

INVESTING IN WEST VIRGINIA'S FUTURE: ALIGNING CLIMATE AND ECONOMIC DEVELOPMENT



by

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The Center for Climate and Energy Solutions is hosting a series of regional roundtables to bring together local, state, and federal policymakers; businesses of all sizes; community organizations; leading academics and issue experts; trade associations; investors; and philanthropy. These conversations are meant to elevate the perspectives of a diverse set of stakeholders deeply embedded in their communities and uniquely positioned to speak to the needs of their states and regions. They are also meant to create opportunities to integrate local perspectives into state and federal policy contexts and, importantly, identify concrete steps to better align the long-term vitality of these communities with the urgent task of facilitating economy-wide decarbonization. Following the discussion, along with subsequent discussions with key stakeholders, C2ES has compiled a series of policy recommendations for state and federal policymakers to help meet urgent local needs and realize the discrete economic opportunities communities can maximize through the transition to a net-zero economy.

INTRODUCTION

REGIONAL ROUNDTABLES

Achieving net-zero emissions will require large-scale change across all sectors of the economy, and efforts to accelerate this transition are intensifying. Yet these changes – and climate change itself – have already begun to profoundly alter social, economic, and political realities in communities across the country. To chart a pathway to sustainable, long-term prosperity, communities must be able to leverage their unique strengths and capitalize on emerging economic opportunities, while

addressing barriers that are often poorly understood outside of their communities. As companies make significant commitments and investments in low-carbon technologies and the facilities and workers who will produce them, policymakers have sought to identify approaches that can benefit communities and businesses alike. Doing this well requires engaging directly with communities to understand not only their unique challenges, but, perhaps more importantly, the future they want to chart for themselves.

Our first roundtable of 2021, held virtually “in” Morgantown, West Virginia, brought together more than four dozen stakeholders, to consider ways to leverage West Virginia’s strengths to create a vibrant and diversified economy that can thrive in a low-carbon future. This brief includes key takeaways from the event, and a series of C2ES recommendations meant to align climate and economic objectives in West Virginia. These recommendations are based on the roundtable discussion itself, as well as consultations with stakeholders before and after the event.

MORGANTOWN, WEST VIRGINIA

West Virginia possesses significant natural resources and has long provided the energy that has powered the U.S. economy. It accounts for more than a tenth of the nation’s coal production, ranks sixth in the nation in natural gas production, and faces significant challenges in an increasingly global economy that is looking to eliminate emissions from fossil fuel consumption. Still, opportunity abounds for the state as its thriving chemical industry and proximity to large population centers and freight corridors complement its strong expertise in the energy sector, punctuated by the presence of leading research institutions like the National Energy Technology Laboratory and West Virginia University.

The present moment is pivotal in West Virginia’s transition to a low-carbon economy. Across the economy, new industries are emerging, and companies and communities that make smart, strategic, and early investments can create long-term, structural advantages. The growing urgency to address climate change and an accelerating shift towards low-carbon investments increase the stakes for near-term decisions that will weigh heavily on whether communities can thrive in the decades to come.

Framing the Discussion

The roundtable discussion, which took place virtually over two days in June 2021, sought to explore the following issues: West Virginia’s strengths and the role infrastructure can play in attracting private investment; the evolution of domestic and global markets; and how policymakers can help industries and workers prepare for new opportunities.

The discussion was permeated by a shared optimism that the state has a number of assets it can leverage to take advantage of growth opportunities in the transition

to a low-carbon economy. Yet participants also acknowledged significant barriers to that success, including the lack of physical infrastructure and policy support, as well as the unmet, fundamental needs of communities that have been reliant on the coal industry for the past century.

This brief summarizes key takeaways from the discussion and, building on insights from the event and dozens of conversations with stakeholders, provides recommendations developed by C2ES for state and federal policies that would position West Virginia to thrive in a low-carbon future. These policy recommendations are meant to: attract private sector investments in low-carbon infrastructure and industries that will create jobs in West Virginia; grow local capacity; boost innovation in new industries; better match the needs of workers with employers; and reduce greenhouse gas emissions in West Virginia.

Key Recommendations

The policy recommendations C2ES has identified based on the roundtable include:

Infrastructure Needs

- Provide a robust broadband infrastructure network for all residents.
- Support local capacity to fix and build new infrastructure.
- Expand funding for community development financial institutions to spur investment in climate mitigation and resilience projects.
- Expand and improve low-carbon transportation infrastructure.

Sectoral Opportunities

- Grow the carbon capture, utilization, and sequestration (CCUS) industry in West Virginia.
- Boost manufacturing of low-carbon products in West Virginia.
- Support the development of industries relating to the circular economy.

Workforce

- Align employer needs with workforce training programs.
- Enable residents of West Virginia to take advantage of remote work opportunities and attract new remote workers to the state.

OVERVIEW AND KEY TAKEAWAYS

West Virginia has an opportunity to learn from other states that have similarly begun to transition away from coal-dependent economies, like Wyoming, North Dakota, Colorado, and Texas. Building on these early learnings, as well as West Virginia's unique assets, the state has the potential to be a national leader in revitalizing legacy energy communities while charting its own pathway forward. During the discussion, participants identified unique assets that could be leveraged in a low-carbon future, and barriers to doing so. They also discussed the state's infrastructure needs, emerging opportunities in growth sectors, and how public-private collaboration on workforce development can benefit employers and workers alike.

ASSETS AND BARRIERS TO INVESTMENT IN WEST VIRGINIA

Assets

Roundtable participants highlighted a number of assets that provide West Virginia with a strong foundation for a low-carbon economy, including a hard-working and highly-skilled workforce, with strong expertise in the energy, chemicals, manufacturing, forestry, and agricultural sectors. West Virginia also possesses abundant natural resources, including hydroelectric and geothermal energy potential, and is also heavily forested. The state also has considerable untapped wind and solar energy resources and significant natural gas reserves. West Virginia's location also provides crucial access to regional demand centers across the Midwest, Mid-Atlantic, and Southeast, making it well suited to serve as a hub for low-carbon manufacturing and low-carbon fuels (e.g., hydrogen and renewable natural gas), as well as industries that can benefit from incorporating circularity, such as chemicals and plastics or recycling and repurposing metals.

West Virginia's legacy of energy production has created a workforce that is both experienced and highly skilled in energy and adjacent industries. As the global energy industry shifts toward low-carbon generation and production, West Virginia's communities can leverage existing skills and infrastructure to realize the new opportunities the changing economy will bring. Workers with years or decades of experience in engineering, heavy machinery operations, siting and maintenance, drilling, and other building trades can bring a wealth of

expertise to low-carbon manufacturing and renewable energy production, including wind and solar PV. Many skills relating to fossil fuel extraction can be directly transferred to projects capping orphaned wells and reclaiming former mining sites.

In addition to a skilled workforce, West Virginia is also home to world-class research institutions like the Department of Energy's National Energy Technology Laboratory (NETL) and West Virginia University (WVU) in Morgantown. These institutions are leaders in developing advanced energy technologies including low-carbon power generation and carbon capture; training the low-carbon energy experts of the future; and supporting the development of new companies and community organizations. They are also significant assets to the state, bringing jobs and sizeable revenue to the region – in 2017 alone, NETL had a \$151 million net economic impact on West Virginia's economy.¹ Maximizing the potential of these institutions will be crucial to West Virginia's long-term economic vitality.

West Virginia has the fourth-largest natural gas reserves in the nation, and paired with carbon capture, this gas could be used to produce low-carbon energy, including hydrogen.² In addition to fossil resources, West Virginia has more than 700MW of installed wind capacity, and more than 415MW of existing hydro-power generation capacity.³ Researchers at WVU in Morgantown are exploring local geothermal potential to provide heating and cooling for buildings.⁴ The state is also 78.5 percent forested, with a majority of its forests designated as timberland, providing resources for both sustainable biomass energy production and natural carbon sequestration. West Virginia's small, historic communities and outdoor recreation, paired with a low cost of living, also make the region a desirable place to live, and remote work presents a valuable opportunity for the state.

West Virginia has the third-largest coal reserves in the United States, and coal mined in West Virginia is largely used for electricity production, particularly in-state.⁵ However, with falling costs of natural gas and renewables, as well as increasing recognition that the carbon intensity of coal makes it incompatible as an electricity generation source with a low-carbon future, coal is rapidly becoming less viable as an economic asset, and some projects might risk becoming stranded entirely. Work is being done to develop non-combustion

uses for coal, including sealcoats for pavement, but this remains less than 1 percent of total coal use and its emissions reduction potential is unclear.⁶ Coal mining in the state has also had profound impacts on the health of coal miners.⁷ Ensuring the health and safety of miners, including reducing exposure to coal dust, and stringent inspection of mines for adherence to best practices is crucial to the industry's long-term ability to find new markets for coal. Participants in the roundtable were almost unanimous in agreement that, in order to meet both climate and economic goals, West Virginia must necessarily transition away from near-total reliance on coal-fired power.

Barriers

The population of West Virginia is relatively small compared to other states and is geographically dispersed throughout the state. In practice, this means smaller tax bases and smaller administrative offices in communities can limit their ability to access federal resources meant to benefit them. Cost-share requirements are a particular challenge, not only because of the difficulty in raising the necessary funding, but because many grants also either do not pay salaries directly or create significant administrative burden to do so. Even if these costs were not an issue, the administrative capacity needed to apply for and manage federal grants is also prohibitive in many cases. Further, many of these grants are awarded based on classic impact metrics, such as the number of people that the grant will benefit, which disadvantages smaller, often rural communities in the application process. These obstacles can often prevent communities in the state from being able to take advantage of federal resources for projects like broadband expansion, that are more readily available to more densely populated areas.

West Virginia's mountainous physical geography also poses a challenge to building and maintaining infrastructure, including electric power transmission, roads and bridges, broadband, pipelines, water and sewer, and other infrastructure projects. More than one in five of the state's bridges are classified as structurally deficient, with an estimated repair cost of \$2.9 billion.⁸ A 2015 report identified an additional \$750 million per year in necessary funds to improve the highway system.⁹ The state's wastewater systems have deteriorated significantly, leaving 59 combined sewer systems requiring \$1.2 billion to meet federal and state requirements, and its water utilities are currently seeking around \$302 million to address repair and improvement needs.¹⁰ Improving

physical infrastructure that can raise the quality of life for residents is also critical to attracting private investment and interest in the state.

Companies that attended the roundtable noted that, as they increasingly look to decarbonize their operations and supply chains to remain competitive in global markets, the availability of low-carbon power is becoming a vital factor in the siting of new operations and the competitiveness of smaller companies throughout the supply chain. Coal-fired electric power plants currently provide more than 90 percent of West Virginia's net electricity generation, making the state less attractive to companies that need reliable access to clean power.¹¹

Regulatory certainty is also essential to support new private-sector investment, particularly in such nascent industries as carbon capture, geothermal, hydrogen, and other renewables in West Virginia. Roundtable participants noted that the state currently lacks a strong regulatory framework for many of these industries, and in some cases, has had direct regulatory barriers, including for the deployment of renewable energy. For example, until 2021, power purchase agreements—often used to finance renewable energy projects—were not explicitly allowed under state law.¹² In 2009, West Virginia passed an alternative and renewable energy portfolio setting a target of 25 percent renewable or alternative energy by 2025, but the state legislature repealed the standard in 2015, inhibiting expansion of the renewable energy industry in the state while also deterring companies that have sought access to clean energy as part of their climate and sustainability goals.¹³

A clear message from participants in the roundtable was that public investments that can leverage private capital to build physical infrastructure including roads, bridges, water and sewer infrastructure, broadband, and electric vehicle charging, as well as federal- and state-level regulatory infrastructure offering certainty for new markets, are essential to support low-carbon energy, industry, and manufacturing in West Virginia.

INFRASTRUCTURE NEEDS

Physical Infrastructure

West Virginia has a variety of physical infrastructure needs that are fundamental to the state's ability to attract and retain residents and industries alike. Investments in smart, low-carbon power, transportation, and digital and industrial infrastructure can lay a foundation for a

diversified, and sustainable economy in West Virginia for decades to come.

As leading industries increasingly look to reduce their emissions through electrification, a growing, 21st century economy will require significant growth in the power sector. Companies are simultaneously looking to ensure they have access to low- and zero-carbon electricity, increasing the urgency of building a robust electricity delivery system that can provide clean, reliable and low-cost power. Decarbonizing West Virginia's power grid is a key step toward attracting industry, and the state can accelerate this transition by building out infrastructure to support the integration of renewables, including wind, solar, geothermal, and hydropower, as well as fossil generation with carbon capture. To support the expansion of the carbon capture, utilization, and sequestration (CCUS) industry, the state should identify permanent geologic storage sites and consider building out options such as pipelines or rail networks to transport captured carbon from generation facilities to geologic storage sites or end-user commercial enterprises that can utilize the captured carbon in products.

West Virginia's transportation networks must also be prioritized. Roads and bridges need significant improvements to make them safer and more passable for both passenger and freight vehicles. The state's rail network could also be a powerful, low-carbon tool for transporting freight, which could enhance West Virginia's potential as a regional industrial hub. However, improvements in track infrastructure and investments in electrifying the rail system are still needed. West Virginia's track infrastructure has historically been reliant on the coal industry, and closures of coal mines have begun to lead to track removal and in some cases, closures of routes that had relied on single commodities, namely coal.¹⁴ Participants stressed the vital need for the state, federal government, and rail providers to work together to capitalize on the opportunity low-carbon rail transport could create, including transport of low-carbon commodities and expansion of tourism.

Digital infrastructure, particularly broadband, is fundamental to competitiveness in the 21st century economy, including in the energy, industrial, and manufacturing sectors. Additionally, the use of digital solutions to improve efficiency can significantly reduce energy use and carbon emissions across the economy. However, as of 2017, only 76 percent of households in West Virginia had access to broadband, well below the national average of 83.5 percent.¹⁵ West Virginia faces

challenges in building out broadband infrastructure, including the state's mountainous geography, which makes construction more expensive and logistically difficult. Low population density also makes it more difficult for providers to extend affordable service to hard-to-reach communities. Even when public funding is available, participants noted that many small, rural communities face cost and administrative challenges, such as those described above, to facilitate projects.

Regulatory Infrastructure

As new industries develop, ensuring regulatory certainty is a crucial task for policymakers. To drive private sector investments, clear rules establishing access to markets, as well as for permitting and liability, are important signals to companies looking to make long-term, often sizeable investments in new technologies. Effectively administering these rules also requires significant expertise and capacity, which can help provide the organizational foundation nascent industries need to grow. Policymakers should provide for effective oversight to ensure the fair operation of markets and mitigate risk from short-term political variability.¹⁶

Roundtable participants noted the recent authorization of power purchase agreements in West Virginia as a demonstration of building momentum in support of low-carbon energy resources in the state. These agreements can also provide certainty to companies looking to ensure that new facilities – significant, long-term investments – will be able to procure clean electricity.

CCUS is another emerging industry that could offer a significant opportunity to drive economic growth and emission reductions in West Virginia. However, while these technologies are still nascent, a clear regulatory framework, including storage and liability regulations, will be essential if the industry is to develop to its full potential in West Virginia. For example, while West Virginia has passed regulations that address mineral rights primacy with regard to CCUS (HB 2860, 2009), the state still lacks regulations to address the issues of long-term liability, funding for the long-term management and monitoring of the storage sites, pore space ownership, and transfer of site ownership.¹⁷ There are other states (e.g., Illinois, Louisiana, Montana, North Dakota, Texas, Wyoming) that have passed legislation to address these issues that can offer guidance to West Virginia in establishing its own regulations and clear enabling policies for CCUS.¹⁸

SECTORAL OPPORTUNITIES

West Virginia's assets, including abundant natural resources, workforce, and proximity to demand centers and shipping routes, all provide a foundation for the state to build a resilient, diversified economy. Key opportunities include industry and manufacturing, CCUS, unique opportunities presented by the circular economy, geothermal energy, and forest carbon.

Industry and Manufacturing

Global demand for electric vehicles is expected to grow by at least 29 percent annually through 2030.¹⁹ Automakers are making significant investments to scale up production of electric vehicles in the coming decade, including General Motors, which has announced plans to invest \$35 billion in electric and autonomous vehicle development by 2025, and Ford Motor Co., which recently announced plans to build two new electric vehicle production plants in Kentucky and Tennessee.²⁰ Leveraging its base of skilled labor, along with its proximity to major demand centers and shipping corridors, West Virginia could have an important growth opportunity in the manufacture of batteries and electric vehicles.

Increased demand for batteries and renewable energy products will also generate additional demand for critical minerals. Participants in the roundtable highlighted growing recognition of the importance of domestic supplies of these critical minerals and materials, as reliable supply chains are crucial from competitiveness and security perspectives. As a result, many companies are looking to onshore production of these materials to the United States. With appropriate policy support, West Virginia could have clear advantages in those industries as mine reclamation, acid mine drainage, and coal slurry ponds could all provide domestic sources of critical minerals without requiring the construction of new mines.

The chemical sector is also evolving as companies increasingly prioritize low-carbon or green chemistry in chemical production and chemical recycling becomes more technically and economically feasible. The chemical industry in West Virginia, with support from NETL's Center for Sustainable Chemicals and Fuels, is innovating new ways to process plastics that can create feedstocks for new materials and expand chemical recycling. West Virginia possesses key advantages to develop

this industry, including its expertise in the chemicals industry, proximity to demand centers and significant potential for low- and zero-carbon infrastructure, including rail and waterways.

Carbon Capture, Utilization, and Sequestration (CCUS)

West Virginia has promising geology for permanent storage of captured carbon dioxide, and it is geographically close to markets that utilize captured carbon.²¹ A 2009 analysis conducted by NETL, American Electric Power (AEP), BP, and others also found that the deep rock formations in the Ohio River Valley were feasible for permanent sequestration due to several viable sandstone injection zones.²² West Virginia also possesses the fourth-largest natural gas reserves of any state.²³ Paired with carbon capture and appropriate leak-detection across transportation and distribution systems, this natural gas could be used to provide low-carbon power generation, as well as low-carbon hydrogen. Access to nearby markets for carbon utilization, as well as permanent sequestration sites could position CCUS in West Virginia to be more cost-effective than in other areas, by reducing transportation related costs.

However, participants stressed that there is an insufficient regulatory framework to facilitate projects, exacerbating uncertainty and risks – real and perceived – that inhibit investment. West Virginia can learn from the successes of other states, such as North Dakota and Wyoming, which have begun developing these frameworks, including through the establishment of state-level incentives and funding for research and development.

Circular Economy and Reclaiming Brownfields

Participants highlighted the opportunities that the circular economy presents for new and existing industries in West Virginia to leverage their proximity to major demand centers while removing materials from the waste stream, increasing efficiency, and reducing overall waste. The knowledge and experience from existing chemicals and plastics industries in the state could be leveraged to spark this new industry in West Virginia. With accessibility to urban centers in Pittsburgh, Cleveland, Columbus, Charlotte, Washington, D.C., Philadelphia, and New York City, facilities located in West Virginia could collect and process waste materials into raw materials needed for manufacturing to provide new goods to these areas. However, scaling these operations would require not only significant investments, but also

access to reliable, low-carbon freight options, such as decarbonized rail, inland waterways, or trucking.

Many of the roundtable participants noted that brownfields and former coal mines in particular present opportunities to take advantage of existing infrastructure in siting industrial facilities. Many of these sites in West Virginia already possess much of the key industrial infrastructure required to run large-scale low-carbon operations that could save up-front costs incurred during the construction of new facilities. This approach can be key to reducing impacts on greenfields, including the state's forests, another key economic resource. Finally, mine drainage sites, coal slurry ponds, and other mine waste sites can be sources of critical minerals, including lanthanides and scandium, that can reduce the need for – and related environmental impact of – new mines.

Geothermal Energy

West Virginia possesses some of the best geothermal potential in the eastern United States, although high temperatures are often found much deeper below the surface than in the western United States, making it more expensive to access high-temperature geothermal energy in West Virginia.²⁴ Geothermal energy in West Virginia is most efficiently applied to improve building efficiency in heating and cooling. For example, participants in the roundtable mentioned a study WVU is currently conducting to assess the energy and cost savings of shifting its campus to renewable heating and cooling using geothermal energy in Morgantown. Geothermal can also provide highly reliable, low-carbon, “baseload” energy, and is especially attractive for providing a clean heat solution for low- and medium-temperature industrial processes, which constitute roughly half of industrial heat demand.²⁵ Like CCUS, an established regulatory framework for geothermal would also provide certainty that could boost investment. Successful demonstration projects will also be critical, and West Virginia's geothermal potential could make the state especially attractive for companies seeking renewable thermal energy or building efficiency improvements to meet their climate targets.

Forest Carbon

West Virginia is estimated to have more than 12.1 million acres of forest land, covering 78.5 percent of the land area in the state. More than 97 percent of that forest land is classified as timberland, meeting productivity

thresholds that enable various economic uses, including timber harvesting.²⁶ Harvesting sustainably produced, low-carbon biomass could be an important opportunity for the state. Preserving forests can also generate economic and climate value because of the carbon they sequester, including through emerging markets for carbon credits. Estimates suggest the global voluntary offset market alone could be as much as \$100 billion by 2050.²⁷ Policies to promote forest carbon markets with responsible accounting and verification in the state should also facilitate participation by rural private forest landowners.

WORKFORCE

Companies participating in the roundtable made the point that the workforce skills prioritized by manufacturing and industrial employers are changing. Increasingly, strong IT or software skills are required in addition to traditional industrial and trade (e.g., electrician, welder) skills. Education and outreach in local communities, including workforce training programs, are essential to foster collaboration between employers, employees, and educators to ensure workers understand the opportunities in a low-carbon economy and have the necessary, often cross-disciplinary skills to thrive in these industries.

West Virginia's workforce is rapidly aging, and many young workers are leaving the state to pursue opportunities in other states. From 2010 to 2020, the state's population declined 3.2 percent, the largest of any state in the country, while the total U.S. population grew 7.4 percent.²⁸ Roundtable participants highlighted that the state already faces pressure to rapidly recruit workers with trade skills who can support the existing economy. Employer flexibility and access to infrastructure can help to retain and attract new businesses and residents to West Virginia. West Virginia's outdoor recreational opportunities and lower cost of living can be attractive to workers looking to relocate from many nearby urban centers, while still preserving access them.

Participants repeatedly stressed that significant, locally-driven outreach and economic development must include investments in local capacity to ensure West Virginians' needs are being met and to bring opportunities to the workers and small businesses that can best utilize them. Recruiting a workforce capable of supporting significant growth in these industries will mean growing the populations of many of the

communities in which they are located. This growth can boost local tax-bases and provide additional administrative capacity that can benefit communities in a variety of ways. Facilitating this growth through local capacity-building is crucial to ensuring that growth reflects the interests and desires of communities.

POLICY

West Virginia has the potential to achieve significant growth in the low-carbon economy but needs stronger state and federal policy frameworks and incentives to support its success. As companies look to achieve their decarbonization goals while remaining competitive in global markets, supportive policy frameworks that can provide certainty along with access to infrastructure will be crucial. The transition to low-carbon industries will require significant up-front capital investment and administrative capacity, which will be prohibitive to

many rural communities without policy support. State and federal policies, including grants, tax incentives and other support will be needed to help address these barriers and attract the private sector investment that can help these communities thrive in a low-carbon future.

Policy will also be needed to support workers in the transition from carbon-intensive to low-carbon industries. In the energy and manufacturing industries in particular, workers will need support to leverage their expertise in an economy which increasingly requires access to and familiarity with digital tools. Grants and incentives can help ease the financial burden of retraining and higher education on companies and workers, but close coordination between the public and private sectors can ensure those investments generate their maximum potential economic benefits.

POLICY RECOMMENDATIONS

INFRASTRUCTURE NEEDS

Provide a robust broadband infrastructure network for all residents.

Participants stressed how important access to broadband has become, as industries integrate digital tools into their day-to-day operations. Further, as remote work opportunities continue to increase significantly in the years ahead, lack of access to broadband will be a barrier for residents of small or rural communities who would like to be able to take advantage of those opportunities. Many people across the country are already working remotely, and with sufficient access to broadband, could consider relocating to West Virginia to take advantage of lower cost of living and outdoor recreation, while maintaining remote access to urban areas.

The federal and state governments should work together to provide funding for the rapid expansion of broadband infrastructure to reach all residents in West Virginia, even those in communities with very low population density where private telecommunications companies may not consider deployment economically justifiable. The state should take advantage to the greatest degree possible of grant programs like the U.S. Department of Commerce Economic Development

Administration FY 2021 American Rescue Plan Act Economic Adjustment Assistance program, which sets aside at least \$200 million to support coal communities.²⁹

Support local capacity to fix and build new infrastructure.

Many communities in transition across West Virginia are grappling with low population density and median incomes, making the co-investments that are typically needed to receive federal funding prohibitive, including for infrastructure projects. Federal agencies should adjust loan and grant programs to enhance accessibility for these communities, through decreased or sliding-scale cost-share requirements. Further, these grant programs should include provisions, where feasible, to employ local workers and build local capacity, and reduce administrative burdens to ensure salaries can be covered by grants. Agencies including the Department of Agriculture, Department of Housing and Urban Development, Department of Energy, and Department of Transportation should all consider these adjustments for infrastructure and other economic development-oriented programs, while prioritizing climate mitigation along with economic growth potential in project selection. These agencies should also provide dedicated

administrative support for small and rural communities which may lack the administrative capacity to apply for and manage federal grants.

West Virginia state agencies can also support communities across the state by enhancing access to federal loan and grant programs.³⁰ The creation of a matching fund for municipalities, nonprofits, and private companies that would reduce the financial burdens of cost-match requirements could be an important tool for meeting economic development objectives. These matching fund awards should prioritize project viability, job creation, and livability improvements.

Expand funding for community development financial institutions to spur investment in climate mitigation and resilience projects.

Community development financial institutions (CDFIs) leverage federal funds alongside private capital to offer financing for individual borrowers, small businesses, or community organizations to create economic opportunity for low-income communities. Many CDFIs serve rural communities and can be effective vectors for investment in low-carbon infrastructure and climate resilience.

Congress should appropriate additional funding for CDFIs through relevant agencies including the US Department of the Treasury Community Development Financial Institution Fund, the US Department of Agriculture Rural Development program, the Appalachian Regional Commission, Department of Energy, and the Economic Development Administration, with particular focus on loans to local small businesses and organizations to support investments in renewable energy and low-carbon infrastructure. To complement this federal funding, West Virginia should direct state funding toward existing organizations offering local community development finance.

West Virginia currently has one CDFI, Partner Community Capital (formerly the Natural Capital Investment Fund), which has served West Virginia and the surrounding region since 2000 and maintains a stated focus on environmental sustainability.³¹ Grants from this CDFI support building energy efficiency retrofits and upgrades, installing solar PV arrays, diverting waste from landfills, and recently have supported continued operations through the COVID-19 pandemic. With appropriate direction, they could also be used to support EV charging infrastructure. State and federal pandemic recovery funding directed toward small

business and community organizations should include apportionments for CDFI funding to leverage private investment and local community connections.

A national climate bank could also help this effort, by providing financial and technical support, or even help to establish a West Virginia Green Bank.³²

Expand and improve low-carbon transportation infrastructure.

Federal transportation infrastructure funding should look to align decarbonization and economic development objectives. Access to low-carbon freight transportation is crucial to industries looking to decarbonize their supply chains, and supporting the widespread availability of those resources will be important to West Virginia's long-term economic development objectives. In addition to repairing roads and bridges throughout the state, the federal government should, in close consultation with state government and the private sector, look for ways to expand accessibility to low-carbon rail and maritime freight transportation.

Similarly, growing demand for medium- and heavy-duty trucks, as well as light-duty passenger vehicles, presents an opportunity to establish robust supply chains in the state. As manufacturers increasingly look to build those supply chains near manufacturing and demand centers to limit transportation related costs and emissions, supportive policies and a strong domestic market for these vehicles will be key to onshoring manufacturing jobs.

Broad access to zero-emission charging and refueling infrastructure will be crucial in supporting on-road electrification and fuel diversification, but will be difficult for the private sector to cost-effectively implement across a low-density, geographically dispersed population. Participants were broadly interested in electrified transportation but reticent to be early adopters without reliable access to charging infrastructure throughout the state. To help increase public access to charging and refueling infrastructure for both passenger and freight vehicles, such infrastructure should be located in high-traffic corridors, including community centers and highway routes. State-level incentives to support the build-out of electric vehicle charging should also take into account West Virginia's low population density and prioritize access to home charging. Utilities, with support from the Public Service Commission of West Virginia, should work with drivers to install and maintain Level 2

home charging equipment, and state-level grants should be provided to help ease the up-front financial burden of installation.

Increased demand for electric vehicle charging will necessarily require both updates to the existing grid to accommodate the increased load and the inclusion of low-carbon sources to keep both costs and emissions low. Any plan to expand access to charging infrastructure at the state level should go hand-in-hand with a plan to improve grid infrastructure and decarbonize the state's electricity portfolio.

SECTORAL OPPORTUNITIES

Grow the carbon capture, utilization, and sequestration (CCUS) industry in West Virginia.

To support the development of West Virginia's full technical capacity to capture carbon, Congress should enhance the 45Q tax credit for captured and sequestered carbon by eliminating thresholds to allow more facilities to participate in the program. Additionally, proposed reforms should be enacted to the current 48A Investment Tax Credit program to enable CCUS retrofits to existing facilities in West Virginia to be eligible for federal incentives.³³ Congress should reinstate the 48C Manufacturing Investment Tax Credit to provide incentives for low-carbon investment, including CCUS technology deployment. The Environmental Protection Agency should also grant West Virginia primary enforcement authority for Class VI underground injection wells. A large percentage of carbon capture projects nationwide have announced their intent to utilize Class VI permits, which would facilitate permanent carbon sequestration in geologic formations, a key element of the state's ability to compete nationally for projects and private sector investment in CCUS.³⁴

The current lack of a consistent state-level regulatory framework exacerbates risk and disincentivizes external investments in CCUS in West Virginia. Regulators at the state level should look to other states with similar resources and opportunities as examples of constructive policy solutions. States like Wyoming and North Dakota have strong regulatory frameworks that have begun to spur growth in CCUS industries and can be replicated in West Virginia. The Department of Energy's Regional Carbon Sequestration Partnerships (RCSP) Initiative also currently supports seven regionalized, public private partnerships focused on expanding regional carbon

sequestration infrastructure. Increased support for this program could facilitate information sharing and drive private sector investments in CCUS opportunities in the state.

The utilization of captured carbon can also be a lucrative market opportunity. Researchers and private companies are working to develop new carbon-based products and identify markets for West Virginia's captured carbon that can be fed through pipelines or rail networks. Ensuring access to the physical and regulatory infrastructure needed to support those opportunities should be a priority for state and federal policymakers.

Boost manufacturing of low-carbon products in West Virginia.

A reinstated 48C manufacturing investment tax credit could also support the construction of new facilities or retooling of existing facilities including brownfields. As part of the American Recovery and Reinvestment Act, the 48C tax credit provided more than \$2.3 billion to 183 domestic, clean energy manufacturing facilities.³⁵ Reviving this tax credit, along with a focus on supporting communities in transition, would leverage skilled labor in these communities to help strengthen domestic supply chains for growing, low-carbon manufacturing. To take full advantage of West Virginia's low-carbon manufacturing potential, Congress should also expand the covered projects under the 48C credit to include low-carbon chemical production, and should include specific provisions to support reclaiming brownfields as part of allowable upgrades to existing facilities.

Support the development of industries relating to the circular economy.

Congress should establish incentives for waste reduction and create tax incentives for chemical recycling of plastics to encourage producers to collaborate with chemical recycling providers to source raw inputs from recycled materials. West Virginia's expertise in the chemical sector, as well as proximity to demand centers, would position it well to capitalize on such incentives.

In addition to recycling materials, state and federal policymakers should focus on remediating brownfields and siting new manufacturing or renewable energy production facilities at these locations. Brownfields are generally already connected to the electric power grid, making them ideally suited to clean energy production. Advanced manufacturing facilities can often be more easily sited and

constructed where access to that existing power infrastructure, as well as buildings, and transportation infrastructure already exist. Repurposing former mine sites also allows for greater conservation of greenfields and forests, while—importantly—siting facilities in communities that have experienced significant distress due to facility closures.

WORKFORCE

Align employer needs with workforce training programs.

Many young West Virginians entering the workforce, as well as more experienced workers looking to leverage their skills in new ways, including changing sectors, need specialized training to succeed in advanced manufacturing jobs and other growth industries. In many cases, jobs that once required only technical training now also require IT or software skills. Workforce development programs such as those supported by the Appalachian Regional Commission, can provide crucial support for workers, including those in coal or power plant communities.

The state should facilitate partnerships between employers and workforce training programs to ensure workers are aware of employment opportunities and the associated required skills, and that training programs are equipped to help workers develop those skills. Generation West Virginia's NewForce program, for example, provides tuition-free intensive coding training based on consultation with employers, community colleges, and nonprofits to help students find meaningful employment in the software development industry, and has an 86 percent placement rate with 100 percent of placed graduates working for companies based in West Virginia, demonstrating the value of the program in

meeting the needs of both employers and employees alike.³⁶ State and federal support to bolster these types of programs can enable further collaboration in this area.

Enable residents of West Virginia to take advantage of remote work opportunities and attract new remote workers to the state.

Whether or not they were prepared for it, many companies and workers found themselves transitioning rapidly to remote work throughout the Covid-19 pandemic. However, while this presented disruptive challenges to many households, it also presented opportunities to transform the workforce to accommodate workers geographically distant from their place of employment. West Virginia can take advantage of this opportunity by attracting young, remote workers who may be interested in relocating away from high-cost, urban areas while maintaining their current jobs to enjoy greater access to the outdoors and lower costs of living, assets which West Virginia has in abundance. At the same time, with enhanced internet access, workers who already live in West Virginia can help grow the state's tax base by maintaining residency in the state while taking remote positions with employers located elsewhere in the country.

Access to infrastructure, including broadband, power and transportation infrastructure, is essential to support remote workers already living in the state and to attracting remote workers from other states. Federal and state policymakers should support the expansion of broadband access to ensure all residents have reliable internet access. Additionally, policymakers at the state level should also offer incentives for companies to hire remote workers in West Virginia.

ENDNOTES

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Other Climate Innovation 2050 Resources:

Getting to Zero: A U.S. Climate Agenda

<https://www.c2es.org/document/getting-to-zero-a-u-s-climate-agenda/>

Pathways to 2050: Scenarios for Decarbonizing the U.S. Economy

<https://www.c2es.org/document/pathways-to-2050-scenarios-for-decarbonizing-the-u-s-economy/>

Restoring the Economy with Climate Solutions: Recommendations to Congress

<https://www.c2es.org/document/restoring-the-economy-with-climate-solutions-recommendations-to-congress/>

Additional Resources:

U.S. Economic Development Administration Investment Priorities

<https://eda.gov/about/investment-priorities/>

Association of American Railroads Freight Railroads & Climate Change Report

<https://www.aar.org/wp-content/uploads/2021/02/AAR-Climate-Change-Report.pdf>

ReImagine Appalachia Appalachian Climate Infrastructure Plan

<https://reimagineappalachia.org/wp-content/uploads/2021/03/ACIP.pdf>

BlueGreen Alliance National Energy Transition Policy Framework

<https://www.bluegreenalliance.org/resources/bluegreen-alliance-national-energy-transition-policy-framework0/>

National Economic Transition Platform

<https://www.nationaleconomictransition.org/>

Midwest Regional Carbon Initiative

<https://www.midwestccus.org/>



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