable electricity alone. Becoming a national leader in the production of green hydrogen will enable the state to meet this challenge and introduce a new industry to the region that will produce high-quality union jobs statewide. Washington State already has a 5-megawatt pilot project under development in Douglas County via the Wells Hydroelectric Project. IRA incentives should facilitate the funding of green hydrogen production. In addition, organizations in Washington State have submitted a proposal for a green hydrogen hub in the Northwest Region, as part of an $8 billion Department of Energy program. If approved, this proposal could bring in significant investment into the region and stimulate green hydrogen production.

As a start, Washington State should produce 55 million kilograms of green hydrogen by 2030, which can replace fossil fuel combustion in power boats, diesel trucks, and aluminum manufacturing and other industrial processes. With an additional $1 billion investment, Washington could produce over 150 million kilograms of green hydrogen. Building and personal automotive use may be replaced by electrification. However, these hard-to-decarbonize sectors will need another fuel source such as green hydrogen.

This recommendation will allow WA's economy to continue providing work in major employment sectors such as trucking, maritime, and manufacturing while completing the necessary transition to a renewable energy economy.

RECOMMENDATION:

Make Washington State a national leader in green hydrogen production

Invest $1 billion into a Green Hydrogen Hub and create a green hydrogen superhighway for the state

Douglas County Public Utility District General Manager Gary Ivory, holding a sign in the foreground, says the renewable hydrogen facility should be operating at the end of the year at this site in a former apple orchard near East Wenatchee. PUD commissioners are in the back ready with shovels. From left, Ron Skagen, Aaron Viebrock and Molly Simpson.

Wells Dam, owned by the Douglas County Public Utility District, will supply electricity to pull hydrogen gas out of well water.

The IRA will further decrease the costs of producing green hydrogen; the Act includes a substantial production tax credit for low-carbon green hydrogen production.[54] Yet because making green hydrogen can consume large amounts of water, facilities should look into ways to reduce water usage as production advances.

Washington State will need to provide places to access this green hydrogen as part of decarbonizing the transportation sector. The state should therefore construct a "green hydrogen superhighway," installing a green hydrogen refueling station for every 100 miles of state highway by 2030. A superhighway will not involve new roads; it will rather be built on top of existing infrastructure across the state, connecting rural areas to major cities along with western ports and major airports. This initiative would also better enable EV charging stations to make statewide carbon-free travel feasible. Trucks can shift to using green hydrogen as a fuel source instead of diesel fuel, which will help make sure that jobs are created in all of WA's regions.

GREEN HYDROGEN

Estimated Job Creation:
Investing $1 billion into a green hydrogen hub could create 600 direct jobs over 7 years or 85 jobs per year in the Pacific Northwest region. Installing a green hydrogen refueling station along every 100 miles of state highway could produce 188 direct jobs over 7 years or 27 jobs per year.

Ensured High-Quality Jobs:
To ensure union and high-quality jobs are created throughout this process, a PLA should be mandated for all work done with state funding on green hydrogen production, refueling stations, and construction work.

Carbon Emission Reduction:
If 55 million kg of green hydrogen are initially produced, then there is potential to reduce emissions by 714,100 metric tons of CO2e, if the fuel produced is directly used for long range trucking.

Cost:
For hydrogen production, Washington should invest $1 billion in a Hydrogen Hub and $314 million to construct a superhighway.

MODULAR NUCLEAR

RECOMMENDATION:

Make Washington State a national leader in the manufacturing and construction of small-scale, modular nuclear plants

Install 2 gigawatts of small modular nuclear reactors (SMRs) by 2040

TARGETS:
By 2028, at least one SMR plant
By 2030, at least three SMR plants
By 2032, at least five SMR plants

Boilermakers Local 242 members conducting assembly work.

Even though renewable energy sources will dominate WA's grid in the coming decades, SMRs can increase grid stability by providing reliable energy when intermittent renewables are not operating. SMRs also act as a zero-carbon alternative in hard-to-decarbonize sectors in Washington State.

SMRs are about one-third the size of traditional nuclear plants, generally producing no more than 300 megawatts. Due to their small size, these reactors can be manufactured in a factory, shipped, and installed onsite.

Their portability makes them a suitable option for rural areas in the state with limited grid coverage. In addition to grid use, SMRs can provide thermal or electrical power to desalination, hydrogen production, and manufacturing. They can complement renewables in buildings that require high energy reliability, such as data centers, by serving as an alternative to fossil fuel–powered diesel generators.

SMR deployment represents an emerging trend in the United States. North America's first grid-scale SMR plant will be built in Washington State[55] in 2027 by Department of Energy (DOE)–funded start-up X-energy in cooperation with Energy Northwest. National policy and public interest imply a future for SMR manufacturing in the country. The IRA includes new federal tax credits for domestic manufacturing of nuclear component parts. The Act allocates $150 million to the DOE's Office of Nuclear Energy and $700 million to the DOE to develop a domestic supply chain. It also catalyzes

MODULAR NUCLEAR

Estimated Job Creation:
18,000 direct jobs over 17 years or 1,059 jobs per year

Ensured High-Quality Jobs:
To ensure high-quality, local jobs are created throughout this process, the state should create Zero Energy Credits (ZECs) for SMR and qualifying technologies and directly purchase ZECs. Washington should require a PLA for all state-funded SMR manufacturing and construction work.

Carbon Emission Reduction:
2,784,028 metric tons of CO_2, equivalent to 599,872 gasoline cars removed from the road for a year

Estimated Cost:
$7.2 billion or $424 million per year for 17 years

industry growth by providing purchasers a 30% tax credit for investments in zero-carbon facilities and in nuclear fuels.[56] Unions in the AFL-CIO have been contributing to SMR design since 2017 and have publicly expressed willingness to provide labor, education, and training to the union workforce to ensure that companies have a qualified supply of workers.[57]

Washington State has the infrastructure to expand its skilled workforce and manufacture SMR technology in-state, all while cutting costs for businesses.

Locating manufacturing facilities in the state, which is creating a pipeline of highly trained workers, could increase SMR company profit margins and productivity. A Massachusetts Institute of Technology study of 200 nuclear structures, systems, and components showed that recruiting an experienced workforce decreased SMR capital costs and the risk of cost overrun.[58]

Washington State offers viable options for SMR deployment, with more than a dozen power plant sites having been proposed, licensed, built, or closed which could be suitable. Examples include BP Cherry Point Cogeneration, Centralia Coal Plant, and Chehalis Generating Facility according to a Golder Associates study for the WA State Energy Facility Site Evaluation Council.[59]

Fossil fuel power plant sites are ideal for SMR thanks to in-place transmission lines and grid connectivity. The IRA also offers a 10% tax credit for site projects in "energy communities" or in areas with closed coal plants or high employment in fossil fuels, further incentivizing siting in the state.

The rise of a new SMR industry can provide a range of benefits to Washington State, including energy resilience and high-quality union jobs. However, there should also be innovation in safe handling, safe permanent disposal, domestic fuel production, and equitable and safe siting. By developing a comprehensive plan (i.e., by bringing labor, environmental, and environmental justice groups; tribes; community groups; and federal, state, and local policymakers and others to the table), the state will be prepared to meet this historical transition strategically and equitably.

TRANSMISSION

RECOMMENDATION:

Develop a 21st century electric system that prioritizes a highly skilled utility workforce, safety, affordability, and local manufacturing

Modernize Washington's transmission and distribution infrastructure

To meet the needs of a 21st century economy, Washington needs to improve and expand its distribution and transmission infrastructure. It took 100 years to build Washington's existing grid system, and a similar feat lies ahead. The state must rapidly modernize its electric grid within the next three decades to address climate change, population growth, and widespread electrification of its economy. By using an influx of federal funding for supply chain development and grid buildout, improving planning and coordination, and increasing efforts to expand its highly-skilled utility workforce, Washington has the opportunity to improve its electrical infrastructure to maintain and create quality jobs and support ambitious decarbonization and resilience efforts.

To ensure a stable grid, Washington must invest heavily in upgrades to its existing system. Nationwide, 70% of power transformers and transmission lines are 25 years or older. Bonneville Power Administration (BPA), a federal entity, estimates a need for $845 million in system upgrades, with most of it going towards upgrading a line that runs between Olympia and Centralia, Washington.[60]

Aging infrastructure that is not properly maintained by a well-trained, appropriately-sized workforce increases the risks of power failures and power lines sparking wildfires. Grid failures disproportionately harm underserved communities, which often have the fewest resources to respond to outages.

At present, much of Washington's utility workforce is focused on system maintenance. This includes journeyman linemen, journeyman line clearance tree trimmers, journeyman metermen, journeyman cablesplicers, power dispatchers, journeyman substation wiremen, and journeymen hydro operators. Washington also has the first-in-the-nation apprenticeship program for tree trimmers. The Joint Apprenticeship & Training Committee of the Northwest Line Construction Industry (NW Line JATC)

trains construction line workers and powerline clearance tree trimmers in Washington and Oregon, providing coursework and on-the-ground training to grow the unionized electrical construction workforce.[61]

With an expectation that 55% of the electric and natural-gas public utility workforce across the country might retire within the next decade, greater investment in labor-management apprenticeship programs is imperative.[62]

To meet its clean energy needs for the future, Washington must build out a new network of transmission and distribution lines. With WA's population expected to grow by one million people between 2024 to 2037, new connections from energy sources to population centers will be of utmost importance. Over 65% of growth is happening in WA's five largest counties: Clark, King, Pierce, Snohomish, and Spokane.[63] As solar and wind projects are constructed across the state, new lines will need to be built in three corridors: east to west, north to south, and southern coastal areas to the interstate-5.[64]

As more zero-carbon energy sources come online and electrification of buildings and transportation becomes the norm, the grid must be modernized to hold and transmit larger volumes of energy to meet peak demand. A 2022 WA Department of Commerce report found that peak loads could increase 30-70% by 2050 for four consumer-owned utilities. In its 2017 Integrated Resource Plan, Puget Sound Energy anticipated building over 104 miles of new transmission lines and adding up to three 230 kV bulk power substations. That same year, Avista projected an increase in peak load of 50% from 2021 to 2024.[65]

The state faces a massive need for workers to construct new power lines but does not currently have a large enough trained utility workforce. Washington anticipates a 21% increase in employment growth in electric power bulk transmission and control from 2020-2030. Within transmission, the greatest need is for power line installers and repairers. A report by the Seattle Jobs Initiative found that 77% of utilities cited chronic labor shortages as a challenge for implementing CETA.[66] IBEW, which staffs Washington utilities, has made public statements on labor shortages, citing the lack of meaningful infrastructure investment and that journeymen are not replacing retiring workers fast enough.[67]

To achieve state decarbonization, Washington needs quicker, more reliable access to electric infrastructure supplies, particularly wires and transformers. A 2020 report by the Department of Commerce found that the United States was 82% reliant on imports to meet its need for large transformers. The average wait time for transformers has grown from about three months in 2018 to over a year at the start of 2022.[68] Supply-chain bottlenecks make it difficult to scale up the grid at the pace necessary to meet climate goals.

Washington has an opportunity to locally manufacture these components, boosting its domestic supply chain and expediting its decarbonization. The Defense Production Act

has spurred significant investment in electric infrastructure manufacturing in other states, with some companies partnering with IBEW locals on these efforts. Today, Washington has over 3,400 workers manufacturing electrical equipment, cables and wires.[69] With significant investment, the state could support expansion with labor standards to ensure these are high-quality jobs.

At present, it can take 10 to 20 years for planning, permitting, and constructing high-voltage power lines. In 2022 there was a backlog of 144 transmission requests from renewable energy generation developers. It will be important for WA to streamline the transmission siting process to reduce backlogs, increase the pace of zero-carbon energy buildout, and save the state money. House Bill 1216, passed during the 2023 legislative session may help address these issues.

Without long-term planning, WA could see delay, inefficiency, and patchworks of infrastructure buildout rather than a cohesive system. Comprehensive planning could help the state map out workforce needs by region, ensure frontline communities can access new, high-quality jobs, and given the dangerous nature of this work, coordinate quality training and safety standards.

Transmission planning is also important to reduce wildfire risk. Aging and unmaintained lines can potentially ignite surrounding vegetation. Often when private utilities cut their budget, tree trimming services are the first to go. This has broader implications when lines spark wildfires, causing millions of dollars in damage for the state and property owners. The state can reduce these risks by investing in line maintenance programs, funding pre-apprenticeship programs to grow the tree-trimming workforce, and conducting feasibility studies on undergrounding and upgrading equipment in high-risk areas.

Recent federal legislation and executive orders have made grid investment more feasible than ever before. The Biden administration recently invoked the Defense Production Act for the manufacturing of transformers and grid components, enabling the federal government to jumpstart the industry by providing financial assistance to domestic manufacturers or purchasing components directly and attaching requirements for labor standards. In 2022, IIJA awarded Washington $18.2 million to prevent outages and make the power grid more resilient. The 2022 IRA creates a $2 billion revolving loan fund for developers to build new transmission lines, and grants $760 million to expedite siting and $100 million to support transmission connection to offshore wind.[70]

Washington should take bold action to transform its electric grid system to be expansive, resilient, and a reliable source of high-quality jobs. Revitalizing its existing systems and building out brand new transmission and distribution lines as it evolves to meet 21st century energy needs. Investing heavily in workforce development, local manufacturing, and future studies will set the state up for success in its transition to a clean energy economy. By taking these steps, Washington can move firmly on a path towards creating the high-quality workforce and strong economy that the state needs.

THE INTERNATIONAL BROTHERHOOD OF ELECTRICAL WORKERS

The International Brotherhood of Electrical Workers (IBEW) represents over 775,000 active members across the United States who work in utilities, construction, broadcasting, manufacturing, railroads, and government.[71] IBEW partners with the National Electrical Contractors Association (NECA) on the National Joint Apprenticeship and Training Committee, one of the country's largest apprentice and training programs.

Solar panels installed by apprentices and Journey level electrician at the Puget Sound Electrical Joint Apprenticeship and Training Committee training center.

IBEW/NECA develops trainings to meet the needs of this historic transition to a clean energy economy. In 2009 they built a core curriculum at the National Joint Apprenticeship and Training Committee for apprentices that includes 3 years of study in a renewable energy concentration like solar, wind, distributed controls, and fuel cells. Training includes 75 lessons, a two-volume workbook, and seven textbooks. IBEW/NECA also created a boot camp to update journeyworkers on new green technology with a hybrid teaching model that integrates in-person and online instruction.[72]

IBEW/NECA partner with industry, universities, and organizations to recruit, retain, and qualify individuals for new climate jobs. They have relationships with vendors and manufacturers who make green products, which helps inform new training. IBEW/NECA work with organizations focused on green job placement and workforce development. They also partner with the American Council on Education to grant apprentices college credit for training courses.[73] In Washington State, IBEW provides hands-on solar installation experience at the Puget Sound Electrical Joint Apprenticeship and Training Committee's Training Center. The Center, which trains 500 Journey Level electrical workers and 1200 apprentices each year, even trained workers to install solar panels on the roof of its own center. IBEW Local 46 has been involved in advocating for and creating union jobs in Washington State through the Healthy Through Heat and Smoke Campaign. In the initiative led by 350 Seattle, IBEW Local 46 campaigned for and won a parks levy with funding to upgrade half of Seattle's 26 community centers for resilience. Union workers from multiple crafts will install heat pumps, HVAC upgrades, and solar panels so centers can provide cooling, clean air, and reliable energy during wildfires and other extreme events.[74]

IBEW/NECA continues to expand their clean energy training programs as well as their commitment to building pathways into careers for historically marginalized communities. In June of 2023, the Department of Energy announced 12 new grant funded projects through the Advancing Equity through Workforce Partnership fund which aims to address the Biden-Harris energy and equity goals. One third of these twelve projects were awarded directly to NECA/IBEW Joint Apprenticeship Training Centers across the West coast. One of the funded projects based in Seattle, Washington through the Emerald Cities Collaborative will create a solar installer and union-based electrical pre-apprenticeship program for BIPOC communities, paving the way to a diverse and inclusive clean energy workforce.[75]

LOW-CARBON MANUFACTURING

Manufacturing plays a pivotal role in WA's economy; more than 270,000 workers[76] were employed under this sector in 2020.[77] Airplanes and other transportation equipment are by far WA's biggest export, and nearly one-fifth of all manufacturing workers in the state are with Boeing.[78]

Most of the state's manufacturing jobs are high-quality, providing good benefits, health insurance, retirement, educational opportunities, and high wages. The average annual salary for these positions was nearly $96,000 in 2019.[79] [80] Many manufacturing workers also belong to unions such as the International Association of Machinists and the Association of Western Pulp and Paper Workers.

Over time, WA's manufacturing jobs have declined, with a net loss of more than 62,000 since 2000.[81] The aluminum industry has shrunk from over 7,000 jobs in 1998 to less than 1,000 today.[82] For each aluminum job lost, three more are lost elsewhere in the economy.[83] These losses in WA's manufacturing are attributable to productivity gains (e.g., automation), higher electricity prices,[84] and the outsourcing of work to other countries.[85]

Loss of local high-quality union jobs has contributed to WA's crisis of inequality, emphasizing the need to address climate change in a way that builds a fairer and more inclusive society. Retaining and creating high-quality union jobs in this new clean energy economy will reverse inequality while creating a climate-friendly and more resilient state.

Washington State has the potential to be a national leader in clean energy manufacturing. Manufacturing is a source of high-quality jobs, and the state maintains manufacturing expertise and a skilled workforce capacity from which to build. The state also has sterling opportunities to lead the west coast in offshore wind manufacturing and renewables recycling and to remerge as an aluminum-producing powerhouse. This section explores ways to create high-quality manufacturing jobs while cultivating a more equitable, inclusive Washington State.

Boeing 737 wing line Renton Tyler Martin, Leath Dy and David Sengaroon

OFFSHORE WIND MANUFACTURING

RECOMMENDATION:

Position Washington State as a west coast offshore wind manufacturing center

Construct and operate blade, tower, foundation, and cable manufacturing facilities to support the west coast buildout of 20 gigawatts of offshore wind by 2030

Build two service ship vessels by 2030

Require labor peace agreements on manufacturing and assembly work

Offshore wind energy will provide a substantial amount of renewable energy across the west coast. With the goals set in this report (6 gigawatts by 2050 in Washington State), along with Oregon's consideration of producing 3 gigawatts by 2030 and California's offshore wind goal of 25 gigawatts by 2045, a considerable offshore wind industry could develop along the Pacific.[86] However, a manufacturing supply chain will be needed to provide for these projects. This infrastructure could be constructed and assembled in Washington State, creating a large number of jobs that build off the skills of trade and manufacturing workers statewide.

Washington State has extensive expertise in manufacturing airplane components along with an extensive shipbuilding industry that lays the groundwork for this offshore wind supply chain.

Washington State should invest in facilities to manufacture offshore wind blades, foundations, towers, and cable facilities locally. To prepare for this industry's maritime needs, the state should also construct at least two service vessels that will be needed for the operation and assembly of these facilities.

IAM members working on a Boeing 737 aircraft wing in Renton, WA

The state is an ideal setting for offshore wind manufacturing: the deepwater ports in Tacoma, Everett, Bellingham and Seattle offer unobstructed access to the ocean and abundant space for the manufacturing of these parts.

The state should take advantage of $17 billion for port buildout and $3 billion for zero-emission port equipment from the federal Inflation Reduction Act to generate thousands of high-quality construction and manufacturing jobs at its ports.

OFFSHORE WIND MANUFACTURING

Estimated Job Creation:
Investing in a blade, tower, foundation, and cable facility and the construction of two service vessels could create nearly 2,000 manufacturing jobs by 2030 or 285 jobs per year.

Ensured High-Quality Jobs:
All facility construction should be completed under PLAs that ensure safe union work. Any manufacturing, service, operations, or other supply chain work should include labor peace and neutrality agreements that afford workers a voice on the job and the ability to fight for fair working conditions.

Cost:
Investment in these facilities would cost $1.05 billion or $150 million per year by 2030.

RENEWABLES RECYCLING

RECOMMENDATION:

Make Washington State a premier solar and wind refurbishing and recycling hub for the west

Recycle or refurbish 100% of Washington State and 10% of U.S. solar panels by 2030 and establish a path forward for wind turbine blade recycling

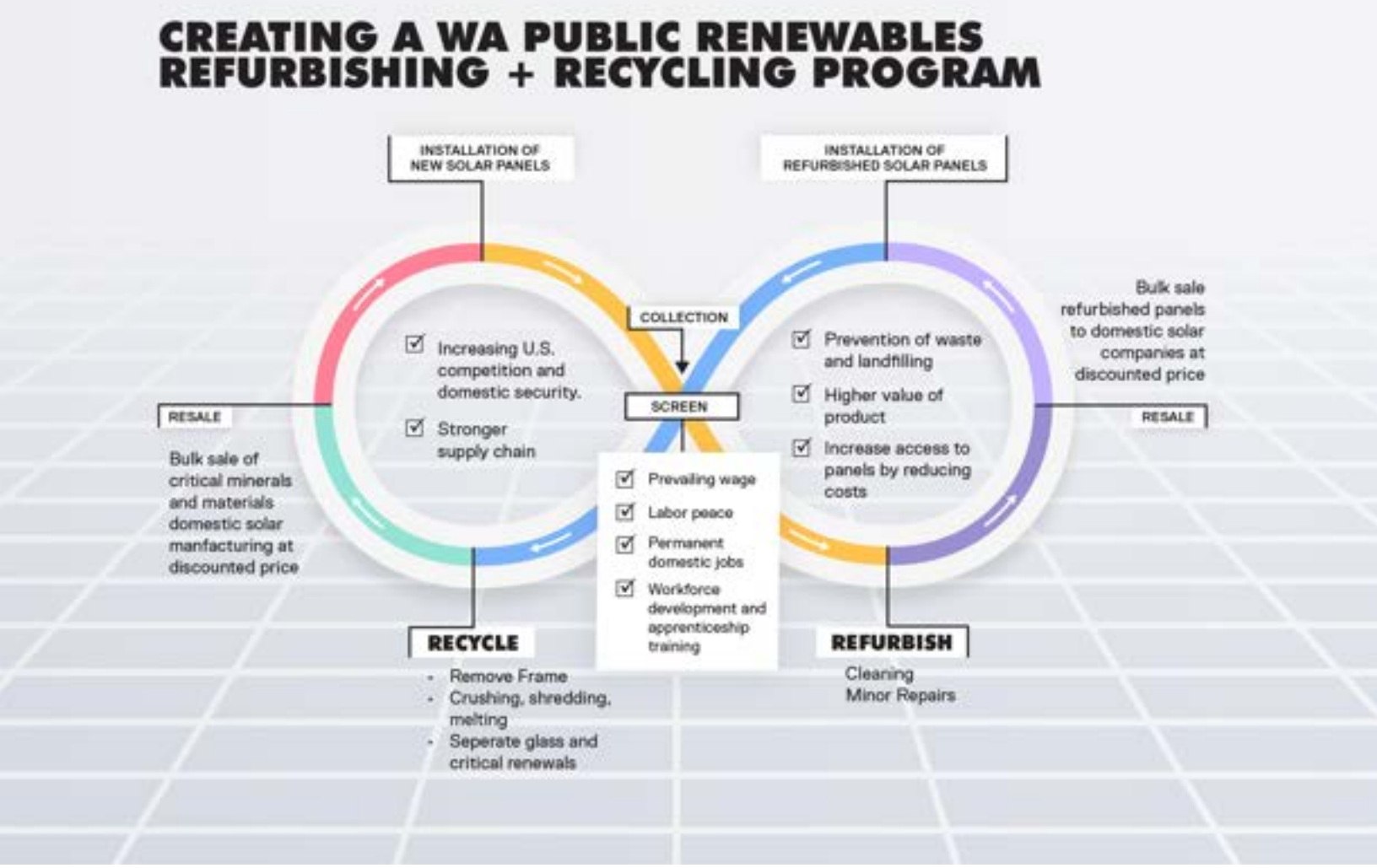
Establish a Washington State Renewables Purchasing Program to spur a secondary market for refurbished panels and remanufactured turbines and to help develop renewables recycling infrastructure

Washington State presently has the only solar panel recycling legislation in the country. The 2017 legislation, which established the nation's first solar panel takeback program, sparked a conversation about the need to collect, manage, and recycle panels at the end of their life.[87]

Solar panels across the country are reaching this end-of-life stage (typically thought to be about 30 years after first use), which coincides with the end of the manufacturer's warranty and a point when systems are about 80% efficient in comparison to new systems.[88]

The legislation directs WA's Department of Ecology to provide guidance for manufacturers to develop plans to collect panels from customers. The panels can then be processed and recycled rather than deposited at landfills.[89] The legislation suffers from shortcomings as written. These drawbacks grant the state a valuable chance to enhance this industry, create high-quality jobs, and promote a more circular economy.

Washington State should establish a renewables purchasing program where it accepts old panels, has them refurbished, and sells them to other solar projects. If the state acts as a market participant to refurbish and resell panels, it can attach labor standards to project installation and refurbishment. The



state can in turn supply much cheaper panels to buildings in communities that need them most, from low-income housing and public schools to community solar farms. Furthermore, the purchaser of a 100% used system would enjoy generous tax deductions on the cost.[90]

Industry experts have found that solar panels can be refurbished at a high rate. Fabtech Enterprises, a company which has managed to refurbish 95% of the panels it has received,[91] stated that solar panels can be refurbished as long as the glass is not cracked. The process involves detailed testing and replacing parts or failed components as needed. By some estimates, refurbishing a panel can prolong its operation for another 10–15 years.[92]

Washington State should sell used, broken panels that cannot be refurbished to recycling facilities to process back into raw materials. If the state acts as a market participant in selling old panels to recyclers, it can place labor peace requirements on the recycling work.

The state already has a number of large-scale industrial recycling facilities. Expanding into solar panel recycling is a golden opportunity to create high-quality, permanent jobs. This industry has representation from unions such as Teamsters, International Longshore and Warehouse Union, and the Steelworkers. Recycling panels and components can recover materials such as indium, glass, silicon, tellurium, silver, and

copper[93] to be reintroduced into the supply chain, strengthening WA's manufacturing sector.

A DOE study indicated that materials extracted from PV panels could total $15 billion by 2050 and be used to produce 2 billion more panels in the future.[94]

The U.S. federal government now prioritizes procurement of items that contain recycled content and will be a large purchaser, a factor which could reduce risk and scale up production.[95] The IRA's Advanced Energy Project Credit also applies to the construction of a renewables recycling facility and incentivizes developers to meet prevailing wage and apprenticeship requirements to take advantage of the higher credit amount.[96]

RENEWABLES RECYCLING

Estimated Job Creation:
2,147 direct jobs over 7 years or 306 jobs per year

Ensured High-Quality Jobs:
Private companies who purchase panels from the government's Renewable Purchasing Program would be required to pay the prevailing wage for panel refurbishing, maintenance, installation, and repair. Washington State can prioritize the sale of broken panels to recyclers with labor peace agreements and who agree to apprenticeship requirements.

Estimated Cost:
$316 million or $45 million per year for 7 years

INTERNATIONAL UNION OF BRICKLAYERS AND ALLIED CRAFTWORKERS

Since its founding in 1865, the International Union of Bricklayers and Allied Craftworkers (BAC) has actively fought to improve its members' quality of life – on and off the job – through access to fair wages, good benefits, and safe working conditions. Today, BAC represents over 75,000 of the most highly skilled trowel trades craftworkers across the United States including bricklayers, stone and marble masons, tile setters, terrazzo workers, restoration workers, and pointers/cleaners/caulkers. With over 156 years of protecting the rights of workers, the BAC is the oldest continuous union in North America.

BAC Local 1 Washington members doing tile setting work at Lake Washington

With its industry partners the International Masonry Institute (IMI) and the International Masonry Training and Education Foundation (IMTEF), BAC is on the forefront of sustainability in the masonry industry. The IMI maintains a Sustainable Masonry Certification Program which is available to signatory contractors. The program covers awareness of LEED credits that pertain to the masonry industry, green strategies in dealing with site use and waste management, and requires the passage of a LEED comprehension test. IMTEF helps the union further prepare for the future by training members in the use robotic lift devises that help reduce strain and increase the safety of the installers.

Furthermore, BAC's training centers around the country prepare members to install high-performance facades such as rain-screen systems with terra cotta, stone, or porcelain cladding. These systems contribute to the energy efficiency of the structures and are adapted to be used in areas that adopt deconstruction policies for projects, as these systems can be removed from structures and reused in other areas, giving a second life to the materials while decreasing the strain on environmental resources.

BAC Local 1 Washington members working on a restoration project at the State Capital.

In Washington State, the BAC Local 1 WA/AK sponsors a pre-apprenticeship program which aims to provide a pathway for women, BIPOC communities, veterans, and formerly incarcerated people into family sustaining careers in the masonry industry while building beautiful long-lasting structures in the communities they live in. Local 1 also maintains a women's committee and mentorship program that helps members find support with someone they can relate to, which helps boost retention and completion of apprentices to highly skilled journey-level workers.

GREEN ALUMINUM PRODUCTION

RECOMMENDATION:

Reopen the Alcoa Intalco aluminum smelter and expedite the buildout of 400 megawatts of clean energy to support the plant

Install 20 megawatts of solar panels at the Intalco plant site, install a small modular nuclear plant at BP Cherry Point, and (in the short term) purchase discounted energy from the federal government through the Defense Production Act

The aluminum industry in the United States has shrunk drastically since its peak in the latter half of the 20th century. In 1985, there were 31 operating aluminum smelters in the country, whereas there are only six today.[97]

The Intalco plant in Ferndale, WA is one that has closed since 1985; it was operated by Alcoa.[98] This plant once employed nearly 700 workers, most of them organized with IAMAW Local 2739, and provided good, family-sustaining work.

IAM Local 2379 employee working at Alcoa Intalco Works in 2015.

The Washington labor movement has campaigned for the reopening of the Intalco plant for the past several years. This campaign has broad support from numerous stakeholders: the local community; elected officials; environmental groups; and Blue Wolf Capital, a private equity firm offering to purchase and reopen the plant.[99] The plant's sidelined workforce has established a collective bargaining agreement with Blue Wolf Capital, concretizing strong benefits, wage improvements, and equity guarantees.[100]

The only need left unsatisfied for the plant's reopening is energy supply. The Intalco plant previously ran on hydroelectric power, which came from the many dams in the region that are managed by BPA. When the plant closed in 2019, its industrial power purchase agreement ended.[101] Aluminum smelting is an energy-intensive industrial process, and the wealth of clean power provided to the Intalco plant was critical to its success. Industrial power customers generally receive low-cost power in bulk, but now that they are trying to reopen the plant, BPA does not have the requisite 400 megawatts of power available at that rate.[102]

GREEN ALUMINUM PRODUCTION

Estimated Job Creation:
4,310 direct jobs

Ensured High-Quality Jobs:
Plant workers are already represented by the International Association of Machinists (IAM) and have ratified a contract with Blue Wolf Capital.

Estimated Cost:
$1.42 billion

The plan to reopen the Intalco plant includes energy-saving alterations to the industrial process to reduce the plant's emissions by an estimated 45%.[103]

A strong domestic green aluminum industry is one pillar of a low-carbon industrial strategy and fundamental to the country's future resilience.

Several potential solutions can rectify the lack of a power purchase agreement for the Intalco plant:

- Site 20 megawatts of solar on the roofs and over the parking lots onsite
- Install an SMR facility at BP Cherry Point, a location two miles north of the Intalco plant that went through the siting process for a proposed gas-fired power plant based on its site suitability and proximity to the refinery industry. An SMR facility could also work here and could completely meet the plant's needs.[104]
- Purchase energy from the federal government at a discounted rate under the authority of the Defense Production Act. The federal government can purchase electricity from the BPA directly and resell it to the Intalco plant. This arrangement is in the national interest, especially within the context of America's aluminum imports from adversarial nations and weak domestic aluminum production capacity. The IRA allocated $500 million to the President to use the Defense Production Act for this purpose.[105]

THE MACHINIST INSTITUTE

The Machinists Institute proudly serves current and future workers to reach their career goals and provides cutting-edge education and training to build a highly skilled and diverse workforce to meet employer demand. We are committed to increasing access and opportunity for communities historically excluded from these family-sustaining careers. We recognize that a highly skilled and diverse workforce is critical to progress on climate strategies and emerging industries focused on clean energy, and we look forward to assisting and training the next generation of workers in areas of sustainable aviation fuel and wind turbine manufacturing. It's about investing in our students and offering a pathway to higher skills and a better standard of living through education and training."

- International Association of Machinists District 751

The Machinists Institute is a nonprofit educational institution serving the aerospace, manufacturing, and automotive machinist industries. The Institute was established by IAM Local 751, a union that represents and trains over 32,000 aerospace and manufacturing workers, including those at Boeing. Today, it offers four registered apprenticeship programs as well as a state-recognized pre-apprenticeship program serving these industries and occupations. Its world-class curriculum is nationally renowned and includes emerging technologies such as electric/hybrid training, robotics, and cybersecurity.

"It was such a great thing to learn about an industry that isn't normally discussed in school. This 10-week program opened my eyes to what you can do not just in manufacturing, but in other industries as well"

- Graduate of the Machinists Institute Youth Academy

The Machinists Institute Youth Academy is a pre-employment training program that shows youth immigrants career pathways in manufacturing and machining skills. Students get hands-on experience with machining, robotics, CNC machining, programmable logic controllers, soldering, and safety practices.[106]

BUILDINGS

Washington State is home to more than 3.2 million housing units[107] and 131,660 commercial properties.[108] Much of the state's building stock is highly energy inefficient; energy used for heating and cooling homes accounts for over two-thirds of the sector's emissions.[109] Buildings are responsible for 27% of WA's greenhouse gases and are the state's fastest-growing emission source.[110] Building-related emissions have sharply inclined by 51% since 1990—more than four times WA's overall emission growth rate.[111]

As climate change intensifies, extreme events such as heat waves will become more frequent and severe.[112] Local residents, especially in frontline communities (including environmental justice and Indigenous communities), will need more efficient housing and climate-resilient heating and cooling systems. Washington State has the nation's second lowest rate of air conditioners in homes at 53%,[113] making communities particularly vulnerable to heat waves. A regional heat wave struck in 2021, setting all-time temperature records in the state and killing 138 people.[114] Improving HVAC systems, increasing building efficiency, installing renewable energy, and implementing widespread heat pump and thermal utility district heating systems to heat and cool communities will reduce building emissions and make the state more resilient to climate impacts.

Decarbonizing buildings, from performing deep retrofits to installing renewables, will require vast amounts of skilled labor and presents an opportunity to create thousands of family-sustaining jobs. Washington State is home to a union workforce ready to spearhead this transition, including electricians, plumbers, pipefitters, construction laborers, iron workers, cement masons, plasterers, sheetmetal workers HVAC technicians, mold remediators, bricklayers, tile setters, and many other workers who have dedicated their careers to ensuring the state has critical building infrastructure constructed to the highest standard.[115] Washington State must take steps to continue to grow and invest in this workforce and make sure that all climate change mitigation and adaptation work has labor standards as the state strives to create safe, healthy, and carbon-free buildings.

Washington State has begun to commit to improving building efficiency statewide. The 2019 Clean Buildings Performance Standard put a cap on energy used by buildings exceeding 50,000 square feet and incentivized early action on retrofits.[116] The Energy Retrofits for Public Buildings Program provided $1.8 million for energy efficiency improvements and $1.2 million for solar projects in 2022.[117] WA's energy code was also amended in 2022 to require the use of heat pumps in new commercial and large residential buildings.[118] However, to fully decarbonize this sector, the state must take bolder coordinated steps to scale up this work while implementing stronger labor standards.[119] Additional state-led measures, such as bulk purchases of retrofit material, can lower implementation costs and time.

Scaling mandatory programs that decarbonize the building sector calls for work by a skilled and trained workforce. Washington State can leverage funding from the IRA to implement electrification and efficiency upgrades and to invest in building decarbonization that produces high-quality jobs and increases equity. Public investments such as carbon-free and healthy schools and public buildings will enable the state to rapidly scale up building retrofits. Such initiatives are critical to reducing carbon emissions while fostering resilience.

ENERGY BURDENS

Energy bills currently place enormous financial burdens on low-income households across the state. About 314,000 households–11% of WA's total–are both low-income and energy-burdened, with an average excess energy burden of $925.[120]

Households living on less than half of the federal poverty line spend more than one-fifth of their income on energy.[121]

Energy burdens disproportionately affect Black, Hispanic, Native American, and older-adult households, and the COVID-19 pandemic has only magnified these disparities.[122] Programs to increase the efficiency of buildings' heating, cooling, lighting, windows, and water heating can reduce the average low-income household's energy burden by 25%.[123] Decarbonizing heating is also important to protect households from volatile natural gas prices, which have risen dramatically due to Russia's war on Ukraine and a surge in U.S. natural gas exports.[124] Because over 40% of all household energy consumption goes towards heating and cooling,[125] decarbonizing this sector is essential for lessening disproportionate energy burdens on WA's low-income residents.

CARBON-FREE AND HEALTHY SCHOOLS

Bricklayers and Allied Craftworkers Local 1 members conducting a terra cotta building restoration on a Seattle public high school.

RECOMMENDATION:

Make WA's schools carbon-free and healthy by 2030

Retrofits - Couple hazard mitigation with deep retrofits, including water infrastructure upgrades, HVAC upgrades, mechanical insulation, and seismic structural upgrades

Renewables - Install 800 megawatts of solar energy to meet school energy demands

Resilience - Increase staffing to allow schools to be open for extended hours during extreme events such as heatwaves, earthquakes, and wildfires

Rectify historic disinvestment - Prioritize work in environmental justice, rural, Indigenous, and energy communities

Washington State is home to 2,472 public schools and 1.1 million public K–12 students.[126] Public school facilities cover 141 million square feet and release nearly 300,000 metric tons of CO_2 equivalent per year.[127] Washington schools increased their solar capacity by over 8 times between 2020 and 2022, from 3.5 to 29 megawatts. This rise in capacity is due to more subscriptions to off-site community solar farms;[128] however, it addresses a fraction of schools' energy demands. To accelerate decarbonization benefits, the state must couple solar installations with deep retrofits that remove and prevent future environmental hazards to create a safer and healthier environment while lowering energy consumption.

In 2019, 97% of WA's schools were found to have at least one water tap containing lead.[129] No amount of lead exposure is safe—even small amounts have been linked to learning disabilities, nervous system damage, and other dangerous consequences.[130] Schools must immediately remove all mold, lead, and other hazards from their facilities. It is also important to ensure that schools are sites for community resilience against climate impacts and other hazards. Facilities should be designed to serve as cooling centers during heat waves, retrofitted to withstand earthquakes and fires, and feature permeable surfaces and rainwater catchments for flooding prevention. These capacities should be prioritized for the oldest and most overcrowded schools; rural areas; and disadvantaged communities, including

those with low incomes, high unemployment, or high racial segregation.[131] These communities are at greater risk than others of adverse health effects from heat, fire, and particulate matter.[132]

Retrofits can include HVAC replacements, heat pump installations, energy-efficient lighting, building controls, mechanical insulation, improved building envelopes, and stronger water infrastructure. Basic upgrades to building envelopes, HVAC, and lighting systems will generate energy savings of 30%–50% alone.[133] These savings can then be directly reinvested into classrooms, creating a better school environment for teachers, students, and staff alike. Retrofitting is a proven path forward: in one district in the United States, the decarbonization of schools raised teacher salaries by up to $3000 per year following a more than million-dollar surplus after retrofits and renewables.[134]

Washington State has several funding opportunities to help decarbonize schools. However, this support must be expanded and paired with federal funds to meet the scale of this multi-billion-dollar issue. Labor unions (e.g., Seattle Education Association and IBEW Local 46) in collaboration with 350 Seattle successfully campaigned for a school levy issuing $18 million for clean energy in schools.[135] Federal legislation has made funds available for states to decarbonize, including a $500 million program to make schools more energy efficient through the IIJA[136] and $50 million via the IRA for schools in low-income and disadvantaged communities to monitor and reduce air pollution and greenhouse gas emissions.[137] The state incentivizes solar installations by making all solar projects under 100 kilowatts exempt from local and state sales and use taxes and has a net metering law under which utility customers can offset their electricity consumption with solar panel production.[138] These funding mechanisms help move the state in the right direction, but bolder investments are necessary to ensure that school decarbonization can be scaled while creating equity and union jobs.

These projects will require a skilled workforce across construction trades. The state has Apprenticeship Utilization Requirements mandating that, for all public works projects by a school district or college that cost more than $1 million, registered apprentices perform at least 15% of the labor hours.[139] Schools should bundle deep retrofit work whenever possible in order to reach this cost threshold. The state should also lower the minimum cost threshold for apprenticeship utilization, require PLAs for school retrofit work, provide on-the-job training, mandate local hiring, and expand funding for state-recognized pre-apprenticeship programs with pathways into state-registered apprenticeship opportunities.

CARBON-FREE AND HEALTHY SCHOOLS

Estimated Job Creation:
25,730 direct jobs over 7 years or 3,676 jobs per year

Ensured High-Quality Jobs:
These jobs should require targeted local hiring that ensures paid on-the-job training with expanded pre-apprenticeships offering direct entry into registered apprenticeship opportunities.

Carbon Emission Reduction:
297,195 metric tons of CO_2 per year, equivalent to 64,036 gasoline cars removed from the road for a year[140]

Estimated Cost:
$5.9 billion or $842 million per year for 7 years

Heat and Frost insulators Local 7

INTERNATIONAL ASSOCIATION OF HEAT AND FROST INSULATORS AND ALLIED WORKERS

The International Association of Heat and Frost Insulators and Allied Workers, which represents nearly 30,000 members, is a union of energy conservation specialists. These workers apply insulation to surfaces such as pipes, tanks, boilers, ducts, and refrigeration equipment to prevent energy loss, reduce emissions, improve safety, and more. They also remove and mediate lead and asbestos, conduct energy audits, and construct buildings to stop fire spread.[141] Since 2014, insulators have trained instructors at more than 40 Joint Apprenticeship & Training Committees around the country on green professional building skills. These programs cover topics such as best practices to conserve water, reduce waste, improve indoor air, and prevent pollution in buildings; the latest energy efficiency heating system technologies; testing and optimizing mechanical systems; and meeting LEED requirements for mechanical trade work and green projects.[142]

In cooperation with the Seattle Building Trades Council, Heat and Frost Insulators and Allied Trades Local 7 played leadership roles in launching the landmark Student and Community Workforce Agreement (SCWA) to help current and former students of Seattle Public Schools train for and work on school district construction projects costing $5 million or more. The organization is one of the first SCWAs in the nation to directly employ individuals involved with the district. It prioritizes BIPOC communities as well as women and residents in economically distressed zip codes. The SCWA serves as a reference for building equity while expanding the skilled union workforce needed to construct carbon-free and healthy schools in Washington State.[143]

CARBON-FREE AND HEALTHY PUBLIC BUILDINGS

RECOMMENDATION:

Make WA's public buildings carbon-free and healthy by 2030

Retrofits - Conduct deep retrofits together with lifecycle improvements and environmental hazard mitigation

Renewables - Install 1.5 gigawatts of solar to meet energy demand

Resilience - Increase staffing in key public buildings (e.g., community centers and libraries) to ensure public access during extreme climate events such as heat waves, earthquakes, and wildfires

Interior of the capitol hall in Olympia, Washington.

Washington State owns or leases more than 11,000 facilities statewide.[144] It is in a position to lead in decarbonization and to enhance resilience by rapidly improving its state and municipal facilities and creating high-quality union jobs in the process. The state has made robust commitments to reducing these emissions: it maintains a goal of 45% emission reduction below 2005 levels by 2030 and has instituted an "Energy Retrofits for Public Buildings" grant program to fund efficiency and solar projects involving schools, hospitals, community centers, and other public buildings owned by state, local, and tribal governments.[145]

The state can decarbonize its public buildings by performing deep retrofits to increase building efficiency, improve outdated HVAC systems, and install onsite solar energy and battery storage. To ensure that this work creates high-quality jobs, the state must require that retrofits are done with union labor and mandate PLAs on all public facility upgrades.

Public buildings could also serve as community resilience centers. As Washington State faces more heatwaves and wildfire smoke, public spaces will become increasingly necessary for protecting residents' health, especially within low-income communities and communities of color that are disproportionately exposed to these risks. Public buildings are currently underprepared to meet these needs; for instance, only two of Seattle's 26 community centers are equipped with air conditioning.[146]

The state must invest in climate resilience at these facilities through electric heat pumps, solar microgrids, and HVAC improvements. Labor unions across Seattle, including IBEW Local 46, Laborers' International Union of North America (LiUNA) Local 242, PROTEC17, SEIU 925, SEIU 1199 NW, Teamsters 117, UAW 4121, and UFCW 3000, recently signed a letter urging Seattle to adopt a series of beneficial measures: to upgrade community centers for climate resilience; to ensure PLAs; and to protect communities most affected by heat waves, pollution, and other environmental injustices. This campaign resulted in the passage of Seattle's 2023–2028 Parks Levy.[147] Such work can be scaled by applying it to community centers, libraries, and schools across the state under a PLA.

CARBON-FREE AND HEALTHY PUBLIC BUILDINGS

Estimated Job Creation:
41,960 direct jobs over 7 years or 5,994 jobs per year

Ensured High-Quality Jobs:
These jobs should require targeted local hiring that ensures paid on-the-job training with expanded pre-apprenticeships offering direct entry into registered apprenticeship opportunities.

Carbon Emission Reduction:
1,148,841 metric tons of CO_2 per year, equivalent to 247,540 gasoline cars removed from the road for a year

Estimated Cost:
$9.7 billion or $1.4 billion per year for 7 years

INTERNATIONAL UNION OF OPERATING ENGINEERS

Stationary Engineers Training Program

The International Union of Operating Engineers (IUOE)—representing over 400,000 union members, most of whom are operating engineers, heavy equipment operators, mechanics, and surveyors—has been providing training in expanding areas of climate work.[148] Efforts include green chemistry and green awareness courses, which teach workers how to design safer chemicals, use renewable feedstocks, prevent waste, reduce accident risk, and more.[149] IUOE is also training workers on building control and maintenance for higher energy efficiency and on the use of global positioning systems to reduce diesel emissions. IUOE partners with colleges to provide college credit towards 2-year associate degrees as well.[150]

Washington IUOE Local 302 offers its members several training and apprenticeship programs. The Stationary Engineers Training Program provides on-the-job training and classroom instruction on energy conservation, HVAC systems, and indoor air quality in facilities such as hospitals, hotels, and high-rise buildings. Local 302 also hosts a Facilities Custodial Services Technician Training Program to train apprentices in sustainable housekeeping in public schools. Apprenticeship programs like these help the state meet its climate goals while building a strong union workforce.

DECARBONIZING HEATING AND COOLING

UA 32 member Damon Marr works on pipes.

RECOMMENDATION:

Equitably increase accessibility to low-carbon heating and cooling by 2030

Enact a District Thermal Utility and Jobs Act to promote the development of statewide district thermal utility networks

Establish utility thermal connections with more than 1 million residents

Execute district thermal utility feasibility studies at all public universities

Expand heat pump installation through the coordinated bulk purchasing and distribution of 230,000 heat pumps for residents not connected to natural gas infrastructure

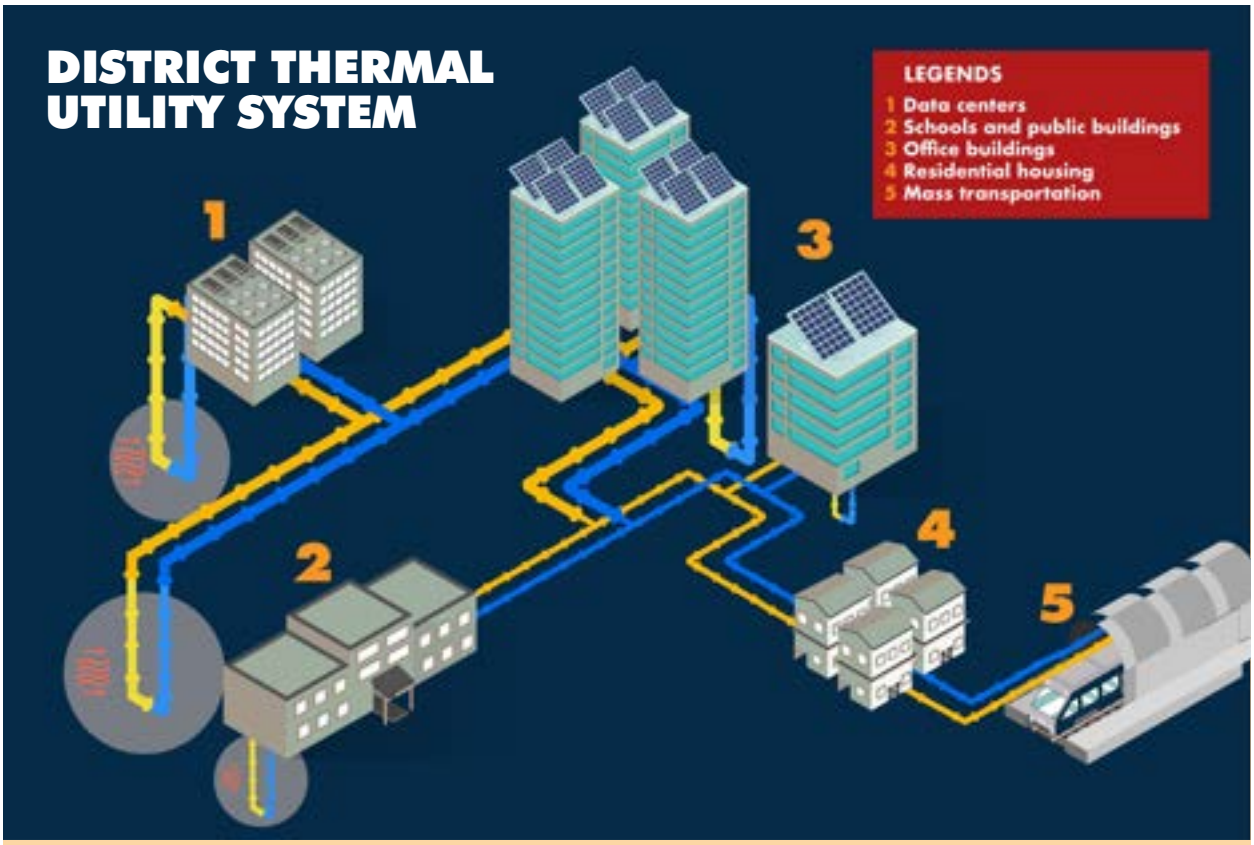
Ensure a direct pipeline for all natural gas and heating workers to transition to thermal utility work and invest $10 million to establish a transitional fund

Washington State is not prepared to deal with rising temperatures. Heat waves such as that which hit in 2021 are projected to become more frequent.[151] But only 1.5 million households, or just over half of the state, use air conditioning.[152] Importantly, heat pumps (whether air-source pumps or those used in thermal district utility systems) can be used for cooling. These pumps are thus especially pertinent for remedying WA's lack of air conditioning.

Greenhouse gases released by heating and cooling residential buildings constitute a significant portion of WA's emissions. About 1.25 million households use gas, coal, wood, or another fuel source to heat their homes,[153] accounting for 11% of WA's total emissions.[154]

District thermal utilities, which connect buildings in a neighborhood or campus to use a network of ground source heat pumps, are being installed in communities nationwide. State grants or loans for installation can result in greenhouse gas reductions and millions of dollars in energy savings.[155] In 2013, the city of West Union, IA, installed a district thermal utility network serving 60 downtown buildings.

Its public infrastructure portion was entirely paid for by a U.S. Department of Housing and Urban Development Community Development Block Grant, Environmental Protection Agency (EPA) Climate Showcase, and DOE funding.[156] By transitioning districts currently reliant on natural gas to thermal district heating, Washington State can provide energy savings and heat resilience to rural and urban communities statewide.



Buildings are interconnected by pipes and ground source heat pumps, creating a district thermal utility system. The temperature difference between a building and the system heats or cools that building.

Public colleges and universities provide a major opportunity to scale district thermal utility projects. In Washington State, they released roughly 350,000 tons of CO_2 equivalent in 2019—over two-thirds of the total emissions from state-owned buildings.[157] Most campuses depend on natural gas-powered central steam plants for space and water heating, many of which are aging and inefficient.[158] While some universities have made significant improvements in boiler and building efficiency, many are not on track to meet their emission reduction targets. Campuses are prime candidates for implementing thermal district heating. In 2009, Bell State University replaced coal-fired boilers with a district thermal system for its 47 major campus buildings, resulting in $2.2 million in annual energy savings and a reduction of 85,000 tons of CO_2 emissions per year.[159] This money can be directly invested back into the university.

Another step for decarbonizing heating and cooling is through heat pumps. Recent improvements in heat pump technology have made this option increasingly popular for sustainable heating and cooling. Washington State has begun to require the use of heat pumps in new commercial and large residential

buildings.[160] To decarbonize the building sector, the state must scale the widespread installation of heat pumps through bulk purchasing and distribution, especially for communities not connected to natural gas infrastructure.

Gas workers' skills, such as pipefitting and electric and refrigerant management, are directly transferable to the installation of thermal district heating and heat pumps; both utilities use similar materials and installation methods.

This work needs to be scaled rapidly, and Washington State has a trained workforce ready to implement it along with the infrastructure in place to increase that workforce. The state should provide a jobs guarantee that ensures all current natural gas and heating workers are provided a job in electric, geothermal, or energy-efficient heating and cooling along with adequate training and strong labor standards.

DECARBONIZING HEATING AND COOLING

Estimated Job Creation:
27,048 new direct jobs created over 7 years or 3,864 jobs per year; retention of more than 3,000 natural gas jobs

Ensured High-Quality Jobs:
These jobs should require targeted local hiring that ensures paid on-the-job training with expanded pre-apprenticeships offering direct entry into registered apprenticeship opportunities.

Carbon Emission Reduction:
5.9 million metric tons of CO2e per year, equivalent to 1,271,268 gasoline cars removed from the road for a year[161]

Estimated Cost:
$10 billion or $1.4 billion per year for 7 years

THERMAL UTILITY AND JOBS ACT

Washington State can enact a Thermal District Utility and Jobs Act to ensure that maintenance and natural gas jobs are protected in the transition from natural gas to geothermal heating and cooling. The state has already passed legislation to scale thermal utilities by improving permitting processes but has not ensured that the transition will create good union jobs.[162]

The Act could require all thermal utility construction to include PLAs that contain prevailing wage and training standards. It can also establish apprenticeship and pre-apprenticeship programs to expand this trained union workforce. Building on a similar law passed in New York, Washington State can enact this bold legislation to accelerate the transition to thermal utilities while maintaining gas job creation and expanding high-union jobs.[163]

LABORERS

The Laborers' International Union of North America (LIUNA) represents more than 500,000 workers who are trained to build, maintain, and strengthen infrastructure. LIUNA has identified many new areas of work in the clean energy economy, from weatherization, pervious surface, solar panel, and wind farm installation to green roofing, waste management, erosion control, and demolition. LIUNA has also established a weatherization training program that readies participants to become weatherization technicians, energy auditors, or supervisors. Furthermore, the organization has created courses on safety and environmental hazards. LIUNA has established partnerships with vocational training programs and high schools regarding green training as well.[164]

In Washington State, LIUNA locals have been at the forefront of many important renewable projects. In addition to other trade union locals, LIUNA Local 348 will be involved in the construction of Horse Heaven, a new clean energy training center in Benton and Franklin Counties.[165] Along with other craft unions, Local 335 built Lund Hill solar farm, a 150 megawatt plant and one of the largest installations of its kind in the state.[166][167]

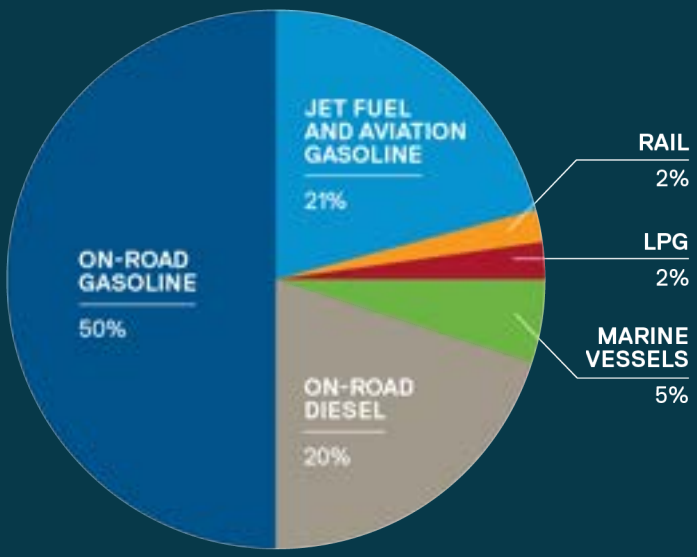
Laborers Local 252 workers

Group photo of ATU 1015 (Spokane) employees.

TRANSPORTATION

Transportation is the largest emission source in Washington State, contributing nearly half of WA's greenhouse gases. The sector's emissions have grown nearly 20% since 1990 as vehicle miles have increased. On-road gasoline and diesel comprise most of WA's emissions.[168] Jet fuel and aviation gasoline contribute an additional 20%, one of the highest aviation fuel proportions in the country.

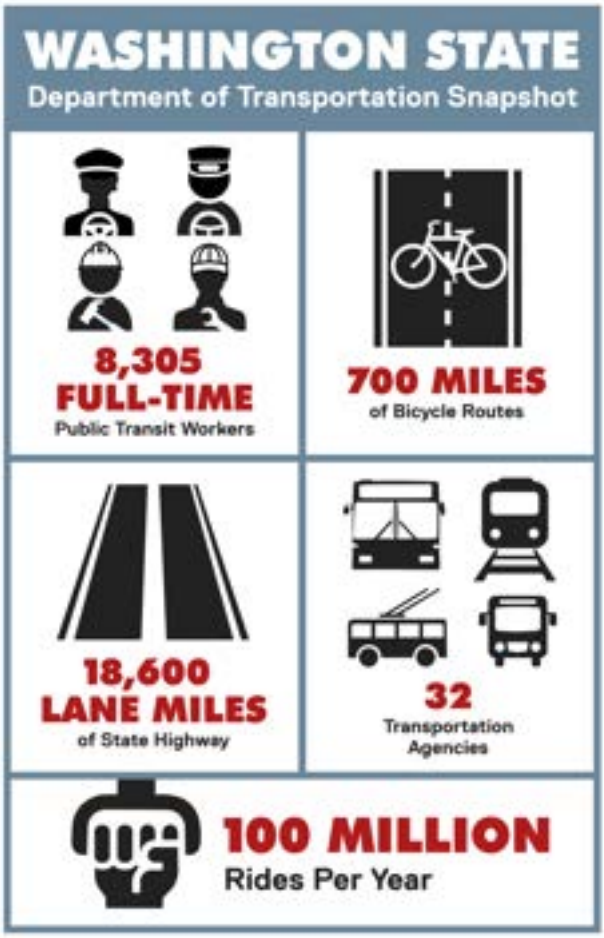
Transportation Emissions in 2018



WA's transportation is largely overseen by the Washington State Department of Transportation, which manages 18,600 lane-miles of state highway,[169] 700 miles of bicycle routes,[170] and 32 transportation agencies. These agencies had 8,305 full-time workers operating fixed route rail, bus rapid transit, commuter, and trolley buses at the end of 2020.[171] Most of these employees hold high-quality union jobs and belong to the Amalgamated Transit Union and the American Federation of State, County, and Municipal Employees. The state DOT's public transit systems manage 110 million rides per year and are a transportation lifeline throughout the state, especially for low-income residents and essential workers. The COVID-19 pandemic reduced overall rider numbers by 45% in 2020, and ridership remains below pre-pandemic levels.[172] However, essential workers have continued to use public transportation throughout the pandemic, and supporting this sector is important for ensuring equitable mobility statewide.

Washington State has not yet made the concrete decisions needed to transform its transportation sector (e.g., via the development of EV infrastructure or large-scale public transit expansion)—nor has it taken steps to position itself as a leader in sustainable aviation production. The transportation sector presents a prime opportunity to reduce emissions, build equity and mobility for all residents, and create thousands of high-quality jobs.

Washington State can be a leader for the nation by demonstrating emission reduction, namely in hard-to-decarbonize transport sectors such as aviation, while generating high-quality jobs and improving equitable access to transit.



The state should lead the buildout of large public transit investments that can produce thousands of high-quality jobs and affordable mobility options for Washingtonians. Investments in public transportation are job-intensive and can lead to myriad construction jobs. The state's DOT should oversee the buildout of public charger installations with certification requirements and labor standards.

The state should also pass incentives to attract companies and promote the growth of a domestic supply chain in sustainable aviation.

WA's vast purchasing power can further be harnessed to lower EV costs and make these vehicles more affordable for the general public. In addition, the state must foster an equity-focused transition for fossil fuel workers by supporting local electric bus manufacturing and assembly, establishing an electric bus upskilling program, and ensuring new jobs are high-quality union positions by 2030.

Several federal funding sources are available to aid in this transition. The IIJA allocated $370 million for WA's transit agencies.[173] The IRA provides up to $7,500 in tax credits to EV purchasers, $297 million for sustainable aviation fuel production, and $3.2 billion for Neighborhood Access and Equity Grants to promote mobility in disadvantaged communities.[174] The state has begun to take steps towards decarbonizing the sector, including a $10.6 million Clean Energy Fund for electrifying transportation, a Clean Fuels Standard requiring fuel suppliers to reduce the carbon intensity of their fuels by 20% by 2038, and mandates around EV infrastructure in new buildings. With suitable investments, ambition, and a focus on high-quality job creation, Washington State can open a way forward to a more equitable and climate-friendly transportation sector.

PUBLIC TRANSPORTATION

RECOMMENDATION:

Expand public transit rail to increase ridership and address inequities

Massively expand public transit through the buildout of a high-speed rail line from Portland, Oregon to Vancouver, British Columbia, and an east–west Washington rail line from Spokane to Seattle; increase ridership by developing multimodal rail stations and making routes accessible and affordable

Although 83% of Washingtonians live within a transit district, public transportation is neither sufficiently accessible nor convenient for many.[175] DOT has identified issues with delays, reliability, limited service, and old infrastructure that create barriers to ridership along existing transit systems. The federally owned long-distance Empire Builder is the sole east–west passenger line through Washington State, running from Seattle to Chicago with only one train in each direction per day, sometimes arriving in the middle of the night at variable times.

The Coastal Starlight, which runs from Los Angeles to Seattle, has incessant delays due to its aging fleet and systems. It recently exhibited a 20% jump in minutes and incidents in delays due to mechanical issues. The Amtrak Cascades, the lone intercity passenger rail service in the Pacific Northwest, has also struggled with on-time performance, equipment needs, and balancing requests for new stations to heighten ridership and retain passengers who may become frustrated with longer travel times. The Amtrak Cascades nonetheless saw a pre-pandemic rise in ridership, indicating that many

Proposed ultra-high-speed grand transportation system from Portland OR to Vancouver BC and east-west Washington rail line.

Washingtonians remain motivated to use public transportation because it is their best or only option.

An ultra-high-speed ground transportation (UHSGT) system from Portland, OR to Vancouver, British Columbia is a transit expansion that could realize greater connectivity and economic growth while reducing emissions and creating high-quality jobs.

According to a DOT feasibility study, high-speed rail service could operate at up to 250 miles per hour and provide connections for nearly 9 million people.[176] Because it would run on its own corridor along Interstate 5, it would not be susceptible to interference from freight trains, which is a common reason for delays on long-distance rails. This system would also cost one-fifth the price of building a new car lane and save 2–4 hours of drive time between Portland and Seattle or Seattle and Vancouver: it would take less than an hour to travel between cities instead of 3 hours by car.[177] [178]

DOT is seeking the best ways to integrate a UHSGT system with modal systems (e.g., the Amtrak Cascades and the Seattle-Tacoma Airport) and with building and land use decisions. If properly integrated with other systems, it could capture up to 20% of intercity trips.[179] [180] Stations that include secure bike parking, bus stops, and Cascades and airport connections could increase UHSGT rider numbers. Improving pathways to stations (e.g., via protected bike lanes, safe sidewalks, and shared-use paths) could further elevate multimodal connectivity and ridership.[181]

A dedicated east–west rail line from Seattle to Spokane through Stampede Pass would create connectivity and reliability in new parts of the state. Strong demand exists for this line; more than 70% of participants surveyed stated they would try the service.[182] According to a DOT feasibility study, the line could generate up to 205,000 annual trips assuming a fare similar to Amtrak systems. To enhance equitable access to transit and ensure greater ridership, the east–west line could be fare-free. The UHSGT should have set prices and be highly subsidized for low-income communities.

PUBLIC TRANSPORTATION

Estimated Job Creation:
Ultra high speed ground transportation system: 118,080 jobs over 12 years or 9,840 jobs per year

East-west rail line: 844 jobs over 12 years or 70 jobs per year

Ensured High-Quality Jobs:
With millions in state funding going towards these projects, the buildout should be completed under a PLA. Railway construction, reconstruction, maintenance, and repair workers must already be paid the prevailing wage per Washington State law.[183] The state should engage in bulk purchasing of materials, including making requests for proposals of large quantities to reduce company risk and incentivize domestic manufacturing. The state should also add Buy America and local content requirements and preference manufacturing from companies with labor peace agreements.

Carbon Emission Reduction:
30,207 metric tons by 2035 metric tons of CO_2 per year, equivalent to 3,805 homes' yearly energy use

Estimated Cost:
Ultra high speed ground transportation system: $41 billion or $3.42 billion per year for 12 years

East-west rail line: $264 million or $22 million per year for 12 years

ELECTRIC VEHICLE TRANSPORTATION

RECOMMENDATION:

Commit to 100% electric school buses and EV public infrastructure buildout by 2030

Electrify nearly 10,800 school buses and commit to expanding EV manufacturing to produce 50% of buses in-state

Ensure union mechanics and maintenance staff are supported by creating a large-scale upskill EV training program

Energize under Electric Vehicle Infrastructure Training Program certification and install 46,000 Level 2 and direct current EV chargers across Washington State

Washington State can demonstrate a commitment to equitably reducing transportation emissions by setting a goal of 100% electric school buses by 2030, with high-quality jobs and pathways for manufacturing and operations workers. As of 2020, only 40 of WA's more than 10,800 school buses were planned to be electrified—less than 1%. Funding is often cited as a barrier to transitioning to electric school buses, but new federal funding changes this calculus.[184] An opportunity remains to coordinate an effective transition the first time and make the greatest impact.[185]

To ensure an equitable transition, Washington should assist union mechanics and maintenance staff by establishing a large-scale upskilling EV training program. This program should be accessible to all personnel supporting state and local operations on internal combustion vehicles and prepare these workers to manage operations for all-electric fleets, including school bus fleets.

As a new wave of bus companies establish themselves locally, Washington State could set a goal of 50% of buses being produced in-state. Moreover, to cut costs and prevent waste, the state could commit to in-state repowering—or retrofitting diesel school buses with batteries—as a way to reach this production goal. Related efforts are emerging around the country. In January 2022, New York City converted five diesel buses to electric for half the cost of purchasing a new bus.[186] Washington State should similarly leverage massive public investments, most notably the IIJA, to ensure that this transition creates well-paying manufacturing jobs in the state.

The state must also install thousands of public EV chargers with labor standards to meet future charging demands. Starting in 2035, Washington State will ban the sale of internal combustion vehicles, creating a larger market for EVs.[187] Its DOT will begin construction of public charging stations in 2023 and plans to roll out chargers over 5 years, though a firm target for the number of chargers needed remains to be determined.[188] If 50% of gasoline cars were electric, the state would need roughly 42,000 Level 2 chargers and 4,000 direct current fast chargers. DOT should require that all workers involved in the installation, operation, and maintenance of EV charging stations be certified journeypersons through a registered electrical apprenticeship program that includes training (e.g., the Electric Vehicle Infrastructure Training Program) to ensure that these jobs are of high quality.

ELECTRIC VEHICLE TRANSPORTATION

Estimated Job Creation:
School Buses - 7,008 direct jobs over 7 years or 1,001 jobs per year

Ensured High-Quality Jobs:
All bus retrofitting and charger repair workers should be paid the prevailing wage per Washington State law.[189] The state should mandate that all workers involved in the installation, operation, and maintenance of EV charging stations be certified through a registered electrical apprenticeship program that includes training (e.g., the Electric Vehicle Infrastructure Training Program). Where possible, the state should engage in bulk purchasing of vehicles, making requests for proposals of larger quantities to reduce company risk and incentivize domestic manufacturing. The state should add Buy America and local content requirements and preference manufacturing from companies with labor peace agreements.

Estimated Cost:
$4.9 Billion or $700 million per year for 7 years

Carbon-Free and Healthy Schools: Transportation for All

As a primary component of carbon-free and healthy schools, electric school buses would eliminate diesel emissions from conventional buses that harm children's health. The batteries from electric buses could also serve as schools' backup energy source. Moving to an all-electric school bus fleet would eliminate thousands of tons of CO_2 emissions each year. The state can further reduce emissions and persuade more people not to drive by guaranteeing no-cost public transportation for students, faculty, and staff. Such an initiative could mirror that of Seattle, which offers free metro bus service for students under 18 while the Seattle Education Association continues to fight for free transportation for staff.[190] More can be done to expand similar efforts across the state as well.

SUSTAINABLE AVIATION FUEL

RECOMMENDATION:

Position Washington State as a national leader in sustainable aviation fuel production

Develop a new economic development zone to encourage the development of a major sustainable aviation fuel (SAF) industry in Washington State. Tax incentives should be linked to job quality, training standards, and labor peace agreements.

Build at least two large in-state SAF biorefinery plants with a local supply chain and inputs, focusing on converting municipal solid waste and forest residuals to biofuels

Commit to 30% of SAF jet fuel available at SeaTac being produced in-state by 2030

Washington State is a global leader in aviation. By positioning itself as a leader in SAF production, the state could demonstrate a way forward for reducing emissions and creating high-quality jobs. Aviation fuels make up nearly 21% of transportation emissions here—a much higher proportion than in other states, where jet fuel and aviation gasoline represent less than 7% of transit emissions.[191] Washington State has grown into the fifth-largest consumer of aviation fuel in the United States, especially as Seattle has become a hub for international flight arrivals.

Jet fuel consumption at Seattle-Tacoma Airport has reached over 600 million gallons per year.[192] Lowering the carbon intensity of aviation fuel will play a role in helping Washington State reduce its overall emissions.

SAF is an important solution to decarbonizing airplane travel given its properties akin to conventional jet fuel but with up to 94% fewer emissions.[193] SAF is often produced with biomass and is considered a "drop-in fuel" because it requires no change to plane infrastructure. For use, it currently must be blended with conventional jet fuel at a limit of no more than 50% SAF.

Seattle-Tacoma International Airport

Washington State is witnessing climbing demand for SAF but a lack of policy incentives to attract investment. The Port of Seattle has pledged that 10% of jet fuel at Seattle-Tacoma Airport will be produced locally from sustainable sources by 2028 and 25% by 2035.[194] Boeing has committed to building commercial planes that can fly on 100% SAF by 2030. The Washington State legislature passed the Low-Carbon Fuel Standard in 2021, which directs the Department of Ecology to reduce emissions from fuel each year through 2050, creating an economic environment ripe for SAF additions.

To encourage SAF plant siting in Washington State, an economic development zone should be established with tax incentives linked to job quality, training standards, and labor peace agreements. Allocating these zones can drive economic improvement in low-income or distressed communities and promote high-quality job growth.

The combination of these incentives and the sheer amount of feedstock and worker capacity could put the state well on its way to exceeding targets and bringing 30% of SAF into Seattle-Tacoma Airport by 2030.

Washington State is equipped to build out a supply chain that can support this new industry. According to a University of Washington and Port of Seattle study, the Pacific Northwest can produce up to 290 million gallons of SAF per year—enough to supply one-third of the fuel dispensed at Seattle-Tacoma Airport—from its forest residuals and municipal solid waste feedstock.[195]

Building out WA's SAF industry could create thousands of direct construction jobs and hundreds of permanent feedstock prep and biorefinery jobs. As noted in a University of Washington analysis, building two plants (i.e., one 106 million gallon/year forest residue SAF plant and one 132 gallon/year municipal solid waste SAF plant) could generate more than 20,000 jobs.[196] These plants need hundreds

of permanent plant managers, engineers, maintenance supervisors, lab managers and technicians, shift supervisors and operators, yard employees, clerks and secretaries, and maintenance staff to continuously operate the facilities. There are also hundreds of jobs in feedstock preparation for both forest residuals and municipal waste.

Using forest residuals for SAF offers resilience and job advantages because this task requires removing flammable forest ground cover and thinning branches and trees in areas at risk of wildfires. Whereas forest residuals tended to be burned in the past, SAF production creates a supply chain and high-quality jobs for feedstock collectors and processors. The State Department of Natural Resources performs forest treatments; these positions would represent high-quality state jobs under collective bargaining agreements.

By using its established aviation industry and highly skilled workforce, plentiful biomass feedstock, and climate-friendly policy environment, Washington State has a unique opportunity to become a west coast leader in SAF and expedite the transition to a carbon-free future while creating new, high-quality jobs and reducing inequality.

SUSTAINABLE AVIATION FUEL

Estimated Job Creation:
20,427 direct jobs over 7 years or 2,918 jobs per year

Ensured High-Quality Jobs:
Companies that accept generous state incentives to build SAF plants in established economic development zones must pay the prevailing wage for the construction, maintenance, and repair of all SAF facilities; recruit from local communities; and agree to apprenticeship requirements.

Carbon Emission Reduction:
2,321,032 metric tons of CO_2 per year, equivalent to 292,364 homes' yearly energy use

Estimated Cost:
$5.5 billion or $785.7 million per year for 7 years

THE INTERNATIONAL ASSOCIATION OF SHEET METAL, AIR, RAIL, AND TRANSPORTATION WORKERS

The International Association of Sheet Metal, Air, Rail, and Transportation Workers (SMART) represents over 150,000 workers across various trades and disciplines, many of whom are actively addressing the climate crisis.[197] These employees include sheet metal workers, service technicians, bus operators and rail conductors, HVAC technicians, sign installers, welders, production employees, and others who enhance energy efficiency and operate systems which contribute to reduced greenhouse gas emissions and better air quality.

SMART's green training curriculum has been expanded to meet a new climate demand for numerous tradespeople: HVAC service technicians; certified energy audit technicians; workers who manage refrigeration, commercial ducts, and air systems; and Testing, Adjusting, and Balancing Bureau–certified technicians. SMART offers this certification, an HVAC testing, adjusting, and balancing program that is pivotal to ensuring good air quality, energy efficiency, and thermal comfort in buildings. The program was founded in collaboration with and is directly associated with SMART.[198]

Many SMART locals also have programs that serve their respective communities, create a more inclusive environment, and support veterans. Washington SMART Local 66 has several such programs, one of which is the SMART Heroes program that provides sheet metal industry training free of charge to enlisted men and women in the U.S. military prior to discharge. When the SMART Heroes program is completed and the military personnel is discharged, the graduate can select any one of the 148 SMART apprenticeship programs in the country and receive advanced placement as a second-year apprentice.

RESILIENCE AND ADAPTATION

Washingtonians are already feeling the effects of climate change, with major heatwaves and droughts, wildfires, extreme winter storms, and inland and coastal flooding being most salient. In February 2021, the state weathered a winter storm that dumped record snow on Seattle[199] and temporarily cut off the Snoqualmie Pass, a crucial transport link between the coast and the rest of the nation. The following summer brought a record-shattering heat wave that took the lives of 138 Washingtonians—the deadliest weather event in state history.[200] By 2050, the number of dangerous heat index days per year is expected to double, the number of days with a high wildfire potential is estimated to triple, and the severity of widespread summer drought is anticipated to skyrocket more than 300%.[201]

These climate projections make one fact glaringly evident: current infrastructure cannot withstand the climate crisis. To meet this challenge, Washington State must adapt to the changing climate and make its infrastructure more resilient. This undertaking also introduces a chance to create high-quality union jobs and advance equity in the state.

Resilience projects take many forms, all of which can produce high-quality jobs while improving the state's capacity to confront the obstacles that climate change presents. Washington State should focus on replacing and expanding aging water infrastructure to improve Washingtonians' health and prepare for impending water supply threats. Doing so will create jobs for plumbers and pipefitters, water service operators, and other construction trades. Another objective entails expanding and improving public sidewalk infrastructure with pervious pavement. This upgrade will increase mobility and safety while helping to recharge the water table, mitigate flooding, and manage water pollution. Concrete masons and related construction laborers will be needed for these activities. Moreover, installing cool roofs on buildings will reduce energy costs, combat the impacts of heat waves, and provide jobs for roofers.

WATER INFRASTRUCTURE

RECOMMENDATION:

Repair, expand, and modernize WA's drinking water systems by 2030

Repair, replace, and expand where necessary WA's water transmission, distribution, treatment, source, storage, and management and monitoring infrastructure

Obtaining and using water in responsible, sustainable ways while ensuring the water system's safety represents a looming challenge for the coming decades. These activities will only become more difficult as climate change worsens. WA's deferred capital reinvestment, aging infrastructure, growing infrastructure resilience considerations, and population aging have caused the state to need roughly $16.3 billion in water infrastructure investment by 2041.[202] WA's water infrastructure needs are varied: larger water systems can usually meet challenges to water quality and capacity fairly efficiently. Smaller and more rural utilities are more apt not to properly monitor for contaminants, make timely repairs, or replace faulty materials.[203]

Plumbers and Pipefitters Local 32 water utility workers with Seattle Public Utilities installing a water main.

The state's investment requirements largely concern transmission and distribution infrastructure. Needs also encompass water treatment, water sources, water storage, and other system needs (e.g., monitoring and backup generators). WA's transmission and distribution infrastructure needs mostly involve pipe replacement but additionally include pump stations, valves, meters, backflow prevention, and service lines. These service lines are especially worrisome because some are either made of lead or contain lead-based components or contaminants.

Lead in drinking water presents a grave threat to human health. In response to the remaining lead pipes, components, and contaminants in America's water systems, the EPA updated its Copper and Lead Rule, mandating the replacement of lead service lines and galvanized pipes installed downstream of lead components.[204] Copper and brass pipes with lead solder must be replaced as well.

As of 2016, Washington State had 916 lead service lines and 6,370 galvanized service lines with lead components (0.04% and 0.28% of WA's service lines, respectively).[205]

As part of the EPA's Copper and Lead Rule updates, water systems must take inventory of all service lines and draft a removal plan for dangerous ones by October 16, 2024.[206] Removing lead pipes and components is a critical part of water infrastructure modernization.

Water systems need to be managed by water service operators, but Washington State presently does not have enough operators to handle this workload. The state has had 4,000 water service operators on average over the past 15 years; WA's population has jumped by more than 20% in the same period. The state is now understaffed by an estimated 300 operators.[207] These operators' hiring and training must be prioritized to efficiently manage the expansion and operations of WA's water system. This emphasis presents an opportunity to create high-quality public sector jobs.

Water system operations also call for skilled workers such as plumbers and pipefitters, electricians, and related construction trades.

If the necessary $16.3 billion is invested in water infrastructure by 2041, these trades can expect around 93,038 new jobs to be created over that timespan.

WATER INFRASTRUCTURE

Estimated Job Creation:
93,038 direct jobs over 18 years or 5168 jobs per year $16.3 billion or $906 million for 18 years.

Ensured High-Quality Jobs:
To ensure union and high-quality jobs are created throughout this process, a PLA should be mandated for all work done with public funding to repair, expand, and modernize WA's drinking water systems.

Estimated Cost:
$11.7 billion or $1.68 billion per year for 7 years

Funding for water infrastructure traditionally comes from state revolving funds with the Drinking Water State Revolving Fund (for dedicated drinking water infrastructure) and the Clean Water State Revolving Fund (for other types of water infrastructure). The Bipartisan Infrastructure Law allocates an additional $50 billion to the EPA for water infrastructure improvements. Washington State received its first funds from this law in September 2022: $31 million in supplemental funding to capitalize the Clean Water State Revolving Fund, $20 million in base funding for the same fund, and $16 million in base funding for the Drinking Water State Revolving Fund.[208]

PERMEABLE PATHWAYS

RECOMMENDATION:

Complete WA's sidewalk systems using pervious concrete to improve active mobility and groundwater recharge

Build sidewalks using pervious concrete that are Americans with Disabilities Act–compliant along 542 miles of urban roads, completed no later than 2030

Laborers Local 252 workers installing a sidewalk.

Another opportunity to increase climate resilience and advance equity through infrastructure improvement comes from WA's sidewalks. Investing in sidewalks can lead to progress on numerous issues: accessibility, mobility, safety, pollutant runoff management, flood mitigation, and groundwater recharge.

At present, the sidewalk networks in every urban area of the state are wholly inadequate. More than 542 miles of road in urbanized areas have no sidewalks.[209] This situation poses a threat to pedestrian safety. For example, nearly half of all arterial roads in the Puget Sound region lack sidewalks; pedestrian deaths rose by 27% in the area between 2010 and 2019.[210] A Seattle Times review of more than 30 counties and cities across the state revealed that no jurisdiction reached even 50% compliance with the Americans with Disabilities Act.[211] This poor adherence is attributable to a host of problems, including a lack of ramps at pedestrian crossings, gaps in pavement, overly uneven surfaces, and overly steep ramps. This issue is especially pertinent because more than 8% of Washingtonians have mobility impairments.[212]

Upgrading and expanding WA's sidewalk systems will bring more than just safety, mobility, and accessibility benefits; installing pervious concrete (also known as enhanced porosity concrete) will improve the state's stormwater management and groundwater recharge. This concrete will also help ease flooding in some flood-prone parts of the state. The Washington Department of Ecology

PERMEABLE PATHWAYS

Estimated Job Creation:
14,724 direct jobs over 12 years or 1,227 jobs per year

Ensured High-Quality Jobs:
To ensure union and high-quality jobs are created throughout this process, a PLA should be mandated for all work done with public funding to complete WA's sidewalk system with permeable concrete.

Estimated Cost:
$1.26 billion or $105 million per year for 12 years

has deemed stormwater runoff the leading threat to WA's urban waters, streambeds, banks, and habitats.[213] Pervious concrete can "reduce stormwater runoff volume, reduce the runoff rate, and help mitigate the urban heat island effect, reduce noise and filter potential pollutants."[214] This concrete allows water to flow through it, both filtering it and allowing for the restoration of groundwater reserves.[215] Groundwater supplies in much of Washington are low after years of drought, and 60% of WA's drinking water comes from groundwater supplies.[216] Using pervious concrete will make the groundwater cleaner and more abundant, increasing the state's resilience. Yet this style of concrete is a more complex material than normal concrete and requires skilled labor to install.[217] The mixing, pouring, and finishing skills differ for each type. Fortunately, Concrete Masons' union locals nationwide (including in Washington State) are training their members to work with pervious concrete.

If Washington State invests the obligatory $1.26 billion to complete its pedestrian network, then concrete masons, public workers, and other construction workers can expect 14,724 new jobs. Two massive windfalls in transportation funding have fortuitously become available to the state recently: the $17 billion Move Ahead Washington package at the state level and the IIJA at the federal level. The latter includes more than $278 billion in transportation infrastructure funding, including $6 billion for the Safe Streets for All program.[218] [219]

OPERATIVE PLASTERERS' AND CEMENT MASONS' INTERNATIONAL ASSOCIATION

Members of the Operative Plasterers' and Cement Masons' International Association are specially trained in applying, placing, and finishing plaster and concrete. The Association has been a national sponsor of the National Ready Mix Concrete Association's Pervious Concrete Contractor Certification program since 2011. Trainees learn about mixtures and production, tools and equipment, general design principles, construction, maintenance, troubleshooting, and more[220]. As mentioned, pervious concrete requires distinct mixing, pouring, and finishing skills from normal concrete. This type of concrete is a promising future resource given its abilities to store water in the ground for later use in drought-prone areas and to reduce flooding in flood-prone areas. The Operative Plasterers' and Cement Masons' International Association's Local 528, in Seattle, has offered this course to its members. Other local chapters around the country are taking bold steps in preparing members for these essential new climate jobs.[221]

OPCMIA Local 528 apprentices learning the concrete mason trade

COOL ROOFS

RECOMMENDATION:

Establish a public program to install cool roofs on 100% of buildings in the Tri-Cities area

Immediately create a publicly owned local development corporation in the Tri-Cities area to install cool roofs on all buildings no later than 2030 with PLAs and local hiring requirements

Local 153 roofers building a cool roof in Renton, WA.

As climate change becomes increasingly extreme, temperatures in Washington State will continue to rise. WA's historically mild climate means that limited infrastructure can combat high heat. For instance, just 53% of homes in the state have air conditioning—fewer than any other state except for Alaska.[222]

Urban areas, which have a high concentration of pavement and thus few trees and little green space, are far hotter than their surrounding areas. This phenomenon leads to the "heat island" effect and poses great pressure (e.g., in health threats and energy expenditure for cooling). Heatwaves are expected to become nearly three times more common in Washington State by 2050, and heat islands cost lives during these periods.[223] As an example, during the "Heat Dome" of summer 2021, 138 Washingtonians died of heat-related illness.[224] People who die during heat waves are also disproportionately likely to be homeless and/or people of color.[225]

Seattle has a significant heat island effect: on average, the city is 4.1 degrees warmer than its surroundings during the day and 4.8 degrees warmer at night—even 17 degrees warmer at times.[226] Moreover, historical redlining and racist urban planning practices

in Seattle have caused communities of color to have fewer trees and green space.[227] But this city is not the only area under threat from the heat; Eastern Washington is also projected to see a large increase in heat extremes. The Tri-Cities area of Kennewick, Pasco, and Richland could have heat waves in excess of 90 degrees Fahrenheit lasting nearly twice as long as it currently does. The number of days over 100 degrees Fahrenheit is also likely to double, making this area the most heat-vulnerable in the state.[228]

Fortunately, intentional infrastructure decisions can be made to abate the effects of rising temperatures and heat waves. A viable option is cool roofing. Cool roofs are designed to reflect solar radiation. They come in several forms, including spray-on, paint-on, membranes for flat roofs, or special tiles for steeper roofs. By reducing energy transferred from the roof to its associated structure, a cool roof can reduce a building's energy consumption by up to 40% and lessen peak energy demand.[229] Cool roofs even benefit buildings without air conditioning, lowering the inside maximum daily room temperature by 2.4 degrees on average.[230]

Coatings or single-ply membranes on low-sloped roofs can serve as the top surface of the roofing assembly and can be applied directly over a roof deck or on top of existing materials. Coatings can be painted on or sprayed on in certain instances, and membranes can be heat-welded to the roof deck; some have strong adhesive bottom layers. Proper installation is critical to these roofs' long-term success. Cool roofing can last over 20 years when installed correctly but will fail quickly otherwise.[231] Roofers who work on these roofs must be highly skilled to ensure proper installation of membranes or coatings.

COOL ROOFS

Estimated Job Creation:
2,711 direct jobs over 7 years or 387 jobs per year

Ensured High-Quality Jobs:
As the work would be managed by a publicly owned entity, union and high-quality jobs would be created throughout this process. A PLA should be mandated for all work done with public funding to install cool roofs.

Estimated Cost:
$577 million or $82.4 million per year for 7 years

WA's buildings need to be outfitted with cool roofs to increase heat resilience. Establishing a public program at the municipal level is a sound means of implementing this initiative. The Tri-Cities area is an ideal target for this undertaking—it is the single most heat-vulnerable area in the state, and its population is growing rather quickly. The cities should collaborate to bulk purchase cool roof materials, organize installer contracts, and determine construction plans. Cool roofs will greatly decrease energy costs for these cities, enhance their heat resilience, and reduce the heat island effect. Doing so on a local scale will allow for greater consideration of locals' input, cost savings due to buying materials in bulk, and the imposition of labor standards on accompanying work.

UNITED ASSOCIATION – UNION OF PLUMBERS, FITTERS, WELDERS & SERVICE TECHS

The United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States and Canada (UA) represents about 355,000 workers involved in the fabrication, installation, and servicing of piping systems. Members include plumbers; pipefitters; sprinkler fitters; heating, ventilation, air conditioning, and refrigeration service technicians; welders; and pipeliners.

The UA offers cutting-edge green training and education to equip workers with the skills they need to meet decarbonization demands. The organization has developed an updated UA curriculum on gray water systems, sprinkler fitter systems, and green auditing and inspection along with a Green Awareness certificate whose curriculum educates students about the specification, purchase, and application of energy-efficient products. UA is also collaborating with the University of Michigan, Washtenaw Community College, and Ferris State University on sustainability technology degrees in plumbing, HVAC, and sprinkler fitting.[232] The UA additionally possesses an HVAC Mobile Green Classroom, a green trailer that demonstrates the latest HVAC equipment and provides hands-on training[233].

The UA has vocally advocated for jobs in the clean energy economy that capitalize on fundamental skills. In New York State, the UA worked with a coalition of climate groups and utilities to assume a leadership role in passing the Utility Thermal Energy and Jobs Act[234]. The Act enables utilities to develop thermal energy network demonstration pilots with labor standards attached, which will maintain and create UA jobs while helping the state decarbonize quickly. UA Local 290, which serves workers in southeast Washington State and Oregon, is partnering with NEXT Renewable Fuels to construct a new renewable diesel facility in Oregon.

The UA has further applied its skills to create a more equitable and sustainable environment. UA Local 32 in Renton, WA partnered with Plumbers without Borders to support the construction of food plots for immigrant and refugee families[235].

WORKFORCE DEVELOPMENT AND QUALITY CAREERS

WA's transition to a low-carbon, climate-friendly economy is nothing short of historic. This transition will touch every sector of the state's economy and will introduce drastic shifts in how goods and services are produced and consumed. These disruptions carry major implications for WA's workforce, labor unions, and industries. High-carbon industries such as wood paper and pulp, aluminum, and steel production as well as coal-fired power generation have seen steep declines, including marked job and economic losses. With more than 300,000 workers engaged in fossil fuel–related activities locally, the state could see dramatic losses in jobs, tax revenue, and economic vitality if this transition is not carefully managed.

A comprehensive mapping of how many Washington workers are employed in fossil fuel–related occupations and industries will show how this transition might influence WA's workforce. Data should include the number of workers in specific industries and occupations. This analysis should also indicate workers' job quality, skills and training, geographic location, and potential to shift to new or comparable careers in WA's growing clean energy economy.

The state can take steps now to ensure that new clean energy jobs are high-quality careers able to sustain WA's families and communities. This transition cannot be built on the backs of those who have labored in fossil fuel industries for decades to power WA's economy or who are helping build WA's new clean energy economy. The very idea of a "just transition" rings hollow in the absence of high-quality careers. Only well-paying jobs with adequate benefits and training will help reverse WA's worsening crisis of inequality. Creating good jobs in these new industries will shore up public support for this climate and energy transition, ensuring WA's residents that the transition will be just and equitable.

SMART Sheet Metal Workers

Washington Federation of State employees taking action in the legislative process.

Much industry behavior is underpinned by the misconception that paying the prevailing wage or having PLAs is prohibitively expensive and diminishes competitiveness. On the contrary, high-road labor policies have been shown to minimally affect operating costs for energy projects and the speed and price of the economy-wide transition to renewable energy. Labor premiums represent a meager portion of all costs tied to wind and solar, and any increases from higher labor standards tend to be offset by greater productivity.[236]

Washington State must also approach this transition in a manner conducive to a diverse, inclusive, and equitable clean energy workforce. Building out the new clean energy economy is an opportunity to address historic inequities and ensure the state is developing a fairer economy than its current one. For far too long, women and BIPOC individuals have been denied full and fair access to high-quality lifetime careers that have transformed the lives of workers fortunate enough to secure these jobs. Building a new clean energy economy on the tenets of equity will enable Washington State to dismantle the systems of exclusion that have exacerbated racial and gender inequality. Many new jobs will be created as the state builds more clean energy, retrofits buildings, improves public transit, and more. These jobs can expand access to middle-class careers for frontline, BIPOC, and other underserved communities.

A collaborative workforce development pipeline must be constructed to train and retain workers in a unionized clean energy economy. This pipeline should include several elements: apprenticeship awareness and navigation programs to recruit workers, state-recognized pre-apprenticeship programs to prepare applicants to successfully enter and complete apprenticeships, union-based apprenticeship programs that welcome diversity, unionized contractors with enough jobs to employ apprentices, and public policies that support these systems.

Washington State should also examine its workforce training programs and verify it is

SMART Local 66, 55, and 16 members with state and international representatives attending Trade Women Build Nations 2022 event in Las Vegas.

funneling funding and other resources into programs that recruit, train, retain, and place workers into high-quality careers. Washington State registered building trades apprenticeship programs are exceptional in that they 1) provide workers with family-sustaining wages, hands-on training, health coverage, and retirement benefits; 2) guarantee job placement during and upon completion of training; 3) provide lifelong access to skills training and education; and 4) provide access to multiple employers for ongoing job placement. When combined with state-recognized pre-apprenticeship programs that target recruitment to underserved communities, these programs can grow a guaranteed pipeline of work for women, tribal communities, justice-involved individuals, and others.

Numerous U.S. states have passed legislation that helps ensure new clean energy jobs are high-quality and family-/community-sustaining careers. Such legislation also enables workers to be protected and supported throughout this transition. The clean energy workforce, meanwhile, is diverse and inclusive. For instance, Illinois' Climate and Equitable Jobs Act includes strong climate goals, PLAs on renewable projects larger than 5 megawatts, the prevailing wage on all non-residential renewable energy projects, a clean energy jobs training program for formerly incarcerated individuals, and $10 million to establish clean energy pre-apprenticeship hubs for frontline communities of color[237]. Furthermore, the state offers advances on capital to equity-eligible contractors (i.e., those who invest in low-income, underserved communities) to cover increases in development costs following from prevailing wage requirements or PLAs[238]. Maine's Act Concerning Equity in Renewable Energy Projects and Workforce Development features a renewable energy pre-apprenticeship program, requires contractors and subcontractors to pay the prevailing wage and benefits, and directs the Maine Public Utilities Commission to prioritize PLAs and employee ownership in renewable energy construction projects when procuring energy under Maine's Renewable Portfolio Standard.

The following recommendations will help Washington State maximize the creation of high-wage, highly skilled careers in the new clean energy economy. These suggestions are intended to protect and support workers as they transition to other segments of the clean energy economy. Lastly, this guidance ensures that WA's clean energy workforce is diverse and inclusive, thereby addressing inequalities in race, gender, income, and wealth that pervade the state's economy.

Local 66's SMART Army serves the community through monthly meal preparation; service at a local homeless shelter for women and children; fundraisers for veterans and their families; holiday meal and gift delivery for families in need; assisting members with mobility issues improve access to their homes and more.

HIGH-QUALITY CLIMATE JOBS

RECOMMENDATION:

Build a successful, equitable clean energy economy in Washington State

Several key job quality, training, and wage standards should be implemented across WA's clean energy projects to ensure its clean energy economy is built efficiently and creates high-quality jobs that reverse inequality. These key provisions include the following:

- Prevailing wage to ensure a family- and community-sustaining wage standard for new clean energy industry jobs
- PLAs to ensure new clean energy projects are completed on time, on budget, and with well-paid, highly skilled workers
- CWAs with targeted hiring goals to create union career opportunities for underserved communities
- Policies that require the use of workers from state-registered apprenticeship programs

CLIMATE INVESTMENT

RECOMMENDATION:

Use climate investments to maximize high-quality manufacturing jobs

- Use Build WA and Buy America manufacturing requirements to spur the development of clean energy manufacturing and supply chain jobs in Washington State
- By applying Build WA and Buy America requirements to procurement, the state can drive local clean energy manufacturing and reduce company risk by providing bulk purchase guarantees.

IAM District 751 members working on a Boeing 767 aircraft during the Covid-19 pandemic.

LABOR VOICE

Washington Federation of State Employees at a rally to Stand Up for the Middle class.

RECOMMENDATION:

Amplify labor voice in climate and clean energy debates

- Include labor representation on all climate and energy decision-making bodies in the state to accelerate WA's transition and ensure workers' needs and interests are addressed in this transition

The socioeconomic, labor, and employment impacts of climate change and the transition to a clean energy economy have been sidelined while policymakers continue to home in on climate and energy issues such as emission reduction. Employees are experts in their workplaces and industries and can guide WA's decarbonization plans. Additionally, workers' needs and interests should be centered in transition plans to ensure no worker is left behind. Labor unions in Washington State represent nearly one in every four workers and bear an exemplary training infrastructure that provides a pathway from frontline communities to high-quality careers. Labor representation on WA's climate and energy decision-making bodies (e.g., the Energy Facility Site Evaluation Council and Washington State Building Codes Council) can inform WA's transition plans, map job impacts and skill requirements, update training programs, and ensure new jobs are good jobs. The state needs a worker- and equity-oriented transition. Labor voice regarding WA's climate and clean energy decisions is therefore not only helpful but essential to ensuring WA's historic transition is just and equitable for all.

Washington State should employ the principle of "nothing about us without us" to ensure that labor-related decisions are not made without workers' input. At the same time, traditionally excluded communities must be consulted on matters relevant to their future. All groups—whether involved in labor, tribal issues, or environmental justice—can join in solidarity to guarantee that no voice goes unheard in conversations that influence the trajectory of their lives.

WORKFORCE DEVELOPMENT PROGRAMS

RECOMMENDATION:

Ensure WA's workforce development programs retain and grow a diverse, inclusive, and highly skilled clean energy workforce

- Use WA's Climate Commitment Act and federal training dollars to devise a workforce development approach that prioritizes high-quality job creation, promotes job placement for fossil fuel workers and frontline communities, expands state-registered apprenticeship programs, and protects near-retirement workers throughout this transition
- To ensure the state develops a highly skilled, trained, and equitable workforce, it should support the following endeavors:
- Transitioning the workforce to new industries based on transferable skills
- Mapping future workforce skill needs so apprenticeship programs can incorporate those attributes into their educational programming
- Establishing a Transition to Retirement program to close the gap for near-retirement workers
- Organizing a workforce transitions body to ensure new clean energy jobs are high-quality and the clean energy workforce is diverse and inclusive
- Strengthen the Washington Climate Commitment Act by mandating applicants' commitment to labor standards in all clean energy work Require, at minimum, that applicants for Climate Investment Account funds commit to pay the prevailing wage, execute PLAs, participate in registered apprenticeship programs, and meet diversity and equity requirements

Meeting WA's climate and clean energy goals will require a historic transition involving challenges and opportunities for workers. The state should exhibit leadership by creating a cohesive plan, identifying job needs to reduce emissions and increase resilience, and pairing workers with apprenticeship programs. Mapping out workforce needs will allow these programs to establish training and upskilling workshops to provide employees the necessary training to decarbonize and strengthen Washington State.

The state should organize a Workforce Transitions Council to oversee this effort. The Council can review findings from the workforce study and mapping. Members can than make recommendations for how to build a diverse and inclusive clean energy workforce with well-paid, highly skilled workers. This panel will contribute to an equitable transition and provide jobs to environmental justice communities and fossil fuel workers who have been most affected by climate change and the transition to a low-carbon economy.

The Puget Sound Electrical Joint Apprenticeship and Training Committee (PSEJATC) providing training for apprentices and journey-level electricians within the International Brotherhood of Electrical Workers Local 46 jurisdiction of Washington State.

SEATTLE PUBLIC SCHOOLS LAUNCHES A PRIORITY HIRE PROGRAM TO FOSTER A DIVERSE AND INCLUSIVE WORKFORCE

Seattle Public Schools (SPS) is making strides to open a diverse pipeline of workers into high-quality union careers. With its special status as a school, SPS has created a unique pre-apprenticeship program to prepare children under age 18—particularly Black youth—for apprenticeships in building trades unions. SPS requires contractors to hire former SPS students, wage earners, and diverse candidates for projects, thus ensuring work for pre-apprenticeship graduates and inspiring confidence that the trades offer a secure and sustainable career pathway. Contracts include language with provisions on cultivating an appropriate environment for workers, particularly those of color and of any gender or sexual identity. SPS recruits youth and families for pre-apprenticeships and apprenticeships through connections with local community groups who conduct outreach on trades-based opportunities. SPS updates its contracts, practices, and recruitment as it receives feedback from students, workers, and community groups on the best ways to meet local needs and create high-quality jobs.[239]

CONCLUSION

Washington State has positioned itself as a climate leader in America. Now it needs to focus on effectively implementing its priorities in a way that centers creation of good, local jobs, economic development, and equity.This means setting ambitious and concrete building and transportation decarbonization goals, investing in large-scale renewable energy production, creating new programs that transition existing workers and train a new, diverse, and inclusive workforce, and developing a new clean energy manufacturing sector. This approach will significantly expand the scale of their climate work, helping to dramatically reduce emissions and create job growth.

With a highly-skilled workforce that developed the country's first jet passenger airliner, operates the largest manufacturing facilities in the world, and manages a sophisticated supply chain with deep water ports, airports and a selection of all kinds of industry partners imaginable – there is no better place to lead the nation in this build out of a brand new clean energy economy. Washington is well-positioned to build out new industries in offshore wind, renewable recycling, and sustainable aviation fuels, and in the process create thousands of family-sustaining union jobs for those who need them most.

The 20 recommendations in this Climate Jobs Roadmap can help Washington chart a path forward that retains and creates high-quality jobs and centers economic, racial, and gender equality. Washington must meet this moment in a way that does not worsen existing inequality. Taking these actions which reduce emissions and energy burden, increase resilience, retain high-quality jobs, and create career pathways for communities most impacted by climate change will help Washington build an economy that is equitable and just for decades to come.

APPENDIX

Federal funding available to Washington through:

2022 Inflation Reduction Act (IRA)
2021 Infrastructure Investment and Jobs Act (IIJA)
Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act of 2022

ENERGY

- The IRA investment tax credit and production tax credit apply to clean energy initiatives including hydroelectric, wind, solar, geothermal, and biomass as well as energy storage projects.
- The IRA includes technology-neutral investment tax credits and production tax credits for clean energy projects and energy storage after 2024.
- Green hydrogen infrastructure is eligible for the 45Y tax credit under the IRA as well as the Section 48 Investment tax credit.
- The IRA includes a clean hydrogen–specific tax credit, 45V, which will provide a credit of up to $3/kg.
- The IRA includes tax credits for investment in (45Y) and power production with (48D) modular nuclear reactors.
- The IRA includes $1 billion to improve energy systems' cost-effectiveness, site or upgrade transmission and distribution lines, reduce emissions from energy generation, develop microgrids, and increase energy efficiency in rural areas.
- The IRA includes $5 billion to establish a grant program to support activities that reduce the likelihood and consequences of impacts to the electric grid due to extreme weather, wildfires, and other natural disasters.
- The IRA creates a $2.5 billion revolving loan fund for transmission developers or microgrid owners and operators to create new electric power transmission lines.
- The IRA includes $3 billion in grants for smart grid technology.

LOW-CARBON MANUFACTURING

- The IRA includes $6 billion in grants for industrial emission reduction projects, including the aluminum industry.
- The IRA includes $10 billion for the 48C tax credit for clean energy manufacturing and recycling facilities.
- The IRA includes $30 billion for a tax credit specifically for wind, solar, and battery manufacturing, including eligibility for offshore wind manufacturing facilities and offshore wind installation vessels.

BUILDINGS

- The IIJA includes $500 million for the Energy Efficient Schools program.
- The IIJA includes $250 million for the Energy Efficiency Revolving Loan Fund Capitalization Grant program, $40 million for the Energy Audit Training Grant program, $550 million for the Energy Efficiency and Conservation Block Grant program, and $3.5 billion for the Weatherization Assistance Program.
- The IRA includes an energy-efficient home tax credit (45L).
- The IRA includes $9 billion for DOE Consumer Home Energy Rebate Programs for whole-home retrofits and efficient electric appliances.
- The IRA includes $1 billion for the Green and Resilient Retrofit Program for housing through the Department of Housing and Urban Development.

TRANSPORTATION

- The IIJA includes $66 billion in national funding for rail transportation.
- The IRA includes a tax credit for EV chargers on a business property for 6% of the cost of the charger (up to a maximum of $100,000). Business properties meeting prevailing wage and registered apprenticeship requirements may be eligible for an increased credit amount of 30%.
- The IRA includes $1 billion for medium- and heavy-duty commercial EVs, charging infrastructure, and related workforce training; school buses are eligible for this funding.
- The IIJA includes $5 billion for school bus fleet electrification.
- The IIJA includes $5.6 billion in grants for low- and no-emissions transit buses and $2 billion for bus facilities.
- The IIJA includes $7.5 billion in grants for EV charging infrastructure.
- The IRA includes $297 million in national grants for the Alternative Fuel and Low-Emission Aviation Technology program.
- In 2023–24, SAF technology will be eligible for the 40B tax credits; in 2025–27, this technology will be eligible for the 45Z tax credits under the IRA.

RESILIENCE AND ADAPTATION

- The IIJA includes $6 billion in national grants under the Safe Streets for All program.
- The IIJA includes $50 billion in national grants for water infrastructure, including $67 million already given to Washington State.
- All construction workers on IIJA projects will be paid the prevailing wage under the Davis–Bacon Act.

APPENDIX: JOB CREATION SUMMARY

	Recommendation	Total Direct Jobs	Years of Job Creation	Direct Jobs per Year
Carbon-Free Electricity	Rooftop PV	148,998	22	6,773
	Utility Scale Solar or Floatovoltaics	20,380	22	926
	Offshore Wind	54,000	22	2,455
	Advanced Technologies (Average of Nuclear and Geothermal)	59,283	22	2,788
	Brownfield PV	84,621	22	3,846
	Brownfield Wind	55,927	22	2,542
	Carbon-Free Electricity - Total	**423,209**	**22**	**19,330**
	Green Hydrogen Production	600	7	85
	Green Hydrogen Superhighway	188	7	27
	Modular Nuclear	18,000 (included in the Advanced Technologies figure)	17	1,059 (included in the Advanced Technologies figure)
	Offshore Wind Manufacturing	1,995	7	285
	Renewables Recycling	2,147	7	306
	Green Aluminum Production	4,310		
	Carbon Free and Healthy Schools	25,730	7	3,676

Recommendation	Total Direct Jobs	Years of Job Creation	Direct Jobs per Year
Carbon Free and Healthy Public Buildings	41,960	7	5,994
Decarbonizing Heating and Cooling	27,048 + Retention of over 3,000 existing natural gas jobs	7	3,864
Public Transportation Buildout	118,925	12	9,910
Electric Vehicle Infrastructure	7,008	7	1,001
Sustainable Aviation Fuel	20,427	7	2,918
Water Infrastructure	93,038	18	5168
Permeable Pathways	14,724	12	1,227
Cool Roofs	2,711	7	387
TOTAL	**784,020**		**54,178**

APPENDIX: EMISSION REDUCTION SUMMARY

	Recommendations	Total Emission Reduction	Emission Equivalent
Carbon-Free Electricity	Rooftop PV	10,000,000 metric tons of CO_2 per year in 2045	2,154,692 gasoline cars removed from the road for a year
	Utility-Scale Solar	864,700 metric tons of CO_2 per year in 2045	186,316 gasoline cars removed from the road for a year
	Offshore Wind	1,884,100 metric tons of CO_2 per year in 2045	405,966 gasoline cars removed from the road for a year
	Onshore Wind	3,670,000 metric tons of CO_2 per year in 2045	790,772 gasoline cars removed from the road for a year
	Carbon-Free Electricity - Total	**16,418,800 metric tons of CO_2 per year in 2045**	**3,537,746 gasoline cars removed from the road for a year**
	Green Hydrogen	714,100 metric tons of CO_2 per year	153,867 gasoline cars removed from the road for a year
	Modular Nuclear	2,784,028 metric tons of CO_2 per year (included in the Advanced Technologies figure)	599,872 gasoline cars removed from the road for a year (included in the Advanced Technologies figure)
	Carbon-Free and Healthy Schools	297,195 metric tons of CO_2 per year	64,036 gasoline cars removed from the road for a year
	Carbon-Free and Healthy Public Buildings	1,148,841 metric tons of CO_2 per year	247,540 gasoline cars removed from the road for a year
	Decarbonizing Heating and Cooling	5.9 million metric tons of CO_2 per year	1,271,268 gasoline cars removed from the road for a year
	Public Transportation Buildout	30,207 metric tons of CO_2 per year by 2035	3,805 homes' yearly energy use
	Sustainable Aviation Fuel	2,321,032 metric tons of CO_2 per year	292,364 homes' yearly energy use

APPENDIX: ESTIMATED COST SUMMARY

	Recommendation	Total Estimated Cost	Years of Investment	Investment per Year
Carbon-Free Electricity	Rooftop PV - 15 gigawatts	$39.2 billion	22	$1.78 billion
	Utility-Scale Solar or Floatovoltaics 2.9 gigawatts	$5.4 billion	22	$243 million
	Offshore Wind 6 gigawatts	$15 billion	22	$681 million
	Advanced Technologies (1.9 gigawatts Nuclear and 2.8 gigawatts Geothermal)	$15.4 billion	22	$699 million
	Brownfield PV 8.5 gigawatts	$22.3 billion	22	$1 billion
	Brownfield Onshore Wind 10.7 gigawatts	$15.5 billion	22	$706 million
	Carbon-Free Electricity - Total	**$112.8 billion**	**22**	**$5.1 billion**
	Green Hydrogen Production	$1 billion	7	$143 million
	Green Hydrogen Superhighway Construction	$314 million	7	$45 million
	Modular Nuclear	$7.2 billion	17	$424 million
	Offshore Wind Manufacturing	$1.05 billion	7	$105 million
	Renewables Recycling	$316 million	7	$45 million
	Green Aluminum Production	$1.42 billion	n/a	n/a
	Carbon Free and Healthy Schools	$5.9 billion	7	$842 million
	Carbon Free and Healthy Public Buildings	$9.7 billion	7	$1.4 billion
	Decarbonizing Heating and Cooling	$10 billion	7	$1.4 billion
	Public Transportation Buildout	$41.3 billion	12	$3.4 million
	Electric Vehicle Infrastructure	$4.9 billion	7	$700 million
	Sustainable Aviation Fuel	$5.5 billion	7	$785.7 million
	Water Infrastructure	$16.3 billion	18	$906 billion
	Permeable Pathways	$1.26 billion	12	$105 million
	Cool Roofs	$577 million	7	$82.4 million
	TOTAL	**$219.5 billion**	**1-22 years**	**$12.4 billion**

APPENDIX: EXISTING GOVERNMENT FUNDING PROGRAMS

Any funding mechanisms should be used for direct spending to implement climate work or create grants and vouchers.

FEDERAL

1. Infrastructure Bill: These pieces of legislation may provide funding for climate programs, transportation investments, building efficiency, and resilience projects. [240] As of the beginning of November 2021, their status is unknown.
2. Buses and Bus Facilities Program (Federal Transit Administration [FTA]): This program provides $809 million in funding for improvements in buses and bus facilities. It has been used to purchase electric buses. It is both a formula and a discretionary program.[241]
3. Capital Investment Grants Program (FTA): This program funds $2.3 billion in new heavy rail, commuter rail, light rail, streetcars, and bus rapid transit projects. Projects must have a budget of $300 million or more with a federal investment of at least $100 million. This program is discretionary.[242]
4. Congestion Mitigation and Air Quality Improvement Program (FTA): This program provides $2.5 billion in funding for states to reduce their transportation emissions. This formula program may need to be spent on already federally funded programs.[243]
5. Energy Efficiency and Renewable Energy Office (DOE): Provides numerous programs that afford local and state governments funding for renewable energy, energy efficiency, and transportation (e.g., "Low Greenhouse Gas Vehicle Technologies Research, Development, Demonstration and Deployment"). These programs tend to be trials of new technologies.[244]
6. EPA's Brownfield Program: This program works to clean up America's brownfield for alternative usage and provides job-training grants, a revolving loan program, assessment grants, and other types of funding. Some grants reach up to $2,000,000 for state assessments.[245]
7. Federal Emergency Management Agency (FEMA) Hazard Mitigation: This grant provides funding for the mitigation of extreme weather events, including long-term planning. Local governments can apply. Grants can go towards "stormwater, drainage and culvert improvements, flood control, property acquisition, slope stabilization, infrastructure protection, seismic and wind retrofits, and structure elevations" among other uses.[246]
8. State Energy Program (DOE): This program provides $55 million in total funding to states for reducing energy costs and improving resilience. Grants are usually around $300,00–$450,000 and have been used to seed green banks. It is a formula program.[247]
9. State of Good Repair Grants (FTA): These grants provide $2.7 billion for funding fixed guideway and high-intensity motorbus systems in revenue service for at least 7 years. The federal government provides 80% of the net capital cost. It is a formula program.[248]
10. Surface Transportation Block Grant Program (FTA): This program provides $12.1 billion in funding for states to improve transportation infrastructure, usually related to highways or alternative transportation methods. It is a formula program.[249]
11. Title XVII Innovative Energy Loan Guarantee Program (DOE): This program provides up to $4.5 billion in loan guarantees for innovative technological projects. It has been used to start large-scale renewable energy projects.[250]
12. Urbanized Area Formula Program (FTA): This program provides $4.9 billion in funding for public transportation operations and capital assistance in urbanized areas (i.e., those with more than 50,000 residents). It is a formula program.[251]

APPENDIX: METHODOLOGY

Please note all estimates are based on the best currently available data. Job numbers, costs, and demand may shift due to changing economic markets and technological developments. Any policy implementation of these recommendations should follow an additional review process.

ENERGY

Recommendation
100% renewable energy by 2045

Energy Capacity Calculation: WA's government funded deep decarbonization model, in an electrification scenario, posits that the electrical capacity needed for deep decarbonization in 2050 would be 220 TWh while considering further electrification, heating, and alternative fuel decarbonization.[252] To account for current production (and its replacement), the net generation of wind, solar, nuclear, and 90% of hydroelectric power was subtracted to cover decreases in hydroelectric from drought.[253] The total MWh needed was then classified into energy generation types including rooftop PV, utility-scale solar, offshore wind, other advanced tech, brownfield PV, and brownfield wind. National Renewable Energy Laboratory studies identified possible energy potentials.[254] For brownfield, 2,449,130.32 acres of brownfield land were divided into possible onshore wind and distributed solar. Capacity factors were calculated based on annual data for 2021, along with 50% for offshore wind and 1400 kWH/kW for distributed PV.[255]

Cost Calculation: The cost of offshore wind declines to $2500/kW according to the International Energy Agency.[256] The cost of generation of onshore wind in the northwest is $1450/kW, the cost of generation of solar in the northwest is $1872, and the cost of distributed solar (1–5 MW) is $2614/kW.[257] The cost of geothermal is $2500/MW.[258] See the SMR recommendation for more information on nuclear calculations.

Job Creation: Solar energy creates 3.8 direct jobs per million dollars invested, 3.1 indirect jobs per million dollars invested, and 4.4 induced jobs per million dollars invested. Wind energy creates 3.6 direct jobs per million dollars invested, 3.5 indirect jobs per million dollars invested, and 4.4 induced jobs per million dollars invested. Geothermal energy creates 3.7 direct jobs per million dollars invested, 3.2 indirect jobs per million dollars invested, and 4.8 induced jobs per million dollars invested.[259] Nuclear energy (assuming electric power generation, transmission, and distribution) creates 4.2 direct jobs per million dollars invested, 1.8 indirect jobs per million dollars invested, and 6.0 induced jobs per million dollars invested.[260]

Emission Reduction: CO_2 emission reduction was calculated using the EPA Avert Model.[261]

Recommendation
Make Washington State a national leader in green hydrogen production

Cost Calculation: Green hydrogen production cost is based on the $1 billion investment proposed in the Pacific Northwest Region Hydrogen Hub Proposal.[262] Washington State had 7,052 highway miles in 2020, including 71 stations, with each station costing $4.45 million.[263] [264]

Job Calculation: Green hydrogen production creates 0.6 direct jobs per million dollars invested, 1.9 indirect jobs per million dollars invested, and 2.2 induced jobs per million dollars invested.[265]

Emission Reduction Calculation: 714,100 Metric tons of CO2e reduction is based on replacing 70,125,000 gallons of diesel with 55,000,000 kg of green hydrogen. Energy from 1kg of hydrogen gas is equivalent to 1 gallon of gasoline and diesel fuel emits 22.45 pounds of CO2 per gallon.[266]

Recommendation

Make Washington State a national leader in the manufacturing and construction of small-scale, modular nuclear plants

Cost Calculation: The capital cost of $3,600 per kW for modular nuclear installation was retrieved from NuScale, a SMR producer.[267] This was multiplied by the 2 GW (2,000,000 kW) goal.

Emissions Reduction Calculation: Potential sites for SMR installation were identified in a report prepared for the Washington State Energy Facility Site Evaluation Council.[268] The emissions of these sites were then evaluated using the EPA Flight Tool.[269]

Jobs Calculation: 2.5 direct manufacturing jobs per million dollars invested in clean energy manufacturing.[270] [271] [272] [273] [274]

LOW-CARBON MANUFACTURING

Recommendation

Position Washington State as the west coast offshore wind manufacturing center

Cost Calculation: Costs were calculated from reported dollars spent on offshore wind projects and supply chain investments (averages of multiple projects in the United States): a foundation average of $125 million, $200 million for wind blade factory, $300 million for cable plant, $350 million for wind tower manufacturing plant, and $38 million per service ship vessel.[275]

Job Creation: 1.9 manufacturing jobs generated per million dollars invested in wind energy[276]

Recommendation

Make Washington State a premier solar and wind refurbishing and recycling hub for the west

Cost Calculation: The International Renewable Energy Agency estimates that the United States could have 1,000,000 tons of solar waste by 2030[277], equivalent to 2 billion pounds. Assuming that the average solar panel weighs 40 pounds, the United States would be wasting about 50,000,000 solar panels by 2030.[278] If Washington recycled or refurbished 10% of United States solar panels this would be 50,000,000 panels. This calculation assumes the FabTech Enterprises model that 95% of panels can be refurbished, and therefore that 5% would be recycled.[279] It costs about $28 to recycle and $65 to repair a solar panel.[280] To repair/refurbish 4,750,000 panels at $65 each is $308,750,000. To recycle 250,000 solar panels at $28 each is $7,000,000.

Jobs Calculation: 6.8 jobs created per million dollars invested in clean energy manufacturing[281]

Recommendation

Reopen the Intalco aluminum smelter and expedite the buildout of 400 megawatts of clean energy to support the plant

Cost Calculation: The capital cost of $3,600 per kW for modular nuclear installation was retrieved from NuScale, a SMR producer.[282] This was added to the cost of solar, found to be $2,614 per kW.[283] The total solar capacity on the plant was found to be about 20 MW using the PVWatts Calculator from NREL.[284] This was subtracted from the total necessary 400 MW (400,000 kW) and then multiplied by capital cost per kW of SMR installation to find the total cost.

Jobs Calculation: 2.5 direct jobs are created per million dollars invested in advanced nuclear technology, and 3.8 direct jobs are created per million dollars invested in solar installation.[285] These numbers were added to the 700 jobs that would be preserved at the plant when it is reopened.[286]

BUILDINGS

Recommendation

Make WA's schools carbon-free and healthy by 2030

Cost Calculation: Public K–12 schools in Washington State cover approximately 141 million square feet.[287] Average school energy use intensity (EUI) is estimated at 50.2 KBTU per square foot,[288] resulting in a total energy usage of 7 trillion BTU or 2.07 billion kilowatt hour (kWh). Electrification and retrofits are estimated to reduce 50% of school EUI. At a cost of $15 per square foot of retrofit and $12 per square foot of electrification,[289][290] total retrofit and electrification costs come to $3.8 billion. To meet the remaining 50% of energy use, WA's schools need to install 800,351 kW of solar, assuming a median conversion across the state of 1,250 kWh per kW of solar[291] and subtracting 29,415 kW of existing school solar[292]. The U.S. Energy Information Administration estimates the cost of solar at $2,577/kW,[293] resulting in a total cost of $2.06 billion.

Job Creation

- For retrofits: 4.7 direct jobs per million dollars invested
- For solar installation: 3.8 direct jobs per million dollars invested[294]

Emission Reduction: Analysis by the New Buildings Institute found that WA'S schools emit approximately 297,195 million MT CO_2e per year.[295]

Recommendation

Make WA's public buildings carbon-free and healthy by 2030

Cost Calculation: Total public building square footage was estimated from the 2018 Energy Information Administration Commercial Buildings Energy Consumption Survey, which reports total public buildings for the western census region.[296] WA's share of public buildings was assumed to be proportional to the ratio of the state's population to the entire region's population. This assumption was verified by comparing the estimated subset of state-owned building square footage (108 million) to that reported by WA's facility inventory (109 million).[297] Using an average EUI of 58.9 KBTU per square foot,[298] total energy use was estimated at 3.7 billion kWH. Electrification and retrofits were estimated to reduce 50% of EUI. At a cost of $15 per square foot of retrofit and $12 per square foot of electrification,[299][300] total retrofit and electrification costs come to $5.8 billion. To meet the remaining 50% of energy demand, 1.5 gigawatts of solar energy would be required (assuming a conversion of 1250 kW per kWH[301]). The state would need to invest $3.9 million into solar energy at an average cost of $2,577 per kW of solar[302].

Job Creation

- For retrofits: 4.7 direct jobs per million dollars invested
- For solar installation: 3.8 direct jobs per million dollars invested[303]

Emission Reduction: The Washington State-owned facilities inventory reports total emissions and square footage of state-owned buildings, which come to a total of approximately 2,916 metric tons CO_2e per millionsquare feet.[304] Assuming the same emissions intensity for federal and locally owned buildings in the state, WA's public buildings emit a total of 626,720 MT CO_2e per year.

Recommendation

Equitably increase accessibility to low-carbon heating and cooling by 2030

Cost Calculation: According to the EIA, approximately 1.01 million homes in Washington State rely on utility gas for heating.[305] At an average cost of $3,531 per residential unit for thermal utility district connection,[306] It will cost $3.57 billion to connect every home reliant on natural gas to a thermal utility district. The EIA also reports that an additional 228,396 homes rely on bottled, tank, or liquefied petroleum gas; fuel oil; coal; coke; or wood for heating. Installing heat pump systems in each of these homes will cost a total of $6.42 billion, assuming an average cost of $27,900 per heat pump system.[307]

Job Creation

- For heat pump installation: 2.6 direct jobs per million dollars invested
- For district thermal heating: 2.9 direct jobs per million dollars invested[308]
- Approximately 3,662 workers are in WA's natural gas industry.[309]

Emission Reduction: The Washington State Greenhouse Gas Emissions Inventory reports that 5.9 MMT CO_2e were emitted from residential space heating in 2018.[310]

TRANSPORTATION

Recommendation

Expand public transit rail to increase ridership and address inequities

Cost Calculation: The cost of a High Speed Rail project for the state of Washington is estimated by the WA Department of Transportation to be $41 billion ($2018). This calculation assumes approximately 90% of the miles of the high speed rail system would occur in Washington State based on the proposed route. . The cost of a East-West electrified rail system is estimated by the Washington State Joint Transportation Committee to be $264 million ($2020). to be $264 million.

Emissions Reduction Calculation: The WA Department of Transportation estimates the emissions reduction induced by a High Speed Rail system in Washington to be 30,207 metric tons of CO2e per year by 2035.

Jobs Calculation: 3.2 direct jobs created per million dollars invested in rail infrastructure.

Recommendation

Position Washington State as a national leader in sustainable aviation fuel production

Cost Calculation: Washington State University and the Port of Seattle estimated the cost of a forest residual SAF facility and a municipal solid waste SAF facility to be $5.5 billion.[311]

Emissions Reduction Calculation: The emissions factor for aviation fuel was found to be 21.5 pounds of CO2 per gallon.[312]

Jobs Calculation: The job numbers estimations were conducted by researchers from Washington State University.[313]

Recommendation

Electrify 100% of school buses and build out public EV charging infrastructure

Cost Calculation: The number of buses was retrieved from the USDOT Federal Highway Administration and then multiplied by a cost of $400,000 per bus.[314] The need for electric vehicle chargers was calculated using the Electric Vehicle Infrastructure Projection Tool (EVI-Pro) Lite from the US Department of Energy. The price per charger was estimated to be $5,440 for a Level 2 and $81,818 for a DC Fast charger cost can vary.[315] Electrify 100% of school buses and build out public EV charging infrastructure.

Jobs Calculation: 1.7 manufacturing jobs created per million dollars invested in electric buses, and 5.5 direct jobs created per million dollars invested in electric vehicle charging infrastructure.[316]

RESILIENCE AND ADAPTATION

Recommendation

Repair, expand, and modernize WA's drinking water systems by 2030

Cost Calculation: In the EPA's 7th Drinking Water Infrastructure Needs Survey and Assessment, WA's projected investment need for water infrastructure was estimated to be $16,322,500,000 by 2041.[317]

Job Creation: 5.7 direct jobs created per million dollars invested[318]

Recommendation

Complete WA's sidewalk systems using pervious concrete to improve active mobility and groundwater recharge

Cost Calculation: In the Washington State Active Transportation Plan: 2020 and Beyond, the state DOT estimated that the state had a deficit of 542 miles of sidewalk that would require $1,258,461,913 ($2020) to fill in.[319]

Job Creation: 11.7 direct jobs created per million dollars invested[320]

Recommendation

Establish a public program to install cool roofs on 100% of buildings in the Tri-Cities area

Cost Calculation: Building areas in the Tri-Cities area were digitally measured using Microsoft Building Footprints GIS feature along with Kennewick, Pasco, and Richland GIS map layers from each city comparison of these measured building footprints with ground-truthed data revealed a distortion of building area which could be explained by application of a correction bias of 5.15 which converts the areas from a planar to geodesic distance.[321] The total roof space was equal to 281,427,106 square feet and was multiplied by $2.05 ($2008) per square foot.[322]

Job Creation: 4.7 direct jobs created per million dollars invested[323]

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