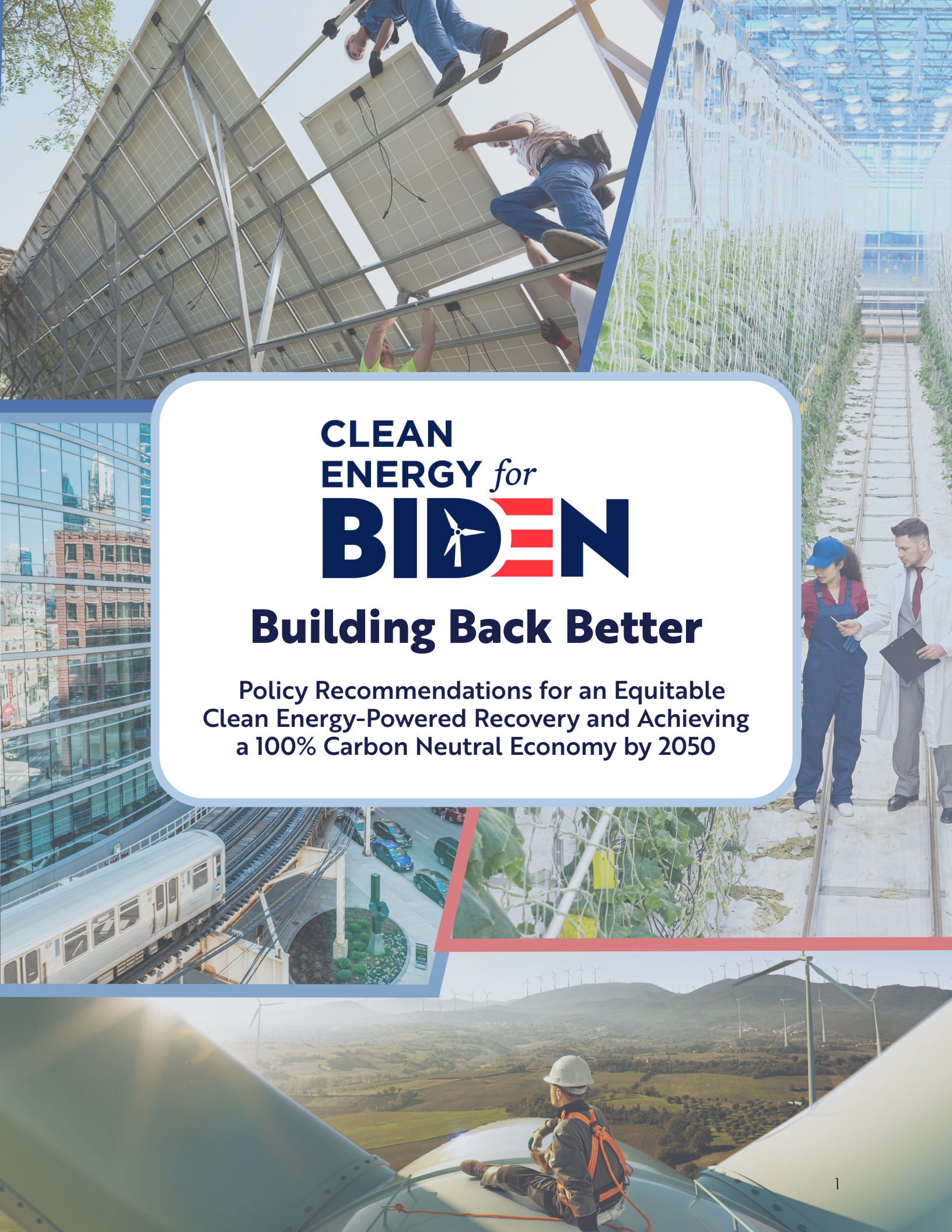

CLEAN ENERGY *for* BIDEN

Building Back Better

Policy Recommendations for an Equitable Clean Energy-Powered Recovery and Achieving a 100% Carbon Neutral Economy by 2050

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Executive Summary

About Clean Energy for Biden

Clean Energy for Biden is a group of clean economy leaders, advocates, policymakers, and former government officials united to elect Joe Biden and Kamala Harris and advance policies, technologies, and investment to address the climate crisis. Launched in April 2020, CE4B now has more than 10,000 members active in 40 states, with 30 local chapters and affinity groups. CE4B's members raised $3 million and contacted tens of thousands of voters through state and national phone banks held nearly daily during the two months before the election.

CE4B members recognize climate change as the greatest threat of our lifetime, and believe in President-Elect Biden's proposed solutions. While scientists forecast that we must reduce emissions significantly over the next decade and achieve net zero by 2050 to avoid the worst impacts of climate change, the U.S. has spent the past four years backsliding on progress, rolling back key regulations, and putting us even further behind. At the same time, the pandemic continues and we have a fragile economy with high unemployment that is having a disproportionate impact on disadvantaged communities and people of color. President-Elect Biden's plans to rebuild energy infrastructure, incentivize clean energy generation, invest in manufacturing, electrify fleets, retrofit buildings, and invest directly in communities provide a clear path to a just and equitable economic recovery that also addresses the climate crisis. Motivated by their personal and professional commitment to addressing climate change and building our clean energy future, CE4B members collaborated to come up with this collection of policy recommendations to help carry out President-Elect Biden's plans.
America's clean energy industry is one of the nation's fastest-growing, with three million jobs across the United States. Through CE4B, the clean energy community has proved itself able to organize and deliver support for President-Elect Biden, using its people power to raise funds and get out the vote to elect new leadership at a pivotal time for our country and the climate.

Our work is not over and the CE4B network will remain active and organized beyond the election and transition to the Biden-Harris administration. We are proud to present the following policy recommendations developed by CE4B members from diverse backgrounds, experiences, and geographies.

Policy Papers

CE4B members come from every sector of the clean energy economy – including transportation, electricity, infrastructure, innovation, finance, and advocacy – and include many of the nation's foremost clean energy and environmental policy experts, clean tech and nonprofit CEOs, and former government officials. The recommendations in this policy guide reflect the group's deep and broad expertise, which members provided on a purely volunteer basis on their own time.

The following 48 policy papers were developed and written by over one hundred volunteer CE4B members. We believe these recommendations will help the incoming Biden-Harris administration as well as members of Congress, to identify policy ideas vetted by experts. While CE4B facilitated the development of the recommendations included in this policy guide, CE4B does not endorse or take a position on any of the policy recommendations, as they are the views of their respective authors. Each individual paper stands on its own and represents the views of the authors who are credited at the beginning of each memo. There are different, and in some cases conflicting, sets of recommendations for attaining similar policy goals (e.g. establishing a Clean Energy Deployment Administration as compared to a National Clean Energy Bank), and some members of CE4B may not agree with or endorse particular recommendations. Accordingly, this policy guide is not intended to be a consensus set of recommendations, nor is it a comprehensive plan. Instead, it is a compilation of concrete policy recommendations to achieve many of the goals laid out in President-Elect Biden's climate and clean energy plan. Each set of recommendations supports President-Elect Biden's plans in some way, which is shown in the policy matrix following the Executive Summary. We hope the Biden Transition Team, as well as congressional leaders, will consider and pursue many of these ideas and utilize the expertise of the recommendations' authors.

Our audience for this document includes members of the Biden Transition Team, staff and principles in an early Biden-Harris administration, and members of Congress who will develop legislative proposals to implement President-Elect Biden's climate and clean energy priorities. Therefore, we have created a matrix which serves to easily reference each set of recommendations to the Biden campaign's climate and clean energy plan objectives.

Finally, we have chosen to make this document public and a CE4B-hosted policy summit for authors to present their recommendations in order to facilitate the exchange of ideas and to ensure these recommendations are available to officials inside and outside the Biden-Harris administration working on policy formation. We encourage continued collaboration between policymakers and the authors of the ideas in this document.

Summary of the Recommendations and How They Support the Biden Plans

Jobs and Workforce Development for a 100% Clean Energy Economy

CE4B members have a direct stake in growing the opportunities and increasing the diversity of the clean energy workforce. The Biden campaign's climate and clean energy plans aim to create millions of well paying jobs rebuilding infrastructure, manufacturing clean vehicles, and deploying clean energy and storage to power our economy. The plan also calls for targeting 40 percent of its $2 trillion investment in clean energy to benefit disadvantaged communities, which will fuel job creation in low income and underserved areas and create opportunities for people who need the jobs most to participate in the massive expansion of America's clean energy workforce.

To support these goals, the authors recommend creating a National Council on Workforce Development in the White House and investing in programs that support green job education and workforce training as a way to bring clean energy jobs to underserved communities and expand the geographic distribution of clean energy jobs to equitably serve more communities. Additionally, authors recommend investing in retraining for those transitioning from the drilling and mining industries, and leveraging federal procurement and funding programs to drive more racial and gender diversity and inclusion in the clean energy workforce.

Climate Justice and Equity for a 100% Clean Energy Economy

A pillar of President-Elect Biden's clean energy and infrastructure plan is to secure environmental justice and create equitable economic opportunity for low-income communities and communities of color. CE4B authors have propos six sets of recommendations to support the Biden plan, recognizing that "(a)ny sound energy and environmental policy must advance public health and economic opportunity for all Americans... and recognize that communities of color and low-income communities have faced disproportionate harm from climate change and environmental contaminants for decades."

Authors of recommendations in this section propose substantial focus on investing in frontline communities and developing programs to better understand and serve their needs while transitioning away from polluting industries. Furthermore, authors recommend increasing frontline communities' access to clean energy jobs and technologies, including vehicle electrification, renewable energy and efficiency, and investing in more sustainable schools. Finally, this section includes recommendations for reducing the burden of high energy bills on families in disadvantaged communities through access to affordable energy efficiency and solar energy, and recommendations for improving energy efficiency in subsidized housing.

Strategic Investments and Incentives that Leverage Private Capital for a 100% Clean Energy Economy

In this section, authors propose recommendations designed to mobilize private sector investment by leveraging federal programs and incentives, as well as utilize markets to advance clean energy and harness the existing consumer preference for investments that

benefit society and the environment.
Specifically, the recommendations propose to build on the 300,000+ renewable energy jobs created by the existing Investment Tax Credit and Production Tax Credit in two main ways: 1) by cancelling the phase down of those credits and transitioning them to a "Clean Energy Investment Credit", also known as a "technology neutral clean energy tax credit" that provides maximum incentives to zero carbon technologies, and 2) reduced incentives for low carbon technologies.

Additionally, two sets of recommendations propose to mobilize private capital for clean energy projects and innovation by establishing a National Clean Energy Bank and/or a Clean Energy Deployment Administration. These proposals would create structures for federal investment in private sector clean energy development, supporting innovation and deployment that would be slower or not possible without federal support and lower cost financing. These two recommendations aim to leverage smaller federal investments to channel hundreds-of-billions of private and public dollars in clean energy technologies, while creating millions of new jobs.

Finally, authors recommend using ESG investing and opening up wholesale electricity competition in order to allow markets to reward and drive scale in clean energy investments.

Clean Transportation for a 100% Clean Energy Economy

The Biden Climate Plan calls for reducing greenhouse gas emissions from transportation by preserving and implementing the existing Clean Air Act, and developing rigorous new fuel economy standards aimed at ensuring 100% of new sales for light- and medium-duty vehicles will be electrified.

Authors offer a number of recommendations in support of these goals. In view of the key role that electric vehicles (EVs) play in reducing reduce transportation-related greenhouse gas emissions and air pollution, authors recommend building DOE programs to reduce costs and barriers of installation, establishing federal programs to subsidize charging infrastructure, modeled on California programs, coupled with investments in pooled EV vehicles/buses and transitioning school buses to zero-emission alternatives within five years for frontline communities. Furthermore, authors propose expanding existing programs deploying charging infrastructure in federal buildings and other facilities, together with transitioning the three million vehicles in the government fleets to zero-emission vehicles. Recommendations also propose raising fuel efficiency standards, creating public fleet zero emissions targets, increasing funding for zero emissions transit programs, and boosting R&D for decarbonization.

Authors highlight that cities have led ambitious climate policy agendas, including bringing environmental justice issues to the forefront, and are ready for investment in transportation powered by clean energy. Furthermore, authors recommend modernizing our transportation sector through electrification, creating cleantech innovation hubs in underserved communities, and helping at-risk areas and vulnerable communities adapt. Additionally, as transportation represents the largest single source of carbon emissions, recommendations include a federal Low Carbon Fuel Standard (LCFS) -- a program that

sets a cap on the carbon intensity of transportation fuels modeled on current successful state-level programs in California and Oregon. A federal LCFS would provide a market-based structure that decarbonizes the transportation fuel supply, protects and expands supports upon the existing 88,000+ biofuel jobs in the U.S. heartland, and complements other policies aimed at full electrification.

Transmission and distribution grid investments are needed to enable transportation electrification in key transportation corridors. Authors recommend a new federal policy that guarantees transmission, broadband, and 5G infrastructure can be located within an interstate right of way, incentives for investments in transmission, broadband, and 5G infrastructure and increased funding for research into DC power conversion technologies. Moreover, U.S. transit systems badly need modernization, and without robust federal funding, additional investment is unlikely to materialize. Authors note the benefits of greater funding for Federal Transit Administration research and innovation, incentives for innovative transit projects as well as for domestic manufacturing of new rolling stock. As inadequate access to transportation disproportionately affects low-income communities, communities of color, and the disability community, authors recommend that an incoming Biden Administration implement policies to create and invest in more accessible, well-maintained transportation options for disabled, Native American, and low-income communities and communities of color.

Finally, aviation is another important policy area, accounting for approximately 11 percent of US transportation GHG emissions. Recommendations include a declining cap on domestic aviation emissions; investments in next generation aviation technology; stronger global standards and instruments; negotiating climate provisions in bilateral air services agreements; multiagency sustainable fuel R&D coordination and purchasing commitments; and optimizing routes to minimize emissions.

Modernizing our Energy System and Grid for a 100% Clean Energy Economy

The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future recognizes that readying our grid and energy system for a 100% clean energy future represents the "biggest job creation and economic opportunity engine of the 21st century," and an essential prerequisite for American competitiveness for decades to come. This effort will require federal attention to the many complex facets of our energy infrastructure. Our authors have accordingly offered a range of recommendations for effective, far-reaching change across many levels of the system, including improving access to markets, focusing federal procurement on clean energy options, increasing investment in R&D, and expanding tax credit programs.

One paper recommends deployment of a new national system to deliver the nation's substantial clean energy resources to consumers through development of a "National Supergrid" and "Super Distribution Systems." Several papers recognize the rapid growth and extraordinary potential of customer-side energy technology to meet clean energy needs. These recommendations included: mechanisms to expedite deployment by reducing costs from permitting delays, interconnection, and other soft costs; making these technologies more accessible to equity and front line communities, and investing in local grid systems that can maximize customer-side contributions . Hardening transmission, distribution and microgrid systems against extreme weather and climate change, adopting intelligent equipment to make these systems "self-healing," and securing currently vulnerable cyber systems needed to reliably supply energy, is the focus of another set of

recommendations.
Investing federal funds to make buildings' energy use interactive with the grid would help make them, and the energy system, greener, healthier and more resilient, according to several papers. Authors also recommend adopting a zero carbon national building standard, and taking down barriers for distributed resources and demand response to provide energy services to local energy systems and markets as electricity use in buildings and transportation increases. The U.S. has been a leader in the rapidly expanding global market for energy storage and EV charging. Storage used to be referred to as the "holy grail" of energy that can unlock variable clean energy generation. With affordable batteries widely available, authors include recommendations to establish market designs that incentivize storage deployment and participation by distributed energy resources. Other recommendations include supporting EV charging infrastructure, particularly combined with storage, which can address grid challenges while quickly charging vehicles.

Innovation and Bringing Technologies to Market for a 100% Clean Energy Economy

A common theme across recommendations is the need for increased funding for clean energy research, development and demonstration, accelerating domestic deployment as well as enhancing U.S. global competitiveness, consistent with the Biden Plan's call for a $400 billion clean energy innovation investment over ten years. One set of recommendations focuses entirely on this topic, recommending a National Energy Innovation Mission and tripling current funding to $25 billion by 2025; the authors project at least one million new jobs and sparking as many as ten decarbonization industries across multiple economic sectors. Commercialization of clean energy technology has also been identified as a key concern, as R&D cannot bridge the gap from bench-scale proof of concept to deployment, with the greatest gap limiting benefits to equity communities and small businesses. A DOE Foundation and restoration of the DOE Office of Technology Transitions could help bridge the infamous "valley of death" for new technologies by coordinating government, private, entrepreneurial and philanthropic efforts to promote commercialization.

Additional recommendations in this section focus on four particular industries: direct air capture of carbon dioxide, advanced nuclear, off-shore wind, and the data component of customer-side clean energy technologies. These technologies could collectively yield hundreds of billions of dollars in direct economic activity, over $1 trillion in by-products, and millions of jobs, including both domestic and international trade benefits. The authors urge federal attention to removing barriers, enhancing U.S. competitiveness, and adopting national standards to advance deployment.

Reducing Reliance on Fossil Fuels and Stopping New Fossil Fuel Infrastructure

The Biden campaign has proposed a goal of achieving net-zero emissions no later than 2050. While not called for in President-Elect Biden's Climate and Clean Energy Plans, carbon pricing can support a range of climate policy goals and provide a source of revenues, in support of investment and climate policy goals. Authors recommend establishing a carbon fee that automatically adjusts if emissions exceed the trajectory required to achieve net-zero emissions by 2050.

Authors also recommend that the incoming Administration stop the "Line 3" project, which would transport crude oil from the Alberta tar sands oil fields into the U.S. across northern Minnesota to Superior Wisconsin, by requiring a full National Environmental Policy Act

(NEPA) Environmental Impact Statement for the project. The new Administration could order an immediate pause on oil pipeline construction and a moratorium on any new projects or expansion projects while they review Trump-era approvals for conflict or undue influence by industry proponents.

To quickly and effectively achieve the goal of decoupling the U.S. government from fossil fuels, authors argue that we must focus not only on new investments in clean energy but divestment of fossil fuel support. Authors highlight the opportunity for the Federal Retirement Thrift Investment Board to create a TSP Climate Choice option that does not include exposure to fossil fuel-related investments.

Rural Development and Investment for a 100% Clean Energy Economy

President-Elect Biden's Clean Energy and Climate Plans call for standing up for farmers and ranchers, and investing in rural communities that are critical to our food supply. Rural communities and their economies are also sensitive to impacts of climate change. In this section, authors have proposed recommendations to bring clean energy jobs and benefits to rural America, particularly agriculture and forestry economies.

Authors highlight that wildfires on the West Coast have pointed to a severe problem: our forests are struggling to adapt to climate change, and our unnatural suppression of regular, small, naturally-occurring forest fires have left them vulnerable to massive, extremely destructive "mega-fires"- with some 80 million acres remaining at risk, according to the US Forest Service (USFS). They propose to pair forest restoration with support for and investment in the wood products industry and bioenergy production to help address these risks. Furthermore, authors note such efforts could generate revenues to offset the estimated $100 billion required for restoration of USFS-managed lands.

Another set of recommendations aims to address the need to transition heavy duty fleets away from oil-based fuels. To move this transition forward for existing fleets, production of algae-based fertilizer and "drop-in" biofuels can power long-haul trucks, heavy machinery, shipping and aviation, and could provide a significant part of the solution. Algae-based production offers the opportunity to augment feed and food production, rather than potential diversion of feed and food products to create fertilizer and fuel.
Finally, authors highlight that nitrogen fertilizer used in agriculture is primarily made using natural gas, a process that consumes 1-2% of global energy, and recommend reducing or eliminating nitrogen fertilizer and transitioning to regenerative agriculture methods. Authors recommend helping farmers economically and help spur economic development in rural areas by reforming Federal Crop Insurance to encourage the building of soil health, offering preferential loans for producers demonstrating risk-mitigation through improved soil health

outcomes, and increasing funding for USDA's Natural Resources Conservation Service (NRCS).

Conclusion

This collection of recommendations, while not intended to form a comprehensive strategy for addressing climate change, represents a menu of policy recommendations designed to help the Biden-Harris administration and Congress quickly identify potential policy ideas to support the plans that helped drive historic engagement by climate voters for the incoming administration. Many of these recommendations were drafted by leading experts, and the proposals are backed up by substantial experience, analysis and stakeholder support. To any reader of this document who is interested in learning more about a set of recommendations, or finding experts to help advance it, we encourage you to contact the authors directly. We have provided a link to the authors' LinkedIn websites to facilitate review of their qualifications and experience and to provide a means of direct contact with the authors.

Appendix

[1] including those who make up the Intergovernmental Panel on Climate Change (IPCC), https://www.ipcc.ch/sr15/chapter/spm/

[2] https://rhg.com/research/the-rollback-of-us-climate-policy/

[3] Wind technicians and solar installers are the number one and three fastest growing occupations in the U.S. respectively according to the Bureau of Labor Statistics, with over 50 percent growth between 2019-2029. See https://www.bls.gov/ooh/fastest-growing.htm.

[4] Each paper is the product of at least three authors and was reviewed by a third party expert to ensure the logic of the recommendations and veracity of the issues and claims. In addition, each paper was independently reviewed by equity and social justice experts to ensure the recommendations support a fair and just transition. Finally, a team of 15 volunteers, fact checkers, and copy editors, and five members of the Northwestern University Law Review compiled, edited, and helped curate these recommendations in order to make this memo a useful reference tool.

Contributors

Building Back Better: Policy Recommendations for an Equitable Clean Energy-Powered Recovery and Achieving a 100% Carbon Neutral Economy by 2050 is a collaborative effort of more than 200 clean energy professionals. The management team is listed here, authors for each recommendation are listed within the specific issue area recommendations.

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More than 200 clean energy professionals developed the recommendations found in this report. These experts represent every sector of the clean energy economy, including transportation, electricity, agriculture, and technology and hold leadership positions in government, industry, academia, and the nonprofit sectors. The authors and reviewers include technical experts as well as some of the leading thought leaders in the nation. Authors are listed on each of the issue topics for which they contributed. The views and recommendations are those of the individual authors and reviewers and do not represent CE4B as a whole.

Please Note

While CE4B facilitated the development of the recommendations included in this policy guide, CE4B does not endorse or take a position on any of the policy recommendations, as they are the views of their respective authors. Each individual paper stands on its own and represents the views of the individual authors on their respective papers.

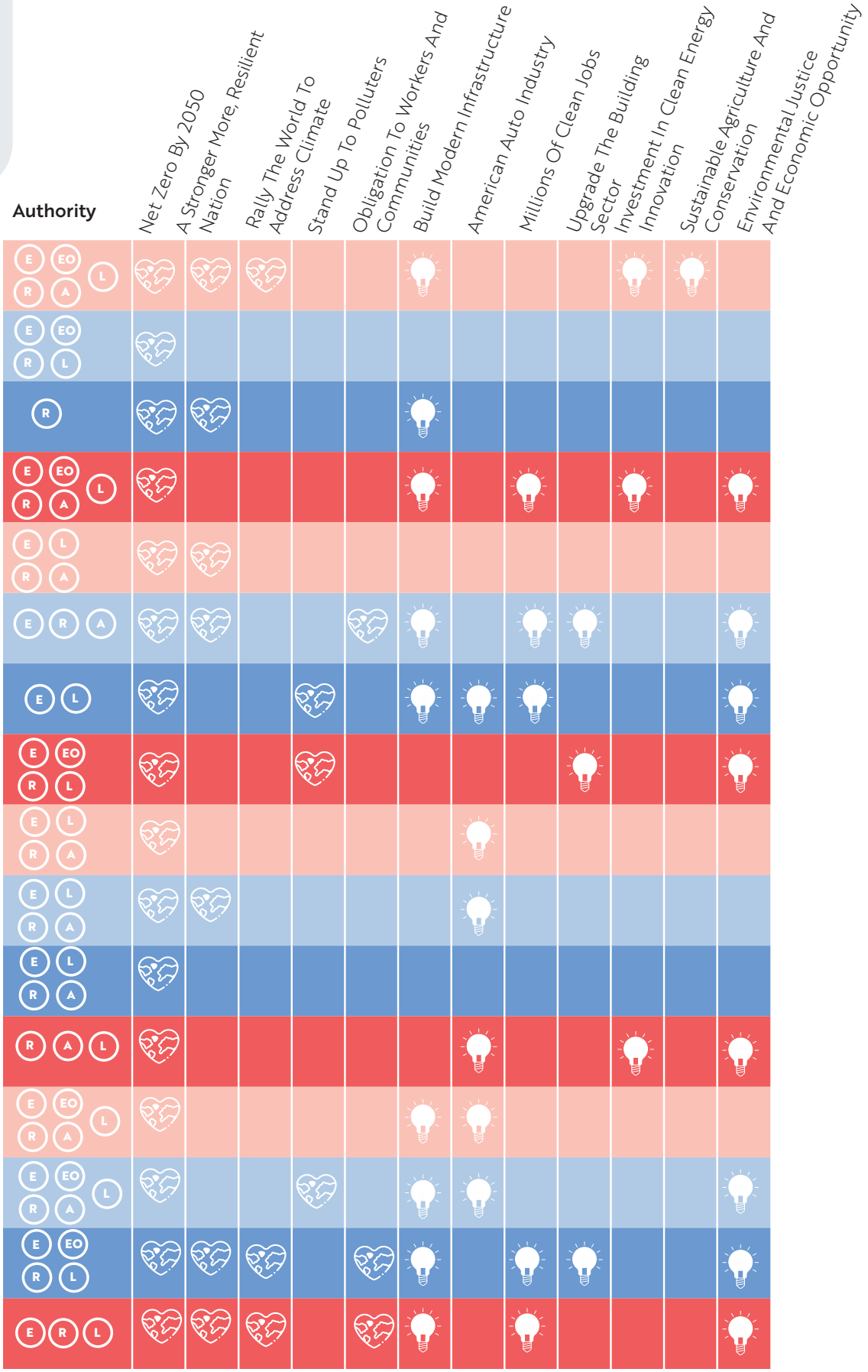
Policy Paper Matrix

Click here to view online version.

- E Existing
- EO New EO
- R New Regulations
- A Approps
- L New Legislation

Biden Climate Plan Category

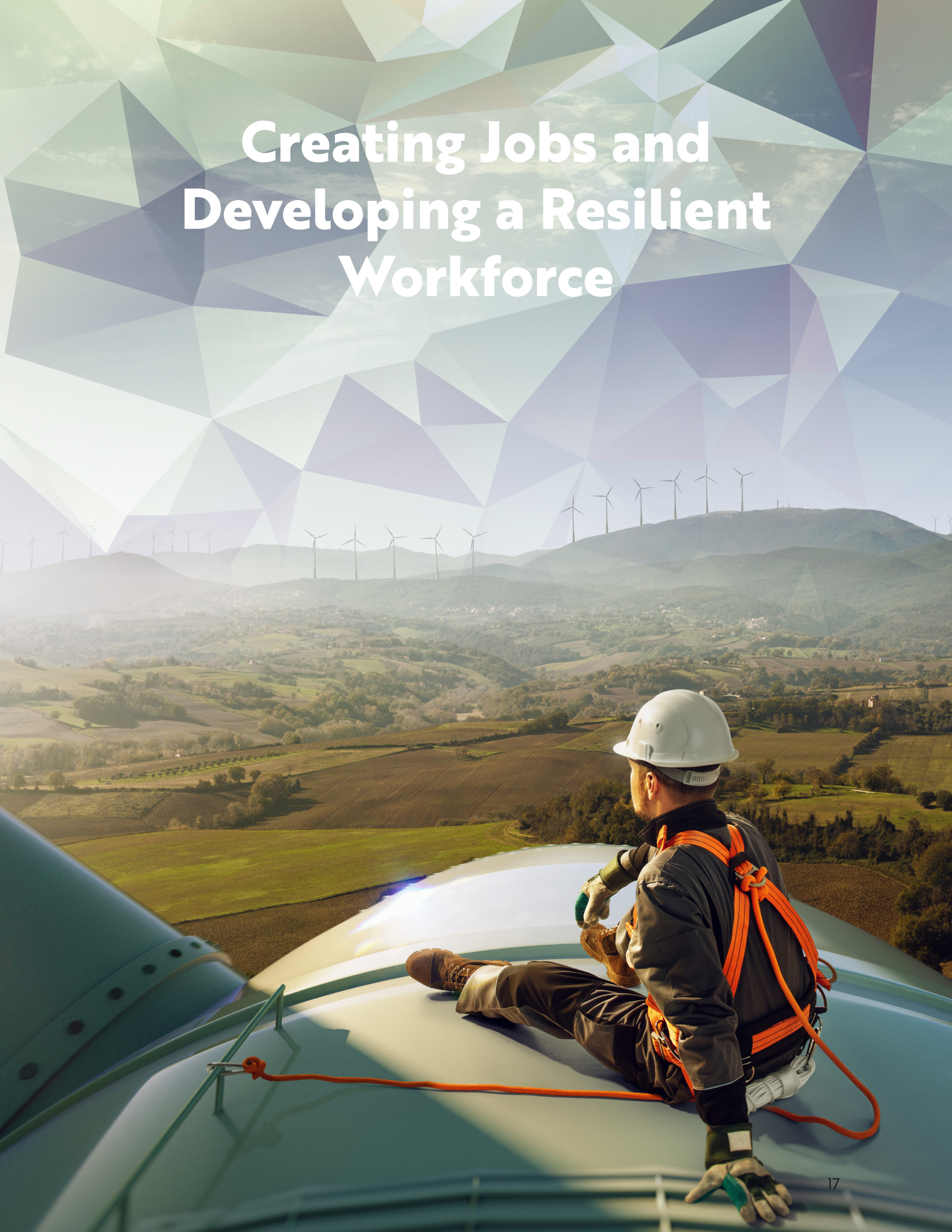
Biden Clean Energy Plan Category




E Existing
EO New EO
R New Regulations
A Approps
L New Legislation
Biden Climate Plan Category
Biden Clean Energy Plan Category
Authority
Net Zero By 2050
A Stronger More, Resilient Nation
Rally The World To Address Climate
Stand Up To Polluters
Obligation To Workers And Communities
Build Modern Infrastructure
American Auto Industry
Millions Of Clean Jobs
Upgrade The Building Sector
Investment In Clean Energy Innovation
Sustainable Agriculture And Conservation
Environmental Justice And Economic Opportunity
Carbon Pricing in Support of Community Investment
(ESG): Motivate Industries to Invest and Use Clean Energy
Fund a National Climate Bank
EV Charging Infrastructure for Economic, Environmental, and Social Benefit
Federal Divestment
Clean Energy Algae Biofuel and Biomaterials Recommendation
Gender & Racial Equality in the Energy Sector
Hydrogen and Ammonia Manufacturing and Distribution Infrastructure
Market-based Competition in Wholesale Electricity Generation
Improving the Resilience of the U.S. Electricity Grid
Investing in Front Line Communities
Key Announcements for President-Elect Biden's Climate Summit
Key Links to Clean Power: An American Supergrid
Leadership and a Trained Workforce
Making America's Schools Healthy and Resilient
National Low Carbon Fuel Standards


E Existing
EO New EO
R New Regulations
A Approps
L New Legislation
Biden Climate Plan Category
Biden Clean Energy Plan Category
Authority
Net Zero By 2050
A Stronger More, Resilient Nation
Rally The World To Address Climate
Stand Up To Polluters
Obligation To Workers And Communities
Build Modern Infrastructure
American Auto Industry
Millions Of Clean Jobs
Upgrade The Building Sector
Investment In Clean Energy Innovation
Sustainable Agriculture And Conservation
Environmental Justice And Economic Opportunity
Leveraging the Texas Expanded Transmission Model
NextGen Highways
Offshore Wind
Overcoming Barriers to Building a Clean Energy Workforce
Policies to Maximize Automated Vehicle Benefits
Policies to Support Cities' Climate Goals
Reducing the Energy Burden for Disadvantaged Communities
Rejecting Line 3 to Support a Clean Energy Future
Supporting Clean Energy Commercialization Through Technology Transfer
Technology-Neutral Federal Clean Energy Tax Incentives
Transit Innovation
Regenerative Agriculture: A Solution to Multiple Climate, Environmental, and Economic Problems
Transportation Justice & Clean Transportation Access
Tripling the federal RD&D budget by 2025
Unlocking Demand: Valuing Distributed Energy Resources and Demand Response

Creating Jobs and Developing a Resilient Workforce



Overcoming Barriers to Building a Clean Energy Workforce

Opportunity/Problem:

A coordinated federal effort for a clean energy (CE) workforce development must be made. There is insufficient access to vocational training for applicants to secure CE jobs. It is often unclear where CE jobs are geographically distributed in the U.S. and where the underserved and under-employed can access the new energy economy. The US workforce is ill equipped by our current education system and does not provide real world experience, training, and material resources to advance and succeed in the clean energy economy.

Recommended Actions:

- Create a National Council on clean energy Workforce Development at the White House, and a Clean Energy Workforce Development Office in the DOE
- Create More Opportunity in Critical Regions: Utilize geographic data to define CE regions and clusters to grow the appropriate industry for each region of the country; focus on frontline/ transitioning communities
- Educate the Workforce: Develop a nation-wide approach to green job training and build an education system that links the careers of the future to the students of today in order to target the next generation of workers, especially women and BIPOC.

Program Type

Program Modification

Authority

Existing Authority

Job Benefits

Would support job creation via a data-driven, coordinated federal effort for vocational and technical training and education that is geographically distributed where jobs are needed.

Economic Benefits

Would support economic development through workforce development and clean energy jobs training at national labs, demonstration sites, regional testing centers, land grant universities, and community colleges.

Equity Benefits

By using a geographic approach, matching CE resource availability to the underserved. The goal is to preserve job growth, enhance local economies and support communities displaced, or affected by the new Clean Economy.

Climate Plan Tie:

This will lead to more competitive, low-carbon manufacturing, deployment, and management and operations by supporting CE technologies through innovation centers and entrepreneurship. Utilizes the Biden-Harris plan's Climate and Economic Justice Screening Tool approach. [1]

Battle Ground State Benefits:

Several DOE national labs and the areas in which they reside (Colorado, Iowa, Tennessee, Pennsylvania and Virginia) can bring the economic benefits of clean energy innovation as will increased training at regional testing centers such as the one in Florida (FSEC).

[1] Biden For President, The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future, https://joebiden.com/clean-energy.

Get America Back to Work - Overcoming Barriers to Building a Clean Energy Workforce

AUTHORS: Greg P. Smestad, Ph.D., Noel Bakhtian

DATE: 09/16/2020

Statement of Issue and Summary of Recommendations:
The clean energy (CE) industry is poised to be a driver of economic growth and American employment now through at least the end of the 21st century. Looking at just the global renewable energy electricity sector's current trajectory, there will be at least 35 million jobs by 2050[2]. By employing American ingenuity, that number could grow many-fold. We have a unique opportunity in the post-COVID era to build back better to set America up to be the world's leader in energy innovation, growing the associated industries to provide wealth to the nation as a whole, target wealth-building in frontline, transitional and low-income communities, and employ upwards of 25% of the American working population.[3] To achieve this, America must have the best trained CE workforce in the world. America should seek not only to capture the jobs that are inherently domestic, but also lead the global transition to capture jobs around the world where America can lead, and there should be clear pathways to these jobs, with relevant education and training directed to a well paying union career. Retraining for employees in legacy industries must be supported, especially in frontline and transitioning communities of color, and must lead to union work that is at similar or better pay, and that will exist through the rest of workers' careers. The CE workforce development programs should be data-driven at the local, state and national levels. The resulting jobs must be provided in an equitable way, by looking at who is under- or unemployed and where they are located in the U.S. This geographic approach will require a coordinated collaboration of the public, private and non-profit sectors. The Biden-Harris administration should work with Congress to **prepare the government, create more opportunity in critical regions,** and **educate the workforce** by removing the following barriers:

Barrier #1: Lack of a Coordinated Federal Effort on Clean Energy Workforce Development.
Recommendation: Create a National Council on Workforce Development at the White House level, and a Energy Workforce Development Office in the Department of Energy.

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[2]Manish Ram et al., Job Creation During the Global Energy Transition Towards 100% Renewable Power System by 2050, Tech. Forecasting & Soc. Change (2020) https://doi.org/10.1016/j.techfore.2019.06.008.

[3] Env't & Energy Study Inst., Fact Sheet - Jobs in Renewable Energy, Energy Efficiency, and Resilience (2019), https://www.eesi.org/papers/view/fact-sheet-jobs-in-renewable-energy-energy-efficiency-and-resilience-2019.

Creating Jobs and Developing a Resilient Workforce

A **National Council on Workforce Development** would pull together and reinvigorate existing government programs, identify gaps, and recommend strategic programs to fill those gaps.

- Link the government's energy (and other) workforce development efforts;[4] many are suggested within this document, but the first act should be to issue a government-wide data call to determine all currently funded, or authorized (but not appropriated) initiatives.
- Leverage expertise of private/public Partnerships, FACAs and national membership associations such as the Council of Economic Advisors, NASEO, NASCAP, CAP, etc.
- Connect those programs to the known internal equity resources (EPA's Office of Environmental Justice, the EJ multi-agency working group[5], and the EPA's EJSCREEN Environmental Justice Screening and Mapping Tool[6]) as well as the nation's experts on building an equitable workforce.
- Focus on application, award, reporting and eligibility streamlining: Implement a single grant system to minimize the level of effort for states and localities.[7]

The **Energy Workforce Development Office** would be a combined career and political team at the S3 Under-Secretary for Energy level to coordinate energy workforce efforts across the federal government.

- Under the Obama-Biden administration (2008-2016) the DOE was successful in leading a nation-wide stimulus program that brought jobs and energy efficiency/renewable energy projects to every corner of America. This can be done again in a bigger and more sustainable way.
- Lead a jobs and workforce effort at the scale of the QTR[8] (Quadrennial Technology Review) building on products like the Energy Employment Report but fully empowering a broad group of stakeholders to drive the conversation and outcomes[9] (as described in an ITIF report).

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[4] Examples: DOE's effort in OE, EERE, and cross cutting efforts such as DOE's Better Buildings programs(https://betterbuildingssolutioncenter.energy.gov/), HHS work (LiHEAP, etc); Department of Labor's Workforce Programs, Department of Agriculture Workforce Programs (including REAP, RESP), EDA (Commerce); https://www.dol.gov/agencies/eta/wioa

[5] U.S. Env't Protection Agency, Environmental Justice, Overview of the EJ IWG, https://www.epa.gov/environmentaljustice/overview-ej-iwg (last visited Oct. 10, 2020).

[6] U.S. Env't Protection Agency, EJSCREEN: Environmental Justice Screening and Mapping Tool, https://www.epa.gov/ejscreen.

[7] For example: streamline eligibility qualification levels for grantees for WAP, HUD, HHS programs (this may require Congressional Action). Develop one application, one reporting process, standardized NEPA, for all of the workforce programs that provide funding to these entities (this could require rulemaking, or at least FRN, but probably not Congressional Action).

[8] U.S. Dep't of Energy, The Quadrennial Technology Review, https://www.energy.gov/quadrennial-technology-review-0.

[9] David M. Hart & Peter L. Singer, Manufacturing USA at DOE: Supporting Energy Innovation, Info. Tech. & Info. Found. (2018), http://www2.itif.org/2018-doe-musa-institutes.pdf.

- Deepen and build relationships with the Department of Labor; state, territory, local and tribal governments; the private sector; universities, colleges and trade schools; unions and non-governmental organizations to lead in partnership with those entities.

Barrier #2: It is often unclear where and how CE jobs are geographically distributed, and where they are most needed. **Recommendation:** Utilize data to define CE regions and clusters to grow the appropriate industry.

Data should be used to understand the locations where these jobs can and should be created, and to think regionally and locally about where to place resources strategically.

- Convene a stakeholder effort at the scale of the QTR (Quadrennial Technology Review), but focused on a review of jobs and workforce development. Collect the best data to make informed estimates about present and future opportunities.[10]
- Utilize the results to map the existing and needed facilities and investment by the public and private sectors by region, including the opportunities and benefits presented by frontline communities and people of color, focusing on utilizing brownfields and areas with known EJ concerns[11], engaging land grant universities, not-for-profit community colleges/trade schools, and minority serving institutions (MSIs).
- Also look to the states such as MI, PA, NC, CO, TX, OK, WY, and VA that have had major job losses in fossil energy and manufacturing. Keep campaign promises to supporters there.

Expand access to clean cnergy testing and training by funding more facilities in areas lacking access - targeted locally to help businesses evaluate aspects of a proposal, and to train associated workforces, possibly through existing Clean Energy Hubs (examples of which are in Appendix A).

Use mapping tools to locate and target the most underserved communities.

- Combine the tools and efforts of U.S. government departments and agencies to allow for a "whole of government[12]" and Geographic Information System (GIS) approach. This

[10] This approach is also inspired by: Tarak Shah, NRDC, Transforming the U.S. Department of Energy in Response to the Climate Crisis (2019), https://www.nrdc.org/sites/default/files/transforming-doe-response-climate-crisis-report.pdf (in which the recommendation was to codify the requirement for DOE to produce the U.S. Energy & Employment Report); *see* Energy Futures Initiative & Nat'l Ass'n of State Energy Offs., The 2020 U.S. Energy & Employment Report (2020), https://www.usenergyjobs.org/; An example of this approach, at a smaller scale, was described by Sarah White & Jason Walsh, Greener Pathways, Ctr. on Wis. Strategy, The Workforce All., & The Apollo All. (2008), https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/report-white-walsh-et-al.pdf.

[11] U.S. Env't Protection Agency, EJSCREEN: Environmental Justice Screening and Mapping Tool https://www.epa.gov/ejscreen.

[12] Whole-of-Government Approach ("WGA") refers to the joint activities performed by diverse ministries, public administrations and public agencies in order to provide a common solution to a particular problem or issue. The approach and content of the initiatives can be formal or informal; and GIS (Geographic Information System) approach: (Office of Minority Programs,DOE, https://www.energy.gov/diversity/office-minority-programs), EPA (EJSCREEN: Environmental Justice

follows from the recommendations of the Energy Futures Institute[13] (led by former Secretaryof Energy Ernest J. Moniz) to create regional centers for energy innovation and jobs.

Barrier #3.1: Lack of Access to the Right Training to be Hired for these Clean Energy Jobs
Recommendation: Develop a nationwide approach to green job training for people already in the workforce or expected to join the workforce in the next few years, target transitioning and low-income communities and communities of color.
Fund studies to identify the careers in clean energy and the pathways to achieve them (through appropriations to existing programs in Depts. of Energy, Labor and Education):

- Utilize existing programs[14] to identify partners and put out a call for experts to develop a suite of careers which have open roles now and growth potential in the next 5-15 years for the existing workforce and new graduates, with a particular focus on transitioning communities and building wealth in communities of color.
- Work with existing workforce programs that partner the public sector and private industry in [15] identifying the barriers to attracting students, employers, and partners. Identify gaps where educational pathway needs are not being met.

Develop a national Green Apprenticeships Program through the Energy Workforce Development Office, in coordination with the Departments of Labor and Education to re-employ Americans from "old economy" jobs of the past.

- Target those who need to transition into a new career due to job loss.
    - Respond to COVID-19 job losses by directly targeting people whose are out of work and whose job may not come back (*e.g.*, airline technician to wind turbine technician; commercial builders to efficiency improvement retrofitters.

Screening and Mapping Tool, https://www.epa.gov/ejscreen); DOE, (https://www.nrel.gov/gis/), Labor (Maps - unemployment rates by county, https://www.bls.gov/lau/tables.htm), Clean Energy resources, and education (training, NCES/Education, https://nces.ed.gov/programs/maped).

[13] Kavita Surana et al., Regional Clean Energy Innovation, Univ. of Md. Glob. Sustainability Initiative & Energy Futures Inst. (2020), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5eb1e601895ed60da199e488/1588717067823/Final_Regional+Innovation+Report_2.20.20.pdf.

[14] Office of Energy Efficiency and Renewable Energy's Better Buildings Program, Weatherization Assistance Program, Advanced Manufacturing Office and Technology Offices as well as those at the Department of Labor (ex. Employment and Training Admin.), Department of Commerce (ex. National Institute of Standards and Technology), National Science Foundation (ex. Civic Innovation), Department of Education (Office of Career, Technical and Adult Education), etc.

[15] *E.g.* U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Solar Training Network, https://www.energy.gov/eere/solar/solar-training-network; U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy Wind Energy Education and Training Programs, https://windexchange.energy.gov/training-programs; U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Training, https://www.energy.gov/eere/amo/training; 360 Training, Hydroelectric Power Plant Operations, https://www.360training.com/generation-hydroelectric-powerplant-operations; Solar Energy Int'l: Solar Ready Colo., Solar Professionals Training & Outreach Program, https://www.solarenergy.org/solar-ready-colorado/; and GRID Alternatives, Solar Training Academy, https://gridalternatives.org/colorado/solar-training-academy.

    - Develop a matrix of skills and how we get them from the skills they have and how can they be applied in the industry (See studies above.)
    - Fund no-cost retraining for current fossil energy professionals, throughCongressional appropriations to existing and expanded community college/land grant/MSI programs, leading to work that is at similar or better pay, and that will exist through the rest of their career.
    - Expand programs to train veterans for careers in clean energy.[16]
- Provide certification to allow employers and clients to recognize expertise, similar to existing programs in the DOE's Weatherization Program[17].
    - Training must have clear certifications/badging (i.e., an auto mechanic vs. an American Society for Engineering Education (ASEE) mechanic have very different salaries).
    - Programs should be designed in coordination with community colleges, land grant universities,Minority Serving Institutions (MSIs), historically black colleges and universities (HBCUs) and union leadership in the targeted areas

Barrier #3.2: Students aren't leaving academia (K12, community colleges, universities) with familiarity or hands-on experience with CE topics, so the energy workforce pipeline is not robust.
Recommendation: Build an education system that links union careers of the future to today's students, especially students of color and women.
In addition to the Green Apprenticeships program above, **build programs linking regional federal-academia-industry collaborations via established student-to-job pipelines that feeds workforce needs back into the education system and enables students to have hands-on experiences before joining the workforce**[18]. Create and utilize consortia led by the DOE national laboratories that bring together regional energy industry players and regional community colleges and universities.

- Share industry/government energy workforce needs with academic partners.
- Build established pipelines between academic players. For example, a two-year degree related to advanced manufacturing (AAD degree) can be the foundation of a four-year degree or lead into regional jobs.
- Create internship and fellowship opportunities for mentorship and hands-on experiences with national laboratory researchers, including by building on existing DOE programs.
- Focus on under-represented minorities.

How the Recommendations Support Frontline or other Underserved Communities:

[16] *E.g.* U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Solar Ready Vets® Pilot Program, https://www.energy.gov/eere/solar/solar-ready-vets-pilot-program.
[17] *E.g.* U.S. Dep't of Energy, Memorandum on the Crew Lead and Retrofit Installer/Technician Job Task Analysis and Certification Updates, and Badges Toolkit, May 20, 2019, https://www.energy.gov/sites/prod/files/2019/05/f63/wap-memo-050.pdf.
[18] *Energy Workforce Development Opportunities and Challenges: Hearing Before the Subcomm. on Energy and Water Dev. and Related Agencies of the H. Comm. on Appropriations*, 116th Cong. (2019) (statement of Noel Bakhtian, Director, Center for Advanced Energy Studies).

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The recommendations enable the government to work in a "whole of government" way to identify and address workforce training and development, enable the country to rapidly expand its CE infrastructure, and provide good paying and lifelong careers. Partners with lower overhead would be encouraged to support CE industries, including land-grant universities,[19] HBCUs to help bring more women, BIPOC and economically disadvantaged people into the workforce.

How the Recommendations Support Biden's Climate Plan:
The Biden-Harris plan[20] proposes to build a modern, sustainable infrastructure and an equitable clean energy future with union jobs, "ensur[ing] these jobs are filled by diverse, local, well-trained workers…make investments in pre-apprenticeship programs and in community-based and proven organizations that help women and people of color access high-quality training and job opportunities…create millions of middle-class jobs that develop a diverse and local workforce and strengthen communities…" Vice President Biden and Senator Harris envision, "new economic hubs for communities all across America." The plan states that we will be, "creating a data-driven Climate and Economic Justice Screening Tool to identify disadvantaged communities, from urban to rural to tribal communities…enabl[ing] agencies and the private sector to make investments in the rural, suburban, and urban communities that need them most."

How the Recommendations Create Jobs, Improve the Economy, and Address Climate Change:
World energy consumption is projected to grow by 28% between 2015 and 2040 (EIA), the energy market is undergoing significant evolution, and the U.S. workforce is shrinking[21]. Some studies have suggested as many as 35 million jobs[22] will be created world-wide. Our clean energy future depends on development of a robust and dynamic clean energy workforce. The recommendations manage the risk of insufficient workforce for building out the U.S. clean energy economy, thereby supporting our climate change goals.

Key Battleground State Activity:
This work is targeted regionally to affect the areas hardest hit by not only energy job losses, but job loss generally. Michigan, Pennsylvania, North Carolina, Colorado, Texas and Virginia have all been hit hard by losses in the energy and manufacturing industries. This plan promises not only a career for current transitioning workers, but for their children as well. In addition, DOE National Labs (Colorado, Iowa, Tennessee, Pennsylvania and Virginia) can be leveraged to bring the economic benefit of clean energy innovation and increased training at Regional Testing Centers (e.g., Florida).

Appendix A - Examples of Successful and Potential Clean Energy Training Sites

[19] Wikipedia, Land-grant University, https://en.wikipedia.org/wiki/Land-grant_university.
[20] *The Biden Plan To Build A Modern, Sustainable Infrastructure And An Equitable Clean Energy Future*, supra note 1.
[21] *Supra* note 3.
[22] *Supra* note 2.

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- A Mid-Region Council of Governments report[23] highlights that a Sandia National Labs) Science and Technology Park contributed significantly to the local economy in 2018-19 by adding 310 jobs and generated increases in economic activity and tax revenue to the city and New Mexico.
- Clean Energy Hubs[24] such as the existing Clean Energy Manufacturing Hubs[25] (DOE Advanced Manufacturing Office and Department of Commerce) Background is available via a 2018 ITIF report[26].
- Some training can be performed at Regional Testing Centers[27] which can provide some of the specialized testing equipment necessary in that part of the industry (e.g. solar, wind, biomass, geothermal, energy efficiency, etc.).
- In Southwest Virginia, there is a partnership to provide commercial-scale solar installations in the coalfield region specifically designed to employ local workers[28]. The initiative will provide affordable solar solutions for businesses, nonprofits and local governments while building local workforce skills and opportunities for well-paying jobs in the growing solar energy sector.

For abandoned coal mines, there are also recent precedents set by other nations:

- The World Economic Forum reports that close to 30 schemes for household heating from geothermal heated mine water are planned across the UK[29].
- In Genk, Belgium, an Interuniversity MicroElectronics Center (IMEC) energy research center and business incubator complex called Energyville is thriving at an abandoned coal mine[30]. This provides financial stimulus and jobs in economically challenged regions.

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[23] Sandia Nat'l Lab'ys, *Sandia Science & Tech Park Spurs Economic Growth* (Aug. 12, 2020), https://share-ng.sandia.gov/news/resources/news_releases/technology_park/.
[24] U.S. Dep't of Energy, Hubs, https://www.energy.gov/science-innovation/innovation/hubs (there are five Hubs supported by various DOE offices).
[25] U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Clean Energy Manufacturing Initiative Current Activities, https://www.energy.gov/eere/cemi/clean-energy-manufacturing-initiative-current-activities.
[26] *Id.*
[27] U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Regional Test Centers for Solar Energy, https://www.energy.gov/eere/solar/regional-test-centers-solar-technologies.
[28] Chris Crowell, *Details on a Cool Partnership Bringing 10 MW of Solar, Local Jobs to Appalachia*, Solar Builder (Sept. 2, 2020), https://solarbuildermag.com/news/details-on-a-cool-partnership-bringing-10-mw-of-solar-local-jobs-to-appalachia/.
[29] Harry Kretchmer, *This British Village Is Heating Homes with Water from a Flooded Coal Mine*, World Econ. Forum (Aug. 24, 2020), https://www.weforum.org/agenda/2020/06/flooded-coal-mine-britain-heating-carbon/.
[30] EnergyVille, About EnergyVille, https://www.energyville.be/en/about-energyville; Jozef Poortmans, *A City Full of Energy*, IMEC (May 5, 2017), https://www.imec-int.com/en/imec-magazine/imec-magazine-may-2017/a-city-full-of-energy.

Gender & Racial Equality in the Energy Sector

Opportunity/Problem:

Women and black, indigenous, and other people of color (BIPOCs) are grossly underrepresented in the energy sector, especially in higher paying technical, professional and leadership positions. In order to realize a just clean energy future, we must ensure those most impacted by climate change develop and benefit directly from the solutions. The recommendations presented here address barriers that disproportionately affect women and BIPOCs create pathways to technical, managerial, executive and board leadership opportunities and increased business opportunities.

Recommended Actions:

- Leverage the power of federal funding and procurement to increase diversity by enhancing tracking and demographic metrics, reporting, transparency, and diversity and Inclusion training for companies receiving federal funding, and increase set-asides for women and minority businesses.
- Enact legislation to support pay equity and overcome barriers, including banning salary history requests, modifying the Family and Medical Leave Act (FMLA) to provide paid family leave, establishing subsidized family care networks and increasing enforcement of existing statutes.
- Build the pipeline of women and BIPOCs in energy by creating K-12 climate literacy programs and internships/training programs to foster girls and BIPOC youth in STEM, increasing funding and recognition for workforce diversity initiatives, and building the capacity of women and minority businesses.

Program Type

√New Program
√Program Modification

Authority

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits

Education and training programs to build energy workforce pipeline, close pay gaps and improve leadership opportunities, increase high-paying jobs and business opportunities for women and BIPOCs.

Economic Benefits

Business and high-paying job growth in the clean energy sector.

Equity Benefits

Ensure women and BIPOCs play an active role in developing climate solutions, resulting in more equitable outcomes; close gender and racial pay gaps; increase education, training, and leadership opportunities and build capacity and funding for women- and Black-owned businesses.

Climate Plan Tie:

Directly contributes to the Climate Plan goal of delivering clean energy benefits to disadvantaged communities and increasing jobs.

Gender and Racial Equity in the Energy Sector

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Problem Statement: Women and Black, indigenous and people of color (BIPOCs) are grossly underrepresented in the energy and energy-related sectors. It is impossible to realize a just clean energy future without ensuring those most impacted by climate change are part of developing the solutions. It is critical that we establish policies and systems to ensure *all* Americans benefit from increased public investment in clean energy. The recommendations are designed for women and BIPOCs, although they could also benefit other underrepresented minority groups: (1) opportunities in the higher paying technical, managerial, executive and board leadership positions in the energy sector and (2) increased R&D and entrepreneurial business opportunities.

The Biden Climate Plan focuses on enabling greater participation of women and BIPOCs in blue collar jobs. We must also expand opportunities to provide higher-paying engineering, professional, supervisory, and management positions. Women make up only 28% of the workforce in science, engineering, and mathematics (STEM) with the gender gap especially high in the fastest-growing and highest paid jobs, such as computer science and engineering.[31] A culture of gender and racial stereotyping and a lack of gender and racial role models in STEM has also resulted in higher STEM degree dropout rates for women, Latinx, Native Americans, and African Americans.[32] [33]

[31] U.S. Chamber of Com. Found., Business Success and Growth Through LGBT-Inclusive Culture (2019), https://www.uschamberfoundation.org/sites/default/files/Business-Success-Growth-LGBT-Inclusive-Culture-FINAL-WEB.pdf.

[32] Esther Landhuis, *Making STEM Education More Welcoming to Underrepresented Minorities*, The Scientist (June 1, 2019), *https://www.the-scientist.com/careers/making-stem-education-more-welcoming-to-underrepresented-minorities-65910.*

[33] Energy Futures Initiative & The Nat'l Ass'n of State Energy Offs., The U S. Energy Employment Report, (2020), https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5ee78423c6fcc20e01b83896/1592230956175/USEER+2020+0615.pdf.

Creating Jobs and Developing a Resilient Workforce

Women make up 47% of the American workforce.[34] Yet only 24% of S&P 500 board seats are held by women[35] and 19% of board members at the top 200 S&P publicly-traded firms are people of color.[36] Additionally, people of color make up only 11% of senior leaders in S&P 500 companies[37] and women hold only 19% of all senior corporate leadership positions.[38] Women also continue to be paid significantly less than their white, male peers.[39] This pay gap is even wider for women of color, and in particular for Latinas.[40] The lack of diversity is even more stark in the energy sector with women representing only 23-32% of the workforce[41] and African Americans making up 8%.[42] Women-founded startups received only 2.7% of the $136.5 billion of venture capital invested in 2019.[43,]

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[34] Mark DeWolf, *12 Stats About Working Women*, U.S. DOL Blog (Mar. 1, 2017), https://blog.dol.gov/2017/03/01/12-stats-about-working-women#:~:text=Women%20are%20Integral%20to%20Today's,three%2Dquarters%20of%20the%20workforce.

[35] Julie Hembrock Daum & Spencer Stuart, 2020 Governance Outlook: Projections on Emerging Board Matters (2020), https://www.spencerstuart.com/-/media/2019/december/2020_nacd_governance_outlook_report.pdf.

[36] Cassie Ann Hodges, *US Venture Capital Investment Surpasses $130 Billion in 2019 for Second Consecutive Year*, NVCA Blog (Jan. 14, 2020), https://nvca.org/pressreleases/us-venture-capital-investment-surpasses-130-billion-in-2019-for-second-consecutive-year/.

[37] Rocio Lorenzo et al., *How Diverse Leadership Teams Boost Innovation*, BCG Henderson Inst. (Jan. 23, 2018), https://www.bcg.com/en-us/publications/2018/how-diverse-leadership-teams-boost-innovation.

[38] U.S. Chamber of Com. Found., Business Success and Growth Through LGBT-Inclusive Culture (2019), https://www.uschamberfoundation.org/sites/default/files/Business-Success-Growth-LGBT-Inclusive-Culture-FINAL-WEB.pdf.

[39] R@obin Bleiweis, *Quick Facts About the Gender Wage Gap*, Ctr. for Am. Progress (Mar. 24, 2020), https://www.americanprogress.org/issues/women/reports/2020/03/24/482141/quick-facts-gender-wage-gap/.

[40] Nat'l P'ship for Women & Families, Quantifying America's Gender Wage Gap by Race/Ethnicity (2020), https://www.nationalpartnership.org/our-work/resources/economic-justice/fair-pay/quantifying-americas-gender-wage-gap.pdf.

[41] Christiane Spitzmueller & Hayley Brown, *Not Enough Talent for the Energy Workforce? Energy's Diversity Problem May Be the Solution*, Forbes (Feb. 1, 2019), https://www.forbes.com/sites/uhenergy/2019/02/01/not-enough-talent-for-the-energy-workforce-energys-diversity-problem-may-be-the-solution/#5e8dd1613f97.

[42] U.S. Energy and Employment Report, Nat'l Association of State Energy Officials (May 2018), https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5afb0ce4575d1f3cdf9ebe36/1526402279839/2018+U.S.+Energy+and+Employment+Report.pdf.

[43] Pitchbook & NVCA, Venture Monitor (2020), https://files.pitchbook.com/website/files/pdf/Q4_2019_PitchBook_NVCA_Venture_Monitor.pdf.

Creating Jobs and Developing a Resilient Workforce

Women still disproportionately bear the bulk of caregiving responsibilities, often forcing them to either take a step back from their career or leave the workforce entirely. Providing mandatory paid parental and family leave for both primary and secondary caregivers would help retain women in the workforce, as well as improve their earnings.[44] In April 2020 United Nations (UN) policy brief noted, "Across the globe, women earn less, save less, hold less secure jobs, and are more likely to be employed in the informal sector. They have less access to social protections and are the majority of single-parent households. Their capacity to absorb economic shocks is therefore less than that of men."[45] The COVID-19 pandemic further exposed these inequities, as it is overwhelmingly women who have left their work to be caretakers. Affordable, nationwide family care will allow working parents and caretakers to attend to family members at little to no cost and help rebalance inequities of unpaid caregiving labor.

Proposed Recommendations:

Leverage the power of federal funding and procurement to increase diversity:
1.Enhance tracking and reporting: Require organizations receiving federal subsidies and grants to enhance and disclose company diversity metrics, including but not limited to the percent of women and BIPOCs who are employed, in management and executive roles, on the board of directors as well as data on new hire, attrition and promotion rates by gender and race, and gender and racial pay gaps.
2.Require training: Company-wide anti-bias and anti-racism training should be a condition of receiving federal funding for businesses and non-profit organizations (including utilities, energy suppliers, energy service companies, and research firms) of 100 employees or greater.
3.Mandate equity action plans for businesses, organizations and public colleges and universities: These entities should report progress on equity action plans that provide solutions to address the policy or cultural barriers to degree attainment, professional licensure, and entry-level, mid-level and senior level employment disproportionately impacting women and BIPOCs.
4.Increase federal funding for women and BIPOC-owned businesses: Establish an incubator for women and BIPOC entrepreneurs with matching venture capital (VC) funds for women- and BIPOC-founded startups Increase the set-aside requirement for minority- and women- owned business enterprises (MWBEs) to 30% for federal contracting and procurement, as well as competitive grant and financial assistance programs. Implement financing structures

[44] Elly-Ann Johansson, The Effect of Own and Spousal Parental Leave on Earnings, Inst. for Evaluation of Lab. Mkt. and Educ. Pol'y (2010), https://ideas.repec.org/p/hhs/ifauwp/2010_004.html; Richard J. Petts, Paternity Leave, Father Involvement, and Parental Conflict: The Moderating Role of Religious Participation, Nat'l Ctr. for Biotechnology Info. (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6201265/; Mercom Cap. Grp., 2019 Q4 and Annual Solar Funding and M&A Report (2019), https://mercomcapital.com/product/2019-q4-annual-solar-funding-ma-report/.

[45] Diane Weaver Dunne, *Is Nationwide Pre-K on the Way?*, Educ. World (June 8, 2000), https://www.educationworld.com/a_issues/issues088.shtml.

for women- and BIPOC -owned businesses, as outlined in the Clean Energy for Biden (CE4B) "Frontline Community Investments" issue paper[46], and direct payment of tax credits, as proposed in "2020 Congressional Action Plan for a Clean Energy Economy."[47]

Enact legislation to advance pay equity and overcome other barriers

1.Ban salary history requests: Support new legislation banning companies from requesting salary histories of prospective employees. In the last three years, 14 states have successfully banned this practice, resulting in a 13% pay increase for black candidates and 8% increase for women.[48]

2.Modify the FMLA to provide paid family leave nationwide and expand FELPA eligibility: Vice President Biden's plan to require at least 12-weeks of paid family leave is a good start. Lowering the eligibility requirements with respect to employer size, hours worked, and tenure to provide broader coverage for more Americans. Eligibility thresholds for the Federal Employee Paid Leave Act (FELPA) should also be expanded. (Currently FELPA benefits apply only to Title 5 employees who work fewer than 1,250 hours and have been employed at least one year.

3. Establish subsidized family care networks: Reliable, nationwide childcare for ages 0-4, such as Georgia's universal pre-K program[49] as well as elder care networks, both with tiered rates based on household income should be the norm. Financial incentives should be given to businesses, non-profits, and colleges and universities that provide on-site care centers.

4. Build the pipeline for women and BIPOCs in energy:

K-12 programs to foster girls and BIPOC youth in STEM: Re-initiate the STEM Innovation Networks, STEM Teacher Pathways, and Effective Teaching and Learning programs established in the Obama administration "to increase the number of students who seek out and are effectively prepared for postsecondary education and careers in STEM."[50]

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[46] Clean Energy for Biden, Community Investments CE4B Frontline Community Investments (2020), https://docs.google.com/document/d/1YOpbn7VHyyt870Y0m51ZJCVcoCX54rSHGiRRaE2jCog/edit?usp=sharing.

[47] "*The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America*" the House Majority Staff Report, p.33 https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.

[48] James Bessen et al., *Stop Asking Job Candidates for Their Salary History*, Harv. Bus. Rev., July 14, 2020, https://hbr.org/2020/07/stop-asking-job-candidates-for-their-salary-history.

[49] "*The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America*" the House Majority Staff Report, p.33 https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf

[50] U.S. Dep't of Educ., FY15 Department of Education Budget, Science, Technology, Engineering and Math (STEM) Education, https://www2.ed.gov/about/overview/budget/budget15/crosscuttingissues/stem.pdf.

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Establish the Climate Change Education Program as proposed in the 2019 Climate Change Education Act (HR 2349).[51] The Department of Education should partner with DOE, NOAA, EPA, and state and local school systems to improve climate literacy by including climate change education in the K-12 curriculum.

Create recruitment and internships/training programs for women and BIPOCs in STEM to increase their entry and reduce attrition in the clean energy workforce:

- Establish post-high school programs that provide necessary entry level training and hands-on experience through a task force made up of DOE, EPA, NOAA, NASA, and the Department of Education, along with industry partners and universities, to map college and vocational school curricula with industry workforce needs. The task force would (1) create job training and skill development programs at technical and community colleges and universities to establish new energy-related degrees and certifications, (2) develop industry recruitment programs to encourage graduates to pursue careers in the clean energy sector, and (3) create ongoing training programs to improve retention.
- Establish paid internships and mentorship programs to connect women and BIPOC students with the national labs and industry partners. Internships would provide students with hands-on research experience, and mentorships would enable industry and government to help students pursue a STEM career and provide career advice and employment opportunities.
- Re-establish the following Obama administration programs: Minority Science and Engineering Improvement Program (MSEIP), Upward Bound Math Science Program, and Hispanic-Serving Institutions STEM and Articulation Program.[52]

Increase funding to advance workforce diversity initiatives: Increase funding for the Clean Energy Ministerial's Clean Energy Education and Empowerment (C3E) Initiative to expand its 'Equal by 30' campaign. Beyond setting targets for equal pay, equal opportunities and equal leadership in the energy sector, C3E should utilize additional resources to establish public-private partnerships to implement these programs with companies across the energy sector. The federal government should provide grants to organizations such as C3E and the Clean Energy Leadership Institute, who are improving recruitment, development, and retention of women and BIPOCs in the energy sector.

Keep diversity efforts at the forefront through government leadership: Hold events designed to raise awareness of gender and racial equity disparities and facilitate the development of new policies, programs, and practices to increase women and minorities in the energy sector. Events include (1) a global conference on gender and racial equality in the energy sector, hosted jointly with the UN Sustainable Development Group, UN Women and other sponsoring groups; and (2) an annual national conference on racial and gender equity to convene private energy companies, non-profits, and advocates to learn how to break down barriers specific to women and people of color in the energy sector and develop collaborative solutions.

Build capacity of women- and BIPOC-owned businesses: Expand the SBA All Small Mentor-Protege program to develop and train small women- and BIPOC-owned businesses and mandate federal Prime Contractors to commit to at least one mentorship annually as a condition of receiving federal funds for energy-related contracts.

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[51] Climate Change Education Act, House Resolution 2349, https://www.congress.gov/bill/116th-congress/house-bill/2349/text

[52] *Supra* note 50.

Creating Jobs and Developing a Resilient Workforce

Check Boxes Below	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy & Addresses Climate Change:
By addressing long-standing systemic failures that have barred the majority of Americans from fully and equally participating in the workforce, these recommendations increase job opportunities and economic mobility for historically disadvantaged groups.

How the Recommendation Supports Frontline or other Underserved Communities:
These recommendations aim to increase representation, decision-making and influence of historically disadvantaged groups, empowering them to participate in solutions to the climate crisis.

How the Recommendation Supports Biden's Climate Plan:
These recommendations speak directly to the Vice President's commitments to "fulfill our obligation to workers and communities who powered our industrial revolution and subsequent decades of economic growth," and not leaving "any workers or communities behind."

Key Battleground State Activity:
The killing of George Floyd and other Black deaths have galvanized many Americans to actively pursue racial and social justice - including getting out the vote. These recommendations promote these important activities.

Bringing Clean Energy Jobs to Underserved Communities

Opportunity/Problem:

Low-income communities, communities of color, and frontline communities do not benefit equally from high-quality job opportunities created by our clean energy economy. Today, Black or African-American workers hold only 8% of clean energy jobs, and communities of color are underrepresented and underserved throughout the clean energy sector. In addition, women are underrepresented in the clean energy workforce. Biden's $2 trillion climate plan will spur millions of new jobs, and it rightfully includes a 40% carve-out of direct benefits to low-income communities and communities of color. Job creation in these communities and equitable representation in the clean energy workforce must be central goals of this funding.

Recommended Actions:

- Ensure equitable representation of low-income communities in a significant and rapid expansion of federal programs that target job creation and help ease the budget shortfalls that many state and local governments anticipate from the COVID-19 pandemic.
- Specifically, relaunch the Energy Efficiency and Conservation Block Grant (EECBG) program and increase funding to the Weatherization Assistance Program (WAP).
- Scale-up innovation and entrepreneurship through nonprofit community job training programs, workforce development programs, community college/technical training, pre-apprenticeships, apprenticeships and entrepreneurial programs targeted to underserved communities.
- Create and utilize the Climate and Economic Justice Screening Tool to identify disadvantaged communities, including urban, rural, tribal and frontline communities, to develop and target clean energy job training programs in those communities.

Program Type

√Program Modification

Authority

√ Existing Authority

Job Benefits

This proposal has the potential to create many thousands of new jobs in the clean energy sector with a focus on economic justice and opportunities by increasing representation of communities of color, low-income, and frontline communities.

Bringing Clean Energy Jobs to Underserved Communities

Economic Benefits

Clean energy jobs represent an opportunity to have healthy, sustainable, good-paying careers in the energy economy of the future.

Equity Benefits

Communities of color, low-income communities and women are persistently underrepresented in the clean energy workforce. This proposal would modify and expand existing programs and support additional efforts to ensure economic justice and opportunities to build an inclusive and diverse clean energy workforce.

Climate Plan Tie:

This proposal would ensure that job-creation and equitable representation in the clean energy workforce is a priority of the 40% carve-out of direct benefits to low-income, communities of color, and frontline communities included in Biden's $2 trillion dollar climate plan.

Battle Ground States Benefits:

Arizona, Colorado, Florida, Georgia, Michigan, North Carolina, Ohio, Pennsylvania, Texa and Virginia have multiple metro-areas and/or counties under persistent poverty that are predominantly black, indigenous or people of color and are underserved and overburdened by environmental pollution and climate change

Bringing Clean Energy Jobs to Underserved Communities

COLLABORATORS: Christina Bowman, Becca Ward, Daniel Kammen, Michael Bueno, Julia Hustwit, Donald M. Goldberg, Zach Friedman, Greg P. Smestad, Ph.D.

DATE: 8/18/20

Statement of Issue and Summary of Recommendations:

Low-income communities, frontline communities[55] and communities of color do not benefit equally from the high-quality job opportunities that are created by our clean energy economy. Today, Black or African-American workers hold only 8% of clean energy jobs,[56] and communities of color are underrepresented throughout the clean energy sector. In addition, women are underrepresented in the clean energy workforce. Biden's $2 trillion climate plan will spur millions of new jobs, and it rightfully includes a 40% carve-out of direct benefits to communities of color, low-income, and frontline communities.[57] Job creation in these communities and equitable representation in the clean energy workforce must be central goals of this funding.

Opportunity / Problem Statement:

These program recommendations focus on what the federal government can do to expand and leverage existing programs that inherently create jobs in local economies, often in partnership with community organizations. There is a significant need and opportunity to invest in energy efficiency, building retrofits, and renewable energy in the United States. Such investment would provide targeted and localized job creation. While there are many federal programs aimed at energy efficiency, the **Energy Efficiency and Conservation Block Grant** (EECBG) program and an increase of targeted funding towards the **Weatherization Assistance**

[55] Frontline communities are those that experience "first and worst" the consequences of climate change. It can include low-income communities and communities of color. It can also refer to Native communities, whose resources have been exploited, and laborers whose daily work or living environments are polluted or toxic. In addition, the term frontline communities are used for places next to big facilities like refineries or in the south.https://ecotrust.org/centering-frontline-communities/

[56] The Solar Found., 10th Annual National Solar Jobs Census 2019 (2020), https://www.thesolarfoundation.org/wp-content/uploads/2020/03/SolarJobsCensus2019.pdf.

[57] Biden's campaign proposal includes a target 40% of historic investment in a clean energy revolution to disadvantaged communities. We do not refer to disadvantaged communities in this paper, but use "low-income communities", "communities of color", and "frontline communities". Part of Biden's historic investment should be directed towards workforce development policies and programs.

Program (WAP) are two underutilized tools that could help ease the budget shortfalls that many state and local governments face by specifically targeting job creation. Additionally, federal support in scaling up non-profit programs and entrepreneurship support that target underserved communities can help spur job creation in other communities disproportionately impacted by legacy environmental injustices.

Recommendations:

- **Expand the Energy Efficiency and Conservation Block Grant Program:** The EECBG was authorized with bipartisan support under President George W. Bush in the Energy Independence and Security Act of 2007 and funded by President Obama under the American Recovery and Reinvestment Act of 2009 (ARRA), led by then Vice President Joe Biden.
    - This authorized program, which focuses on building community partnerships, should be modified and given additional funding to prioritize projects, including schools with high energy burdens in low-income and underserved communities, especially those hit hardest by COVID-19.
- **Increase Weatherization Assistance Program funding**: Increasing funding for WAP would support job creation and improve local economies, especially in underserved communities. ARRA increased the WAP budget from $230 million annually to $5 billion over 3 years.[58] In 2010 alone, WAP weatherized over 340,000 household units, supported 28,000 jobs and increased national economic output by $4 billion.[59] WAP funding should be increased to $5 billion annually to help weatherize more low-income homes.[60]
    - Enable WAP and Low Income Heating Assistance Program (LIHEAP) program coordination for state and local agencies (and expand LIHEAP eligibility, see more information in Appendix) and include electrification and renewable energy

[58] Greg Carlock, Building Energy Efficiency and Energy Assistance: Creating Jobs and Providing Relief to States Across the Country, World Resources Inst. (2020), https://files.wri.org/s3fs-public/expert-note-building-efficiency-energy-assistance.pdf.
[59] Bruce Tonn et al., Weatherization Works II—Summary of Findings from the ARRA Period Evaluation of the U.S. Department of Energy's Weatherization Assistance Program, Oak Ridge Nat'l Lab'y (2015), https://www.energy.gov/sites/prod/files/2015/09/f26/weatherization-works-II-ARRA-period-eval.pdf.
[60] *Supra* note 60.

generation on the list of approved WAP measures.[61] This would require Congressional authorization and enabling legislation.[62]

- **Other federally funded programs and policies**:
  - Through the **Small Business Administration (SBA) Office of Investment and Innovation**,create national business training and entrepreneurial support programs for women, communities of color, low-income communities, and youth. This would provide a platform for states to create opportunities, competition, and local job training. Programs could be modeled after "clean energy pitch" competitions (see examples in Appendix).
  - Through the **Department of Education** and the **Department of Energy (DOE),** provide technical and financial assistance to state universities, community colleges, tribal colleges, and technical schools to launch and expand green energy and economy training programs and degree options,[63] including joint partnership, education, and job-training programs.[64] For example:
    - Partner with Historically Black Colleges and Universities (HBCUs) and other Minority Serving Institutions[65] to feed students into STEM internships at the DOE and the national laboratory system.[66]
    - The National Science Foundation has traditionally partnered with Minority Serving Institutions to fund education and research.[67] Expand funding to the Foundation to focus the partnership on clean energy and green economy fields.

[61] Some states and local agencies coordinate the WAP and LIHEAP assistance in a comprehensive approach, others do not, due to differing program eligibility rules and navigating different statute requirements. More information can be found in the Appendix. *See also* https://scholars.org/contribution/improving-effectiveness-federal-energy-assistance-low-income-households;https://votesolar.org/files/2015/1199/4944/Sustainable_Investment-__A_Working_Paper_on_Using_Federal_Energy_Assistance_for_Solar_Nov_2017.pdf

[62] For more information, see Clean Energy Recovery Recommendation Issue Paper, "Reduce energy burden: Increase affordable and accessible solar and energy efficiency to underserved communities."

[63] Johanna Bozuwa et al., *A Green Stimulus to Rebuild Our Economy*, Green Stimulus Proposal (Mar. 22), https://medium.com/@green_stimulus_now/a-green-stimulus-to-rebuild-our-economy-1e7030a1d9ee.

[64] Nat'l Sci. Found., Programs: Directorate for Education and Human Resources (EHR), https://www.nsf.gov/funding/programs.jsp?org=EHR.

[65] U.S. Dep't of Educ., United States Department of Education Lists of Postsecondary Institutions Enrolling Populations with Significant Percentages of Undergraduate Minority Students, https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

[66] U.S. Dep't of Energy, Off. of Econ. Impact & Diversity, https://www.energy.gov/diversity/office-economic-impact-and-diversity.

[67] Includes Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), Asian American and Pacific Islander Serving Institutions (AAPISIs).

- **Workforce development policies** at the federal and state level should include job quality and equity measures to ensure that communities of color, low-income, and frontline communities have access to high quality, well-paying clean energy jobs.[68] All clean energy projects to promote fair labor standards and training programs that result in credentials with pathways to a union job. At a minimum, salaries and benefits in the clean energy sector should be comparable to those in the fossil fuel sector.

- **Scale-up nonprofit community job training programs, innovation, and entrepreneurship:** Scale up workforce development programs, community colleges and technical apprenticeship training,[69] such as the High Road Training Partnerships.[70]
  - **Expand technical solar training and jobs programs**, such as GRID-Alternatives, a nonprofit that provides solar job training targeted toward at-risk individuals, women and underserved communities. The program provides both in-classroom and onsite solar education. Another example, the Solar Training Network[71] funded by DOE's SunShot Initiative,[72] is designed to meet the workforce needs of the solar industry through solar training and strategic employment partnerships.
  - **Expand Workforce Development Boards**, which exist to coordinate local economic development opportunities and workforce programs. For example, the National Association of Workforce Boards was a key partner in the Sunshot Initiative to train 75,000 people for careers in solar by 2020.[73]
  - **Expand existing economic development programs,** which can be augmented or redirected to support frontline and fossil fuel-dependent communities and workers (even if a given program was not originally designed

[68] Adenike Adeyeye, *Fed, States Should Protect Clean Energy Jobs for Black and Latino Workers*, Union of Concerned Scientists: Blog (Apr. 22, 2020), https://blog.ucsusa.org/adenike-adeyeye/fed-states-should-protect-clean-energy-jobs-for-black-and-latino-workers.

[69] Alicia Mazzara & Gabe Horwitz, *The 7 Habits of Highly Effective Workforce Programs*, Third Way (July 7, 2014), https://www.thirdway.org/report/the-7-habits-of-highly-effective-workforce-programs.

[70] High Road Training Partnerships aim to create economically resilient communities by focusing first and foremost on equity and job quality. Workers, labor and other worker organizations, and employers are recognized as industry experts and work alongside community-based organizations and training institutions to provide workforce development solutions with pathways to quality jobs for all, especially those from the most disadvantaged communities. https://cwdb.ca.gov/initiatives/high-road-training-partnerships/

[71] Nat'l Ass'n of Workforce Boards, Solar Training Initiative, https://www.nawb.org/solar_training_initiative.asp.

[72] U.S. Dep't of Energy, The SunShot Initiative, https://www.energy.gov/eere/solar/sunshot-initiative.

[73] Nat'l Ass'n of Workforce Boards, Solar Training Initiative, https://www.nawb.org/solar_training_initiative.asp.

for that purpose) to go beyond the $80 million allocated for fossil-fuel community workforce development transition programs.[74]

- **Expand programs to train military veterans for careers in clean energy**, for example, DOE's Solar Ready Vets Network, which piloted in 2014. This program allows existing military personnel to pursue civilian job training, employment skills training, apprenticeships, and internships up to six months prior to their separation.[75]

- **Design and develop the Climate and Economic Justice Screening Tool**[76] to identify underserved urban, rural, tribal and other frontline communities ,and develop and target clean energy job training programs in those communities. Utilizing this data-driven approach, funding could be directed to union apprenticeship programs (such as the High Road Training Partnership) in communities of color, ndigenous communities, and low-income communities.[77]

Check Boxes Below (EECBG)	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

Check Boxes Below (WAP)	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

See the Appendix for:

- A list of organizations that are highlighting the jobs benefits of the clean energy transition;
- Current representation in the clean energy jobs workforce (solar, energy efficiency);

[74] Env't Defense Fund, Economic Development for Communities in Transition, https://www.edf.org/economic-development-communities-transition.
[75] U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Solar Ready Vets® Pilot Program, https://www.energy.gov/eere/solar/solar-ready-vets-pilot-program.
[76] The Climate and Economic Justice Screening Tool would be an expanded version of the U.S. Environmental Protection Agency's EJSCREEN: Environmental Justice Screening and Mapping Tool, https://www.epa.gov/ejscreen and described here: https://joebiden.com/environmental-justice-plan/#
[77] Green Stimulus Proposal, A Green Stimulus to Rebuild Our Economy, https://medium.com/@green_stimulus_now/a-green-stimulus-to-rebuild-our-economy-1e7030a1d9ee.

- Clean energy and climate pitch competitions for entrepreneurship support programs.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

- By increasing funding to programs such as WAP, EECBG, and workforce development programs, the U.S. could rebound from the economic downturn due to the COVID-19 crisis with a stronger and more equitable clean energy workforce that provides jobs and economic justice for the historically underserved, such as low-income, communities of color and frontline communities. For example:
  - DOE estimates that per dollar spent, the EECBG resulted in approximately $1.76 in bill savings and created one job per $36,000 invested. From previous ARRA funding levels, the EECBG created 62,900 jobs, avoiding 25.7 million metric tons of carbon equivalent.
  - If WAP is funded at the proposed level of $5 billion annually, WAP could support an estimated 70,000 jobs and $10 billion in economic output.[78] In 2016, for every dollar of WAP funding, $1.62 of non-federal funds were leveraged by states and local agencies.[79]

How the Recommendation Supports Frontline or other Underserved Communities:

- Economic injustices go hand-in-hand with other legacy practices that have disproportionately impacted communities of color, low-income and frontline communities. The Biden-Harris administration should address the lack of jobs and other economic opportunities in these underserved communities by creating supporting programs for entrepreneurship and innovation, and expanding workforce development programs and federal programs that help create local jobs. In doing so, the Biden-Harris administration can address many injustices at once, but most importantly, it will provide jobs and economic security to those who need it most.

How the Recommendation Supports Biden's Climate Plan:

- The Biden plan sets a target of reducing the carbon footprint of the U.S. building stock 50% by 2035. By increasing funding for effective, proven, and established programs like WAP and EECBG, the Biden-Harris administration can quickly deploy resources to create jobs, begin retrofits, and prioritize the health and economic recovery of those most disproportionately impacted by COVID and legacy environmental injustices.

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[78] Greg Carlock, Building Energy Efficiency and Energy Assistance: Creating Jobs and Providing Relief to States Across the Country, World Resources Inst., https://www.wri.org/publication/building-energy-efficiency-and-energy-assistance.
[79] U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Resource Summary: Leveraging Weatherization Assistance Program Funds for Greater Impact (2018), https://www.energy.gov/sites/prod/files/2018/08/f54/WAP-leveraging-factsheet-final.pdf.

Creating Jobs and Developing a Resilient Workforce

- **Job Creation as Climate Action**. Key components of Biden's climate plan include job-creation and racial, social and economic justice. By increasing funding for federal and non-profit programs that can be scaled quickly to aid in job-creation, with a particular emphasis on low-income communities, frontline communities and communities of color. Creating jobs in communities where aid is being directed can create economic justice opportunities for those communities. In addition, workforce development and apprenticeship programs can act as a community college pipeline tailored for cultivating the skills of today and tomorrow's markets, as part of Biden's campaign proposal to create millions of new jobs.

Key Battleground State Activity:

- State's with multiple metro-areas and/or counties under persistent poverty that are predominantly low-income, frontline and communities of color and burdened by environmental pollution and climate change impacts include:
    - Arizona, Colorado, Florida, Georgia, Michigan, North Carolina, Ohio, Pennsylvania, Texas, and Virginia.[80]
    - For example, Georgia is in the top five states with the most energy burden. Low-income households use 36% more electricity than the low-income national average.
- Programs for job-creation through community and technical colleges and apprenticeships for local economies to build local economic resilience and training can be targeted in battleground states.
- Programs for women, youth, communities of color, low-income and frontline communities entrepreneurial and innovation support can be targeted in battleground states.

APPENDIX

There are organizations that target underrepresented groups and BIPOC communities to bring them into the clean energy workforce, creating jobs in local economies. Some of these models could be targeted in fossil-fueled based communities. This list is not exhaustive of all of the organizations that seek to create economic opportunities, professional development, and create jobs for underserved communities.

Organization	*Mission*
Clean Energy Leadership Institute (CELI)	CELI's mission is to empower and connect diverse young professionals seeking leadership roles in the clean energy field. Its community of emerging leaders consists of slightly over 50%

[80] Cong. Rsch. Serv., The 10-20-30 Provision: Defining Persistent Poverty Counties (2019), https://fas.org/sgp/crs/misc/R45100.pdf

	female and 35% people of color.
Texas Energy Poverty Research Institute (TEPRI)	TEPRI's mission is to inspire lasting energy solutions for low-income communities.
Elevate Energy	Elevate Energy helps people do more with less energy. We design and implement efficiency programs that lower costs, protect the environment, and ensure the benefits of energy efficiency reach those who need them most.
Peak Coalition	To reduce the negative and racially disproportionate health impacts of a city's peaker plants by replacing them with renewable energy and storage solutions. Our collaboration brings technical, legal, public health, and planning expertise to support organizing and advocacy led by communities harmed by peaker plant emissions
Solar One	To design and deliver innovative education, training, and technical assistance that fosters sustainability and resiliency in diverse urban environments.
Civic Works	Civic Works is Baltimore's urban service corps and an AmeriCorps program. Our mission is to strengthen Baltimore's communities through job training and volunteerism.
Power 52	Power52 provides employment training for at-risk adults, returning citizens, and underserved individuals living in Baltimore City and surrounding counties that prepares participants for careers in the solar industry as well as other green job opportunities
Solar Holler	Help Appalachian homes, businesses and nonprofits mine the sun for clean and affordable energy that will power communities.

Additional Clean Energy Workforce Statistics:

Solar

- According to the National Solar Foundation: women make up 26% of the solar workforce; Latino/Hispanic workers make up 17%; Asian workers make up 9%; and black or African American workers make up 8%. 8% of solar workers are military veterans.[81]

[81] The Solar Found., 10th Annual National Solar Jobs Census 2019 (2020), https://www.thesolarfoundation.org/wp-content/uploads/2020/03/SolarJobsCensus2019.pdf.

Energy Efficiency

- According to the Union of Concerned Scientists: 25% of the energy efficiency workforce is female, compared with 47% of the national workforce. 8%of the energy efficiency workforce is Black, compared with 12% of the national workforce. And 15% of the energy efficiency workforce is Latino, compared with 18% of the national workforce.[82]

Clean Energy and Climate Entrepreneurship and Innovation Competitions:

- NYSERDA's 76West competition, https://www.nyserda.ny.gov/All-Programs/Programs/76west
- Clean Energy Prize @ MIT, https://cep.mit.edu/
- Global Climathon competition, https://climathon.climate-kic.org/

WAP and LIHEAP coordination and expanding eligibility: [83]

- The LIHEAP statute allows for energy aid agencies to use up to 15% of funds for residential weatherization measures, which can include solar. With a special waiver from the Department of Health and Human Services, energy assistance agencies can use up to 25% of their funding for measures such as solar, to demonstrate "measurable savings in energy expenditures by low-income households."
- LIHEAP administrators can allocate these weatherization funds for solar using the rules for the WAP, LIHEAP rules drafted by the states, or a combination of both.
- Assurance 16 allows LIHEAP grantees to use up to five percent of their funds to provide services that help households reduce their energy needs and thereby reduce their need for energy assistance. By using LIHEAP funds for renewable energy projects, it would be possible for grantees to use some Assurance 16 funds to provide education about the project and the impact it could have on clients' energy consumption and bills.
- As an initial matter, WAP has not given blanket approval for this use of funds; the program will review each request on a project-by-project basis.

[82] Adenike Adeyeye, *Fed, States Should Protect Clean Energy Jobs for Black and Latino Workers* (Apr. 22, 2020), https://blog.ucsusa.org/adenike-adeyeye/fed-states-should-protect-clean-energy-jobs-for-black-and-latino-workers.

[83] Tony G. Reames, Improving the Effectiveness of Federal Energy Assistance for Low-Income Households, Scholars Strategy Network (2017), https://scholars.org/contribution/improving-effectiveness-federal-energy-assistance-low-income-households; Kemet Azubuike, Sustainable Investment: A Working Paper on Using Federal Energy Assistance for Solar, Vote Solar, https://votesolar.org/files/2015/1199/4944/Sustainable_Investment-__A_Working_Paper_on_Using_Federal_Energy_Assistance_for_Solar_Nov_2017.pdf.

- At the end of the approval process, WAP may grant approval for approximately $3,600 to be used for solar, for each home (or unit in a multifamily dwelling). Accordingly, WAP expects that a pilot project application will include other sources of funding.
- Residential Energy Assistance Challenge Option (REACH): within the LIHEAP statute, the .EACH program was included to get states to become innovative with energy assistance. REACH's objectives are to tackle health and safety risks that result from high energy burdens on low-income Americans, prevention of homelessness from the inability to pay energy bills, target energy assistance to individuals who are in most need, and increase the efficiency of energy usage by low-income families. Increasing the efficiency of energy usage by low-income households could be another inroad for the adoption of solar technologies in energy assistance policy. (Not appropriated)
- For example, converting or upgrading a gas to an electric boiler is never going to meet a SIR of 1. Also, the eligibility guidelines for these programs are different, making a targeted and comprehensive approach for state and local agencies difficult.
- By aligning eligibility and coordinating and communicating effectively at the federal agency level, and leaving it to be implemented by the states will help streamline energy assistance delivery, and help create jobs through expanded technology implementation. By specifically adding language for renewables, many more undeserved households could be addressed, and whole communities could be targeted instead of single applicants.

Leadership and a Trained Workforce will be Required for Clean Energy Transition

Opportunity/Problem:

When fossil fuel plants are closed without transition plans, workers will lose jobs and communities will lose significant revenue. If we follow President Trump's lead and ignore or lie about this inevitable change, harm to these communities and workers is guaranteed and consumers will suffer through higher electricity rates and environmental degradation.

Recommended Actions:

- Acknowledge honestly the current impact to fossil fuel-dependent communities of the clean energy transition.
- Pursue legislation that would secure pension and health benefits for coal and oil & gas jobs that might be at-risk or non-existent in the shifting economy.
- Explore the most effective transition strategies, learning from successes in the auto industry and lumber industries, and support state plans that focus on the same goals.

Program Type

√ New Program
√ Program Modification

Authority

√ Existing Authority
√ Requires New Legislation

Job Benefits

This will increase clean energy jobs more quickly by addressing and overcoming resistance to creating these jobs from fossil fuel-industry jobs that are disappearing.

Economic Benefits

New jobs and reinvestment in and support of at-risk communities

Equity Benefits

Transitioning fossil fuel-based workers and communities to the clean energy economy will improve the lives of impacted workers who are suffering from underemployment, low income, and high rates of externalities such as drug addiction, and provide health benefits to traditionally underserved communities.

Climate Plan Tie:

Direct support of carbon emission reductions and "fulfull[ing] our obligation to workers and communities who powered our industrial revolution and decades of economic growth."

Battleground State Benefits:

Coal industry jobs, particularly mining jobs, are focused in battleground states such as PA, OH, VA, and TX which understand the impact and reality of lost jobs. Hearing the Biden-Harris Administration focus on a transition plan for these impacted communities will be a stark contrast to the Trump Administration's false promises and ineffective results.

Leadership and a Trained Workforce will be Required for a Clean Energy Transition

COLLABORATORS: Alan Claus Anderson, Beverly Jurenko, Vanessa C. Tutos

DATE: September 16, 2020

Statement of Issue and Summary of Recommendations:

The opportunity and problem:
Clean energy generation has reached a tipping point where it is more cost effective to build new renewable generation than continuing to operate many existing fossil fuel power plants.[84] This economic reality means fossil fuel power plants will be closed at an increasing rate. This will lead to more jobs in clean energy overall, but there could be disproportionate harm in communities hosting fossil fuel generation or dependent on jobs in the fossil fuel extraction industry. If we ignore impacted fossil fuel workers, communities and families will suffer and be left out of benefits the clean energy transition provides. We must plan for this transition in a way that proactively preserves the social fabric of these communities and avoids a downward spiral as they simultaneously cope with both job losses and loss of tax revenue.

Notably, the Trump Administration has dealt with this problem by promising these communities that coal industry jobs will return,[85] thereby ignoring the crisis in these communities and abdicating the responsibility to put in the hard work to find solutions.[86] There is no question that most of these jobs in fossil fuel generation are gone forever, and coal-fired power generation will never be a source of new generation with a quickening pace of plant closures.[87]

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[84] Lazard, Lazard's Levelized Cost of Energy Analysis—Version 13.0, 2 (November 2019), https://www.lazard.com/media/451086/lazards-levelized-cost-of-energy-version-130-vf.pdf; Anderson, A.; Hagedorn, L.; Schulte, A, Annual Economic Impacts of Kansas Wind Energy – 2020 Report
[85] C-Span, *Road to the White House 2016: Presidential Candidate Donald Trump Rally in Charleston, West Virginia* (May 5, 2016), https://www.c-span.org/video/?409094-1/donald-trump-addresses-supporters-charleston-west-virginia#.
[86] Katelyn Newman, *Mayor: Trump Missed Opportunity to Address Opioids*, U.S. News (Aug. 5, 2017), https://www.usnews.com/news/politics/articles/2017-08-05/mayor-in-west-virginia-says-trump-missed-opportunity-to-address-opioids.
[87] U.S. Energy Information Administration, Electric Power Monthly, Table 6.6. Planned U.S.Electric Generating Unit Requirements, https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_06; Darren Sweeney & Taylor Kuykendall, *US Utilities, Power Providers Continue Plans*

The full report attached provides a detailed analysis of this issue and opportunity.

Potential Policy Solutions:
First and foremost, the Biden-Harris Administration can lead with continued transparency about what is happening in fossil-dependent communities. The Trump Administration's failed efforts to prop up the coal industry, and lying about the realities of the industry, has only exacerbated the harm.

Next, the Biden-Harris Administration can lead by pursuing legislation that would secure pension and health benefits for coal workers that may be non-existent or at risk in the shifting economy.

Finally, the Federal Government should focus its resources on exploring the most effective transition strategies. We have examples from the auto industry[88] and the lumber industry,[89] and some communities are already currently working on this transition. The Biden Campaign's proposed Task Force on Coal and Power Plant Communities which will prepare recommendations for state planning as well as include access to federal investment, is an important step. Next, the Biden-Harris Administration can implement those recommendations from the Task Force, and support state plans that focus on the same goals.

Opportunity / Problem Statement:
When a community hosts a coal power plant, that plant can be the source of 40%-70% of local tax revenue. Additionally, communities that have a workforce dependent on that industry have already suffered from lost jobs, and this will continue as coal industry jobs continue to disappear. The Trump Administration has ignored this problem by falsely promising that jobs will return instead of addressing the economic reality, and is therefore harming these communities. The Biden-Harris Administration has the opportunity to show leadership by recognizing the economic realities and by providing recognition and support for the impacted communities.

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to Accelerate Coal Retirements, S&P Global (Aug. 18, 2020), https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/081820-us-utilities-power-providers-continue-plans-to-accelerate-coal-retirements; Eric Lipton, *"The Coal Industry is Back," Trump Proclaimed. It wasn't.*, N.Y. Times (Oct. 5, 2020), https://www.nytimes.com/2020/10/05/us/politics/trump-coal-industry.html.

[88] Barry Wood, *Transition Time in the Rebounding U.S. Auto Industry*, Market Watch (Jan. 13, 2014), https://www.marketwatch.com/story/transition-time-in-the-rebounding-us-auto-industry-2014-01-13.

[89] USDA, Understanding the Social and Economic Transitions of Forest Communities (2018), https://www.fs.fed.us/pnw/pubs/science-update-18.pdf.

Creating Jobs and Developing a Resilient Workforce

Check Boxes Below	
	Is this a modification of an existing program?
X	Does this roll back a Trump Administration regulation? ***Yes, those regulations and policy decisions that have been used to prop up uneconomic fossil fuel generation and delay assistance to impacted communities***

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
The market reality is that much of the nation's fossil fuel generation is not economically competitive with renewable energy. Because of this, fossil fuel generation plants are closing at an increasingly rapid pace. Clean energy transition benefits include increased clean energy jobs, lower electricity prices, and lower carbon emissions. However, we must implement a plan to help fossil fuel workers and communities impacted by this transition. Some in the coal industry will continue to fight this transition, but there have now been four years of failed promises of a coal industry recovery. Showing a path forward may provide hope, and light a way to an alternative from the failed promises.

How the Recommendation Supports Frontline or other Underserved Communities:
Fossil fuel generation and extraction has had a large impact on many communities, first through the direct negative environmental impact, and now through a loss of jobs and local tax revenue.[90] Transitioning these workers and communities to the clean energy economy has the opportunity to significantly improve the lives of impacted workers who are suffering from underemployment, low income, and high rates of externalities such as drug addiction. Moreover, fossil fuel generation and petrochemical processing are disproportionately located in areas with a higher percentage of people of color. As fossil fuel generation is closed, the clean replacement power will have a direct positive health impact on low-income communities. With a transition plan for these communities, we can have a direct, and sustainable, economic impact for many low-income workers and people of color.

How the Recommendation Supports Biden's Climate Plan:
These recommendations directly support the following points from Vice President Biden's Climate Plan:

[90] Headwater Economics, Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities (2019), https://headwaterseconomics.org/wp-content/uploads/HE_Coal_Transition_Solutions_2019.pdf.

Creating Jobs and Developing a Resilient Workforce

I. ENSURE THE U.S. ACHIEVES A 100% CLEAN ENERGY ECONOMY AND NET-ZERO EMISSIONS NO LATER THAN 2050

By removing uneconomic impediments to the transition to renewable energy, the opportunity to achieve 100% clean energy can move forward. Funding increased research and development, as well as renewable energy focused budget priorities, makes the goal of 100% clean energy achievable.

V. FULFILL OUR OBLIGATION TO WORKERS AND COMMUNITIES WHO POWERED OUR INDUSTRIAL REVOLUTION AND DECADES OF ECONOMIC GROWTH

These recommendations directly support Section V of the Biden Climate Plan, first by illuminating the free market benefits of moving to clean energy, then being honest about the short-term negative impacts that will be experienced by some communities. By addressing these issues, and putting in the sustained work to provide support for impacted communities, the Biden-Harris Administration can help mitigate negative consequences of a diminished fossil fuel generation industry.

Key Battleground State Activity:

All 50 states will be impacted by decreasing fossil fuel generation and all states can benefit from increased clean energy jobs. Coal industry jobs, particularly mining jobs, are focused in battle ground states such as Pennsylvania, Ohio, Virginia, and Texas. These states will understand the impact and reality of lost jobs. Hearing the Biden-Harris Administration focus on a transition plan for these impacted communities will be a stark contrast to the Trump Administration's false promises and ineffective results.

Strengthening Climate Justice and Expanding Equity

Investing in Frontline Communities

Opportunity/Problem:

Structural barriers are estimated to have contributed to several trillion dollars of wealth inequality between white and black families in the United States and massive underinvestment in communities of color[91] and low-income communities. These communities experience or are at risk of experiencing higher or more adverse human health or environmental effects, and are more vulnerable to the impacts of Climate Change ("frontline communities") and from their proximity to polluting industrial facilities ("fenceline communities").

Recommended Actions:

- Create a standardized definition of what constitutes a frontline community
- Establish clear metrics for determining benefits to frontline communities
- Establish a core set of principles to guide federal engagement and investment
- Provide technical training and resources for accessing financial investment dollars in Frontline Communities
- Retool existing federal programs to support climate mitigation and develop new agency capacity for frontline engagement
- Create a cross-cutting interagency group
- Expand local climate banks through support of a National Climate Bank as contemplated in S.2057/H.R.5416 (2019)
- Improve federal contracting requirements

Program Type

√ New Program
√ Program Modification

Authority

√ Existing Authority

Job Benefits

Increased investments in frontline communities, including clean energy projects, will aid in job-creation, and should include targeted carve-outs for hiring from frontline communities.

Economic Benefits

Directing investments to frontline communities, such as a significant portion of Biden's 40% of investments to disadvantaged groups will help deliver economic benefits and justice.

Equity Benefits

Intentional disinvestment has resulted in (estimated) trillion dollars and massive underinvestment in communities of color[92] and low-income communities, and frontline and fenceline communities. Directing more investments at a scale to the population need will help address equity.

Climate Plan Tie:

Biden's climate plan calls for a historic investment of 40% in underserved and overburdened communities, and targeting resources in a way that is consistent with prioritization of environmental and climate justice, which is also economic justice.

Battleground State Benefits:

Arizona, Colorado, Florida, Georgia, Michigan, North Carolina, Ohio, Pennsylvania, Texas, Virginia

[91]Veronica Chau et al., Financial Institutions Can Help Break the Cycle of Racial Inequality, BCG, June 11, 2020, https://www.bcg.com/publications/2020/financial-institutions-fighting-racial-inequality.
[92]Id.

Investing in Frontline Communities

COLLABORATORS: Michael Bueno, Christina Bowman, Trenton Allen, Kerry E. O'Neill, Jahi Wise, Bracken Hendricks

DATE: August 14, 2020

Statement of Issue and Summary of Recommendations:
A Frontline Community is defined as a community with significant representation of communities of color, low-income communities, or Tribal and Indigenous communities, that experiences or is at risk of experiencing higher or more adverse human health or environmental effects.

Opportunity / Problem Statement:

- Historical or past governmental policies are estimated to have contributed to several trillion dollars and massive underinvestment in communities of color[93] and low-income communities, frontline, and fenceline communities.
- According to the U.S. Department of Energy's analysis of American Community Survey data, approximately 50 million of U.S. households, or 44% of the total population, were defined as low income.[94]
- Black and Hispanic communities in the U.S. are exposed to far more air pollution than they produce even though they drive less, use less electricity and consume fewer goods and services.[95] By contrast, white Americans experience better air quality than the national average, even though their activities are the source of most toxic air pollutants. Climate change will also cause the most economic harm in the nation's poorest communities. There are long standing disparities in income and levels of poverty for people of color.[96] Research shows that low-income people are more likely to live in flood-prone areas, and are less likely to receive federal aid when floods occur.[97]

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[93] *Id.*
[94] U.S. Dep't of Energy, Off. of Energy Efficiency and Renewable Energy, Low-Income Community Energy Solutions, https://www.energy.gov/eere/slsc/low-income-community-energy-solutions.
[95] Christopher W. Tessum et al., Inequity in Consumption of Goods and Services Adds to Racial-Ethnic Disparities in Air Pollution Exposure, 116 PNAS 6001 (2019), https://www.pnas.org/content/116/13/6001.
[96] Valerie Wilson, Racial Disparities in Income and Poverty Remain Largely Unchanged Amid Strong Income Growth in 2019, Econ. Pol'y Inst.: Working Econ. Blog, Sept. 17, 2020, https://www.epi.org/blog/racial-disparities-in-income-and-poverty-remain-largely-unchanged-amid-strong-income-growth-in-2019/.
[97] The Nat'l Acads. of Sci., Eng'g, & Med., Framing the Challenge of Urban Flooding in the United States (2019), https://www.nap.edu/catalog/25381/framing-the-challenge-of-urban-flooding-in-the-united-states; Paola Rosa-Aquino, *NPR Investigation Finds FEMA Aid Favors the Rich and White*, The

Proposed Recommendation:

- Standardized Definition: Create a standardized definition of "frontline community" for use across federal agencies that appropriately reflects the vulnerable populations most impacted by poverty, pollution, and climate change. Existing federal data and models on climate weather events such as hurricanes, floods, wildfires, or extreme storms should be leveraged to further identify these frontline communities to ensure none are left behind. Examples:
    - Legislation such as the Climate Equity Act of 2020 and Environmental Justice For All Act (H.R.5986) offer good starting points built on input from community, environmental justice, and policy leaders.

- Clear Metrics: Clarify metrics for what constitutes investment in frontline communities, specifically for programs that fund community development projects or provide direct grants to entities carrying out such projects for the federal government to be able to identify frontline communities. The benefits of these programs should:
    - Directly reach the community, and not in the form of trickle-down benefits that may reach communities long after the policy has been implemented (i.e. similar to EPA's environmental justice small grants that go directly to community-based organizations).[98]
    - Be meaningful, relevant, and useful for the community and informed by community-identified needs.[99]

- Core Principles: Codify the Jemez Principles for Democractic Organizing into an Executive Order that will govern the actions and decisions of federal agencies in delivering the promise of direct investment to frontline communities. The principles should reflect the needs and desires of communities most impacted by climate change, environmental injustice, racism, and systematic disenfranchisement. Examples:
    - Jemez Principles for Democratic Organizing - Grounded in environmental activism of communities and color and indigenous communities around the world, these principles have been adopted across environmental activist communities and organizations, serving as a template for defining meaningful engagement and inclusion of frontline communities in decision making for investment programs.

Grist, Mar. 7, 2019, https://grist.org/article/npr-investigation-finds-fema-aid-favors-the-rich-and-white/.

[98] Since its inception in 1994, the Environmental Justice Small Grants Program has awarded more than $28 million in funding to over 1400 community-based organizations, and local and tribal organizations working with communities facing environmental justice issues. https://www.epa.gov/environmentaljustice/environmental-justice-small-grants-program

[99] Sona Mohnot et al., Making Equity Real in Climate Adaptation and Community Resilience Policies and Programs: A Guidebook, The Greenlining Inst. (2019), https://greenlining.org/wp-content/uploads/2019/08/Making-Equity-Real-in-Climate-Adaption-and-Community-Resilience-Policies-and-Programs-A-Guidebook-1.pdf.

- Provide Implementation Knowledge in Frontline Communities: Even with dedicated investments to frontline communities, local organizations and community members may not have the necessary capacity to utilize funding streams such as grants or loan guarantees. Along with budgeting for frontline projects, there needs to be dedicated funding to provide staffing and means for potential beneficiaries to access technical assistance, support, and other aid mechanisms to ensure these investments truly serve community needs. Examples include:
    - Incubator for minority businesses serving frontline communities.
    - New funding streams dedicated to increasing investment in women- and minority-owned businesses
    - Provide clean energy, solar installation, and other technical job training programs, especially at HBCUs and other minority serving institutions.

- Retool established programs: Utilize existing federal programs that provide direct community investment and benefits to support climate change mitigation and adaptation projects in frontline communities. Examples:
    - Community Development Financial Institutions
    - Credit Unions
    - Pay as you save (PAYS) model
    - Community Development Block Grants
    - Rural Business Development Grants and related loan programs
    - Small Business Innovation Research/ Small Business Technology Transfer Grants
    - Federal loan guarantees for clean energy projects
    - EPA's Grants- Water State Revolving funds, Environmental Justice and Urban Waters grants
    - Economic Adjustment Assistance Program (EDA)

- Create new agency capacity for frontline engagement: Certain agencies lack the internal institutional framework to manage and coordinate cross-cutting programs focused on frontline investment, particularly on the clean energy front. Where practicable, new offices of frontline community investment and support should be created to serve such a role in individual agencies. Examples:
    - Department of Energy - Creating a new institutional body with the authority to coordinate across agency offices and programs to best leverage public dollars for frontline community investment. The existing Office of Indian Energy and Policy Programs in DOE serves as one model that could be scaled up to meet the challenges of engaging with and offering direct support to minority communities struggling with persistent poverty, reliable access to clean energy, and climate change-induced impacts. The DOE Office of Economic Impact & Diversity, primarily tasked with advising the Secretary on agency activities related to

minority populations, should expand its scope of authority to help direct external DOE public funds to frontline community initiatives.
    - Environmental Protection Agency - EPA's Office of Environmental Justice funds and works on cross-cutting issues that help mitigate climate impacts, along with reducing legacy pollution in low income communities, communities of color and indigenous communities. This structure serves as another model for DoE and other agencies to replicate.

- Create a cross-cutting interagency group: Coordinate DOE, EPA, FEMA, Commerce, HUD, and other agencies that are tasked with directing the 40% investment benefit to overburdened communities to ensure a significant portion is directly benefiting frontline communities.[100] This can be done from the Biden Plan's newly proposed White House Council on Environmental and Climate Justice (or White House Council on Environmental Quality), which reconstitutes and builds upon the Federal Interagency Working Group on Environmental Justice established through EO 12898.[101]

- Expand local climate banks: Increasing frontline community access to the financial tools (low-cost loans, rebates, grants) necessary to deploy clean energy and climate infrastructure technologies at scale through the creation of locally controlled climate banks. Support the creation of state/local climate banks with public advisory boards to enable frontline communities to control and oversee deployment of capital in their communities.[102] Capitalize state/local climate banks with federal funds to expand their operating capacity. Such capitalization could come through mechanisms like the National Climate Bank proposed by S.2057/H.R.5416

- Improve federal contracting: Similar to the proposal of "Core Principles," shift to a "community as the client" model to ensure federal contracting serves the needs of frontline communities to include an employment carve-out with a significant portion of project hires representing frontline communities.

Potential policy solutions include:

- Motivating commercial lending partners, contractors, deployment channels or capillaries to make their tools/resources available in frontline communities. See e.g. Connecticut Green Bank's support of Posigen's deployment of low and moderate income solar statewide.[103]

[100] Biden For President, The Biden Plan to Secure Environmental Justice and Equitable Economic Opportunity, https://joebiden.com/environmental-justice-plan/.
[101] https://www.archives.gov/files/federal-register/executive-orders/pdf/12898.pdf
[102] Coal. For Green Cap., Supporting State and Local Green Banks (2019), http://coalitionforgreencapital.com/wp-content/uploads/2019/09/Supporting-State-and-Local-Green-Banks.pdf.
[103] Lisa Prevost, *Connecticut Program Pairs Energy Efficiency With All Solar Installations*, Energy News Network (June 7, 2019), https://energynews.us/2019/06/07/northeast/connecticut-program-pairs-energy-efficiency-wi

- Eliminating barriers to community ownership of clean energy projects, particularly those that add long-term financial ownership burdens.
- Support the creation of frontline-owned businesses in frontline communities that deploy clean energy and climate infrastructure so that wealth creation from climate investment is retained in those communities.

Check Boxes Below	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

- Improved financing access for frontline community energy projects will spur economic development, creating millions of new local job opportunities,yielding more clean energy deployment, and simultaneously reduce emissions.[104]
- Supports the creation of frontline owned businesses in frontline communities that deploy clean energy and climate infrastructure so that wealth creation from climate investment is retained in those communities.

How the Recommendation Supports Frontline or other Underserved Communities:

- Building local financing institutions like local climate banks helps remove structural barriers (e.g. cost of capital, perceived consumer risk, transaction size) to stable and accessible sources of capital in frontline communities.
- Ensures federal dollars earmarked for environmental remediation and climate mitigation and adaptation go to and are used in frontline and underserved communities.
- Establishes universal guiding principles to improve access to programs and dollars for frontline communities across the federal enterprise.

How the Recommendation Supports Biden's Climate Plan:

- The Biden Climate Plan commits to ensuring that communities harmed by climate change and pollution are the first to benefit from the Clean Economy Revolution. These frontline communities are the focus of this paper and these recommendations call for the engagement and direct financial investment in these frontline communities. In addition, amid renewed focus to eliminate structural barriers for communities of color, the Biden-Harris Administration has an opportunity to make economic justice a cornerstone of its economic policy.

th-all-solar-installations/; NRDC: Green Bank Network, Solar For All, https://www.nrdc.org/sites/default/files/green-banks-connecticut-tt.pdf.

[104] Saul Griffith & Sam Calisch, Mobilizing For a Zero Carbon America: Jobs, Jobs, Jobs, and More Jobs, Rewiring Am. (2020), https://www.rewiringamerica.org/jobs-report.

Key Battleground State Activity:

- States with multiple metro-areas and/or counties under persistent poverty that are predominantly Black, Indigenous, or people of color, and burdened by environmental pollution and climate change impacts:
    - Arizona, Colorado, Florida, Georgia, Michigan, North Carolina, Ohio, Pennsylvania, Texas, Virginia[105]
- Many battleground states have already begun to experiment with localized climate finance institutions.[106]

[105] Cong. Rsch. Serv., The 10-20-30 Provision: Defining Persistent Poverty Counties, https://fas.org/sgp/crs/misc/R45100.pdf.
[106] See SELF in Florida, Michigan Saves in Michigan and the Colorado Clean Energy Fund in Colorado.

Improving Frontline and Vulnerable Community Health and COVID-19 Resistance Through Transportation Electrification

Economic Benefits

Stimulus from EV manufacturing, EV charging infrastructure, increased access to transportation, reduced losses to the economy from lost work/sick days and costs of hospitalization/medical care for unnecessarily bad health.

Equity Benefits

All of the recommendations are focused on improving jobs, economic opportunities, health and quality of life for equity communities.

Climate Plan Tie:

The Biden-Harris Climate Plan prioritizes low-income, communities of color, and frontline communities who bear a disproportionate amount of toxic air pollution. The plan centers on the needs of these communities across all agencies, especially in terms of reducing air pollution, improving health, jobs, and better transportation options.

Battle Ground State Benefits:

These recommendations would improve jobs prospects, economic opportunities, quality of life and health of people in environmental justice communities in battleground states.

[107] Frontline communities are those impacted "first and worst" and can include low-income communities, communities of color, and those communities who have been underserved and overburdened by disproportionate toxic air pollution; see Carolyn Holland, Centering Frontline Communities, Ecotrust Blog (May 20, 2017), https://ecotrust.org/centering-frontline-communities/#:~:text=Frontline%20communities%20are%20those%20that,vulnerable%20as%20our%20climate%20deteriorates.
[108] Vulnerable communities include low income and communities of color.

Improving Frontline and Vulnerable Community Health and COVID-19 Resistance Through Transportation Electrification

AUTHORS: Nadia Anderson, Christina Bowman, Bernice I. (Bicky) Corman, Arthur Haubenstock, Caroline Normile, Hana Creger[109]

DATE: Updated September 28, 2020

Statement of Issue and Summary of Recommendations: Systemic racism and a legacy of health and social inequities have contributed to COVID-19's disproportionate impact on frontline and vulnerable communities. Air pollution, particularly from vehicles, substantially increases health risks to these communities. Federal stimulus action to reduce transportation sector emissions would sharply reduce risks while simultaneously spurring investment and job creation in communities and populations bearing the brunt of the pandemic.

Opportunity / Problem Statement:
The Centers for Disease Control (CDC) recently confirmed COVID-19's grossly disproportionate impacts on Hispanic, Black and American Indian/Alaska Native populations.[110] A new Harvard School of Public Health study shows a much higher mortality rate for people with COVID-19 living in areas with high air pollution,[111] and disadvantaged neighborhoods and communities of color are likely the hardest hit.[112] This increased risk of death is associated with factors often caused, and always significantly exacerbated, by lifetimes of breathing dirty air.[113] According to a

[109] The team would also like to thank Richard Ezike for his helpful comments and suggestions.
[110] Andrea Kane & Paul LeBlanc, *CDC Report Offers Detailed Demographic Breakdown of Who is Getting Coronavirus*, CNN (June 16, 2020), https://www.cnn.com/2020/06/15/politics/cdc-coronavirus-demographics-report/index.html (COVID-19 figures are of cases in which racial background was identified).
[111] Harv. T.H. Chan School of Pub. Health, Air Pollution Linked With Higher COVID-19 Death Rates (May 5, 2020), https://www.hsph.harvard.edu/news/hsph-in-the-news/air-pollution-linked-with-higher-covid-19-death-rates/.
[112] Lisa Friedman, *New Research Links Air Pollution to Higher Coronavirus Death Rates*, N.Y. Times (Apr. 17, 2020), https://www.nytimes.com/2020/04/07/climate/air-pollution-coronavirus-covid.html.
[113] Xiao Wu et al., A National Study on Long-Term Exposure to Air Pollution and COVID-19 Mortality in the United States, Harv. T.H. Chan School of Pub. Health (2020), https://projects.iq.harvard.edu/covid-pm; *see also* Union of Concerned Scientists, Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic (2019), Inequitable-Exposure-to-Air-Pollution-from-Vehicles-in-the-Northeast-and-Mid-Atlantic (finding that soot exposure was 24% higher for African Americans and 23% higher for Latinos; and that white Americans are exposed to 14% less soot from tailpipes than the average American).

recent American Lung Association (ALA) report, transportation emissions are a leading cause of degraded air quality in frontline and vulnerable communities, particularly from older cars and trucks.[114]

Disproportionate transportation emission burdens in frontline and vulnerable communities is directly connected to the legacy of redlining and subsequent zoning and planning. Major highways were sited through communities of color, and facilities producing high truck and rail traffic were clustered in these same locations. The inevitable result: air quality degradation.[115] Frontline communities have been excluded from the transportation planning and decision-making process historically and through to the present day. Agencies and organizations implementing new programs are susceptible to bias, attributed to the lack of diversity among top decision-makers, who seldom reflect the geographic or racial backgrounds of the populations served.[116] New clean transportation program development often bypasses meaningful public engagement with underserved and priority stakeholder groups, leading to the development and deployment of programs that fail to meet the needs of the populations they were intended to help.

The Biden-Harris Administration could address the legacy of past actions and programmatic approaches, enhance the health and COVID-19 resistance of frontline and vulnerable communities and workers, and spark local investment and job creation at the same time. The very first step is to ensure that the most affected communities are included in the formation of new programs and policies and any revival of prior successes. Their insights, along with the voices and perspectives of directly connected academics and advocates, must be foundational to this more equitable future.

Proposed Recommendations:

1. **Establish an Inclusive Frontline & Vulnerable Community Clean Transportation Advisory Committee**
    - Create an advisory committee composed of representatives from priority communities, academics, advocates, state and local government agencies, and electric utilities to identify clean transportation opportunities for affected communities.[117]

[114] American Lung Association, *State of the Air* at 14 (Apr. 21, 2020), https://www.stateoftheair.org/assets/SOTA-2020.pdf.
[115] Casey Berkovitz, *Environmental Racism Has Left Black Communities Especially Vulnerable to COVID-19*, The Century Found. (May 19, 2020), https://tcf.org/content/commentary/environmental-racism-left-black-communities-especially-vulnerable-covid-19/?session=1.
[116] Thomas W. Sanchez, An Inherent Bias? Geographic and Racial-Ethnic Patterns of Metropolitan Planning Organization Boards, The Brookings Inst. (2006), https://www.brookings.edu/wp-content/uploads/2016/06/20060124_mpos.pdf.
[117] This could be a White House or inter-agency advisory committee, and/or each relevant department or agency (e.g., DOE, DOT, EPA) could have its own committee.

2. **Provide federal grants to increase transportation electrification and charging in frontline and vulnerable communities**:
    - For school districts, elderly and community support organizations, and higher education institutions to replace older large buses with smaller electric jitneys.
    - For municipalities to replace garbage trucks and other municipal vehicles with EVs in partnership with the private sector (such as Waste Management, Republic Services, etc.); and to create bikeshare and scooter share programs.
    - For agricultural collectives and other rural entities to electrify vehicles and equipment.
3. **Provide tax and other investment incentives**:
    - Reduce the cost of financing of electric trucks serving frontline and vulnerable communities, including agricultural workers, through small business refundable and transferable electric truck tax credits and Small Business Administration loans and loan guarantees.
    - Incentivize private investment to close the $2.2 billion investment gap in charging infrastructure needed to meet projected electric car demand across the United States' most populous areas in 2025[118] through a refundable and transferable investment tax credit and loan guarantees focused on ensuring equitable access for frontline and vulnerable communities.
4. **Expand and scale-up programs that reduce air pollution and transition from polluting vehicles for cleaner EVs and other clean mobility options:**
    - Reboot the "Cash for Clunkers" program to closely follow state examples, such as California's "Clean Cars 4 All" program,[119] that incentivize lower-income drivers to replace older high-polluting cars with EV and electric bikes and sharing services, transit passes, and other low- and no-carbon alternatives.[120]
    - Fund "shared highway" infrastructure, enabling safe riding and boarding through EV lanes, bike lanes, and safer bus stops, resolving ongoing urban and rural safety issues.
    - Expand the oversubscribed DOT Low- or Zero-Emission Vehicle Grant Program, including a focus on transitioning fleets and infrastructure in vulnerable and frontline communities.[121]

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[118] Jacqueline Toth, *Report: $2.2 Billion Needed to Meet U.S. Electric Car Charging Demand Through 2025*, Morning Consult (Aug. 13, 2019), https://morningconsult.com/2019/08/13/report-2-2-billion-needed-to-meet-u-s-electric-car-charging-demand-through-2025/.

[119]The "Cash for Clunkers" program should closely follow state examples such as California's "Clean Cars 4 All" program.

[120] *See* Cal. Air Res. Bd., Clean Cars 4 All, https://ww2.arb.ca.gov/our-work/programs/clean-cars-4-all.

[121] On file with Author. file:///Users/christinabowman/Downloads/US-Stimulus-Strategy-June-2020%20(1).pdf

- Replicate California's FARMER program on a national level, funding clean harvesting equipment, heavy-duty trucks, pumps, tractors, and other agricultural equipment.[122]
- Replicate California's Clean Mobility Options pilot,[123] Carsharing and Mobility Hubs at Affordable Housing,[124] and the Sustainable Transportation Equity Pilot,[125] where vulnerable and frontline communities plan and implement clean transportation to meet their needs.
- Replicate California's Rural School Bus Pilot Project[126] and Clean Mobility in Schools Pilot.[127]
- Replicate California's One-Stop-Shop Platform,[128] a centralized web tool integrating application processes for multiple clean mobility financial incentives, solar incentives, energy efficiency, and other government-funded programs to reduce air pollution.
- Expand low-income EV shared-use programs to increase access to affordable transportation, and decrease air pollution from dirty vehicles:
  - Launch a new program[129] building on EV ridesharing pilot projects to transition from diesel buses and fleets to all-electric buses and jitneys.
  - Leverage data-driven approach to locate low-income communities that would benefit most from EV shared-use programs.[130]

5. **Reduce emissions from the federal fleet and deploy in areas of concern:**
   - To the maximum extent practicable, require all vehicles owned or operated by federal agencies to be EVs, starting with those serving frontline and vulnerable communities, and that federal buildings and leased office space incorporate sufficient EV charging infrastructure to meet federal needs.

Check Boxes Below

[122] Cal. Air Res. Bd., FARMER Program, https://ww2.arb.ca.gov/our-work/programs/farmer-program.
[123] Moving Cal., Clean Mobility Options Voucher Pilot Program, Cal. Climate Invs. (2019), https://ww3.arb.ca.gov/msprog/lct/pdfs/cmo-voucher.pdf.
[124] Moving Cal., Car Sharing and Mobility Hubs at Affordable Housing Pilot Project, Cal. Climate Invs. (2018), https://ww3.arb.ca.gov/msprog/lct/pdfs/mobilityhubs.pdf.
[125] Moving Cal., Sustainable Transportation Equity Project (STEP), Cal. Climate Invs., https://ww3.arb.ca.gov/msprog/lct/opportunitiesgov/step.htm.
[126] Cal. Climate Invs., Low Carbon Transportation Investments, Rural School Bus Pilot Project, http://www.caclimateinvestments.ca.gov/lcti/2019/5/30/rural-school-bus-pilot-projects.
[127] Cal. Climate Invs., Low Carbon Transportation Investments, Clean Mobility in Schools Pilot Project, http://www.caclimateinvestments.ca.gov/lcti/2019/7/29/clean-mobility-in-schools.
[128] GRID Alts., One-Stop-Shop Pilot, https://gridalternatives.org/what-we-do/access-electric-vehicles/one-stop-shop.
[129] Similar to DOE's Clean Cities Program, and potentially partnered with DOT.
[130] The dashboard has data filters to show communities where there may be opportunities or need for a program based on population, mobility, and income demographics; information available at EV Shared-Use Mobility Program.

Both	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Building a national electric vehicle charging network could help get more than 35,000 Americans who lost electric and electric-hybrid vehicle-related jobs[131] back to work, in addition to creating tens of thousands more construction jobs across the country.[132] ALA estimates that transitioning to renewables-powered transportation solutions by mid-century will save thousands of lives, avoid tens of thousands of asthma attacks, hundreds of thousands of other health impacts, and tens of billions of dollars in health costs. Implementing this transition in 2020 would reduce climate-threatening emissions by more than 1.4 billion metric tons in 2050, compared to business as usual.[133]

How the Recommendation Supports Frontline or other Underserved Communities:

All of the recommendations either solely serve, or should prioritize, frontline or underserved communities. Communities should have the ability to select and shape the mobility options that meet their needs, rather than having any particular solutions or technologies prescribed for them.[134] Equity must also be integrated throughout the mission, process, implementation, and evaluation of every pilot, program, and funding stream.[135] The Electric Vehicle Equity Toolkit[136]

[131] E2, Clean Energy & COVID-19 Crisis | August 2020 Unemployment Analysis, https://e2.org/reports/clean-jobs-covid-economic-crisis-august-2020/.
[132] E2, Clean Jobs America 2020, https://e2.org/reports/clean-jobs-america-2020/.
[133] ALA Report, *supra*, n. 114, p. 1.
[134]For example, the Mobility Equity Framework was used to co-design and select the most equitable clean mobility options in a disadvantaged community in San Francisco; *see* Hana Creger et al., Mobility Equity Framework (2018), https://greenlining.org/wp-content/uploads/2019/01/MobilityEquityFramework_8.5x11_v_GLI_Print_Endnotes-march-2018.pdf; Julia Kong, *Co-Designing Equitable Transportation in Southeast San Francisco*, Reflex Design Collective (Apr. 17, 2019), https://medium.com/reflex-design-collective/co-designing-equitable-transportation-in-southeast-san-francisco-43ac70b4ae55.
[135] *See* The Greenlining Inst., Making Equity Real in Mobility Pilots Toolkit, https://greenlining.org/publications/reports/2019/making-equity-real-in-mobility-pilots-toolkit/.
[136] The Greenlining Inst., Electric Vehicles for All: An Equity Toolkit, https://greenlining.org/publications/2016/electric-vehicles-equity-toolkit/.

and the Electric Carsharing in Underserved Communities Report[137] can help ensure electric vehicle strategies are equitable and structured to meet community needs.

How the Recommendation Supports Biden's Climate Plan:
The recommendations follow the Biden Climate Plan's three top-line priorities to:

1) establish an enforcement mechanism with milestone targets by the end of his first term; 2) make a historic investment in clean energy and climate research and innovation; and 3) incentivize the rapid deployment of clean energy innovations across the economy, especially in communities most impacted by climate change.

The focus of these recommendations is to address many concerns expressed in the Biden Climate Plan, in particular, that "vulnerable communities are disproportionately impacted by the climate emergency and pollution," and would help "ensure that communities harmed by climate change and pollution are the first to benefit from the Clean Economy Revolution." They would contribute to the Plan's objective of "accelerating the deployment of electric vehicles," and "target 40% of Biden's historic investment in a clean energy revolution" to benefit frontline and vulnerable communities. Establishing advisory committees to incorporate communities' perspectives and enable them to identify their own priorities is consistent with the Plan's objective of "empowering local communities to develop transportation solutions."[138]

Key Battleground State Activity:[139]
Spurring investments in manufacturing EV fleets (e.g. buses and their drivetrains) directly impacts job creation in several battleground states:

- In Michigan, the clean vehicles industry employs tens of thousands of people—more than any other state except California.
- Detroit's automakers and their suppliers are investing billions of dollars in the EVs of the future, which will be vital for improving air quality and reducing carbon dioxide emissions.[140]
- Clean energy has also been vital for rural economies. In 2019, North Carolina had the greatest number of clean energy jobs in rural areas,29,000, followed by Michigan and Texas.[141]

[137]Joel Espino & Vien Truong, Electric Carsharing in Underserved Communities, The Greenlining Inst., https://greenlining.org/wp-content/uploads/2015/01/Electric-Carsharing-in-Underserved-Communities-spreads.pdf.
[138] These committees should have budget authority and be able to compensate environmental justice leaders and community members for their input. More information can be found in the Appendix.
[139] Battleground states: Arizona, Colorado, Florida, Georgia, Iowa, Maine, Michigan, Minnesota, New Hampshire, Nevada, North Carolina, Ohio, Pennsylvania, Texas, Virginia, Wisconsin.
[140] Bret Kenwell, *GM, Ford Bump Up Investments in Electric and Autonomous*, The Street (Mar. 24, 2019), https://www.thestreet.com/lifestyle/cars/gm-ford-invest-in-electric-and-autonomous-14904586.
[141] E2, Clean Jobs America 2020 (2020), https://e2.org/reports/clean-jobs-america-2020/.

- Alabama, California, Georgia, Indiana, Minnesota, New York, North Carolina, and South Carolina build cars and buses using components from many other locations throughout the United States.[142]
- Switching from gasoline to electricity saves consumers money. During 2018, rural drivers in the following states saved by switching:[143]

  $763 in Arizona, $748 in Florida, $770 in Iowa, $673 in Michigan, $1,011 in Nevada $684 in Ohio, $741 in North Carolina, $674 in Texas, $668 in Virginia, $733 in Pennsylvania, $552 in Maine, and $635 in Wisconsin
- Battleground state residents support tax rebates for energy-efficient vehicles:[144]

  79% in Texas

  80% in Ohio, Florida, Georgia, North Carolina

  81% in Minnesota, Pennsylvania, Nevada, Maine

  82% in Colorado, Virginia, Michigan, New Hampshire, Wisconsin

[142] Dan Lashof, Manufacturing Electric School and Transit Buses: Creating Jobs and Economic Growth, World Res. Inst. (2020), https://files.wri.org/s3fs-public/expert-note-electric-buses.pdf.
[143] Union of Concerned Scientists, State Electric Vehicle Benefits (2019), https://www.ucsusa.org/resources/state-electric-vehicle-benefits.
[144] Jennifer Marlon et al., *Yale Climate Opinion Maps 2020*, Yale Program on Climate Change Comms. (Sept. 17, 2019), https://climatecommunication.yale.edu/visualizations-data/ycom-us/.

APPENDIX

Additional information on the Opportunity and Problem Statement of "Improving Health and COVID-19 Resistance in Frontline and Vulnerable Communities Through Transportation Electrification."

While federal, state and private sector action has not focused on clean transportation as a COVID-19 mitigation measure, the 2008-2009 federal stimulus included clean transportation successes that could be followed to better protect frontline and vulnerable communities. For example, the $3 billion Car Allowance Rebate System (affectionately known as the "Cash for Clunkers" program), replaced more than 700,000 gas-guzzling, polluting, older vehicles with new, fuel-efficient ones.[145] To counteract decades of transportation injustices, we need transportation planning and decision making processes that are equitable and community driven.

Despite being cheaper to drive and maintain than gas vehicles, EVs remain an expensive option for very low-income Americans, while privately owned cars and shared cars contribute to car dependency and congestion. Clean transportation equity policies should support a range of zero or low-emissions options, including electric public transit, electric carsharing, electric and traditional bikes, scooters, and walking.[146]

Additional information on How the Recommendation Supports Biden's Climate Plan:
The recommendations are also consistent with the Plan's attention to the burden of dirty air on communities of color. The Federal Clean Fleets recommendation aligns with the Plan's call for a first-day Executive Order to "use [the] Federal government procurement system – which spends $500 billion every year – to drive towards 100% clean energy and zero-emissions vehicles." The proposed grants would be consistent with the Plan's call for "Mak[ing] a historic investment in energy and climate research and innovation, as well as clean and resilient infrastructure and communities" as part of the first-year legislative agenda. For example, The Clean Corridors Act of 2019 (H.R. 2616) and EV Freedom Act (H.R. 5770)would immediately create jobs and expand the nation's EV changing and clean fuels networks.

[145] Bengt Halvorson, Commentary: Emissions—Not Gas Mileage—Should be Foundation for Cash-for-Clunkers Reboot, Green Car Reps. (May 5, 2020), https://www.greencarreports.com/news/1128051_commentary-emissions-not-gas-mileage-should-be-foundation-for-cash-for-clunkers-reboot.
[146] Hana Creger, *We'll Need More Than EV's to Fix Our Broken Transportation System*, Elec. Auto Assn. (Aug. 11, 2020), https://www.electricauto.org/blog/well-need-more-than-evs-to-fix-our-broken-transportation-system.

Reducing the Energy Burden for Disadvantaged Communities through Affordable and Accessible Solar and Energy Efficiency

Opportunity/Problem:

On average, low-income households spend more than three times their household income on utilities than non-low-income households. Households with higher energy burdens often experience negative long-term effects on their health, increased economic hardship, and difficulty moving out of poverty. Energy efficiency (EE) and renewable energy (RE) investments in low-income housing can alleviate energy burdens for low-income households while ensuring ALL communities and ratepayers benefit from clean energy investments.

Recommended Actions:

- Modify HUD regulations to increase EE & RE investments in public housing
- Modify federal funding regulations to enable comprehensive EE/RE projects including community solar
- Modify income verification requirements to facilitate community solar participation
- Federal funding for climate resiliency projects in frontline communities
- Create an 'on-bill' financing model to incentivize utilities to finance clean energy projects in frontline communities
- Create an interagency task force to establish one-step enrollment of all income-qualified housing, food, and energy assistance programs

Program Type

√ New Program
√ Program Modification

Authority

√ Existing Authority
√ Requires New Regulations

Job Benefits

Increased clean energy projects will result in more living wage jobs.

Economic Benefits

Growth in clean energy sector and jobs, reduced public healthcare costs, reduced operational costs from assistance programs due to streamlined implementation

Reducing the Energy Burden for Disadvantaged Communities through Affordable and Accessible Solar and Energy Efficiency

Equity Benefits

Reduced energy burden for low-income families, increased home energy performance and comfort in low-income homes, improved health outcomes of low-income households, barriers to participation in assistance programs addressed, increased investment and economic growth in frontline communities

Climate Plan Tie:

Supports key elements of the Biden Climate Plan including expanding low-income residential solar, community solar, and 'on-bill' financing. Also consistent with the Climate Equity Act (H.R. 8019) to ensure that frontline communities benefit from these recommended actions.

Battleground State Benefits:

Climate resilience projects would benefit vulnerable battleground states such as TX, FL, PA, and VA. Recommendations expanding community solar also benefit battleground states of MN and PA, which have bipartisan support for community solar.

Clean Energy Recovery Recommendation

Reduce Energy Burden: Increase affordable and accessible solar and energy efficiency to disadvantaged communities

AUTHORS: Anna Lising, Krystal Laymon, Claire Woo, Kacie Peters, and Kaylene Hung

DATE: August 16, 2020

Problem Statement: Clean energy is about a better, sustainable future -- yet most clean energy solutions, such as distributed solar, energy efficiency, and electric vehicles - have largely been accessible only to white, wealthy urban dwellers.[147] These clean energy solutions have historically been cost prohibitive for low-income communities. As states, cities, and utilities invest in a clean and modern electricity grid, we have an obligation to ensure that ALL taxpayers and ratepayers benefit.

Statement of Issue and Summary of Recommendations: On average, low-income households spend more than three times their household income on utilities compared with non-low-income households. Households with higher energy burdens often experience negative long-term health effects, increased economic hardship, and difficulty in moving out of poverty.[148] Increased energy efficiency (EE) and renewable energy (RE) investments in affordable housing can alleviate energy burdens for low-income households while ensuring frontline communities and low-income ratepayers benefit from clean energy investments.

We therefore recommend the following policy actions:

- Modify HUD regulations to increase EE and RE investments in public housing
- Modify federal funding regulations to enable comprehensive EE/RE projects including community solar (CS)
- Modify income verification requirements to facilitate community solar participation
- Federal funding for climate resiliency projects in frontline communities

[147] Deborah A. Sunter et al., Disparities in Rooftop Photovoltaics Deployment in the United States by Race and Ethnicity, 2 Nature Sustainability 71 (2019), https://doi.org/10.1038/s41893-018-0204-z; Eric Daniel Fournier et al., On Energy Sufficiency and the Need for New Policies to Combat Growing Inequities in the Residential Energy Sector, 8 Elementa Sci. Anthropocene 24 (2020), http://doi.org/10.1525/elementa.419.
[148] "Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities," ACEEE, April 2016.

- Create an 'on-bill' financing model to incentivize utilities to finance clean energy projects in frontline communities
- Create an interagency task force to establish one-step enrollment of all income-qualified housing, food, and energy assistance programs

These recommendations are consistent with the Climate Equity Act (H.R. 8019) in that they review and modify federal grant-making and investment programs "to ensure that frontline communities benefit by targeting investments and addressing existing barriers."[149] Additionally, to ensure these policies result in an equitable and just outcome, we recommend frontline communities play an integral role in their drafting and review to help minimize negative impacts and maximize frontline community benefits.

Modify HUD regulations to increase EE and RE investments in public housing

Federal housing law sets federally subsidized affordable housing rent and utilities at 30% of household's monthly income.[150] This fixed amount means any utility savings from EE or solar projects perversely results in a rent increase- meaning that HUD tenants continue to pay the same amount each month and never realize financial benefits from EE and RE investments. HUD tenants are also susceptible to "split incentive" obstacles, whereby the capital costs of EE upgrades fall on landlords who do not reap the financial rewards of energy conservation, while tenants have no incentive to pay for upgrades to buildings they do not own.[151] Additionally, if a landlord pays the utility bill, a tenant has even less incentive to reduce electricity consumption.

To ensure that all HUD tenants can directly benefit from solar projects, we recommend expanding the July 8, 2019 HUD memo to apply to all solar installations on affordable multifamily housing nationwide.[152] This memo exempts solar credits generated from projects serving multi-family affordable housing from being factored into utility allowance calculations, meaning that solar credits can be applied to tenant utility accounts, thereby reducing their utility bills, *without* impacting their rent amount (i.e. they actually save money each month). However, the current rule applies only to projects associated with California's Solar On Multi-family Affordable Housing (SOMAH)[153] program. Expanding this rule to all solar projects serving multi-family affordable housing nationwide ensures that underserved communities throughout the country directly benefit from public investment in distributed solar.

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[149] Climate Equity Act 2020, https://www.harris.senate.gov/imo/media/doc/Climate%20Equity%20Act%20of%202020.pdf

[150] U.S. Dep't of Hous. and Urb. Dev., HUD Exchange, HUD Home Rent Limits, https://www.hudexchange.info/programs/home/home-rent-limits/.

[151] Koel Wrigley & Robert H. Crawford, Identifying Policy Solutions for Improving the Energy Efficiency of Rental Properties, 108 Energy Pol'y 369 (2017), https://doi.org/10.1016/j.enpol.2017.06.009.

[152] US Dep't of Hous. and Urb. Dev., Memo on Treatment of Solar Virtual Net Energy Metering Credits on Tenant Utility Bills, July 8, 2019, https://calsomah.org/sites/default/files/docs/SOMAH_HUD_Solar_VNEM_Credits_memo_2019-07-08.pdf.

[153] Cal. Pub. Utilities Comm'n, The Solar on Multifamily Affordable Housing (SOMAH) Program, https://www.cpuc.ca.gov/General.aspx?id=6442454736.

To address split incentives,[154] we recommend that DOE and the Green Building Council establish a national building energy performance benchmarking program and model national mandatory building energy performance standards to ensure all Americans, particularly renters and those living in subsidized housing, realize the financial and health benefits of energy efficient housing and equipment.

Modify federal funding regulations to enable cross-funding for comprehensive EE/RE projects including community solar

Funding for EE and RE projects is typically siloed and does not allow for comprehensive building or home retrofits. Strict limitations on the use of clean energy funds often results in the following outcomes: rooftop solar projects are abandoned because funding does not allow for necessary roof repairs; rooftop solar is installed on buildings with leaky building envelopes; and EE retrofits are not expanded with the installation of on-site RE generation.

We therefore recommend modifying HHS regulations to expand the use of Low Income Home Energy Assistance Program (LIHEAP) funding[155] to allow RE projects as part of LIHEAP--funded EE projects. This would leverage cost savings by building RE projects, such as CS, while construction and electrical work is already underway on-site. Similarly, we recommend modifying DOE regulations to expand the use of RE funding to allow for EE and roof repair projects, as well as raising Weatherization Assistance Program (WAP)[156] project cost caps (which requires Congressional action) to make efficiency-plus solar projects feasible. This would ensure that solar arrays are tailored to buildings' actual energy needs rather than overbuilding to compensate for weatherization deficiencies. Additionally, allowing funding to cover roof repairs ensures that otherwise viable solar projects can proceed.

These policy changes are critical to expanding access to EE upgrades and solar generation to frontline and underserved communities, which typically consist of older and inefficient homes and buildings. Beyond the immediate impacts of reducing energy costs and alleviating the energy burden of low-income households, improving the housing and building stock would increase property values and create generational wealth. It would also improve health outcomes by allowing more household income to go towards healthcare needs, sealing drafty building envelopes, and displacing harmful fossil fuel plants with clean, renewable energy generation.

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[154] Consortium for Building Energy Innovation, Creating an Energy Savings Win-Win for Owners and Tenants, http://www.cbei.psu.edu/split-incentives-and-green-leases/index.html#:~:text=Traditional%20leasing%20agreements%20often%20create,benefits%20of%20reduced%20utility%20costs ("Traditional leasing agreements often create a condition known as "split incentives" between owner and tenant, in which capital improvements that yield energy savings result in one party paying for improvements while the other party receives the benefits of reduced utility costs.").

[155] U.S. Dep't of Health and Hum. Servs., Low Income Home Energy Assistance Program (LIHEAP), https://www.acf.hhs.gov/ocs/programs/liheap.

[156] U.S. Dep't of Energy, Off. of Energy Efficiency & Renewable Energy, Weatherization Assistance Program, https://www.energy.gov/eere/wap/weatherization-assistance-program.

Modified income verification and subscriber management requirements to facilitate CS participation

Community solar (CS) is the most flexible way for all Americans to access locally-generated clean energy: it does not require home ownership; upfront investment; or long term residency. However, programs aimed at reaching low-income families are falling short for the following reasons: (1) state programs require onerous and sensitive documents like tax returns to prove eligibility; (2) subsidized housing tenants risk losing rental assistance when they receive savings from CS projects; (3) subscriber management rules vary by state and/or utility, making it difficulty to deploy CS at scale; and (4) inflexible subscriber management rules, such as forfeiting unused CS credits even when moving within the same service territory, force renters (particularly low-income renters who tend to move more frequently) to forego CS benefits.

The Biden-Harris administration can address these issues by: (1) charging federal assistance programs (LIHEAP, SNAP,[157] TANF,[158] Utility Allowance Programs,[159] etc.) with verifying income eligibility for state CS programs; (2) expanding the HUD ruling to CS projects serving low-income households nationwide, as detailed above; (3) investing LIHEAP funding into CS assets and other technologies to reduce energy burdens so that more low income families can receive long term energy benefits, as detailed above; and (4) building a coalition of state utility regulators to create national CS subscriber rules, thereby ensuring consistency across states/service territories. This coalition should also work with utilities to develop solutions that would allow updating CS subscriber lists on a monthly basis (some states cap updates to CS subscriber lists to just twice a year) and enable CS subscribers to transfer unused CS credits when moving within their service territory.

Federal funding for climate resiliency projects in frontline communities

As we work to avert the worst impacts of climate change, we must also adapt to impacts that are now unavoidable. Frontline communities are the most vulnerable to extreme climate events, yet lack the resources and infrastructure to mitigate risks and recover from these events.[160]

Community Resilience Centers (CRCs), such as solar plus energy storage microgrids, have the potential to provide communities with much needed resiliency in the face of natural disasters. Equipping publicly-accessible buildings (such as community centers, public schools, and public

[157] U.S. Dep't of Agric., Supplemental Nutrition Assistance Program (SNAP), https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program.
[158] U.S. Dep't of Health and Hum. Servs., Off. of Family Assistance, Temporary Assistance for Needy Families (TANF), https://www.acf.hhs.gov/ofa/programs/tanf.
[159] Tenants of federally subsidized housing can receive utility allowances, ranging from $10 to over $200, to help pay for energy costs; *see* U.S. Dep't Hous. and Urb. Dev., Utility Allowances, https://www.hud.gov/program_offices/public_indian_housing/programs/ph/phecc/allowances.
[160] Rachel Cleetus et al., Surviving and Thriving in the Face of Rising Seas, Union of Concerned Scientists (2015), https://www.ucsusa.org/sites/default/files/attach/2015/11/surviving-and-thriving-full-report.pdf.

libraries) with backup power provides frontline communities with essential shelter and services such as refrigeration for medicine and electricity to charge phones.[161] We recommend DOE set up new environmental justice grant programs for CRCs in frontline communities. Grant proposals should be evaluated based on resiliency impact and benefits and include criteria such as public access to the site and the ability to provide essential services (such as plug load, lighting, and refrigeration) for up to 3 days.

Create an on-bill financing model and incentivize utilities to finance clean energy projects in frontline communities

Traditional financing programs and incentives for residential EE and RE projects are often inaccessible for low and moderate-income families, who may be credit-challenged and unlikely to have sufficient savings for upfront payments. Programs often are particularly inaccessible for renters, disproportionately impacting low-income households. On-bill financing addresses these barriers by providing Americans with an incremental payment plan through their utility bills. On-bill financing and on-bill repayment are structured in the form of an investment from the utility or a third-party that collects repayment via customer bills. In addition, the on-bill tariff model differs in that tariffs are not an investment, but rather a utility expenditure for which cost recovery is tied to the utility meter according to terms set forth in a utility tariff.

We recommend DOE collaborate with utilities and industry stakeholders to create an on-bill tariff model and then incentivize utilities to offer on-bill financing to ensure low- and moderate-income households have access to residential energy efficiency and renewable energy solutions. Interagency partnerships will be needed including USDA's Rural Energy Assistance Programs (REAP),[162] which works with cooperative utilities to support loan investments in the community and can often finance EE and RE measures. Other federal loan guarantee programs with Community Development Financial Institutions (CDFIs)[163] can be developed by DOE, HUD, and HHS to drive energy efficiency and renewable energy investments with utilities.

Create an interagency task force to establish one-step enrollment of all income-qualified housing, food, and energy assistance programs

Enrolling in assistance programs is often cumbersome, difficult to navigate, and demoralizing for applicants. Applicants are typically required to provide tax and social security documents, complete dozens of forms, and make several trips, taking time away from their days, families, and jobs. The process usually leaves applicants feeling overwhelmed, confused, and dejected.

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[161] Cmty. Power Network, Solar Plus Storage: A Resiliency and Climate Mitigation Strategy for Vulnerable Communities (2016), https://www.solarunitedneighbors.org/wp-content/uploads/2017/09/Solar-Plus-Storage-Concept-Paper.compressed.pdf.https://www.solarunitedneighbors.org/wp-content/uploads/2017/09/Solar-Plus-Storage-Concept-Paper.compressed.pdf

[162] U.S. Dep't of Agric., Rural Development, Energy Programs, https://www.rd.usda.gov/programs-services/all-programs/energy-programs.

[163] U.S. Dep't of the Treasury, Community Development Financial Institutions Fund, What Does the CDFI Fund Do?, https://www.cdfifund.gov/Pages/default.aspx.

Given that many of our federal housing, food, and energy assistance programs have similar income eligibility requirements, we recommend establishing a Task Force consisting of leaders from DOE, HHS, HUD, and USDA and managers of the public housing, Section 8 affordable housing, WAP, LIHEAP, SNAP, and TANF programs, as well as external subject matter experts, such as the National Energy and Utility Affordability Coalition (NEUAC). The Task Force would be charged with creating a one-stop enrollment process for all assistance programs. Eligibility criteria and screening for all assistance programs would be consolidated into a single application, which would be housed in a centralized database that meets strict cybersecurity requirements to protect personally identifiable information, thereby minimizing paperwork and redundancies for both the administering agencies and applicants.

With a one-stop application process, any person applying for an assistance program would automatically be screened for and enrolled into all assistance programs they qualify for. For example, if someone applied for LIHEAP, they could automatically be enrolled in WAP, SNAP, TANF, and/or a low-income community solar program. We recommend automatic enrollment as studies have found time and time again that offering programs as opt-out versus opt-in produces significantly higher participation levels.[164] This would ensure families get the assistance they need while providing them with a more convenient and dignified experience.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Solar jobs have increased 167% over the past decade, adding 156,000 jobs.[165] Community solar and resilience projects would further increase job growth in the solar and battery industries, as well as job growth for skilled trades from the construction, installation, and continued operations and maintenance of these projects. The climate justice grant program should include job creation and workforce development as part of its criteria and project Key Performance Indicators.

How the Recommendation Supports Frontline or other Underserved Communities: Each of the policy recommendations detailed above prioritizes equity to ensure clean energy investments primarily benefit and serve frontline communities.

How the Recommendation Supports Biden's Climate Plan: These policies are critical to fulfilling the campaign's commitment to deliver at least 40% of the benefits to frontline communities. Supporting energy efficiency in affordable housing and community solar programs creates jobs, helps transition workers into clean energy, and increases resiliency, as clean energy projects can be sited to optimize around grid capacity and load constraints, thereby

[164] Beia Spiller, *To Opt-In or Opt-Out: What Works for Time-Variant Pricing*, Env't Def. Fund (Aug. 7, 2014), http://blogs.edf.org/energyexchange/2014/08/07/to-opt-in-or-opt-out-what-works-for-time-variant-pricing/.
[165] The Solar Found., National Solar Jobs Census, https://www.thesolarfoundation.org/national/.

increasing reliability and decreasing the need for additional fossil fuel peaker plants in residential communities.

Key Battleground State Activity: Florida, Pennsylvania, Virginia, and Texas are battleground states that have coastal communities and face particularly high climate risks.[166] The Texas power grid also has the lowest reserve margin in the country and is particularly susceptible to large-scale power outages. The Texas Coastal Resiliency Master Plan[167] to support resilient local communities along the coastline and Florida's Resilient Coastline Program[168] offers resources and funding to prepare coastal communities for the effects of climate change. However, there are no initiatives supporting CRCs in these battleground states. The largest market for operating CS assets is Minnesota, with 705 MW of projects installed to date, creating $2.2 million in energy credits for consumers.[169] Pennsylvania is also considering a CS bill (HB 531 sponsored by State Rep. Aaron Kaufer (R-Luzerne) and State Rep. Donna Bullock (D-Philadelphia)), which has bipartisan support, as PA Republicans see community solar as a way to provide income for under-utilized farmland and rural communities.

[166] Olivia Rosane, *9 out of 10 States Most at Risk From Climate Change Voted for Trump*, EcoWatch (Jan. 30, 2019), https://www.ecowatch.com/red-states-climate-change-risks-2627505785.html.
[167] Adaptation Clearinghouse, Texas 2017 Coastal Resiliency Master Plan, https://www.adaptationclearinghouse.org/resources/texas-2017-coastal-resiliency-master-plan.html.
[168] Fla. Dep't of Env't Protection, Florida Resilient Coastlines Program, https://floridadep.gov/rcp/florida-resilient-coastlines-program.
[169] John Farrell, *Why Minnesota's Community Solar Program is the Best*, Inst. For Local Self-Reliance (Sept. 3, 2020), https://ilsr.org/minnesotas-community-solar-program/.

Cost Saving and Co-Benefits through Clean Energy in Affordable Housing

Opportunity/Problem:

Clean energy projects are a powerful tool for injecting desperately needed capital into the nation's affordable housing sector, and these projects produce a host of important co-benefits. Strategic changes by federal agencies can remove barriers and properly incentivize the affordable housing sector to maximize cost-saving clean energy innovations.

Recommended Actions:

- Making Better Decisions through Building and Utility Data.
- Incentivizing and Unblocking Cost-Saving Clean Energy Projects.
- Raising Minimum Standards for Building Design and Construction.

Program Type

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority

√Existing Authority
√Requires New Legislation
√Requires New Regulations

Job Benefits

Clean energy projects in the affordable housing sector present an opportunity for the creation of high-quality jobs that directly serve low-income households and communities of color.

Economic Benefits

Clean energy projects create jobs, reduce wasteful consumption and spending, and establish new revenue streams that can be used to preserve the existence of affordable housing in the country.

Equity Benefits

Clean energy projects in affordable housing preserve and improve affordable housing, improve indoor health and comfort, and increase disaster resilience for our most vulnerable citizens.

Climate Plan Tie:

These proposals support Biden's Climate Plan by expanding renewable energy and energy-efficiency in a way that promotes environmental justice, economic opportunity, disaster resilience, and the fiscal efficiency of the US Government.

Battleground State Benefits:

Affordable housing is located and needed nationwide, and the green jobs that result from clean energy projects provide a key opportunity for a healthier and more stable future for workers transitioning out of the fossil fuel sectors in locations like Pittsburgh and Detroit. See examples like Pittsburgh's Energy Innovation Center.

Cost Savings and Co-Benefits Through Clean Energy in Affordable Housing

AUTHORS: Julia Hustwit, Vidur Prasad, Christina Bowman, Caroline McGregor, Blakely Jarrett

DATE: 8/28/2020

Statement of Issue and Summary of Recommendations:
Clean energy projects are a powerful tool for injecting desperately needed capital[170] into the nation's affordable housing sector, and these projects produce a host of important co-benefits.[171] Strategic changes by federal agencies can remove barriers and properly incentivize the affordable housing sector to take up this tool and use it to its maximum potential. Recommended changes include:

- **Making Better Decisions through Building and Utility Data.**
- **Incentivizing and Unblocking Cost-Saving Clean Energy Projects.**
- **Raising Minimum Standards for Building Design and Construction.**

Opportunity / Problem Statement:
The federal government, through the U.S. Department of Housing and Urban Development (HUD), the U.S. Department of Agriculture (USDA), and the U.S. Department of Treasury (Treasury) subsidizes millions of affordable housing units for low-income families nationwide.[172] Federal funding covers, to varying degrees, both the capital costs and operating costs –including utility costs– of millions of single-family and multifamily residential properties in every corner of the country. HUD's programs provide the highest level of support for affordable housing

[170] For example, the National Association of Housing and Redevelopment Officials (NAHRO) estimated that the backlog of capital needs in the national public housing program alone was as much as $70 Billion in 2019. Public housing is just one program within the affordable housing umbrella. National Association of Housing and Redevelopment Officials, *Capital Fund Backlog*, (April 2020), https://www.nahro.org/wp-content/uploads/2020/04/CAPITAL_FUND_BACKLOG_One-Pager.pdf.
[171] U.S. Environmental Protection Agency, *Energy Efficiency in Affordable Housing*, (July, 2018), https://www.epa.gov/sites/production/files/2018-07/documents/final_affordablehousingguide_06262018_508.pdf.
[172] U.S. Senate Committee on the Budget, *Chairman Enzi Presses Federal IG Offices on Housing Duplication and Overlap*, (March 15, 2018), https://www.budget.senate.gov/chairman/oversight/chairman-enzi-presses-federal-ig-offices_on-housing-duplication-and-overlap.

properties and serve the most vulnerable families in the nation, with a high concentration of children, elderly, people with disabilities, and people of color.[173]

Unfortunately, problems plague the national affordable housing stock and, particularly, HUD's programs. HUD's early real estate development practices were guided by systemic racism[174] and inhumane design.[175] Decades of public disinvestment have left properties crumbling, inefficient, unhealthy, and susceptible to disaster.[176] Program structure, capacity shortages, and resistance to change keep our affordable housing programs, building stock, and vulnerable families stuck in a dysfunctional past. But it doesn't have to be this way.

Clean energy is a powerful solution to these problems. Energy-efficiency and renewable-energy projects in the affordable housing sector cut down on wasteful spending, generate new revenue streams, and create good, green, local jobs[177] –all of which mean money that can be immediately reinvested in those people and properties who've heretofore been ignored. Moreover, clean energy projects produce additional critical co-benefits beyond financial and environmental concerns, including improvements to public health and disaster resilience.[178]

To use clean energy as a transformative tool, the following realities must be addressed:

- **HUD must fully characterize its housing stock and accurately track how much it spends on utility costs.**

[173] National Law Income Housing Coalition, *Who Lives in Federally Assisted Housing?*, 2 Housing Spotlight (Nov 2012), https://nlihc.org/sites/default/files/HousingSpotlight2-2.pdf.
[174] Ari Shapiro & Richard Rothstein, *'The Color Of Law' Details How U.S. Housing Policies Created Segregation*, National Public Radio (May 17, 2017), https://www.npr.org/2017/05/17/528822128/the-color-of-law-details-how-u-s-housing-policies-created-segregation.
[175] "Geographer Rashad Shabazz, for one, recalls in his book *Spatializing Blackness* how the housing project in Chicago where he grew up…felt more like a prison than a home. Accounts of isolation, confinement, and poor maintenance are echoed by public housing residents nationwide." Ella Comberg, *7 Lessons from New York's New Affordable Housing Design Guide*, Arch Daily (June 1, 2018), https://www.archdaily.com/894973/7-lessons-from-new-yorks-new-affordable-housing-design-guide.
[176] Luis Ferré-Sadurní, *Amid Leaky Roofs and Lead Paint, Nycha Tenants Are Outraged and Hopeful*, The NYT (June 12, 2018), https://www.nytimes.com/2018/06/12/nyregion/nycha-housing-projects.html.
[177] U.S. Government Accountability Office, *Green Affordable Housing: HUD Has Made Progress in Promoting Green Building, but Expanding Efforts Could Help Reduce Energy Costs and Benefit Tenants*, (Oct. 2008), https://www.gao.gov/assets/290/282596.pdf.
[178] Ruth Ann Norton et al., *Non-Energy Benefits of Energy Efficiency and Weatherization Programs in Multifamily Housing: The Clean Power Plan and Policy Implications*, Green & Healthy Homes Initiative (Sept. 2016), https://www.greenandhealthyhomes.org/wp-content/uploads/ghhi.pdf.

HUD has very limited data on the basic characteristics of its buildings and has no accurate, auditable, or centralized accounting system to track taxpayer spending on utility costs. However, HUD staff are aware that a significant and growing proportion of the affordable housing budget is spent on utility costs,[179] billions of dollars could be saved by eliminating wasteful consumption,[180] hundreds of millions of dollars per year could be saved in payment errors,[181] and utility cost reduction efforts offer some of the highest returns on investment possible.[182] HUD's lack of baseline data, ongoing tracking, or modern data management systems prevent HUD and its grantees from being able to engage in 21st century property management and clean energy projects.

- **Federal grantees must be incentivized and assisted in saving money.**

Across its different programs, HUD reimburses nearly all of the utility costs for most of its affordable housing grantees and their tenants, providing them no financial incentive to build or operate properties efficiently. To correct this fundamental problem, some special incentives have been layered on to HUD's core programs.[183] However, this "layered fix" creates an incomplete and highly complex knot of policies, processes, and formulas that take individuals many years to learn; it's difficult for grantees to use and impossible for HUD to oversee. Frustration and fraud abounds. And, most of HUD's grantees simply cannot participate in existing clean energy programs due to structural barriers created by an inability to leverage required third-party capital from private markets and a lack of capacity in terms of staff

[179] Will Fischer, *Public Housing Squeezed Between Higher Utility Costs and Stagnant Funding*, Center on Budget and Policy Priorities (Oct. 11, 2006), https://www.cbpp.org/research/public-housing-squeezed-between-higher-utility-costs-and-stagnant-funding.

[180] A commonly used rule-of-thumb in the industry is that an average existing building wastes at least 30% of its energy and that it is possible to improve efficiency by at least this much in a cost effective manner (costs of retrofit will be covered by utility cost savings). "Study after study provides evidence that it is profitable to achieve a large amount of building energy efficiency. In a 2009 report, McKinsey & Company estimates the U.S. can reduce 28% of the commercial and residential building energy consumption by 2020, saving $1.2 trillion at only $500 billion cost. The National Academy of Sciences states in a 2009 report that the U.S. can save 32% of commercial building energy use by 2030. Rocky Mountain Institute estimates the U.S. can reduce at least 38% (up to 69%) of energy consumption in buildings by 2050 for a $1.4 trillion profit." RetroFit, *Guide to Building the Case for Deep Energy Retrofits*, Rocky Mountain Institute (Sept. 2012), https://rmi.org/wp-content/uploads/2017/04/Pathways-to-Zero_Bldg-Case-for-Deep-Retrofits_Report_2012.pdf.

[181] *Improper Payments for Utility Subsidies in Public Housing* (Dec. 20, 2018), on file with HUD Inspector General.

[182] *See* HUD utility cost savings estimates and budget planning for utility benchmarking program prepared for HUD Secretaries Shaun Donovan and Julian Castro, on file with HUD.

[183] Evan White, Utilities in Federally Subsidized Housing, June 2012, https://www.aceee.org/files/pdf/resource/white_utilities_in_federally_subsidized_housing_2012.pdf.

headcount, professional expertise, market awareness, and data access.[184] Further, recent changes in HUD policy ban the easiest and most popular method for bringing renewable energy to affordable housing – Power Purchase Agreements and Solar Leases.[185] Meanwhile, taxpayers and low-income communities lose out on the financial, environmental, health, and safety benefits of clean energy projects.

- **Federal investments must be cost effective in the long-term.**

HUD funds the new construction and rehabilitation of affordable housing and then funds the operations and maintenance of those same properties, including utility costs. However, HUD's building performance requirements are very low and sometimes nonexistent, leading the agency to make wasteful investments of taxpayer money over the property lifecycle. Moreover, HUD and the Federal Emergency Management Agency (FEMA) make increasingly large outlays for immediate response in disaster areas, but relatively little funding is provided to proactively improve the disaster resilience of the country as whole, before disaster strikes.[186] Lacking data, HUD has no way to determine which of its affordable housing properties are most vulnerable, and so it cannot protect those properties, its residents, or taxpayers from inevitable losses of money, physical infrastructure, cultural assets, and human life. With proper policy, tools, and data, HUD could strategically invest in clean energy projects that eliminate waste by promoting energy efficiency in general and energy independence during disasters.[187]

Recommended Actions:

- **Making Better Decisions through Building and Utility Data.**
    - Direct HUD to collect key building characteristic and utility cost data for the national affordable housing stock and to share it with federal and academic partners. Include accurate street addresses, square footage, floor count, unit count, occupancy rates, vulnerable populations, building age, construction type, building systems, utility types, metering configurations, utility consumption, and utility cost.
        - Expand the Department of Energy's (DOE) Green Button Data program to facilitate necessary data collection for multifamily properties.

[184] The Energy Programs Consortium (EPC), Multifamily Energy Efficiency: Reported Barriers and Emerging Practices, (Nov. 2013), https://www.aceee.org/files/pdf/resource/epc_%20multifamily_housing_13.pdf.
[185] *See* 2018 determinations by HUD Public Housing General Counsel regarding the permissibility of solar contracts, on file with HUD.
[186] Daniel J. Weiss & Jackie Weidman, *Disastrous Spending: Federal Disaster-Relief Expenditures Rise amid More Extreme Weather*, Center for American Progress (April 23, 2013), https://www.americanprogress.org/wp-content/uploads/2013/04/WeissDisasterSpending-1.pdf.
[187] U.S. Department of Housing and Urban Development, Combining Energy Efficiency and Disaster Mitigation Efforts in Residential Properties, (Spring 2017), https://www.huduser.gov/portal/periodicals/em/spring17/highlight2.html.

- Provide federal funding to modernize the data management and metering systems of energy, water, sewer, and solid waste utility companies nationwide, and require utility providers nationwide to provide at least 60 months of automated, standardized, and accurate utility data, on a unit and property basis, to all residents, owners, and managers of properties by 2025.
- Provide federal funding to cities to standardize and integrate property records systems nationwide.
- Develop public-private partnerships with real estate data companies to enhance the federal government's data access and analytics capabilities.

- Direct and support HUD in relaunching its Comprehensive Strategy for Utility Benchmarking and align utility benchmarking policies across HUD and USDA grantees.
  - In the first 100 days, unblock HUD's Federal Register Notices FR–5916–N–17 and FR–5913–N–27, and enact the utility benchmarking policies previously planned by HUD's Office of Multifamily Housing (MFH) and Office of Public & Indian Housing (PIH).
  - Provide sufficient federal funding to build the HUD-USDA Utility Benchmarking and Building Performance Data System, as previously scoped with support by the Department of Energy (DOE), the General Services Administration (GSA), and the Department of Environmental Protection (EPA).
  - Reinstate the Obama administration's plan to align USDA's utility benchmarking policies with HUD's.
- Combine and use the data to support better decision making by the US Government, private companies, homeowners, and renters related to real estate investments and climate change risks and hazards.
  - In the first 100 days, find and eliminate payment errors made by HUD's Office of Public & Indian Housing for utility costs in public housing, amounting to hundreds of millions of dollars per year, and prevent future problems through utility benchmarking and software design. Involve the Inspector General (IG) and Government Accountability Office (GAO) as needed.
  - Use the collected data to further automate the approval process for affordable housing properties for DOE's Weatherization Assistance Program.
  - In the first 100 days, direct FEMA to provide the public with forward-looking flood maps, and cross-reference HUD, USDA, and Treasury's affordable housing properties.
  - Direct DOE to map the renewable energy potential of all affordable housing properties nationwide and provide HUD, USDA, and Treasury consolidated reports to use in investment planning and to provide to their grantees.
  - Reestablish the HUD-NOAA partnership to develop a free climate change vulnerability assessment tool for HUD grantees in the affordable housing programs and Community Development Block Grant (CDBG) program.
  - Fund a study to determine the extent to which HUD, USDA, and Treasury are investing in housing and communities that are likely to be destroyed before the

end of their useful life, and develop recommendations for evaluating investments going forward.

- Fund a study to determine which housing and communities in the United States will need to be relocated in the future due to sea-level rise, how and when to conduct "managed retreat," and what the human and economic costs of such action will be, including the effect of lost home equity on middle-class wealth.
- In the first 100 days, unblock the publication of HUD's already-complete guidebook on disaster resilience for American communities in the CDBG program.
- Provide substantial technical assistance funding to aid affordable housing providers with adoption utility benchmarking practices, disaster resilience planning, and clean energy projects. Relaunch the partnership between HUD and the Environmental Defense Fund's Climate Corps program to send skilled interns to affordable housing providers across the country to institute their internal utility benchmarking practices.
- In the first 100 days, provide full funding to finally eliminate all lead paint, water, and soil hazards from all housing -- affordable and market-rate -- in the country. This will not only stop the scourge of lead poisoning in the country once and for all, but it will clear a common barrier that prevents homes from being upgraded through the Weatherization Assistance Program and similar initiatives.

- **Incentivizing and Unblocking Cost-Saving Clean Energy Projects.**

  - Overhaul the funding formulas in HUD's PIH and MFH programs -- including for properties converting from PIH to MFH through the Rental Assistance Demonstration Program – to simply and directly incentivize all grantees and tenants to build and operate their housing units efficiently. This may be accomplished most quickly through legislation requiring funding formulas to be based on "benchmarked utility consumption and cost," since the negotiated rulemaking process within HUD has prevented such changes for decades.[188]
    - Base federal subsidies for owner-paid and tenant-paid energy and water costs on the national benchmarked average consumptions (as determined through the HUD-USDA Utility Benchmarking and Building Performance Data System) for each unique property multiplied by the prevailing average energy and water rates in a given zip code. Apportion the total subsidy amount between the owner and tenants as appropriate, depending on the owner-paid/tenant-paid utility split. In this way, owners and tenants will be inherently rewarded for efficiency. Utilize

[188] Harvard researchers first recommended utility benchmarking to HUD in 2003. It took until 2015 to achieve agreement within HUD to instate utility benchmarking. The Trump Administration promptly shelved the initiative upon taking power. Harvard University Graduate School of Design, Public Housing Operating Cost Study, U.S. Department of Housing and Urban Development (June 6, 2003), https://www.hud.gov/sites/documents/DOC_9238.PDF.

the same funding formula for both "public" and "assisted" housing. The utility subsidies for HUD, grantees, and tenants will be simple, predictable, fair, and properly incentivized.

- After funding formulas are overhauled, close HUD's Public Housing Energy Performance Contracting program and Rate Reduction Incentive, as well as the Multifamily Pay for Success program, since these "layered fix" financial incentives will no longer be needed and are overly complicated.

- Seed a federal "Power Up" revolving loan fund for paid-from-savings retrofit projects in affordable housing, allowing small grantees that can't attract private capital the opportunity to fund their building improvements and clean energy projects and to repay their loans through resultant cost savings. Consider extending eligibility for this program to city governments, non-profits, schools, hospitals, market-rate housing providers, single-family home owners, and other property owners that the private market doesn't serve.
- Direct HUD to develop a strategy for incentivizing utility cost reduction efforts in the Housing Choice Voucher program – likely but not exclusively through redesign of Utility Allowance policies. Reference and align with California and Washington State's "energy-efficient utility allowance" policies as appropriate.[189]
- In the first 100 days, direct HUD to stop banning the use of Third-Party Owned Solar Financing Contracts (i.e. Power Purchase Agreements and Solar Leases) in affordable housing. As necessary, work with Congress to amend the Antideficiency Act to clarify the ability of federal agencies and grantees to use innovative loans and payment plans to procure or lease large items over time, as in the case of renewable energy systems.
- Update outdated statutory and regulatory language to clear the path for HUD to incentivize truly sustainable, resilient, healthy, and equitable investment in the built environment with a long-range view, including making specific mention of renewable energy, water efficiency, indoor health, disaster resilience, and green jobs, in addition to just "energy efficiency."[190]
- In the first 100 days, reorganize HUD by merging the Office of Healthy Homes and Lead Hazard Control (OHHLHC), the Office of Environment and Energy (OEE), and the Office of Fair Housing and Equal Opportunity (FHEO) into a single Office of High-Performance Housing and Communities. Give it the mandate to coordinate across the agency to institute the use of the best, contemporary architectural and

[189] Nehemiah Stone et al., *Energy Efficiency-Based Utility Allowances: A Driver for More Efficient Affordable Housing*, (2004), https://www.aceee.org/files/proceedings/2004/data/papers/SS04_Panel2_Paper27.pdf.

[190] HUD lacks clear authorization and mandate for comprehensive programs and projects that promote sustainability, resilience, health, and opportunity, since the strongest and clearest statutory language that promotes this category of work is limited to "energy efficiency" in "public housing" only. The language does not even cover water efficiency, despite water being a major part of HUD's utility costs, and it does not extend to the whole of HUD's portfolio. Such narrowness is sometimes used to prevent HUD from promoting best practices and saving money in ways not explicitly covered by statute. 42 U.S.C. § § 15811-15842.

urban planning practices that promote public health, environmental sustainability, disaster resilience, equity, accessibility, and affordability.

- **Raising Minimum Standards for Building Design and Construction.**
  - Increase and align the minimum building performance requirements for new construction and rehabilitation across HUD's programs – especially those affecting affordable housing. Provide additional incentives for designing, building, and operating at elite levels. Require all new affordable housing constructed with federal money –including LIHTC properties– to be net-zero energy. Provide an interest rate deduction, mortgage insurance discount, or other tax incentive for homeowners using FHA loans to purchase net-zero energy homes.
  - Update federal procurement standards to permit and encourage the use of design competitions and lifecycle cost assessment in procurement by federal agencies and federal grantees alike.
  - Develop a public-private partnership to restructure model building codes into a unified, tiered structure of minimum codes, stretch codes, and reach codes; to update building codes to address climate change; and to educate builders, consumers, and policymakers that minimum building codes do not represent a guarantee of a reliable level of building safety, performance, or value.
  - Provide federal incentives to states, cities, counties, and tribal communities to improve building codes, with a goal of adopting net-zero requirements nationwide as a minimum. Fund community colleges and training centers across the nation to train a new generation of code inspectors, especially in rural areas.
  - Provide federal support for land banks as a method to rehabilitate abandoned properties into net-zero, transit-oriented affordable housing.

Making America's Schools Healthy and Resilient

Opportunity/Problem:

After decades of underinvestment, our nation's K-12 school infrastructure is unprepared to tackle the dual crises of COVID-19 and climate change. With the onset of COVID-19, concerns about school indoor indoor air quality and infrastructure have become central to the health and wellbeing of children, families, and communities. This presents an opportunity to improve health and equity within our K-12 schools and start them on a path to rapid decarbonization.

Recommended Action(s):

- Establish and fund a Sustainable School Corps through passage of the Rebuild America's Schools Act (H.R. 865 / S. 266)

Program Type:

√ New Program

Authority:

√ Existing Authority
√ Requires Legislation

Job Benefits:

This initiative could employ nearly 115,000 apprentices and supervisors for year long engagements. [191] For every $1 million of building retrofit work, approximately 20 jobs are created.[192]

Econ. Benefits:

Reopening schools is an imperative for restarting local economies in the short term. With children out of school, many parents are unable to fully perform their jobs. Over the long term, school closures have the potential to reduce the lifetime wages of those students impacted. The cost to the US in future earnings of four months of lost education is $2.5 trillion—12.7 percent of annual GDP.[193]

Equity Benefits:

Schools with greater need would be prioritized for the distribution of grant funds, in part to redress the long-standing imbalance in spending per pupil for underserved communities. In addition, grants for job training and certification would also focus on programs serving low income communities. In line with the Biden Climate Plan, 40% of funds would be directed to underserved communities.

Climate Plan Tie:

- Reduce the carbon footprint of the U.S. building stock 50% by 2035. Retrofitting public schools offers a pathway to achieve those reductions in building stock emissions.
- Create well-paying union jobs in the clean economy. The Sustainable School Corps will enliven the existing job training infrastructure to rapidly scale up our clean economy workforce delivering over 100,000 jobs in the process.
- Environmental justice. The Sustainable School Corps will focus investment in schools and workforce training in disadvantaged communities.

Battleground State Benefits:

K-12 schools in all battleground states would be beneficiaries of this work.

[191] 30,000 buildings would represent approximately 30% of the nearly 100,000 K-12 buildings. Jobs created are based on author calculations. See Table 1 in the Appendix.
[192] How Does Energy Efficiency Create Jobs?, American Council for An Energy-Efficient Economy (last visited Oct. 20, 2020), https://www.aceee.org/files/pdf/fact-sheet/ee-job-creation.pdf.
[193] George Psacharopoulos et al., The COVID-19 Cost of School Closures, Brookings Institution (Apr. 29, 2020), https://www.brookings.edu/blog/education-plus-development/2020/04/29/the-covid-19-cost-of-school-closures/.

Making America's Schools Healthy and Resilient

AUTHORS: Sara Ross, Jonathan Klein, Jennifer Moses

DATE: September 2020

Statement of Issue and Summary of Recommendations: America's schools are in crisis. With the arrival of the COVID-19 pandemic, schools across the country are grappling with how to continue to fulfill their mission safely. Since the onset of the pandemic, K-12 schools have been focused on finding new ways to deliver instruction, while continuing to support at-risk students. With competing demands and limited resources, schools have been unable to tackle a hard reality: Many of America's classrooms are unsafe.

Our schools have suffered from chronic underinvestment in infrastructure. With minimal support from the federal government, America's public schools suffer an annual shortfall of $46 billion.[194] As a result of this underinvestment, nearly half have reported problems related to indoor air quality (IAQ)."[195] While poor indoor air quality has long been understood to contribute to a variety of health and learning issues, the coronavirus has made improving indoor air quality urgently relevant to the 50 million K-12 students and 6 million adults who occupy close to 100,000 public school buildings.[196]

We cannot reopen schools safely without addressing indoor air quality. Centers for Disease Control and Prevention (CDC) guidance confirms that COVID-19 spreads via aerosols- thus, without good ventilation, indoor environments increase the risk of COVID transmission.[197] Accordingly, expert guidance for safely reopening schools details a series of recommendations including increasing outdoor air ventilation, filtering air and verifying ventilation and filtration performance.[198]

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[194] This shortfall represents both regular maintenance and operations costs as well as capital construction costs. Mary Filardo, *State of Our Schools: America's K–12 Facilities 2016*, 21st Century School Fund (2016), https://files.eric.ed.gov/fulltext/ED581630.pdf.
[195] Take Action to Improve Indoor Air Quality at Schools, Environmental Protection Agency (last visited Oct. 21, 2020), https://www.epa.gov/iaq-schools/take-action-improve-indoor-air-quality-schools.
[196] Nation's Infrastructure Report Card, American Society of Civil Engineers (2017), https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Schools-Final.pdf.
[197] How COVID-19 Spreads, The Centers for Disease Control and Prevention (last visited Sept. 21, 2020), https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html.
[198] Emily Jones et al., *Healthy Schools: Risk Reduction Strategies for Reopening Schools*, Harvard T.H. Chan School of Public Health Healthy Buildings Program (June 2020), https://schools.forhealth.org/wp-content/uploads/sites/19/2020/06/Harvard-Healthy-Buildings-Program-Schools-For-Health-Reopening-Covid19-June2020.pdf.

And yet, the COVID-19 pandemic is not the only crisis faced by our schools. From extreme weather, to rising sea levels and raging forest fires, communities are facing manifestations of climate change and demanding changes to school operations and curriculum to address both the moral imperative and the pragmatic realities.[199] Our schools, as the second largest sector of public infrastructure after roads and highways, constitute a critical component to addressing climate change and resiliency.[200]

The present moment offers an opportunity to tackle these two imperatives -- to make our schools safe in a time of COVID-19 and to make them resilient as we face climate change. The pandemic urgently requires us to address indoor air quality in schools. And yet doing so piecemeal without integrating in a broader goal of decarbonizing our public school infrastructure would be a missed opportunity. We recommend that the Biden-Harris administration:

- Establish and fund a Sustainable School Corps through passage of the *Rebuild America's Schools Act* (H.R. 865 / S. 266)

Opportunity / Problem Statement: After decades of underinvestment, our nation's K-12 school infrastructure is in severe disrepair and unprepared to tackle the dual crises of COVID-19 and climate change. Communities of color that have suffered from decades of policy choices and insufficient public and private investment have made the infrastructure needs of these communities acute.[201] Research strongly indicates that correcting this neglect would likely boost students' health and school performance. With the onset of COVID-19, concerns about school air quality and infrastructure have become central to the health and wellbeing of children, families, and communities.[202] There is an opportunity to improve health and equity within our K-12 schools and start them on a path to rapid decarbonization.

Proposed Recommendation:

"You'll die of old age. I'll die of climate change." — Climate Striking California Student (2019)

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[199] Oliver Milman, *US to Stage Its Largest Ever Climate Strike: 'Somebody Must Sound the Alarm,'* The Guardian (Sept. 20, 2019), https://www.theguardian.com/world/2019/sep/20/climate-strikes-us-students-greta-thunberg .

[200] Lauren Camera, *Will Trump Help Rebuild America's Schools?,* US News and World Report (Jan. 31, 2018), https://www.theguardian.com/world/2019/sep/20/climate-strikes-us-students-greta-thunberg .

[201] Chye-Ching Huang & Roderick Taylor, *Any Federal Infrastructure Package Should Boost Investment in Low-Income Communities*, Center on Budget and Policy Priorities (June 28, 2019), https://www.cbpp.org/research/federal-budget/any-federal-infrastructure-package-should-boost-investment-in-low-income.

[202] *Id.*

"The cheapest way to get carbon out of the atmosphere and create jobs is through energy efficiency.... If we retrofitted every public school in America, if we retrofitted every government building, and then if we started on all our commercial buildings, we'd create millions of construction jobs." — *Leo Gerard, International President of United Steelworkers*

The *Rebuild America's Schools Act* (H.R. 865 / S. 266) offers legislation which would annually inject $7 billion in federal funds to maintain our nation's school buildings. Passage of this Act should fund the Sustainable Schools Corps which will train and employ more than 100,000 under- or unemployed workers to make decades-overdue upgrades to our highest-need school buildings.

Energy costs represent the second highest operational expense to schools, second only to salaries, totaling approximately $8 billion annually nationwide.[203] Energy efficient upgrades and clean technologies can reduce that amount by $2 billion annually.[204] The specific projects would vary by school but include upgrading ventilation systems, replacing inoperable or leaky windows, enhancing insulation and air sealing, installing high-performance heating and cooling systems, installing energy-efficient lighting systems, and installing solar panels and other renewable energy sources.

The *Rebuild America's Schools Act* will create demand for the Sustainable Schools Corps to retrofit public K-12 schools across the country in urban, suburban, and rural settings. Priority would be given to school buildings in highest need of modernization, in low-income communities and native or indigenous communities where learning loss is expected to be most acute, and in communities most impacted by the coronavirus pandemic.[205]

Assuming $3 million in project costs per school for 30,000 schools generates an overall project spend of $90 billion.[206] Using the leverage of public-private funding models as contemplated in the National Climate Bank Act (S.2057) and as borne out in previous work, private sector capital

[203] "Guide to Financing EnergySmart Schools, U.S. Dep't of Energy, EnergySmart Schools Program (2018), https://www1.eere.energy.gov/buildings/publications/pdfs/energysmartschools/ess_financeguide_0708.pdf.
[204] Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Emission Programs, U.S. Environmental Protection Agency (2011), https://www.epa.gov/sites/production/files/2015-08/documents/k-12_guide.pdf.
[205] *See* Brenda Alvarez, *COVID-19 and the Impact on Communities of Color*, National Education Ass'n (Apr. 24, 2020), https://www.nea.org/advocating-for-change/new-from-nea/covid-19-and-impact-communities-color; Health Equity Considerations and Racial and Ethnic Minority Groups, Centers for Disease Control and Prevention (July 24, 2020), https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html.
[206] Author estimates for demonstrative purposes based on typical costs of energy efficient renovations ($30 per square ft) and typical school size (100,000 sq ft).

to fund these projects could be expected as a rate of three private sector dollars for every one public sector dollar.[207]

The Corps would leverage an existing and distributed infrastructure that is already adept at identifying, training, and certifying the next generation of clean energy workers. This infrastructure includes local community and technical colleges that have developed programs devoted to the study of clean energy such as Greenfield Community College in Greenfield, Massachusetts, Century College in White Bear Lake, Minnesota, and Texas State Technical College in Waco, Texas. These entities are already well-positioned in their local communities to identify, screen, train and onboard workers for a rapidly scaled-up Sustainable Schools Corps. Corps members would be matched with existing private sector contractors who regularly perform this building retrofit work.

The Corps would utilize existing certification programs such as the Building Performance Institute, ASHRAE, and NABCEP where appropriate to ensure Corps members are meeting generally accepted standards for proficiency in the field.

The Sustainable School Corps would be a collaborative effort between federal agencies and in consultation with state agencies to ensure the funds are targeting the schools most in need.[208]

Funding for the Corps could flow through existing grant programs for job training and/or be available as a tax-credit, tax-deduction, or a rebate for energy efficient school projects that flows to the person or entity primarily responsible for training Corps members, hiring Corps members, and/or creating apprenticeship jobs to implement the school retrofit projects.[209]

Check Boxes Below	
No	Is this a modification of an existing program?
No	Does this roll back a Trump Administration regulation?

[207] So-called "green banks" have already funded $3,670,000,000 is clean energy investments using $1,079,000,000 in public funds and $2,591,000,000 in private and philanthropic capital. *See* National Climate Bank Act, S. 2057, 116th Cong. (2020) (sponsored by Sen. Ed Markey), https://www.congress.gov/bill/116th-congress/senate-bill/2057/text.

[208] For example, the Departments of Education & Energy with technical assistance from the Environmental Protection Agency; the Centers for Disease Control and Prevention; and the National Institute for Occupational Safety and Health.

[209] For example, 179D Commercial Buildings Energy-Efficiency Tax Deduction is an existing deduction for energy efficiency projects. *See* 179D Commercial Buildings Energy-Efficiency Tax Deduction, U.S. Dep't of Energy (last visited Oct. 21, 2020), https://www.energy.gov/eere/buildings/179d-commercial-buildings-energy-efficiency-tax-deduction.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

The Sustainable School Corps Creates Jobs. If the Sustainable School Corps reached 30,000 buildings nationally, it could employ 5,000 crews of 20 for year-long apprenticeships, with 100,000 apprentices gaining meaningful work experience.[210] Adding the 15,000 supervisors to manage and train these crews, this initiative could aim to employ nearly 115,000 people for year long engagements.[211]

The Sustainable School Corps Improves the Economy. By addressing teacher and parent concerns about air quality and COVID transmission, retrofitting schools will have immediate positive impacts on the economy by facilitating the full reopening of schools. Fully reopening schools are a necessity for parents to re-engage in the workforce, and to protect the livelihoods of those working at schools. The members of the Sustainable School Corps themselves will earn $3 billion in wages which will energize local economic activity.[212] Over the longer term, a Sustainable School Corps readies our workforce by creating a cadre of trained workers who can carry out this retrofit work in building stock across multiple sectors (e.g. municipal, commercial, residential). Lastly, retrofitting our public schools will reduce ongoing operating costs and reduce the $8 billion spent annually by schools on utilities.

The Sustainable School Corps Addresses Climate Change. The Sustainable School Corps would help to reduce the greenhouse gas (GHG) emissions of our public schools which are the second largest sector of the country's public infrastructure. America's K-12 public schools include >100,000 buildings (totaling 7.5 billion square feet – equivalent to 2,800 Empire State Buildings) on an estimated two million acres of land.[213] Energy efficient upgrades and clean technologies in just one elementary school decrease greenhouse gas (GHG) emissions by ~1,000 metric tons annually -- equivalent to the emissions associated with 2,504,911 miles driven by an average passenger vehicle.[214] If the Corps delivered energy efficient upgrades and clean technologies to 30,000 schools, 30,000,000 metric tons of emissions could be averted annually.

How the Recommendation Supports Frontline or other Underserved Communities:

Federal investment would help address school building inequity in low income communities and communities of color that, at the same time, disproportionately bear the effects of the pandemic

[210] Author estimates. See Table 1 in the appendix.
[211] Author estimates. See Table 1 in the appendix.
[212] Author estimates. See Table 1 in the appendix.
[213] Mary Filardo, *State of Our Schools: America's K–12 Facilities 2016*, 21st Century School Fund (2016), https://files.eric.ed.gov/fulltext/ED581630.pdf.
[214] Author calculation. Assumes 85,000 sq ft school that achieves an annual 1.4 million kWh reduction in energy usage. Energy usage reductions are converted into reductions in GHG emissions using the EPA's GHG equivalent calculator available at: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

and of environmental racism. The *Rebuild America's Schools Act* (H.R. 865 / S. 266) makes specific provision for the prioritization of schools in underserved neighborhoods.

In addition, on the job training side, the Corps would seek out specialized efforts such as California's RichmondBUILD Academy, the Rising Sun Center for Opportunity's Climate Careers program, Elevate Energy's Contractor Accelerator, and RMI and Emerald Cities Collaborative's Contractor Academy to attract a diverse set of applicants.

How the Recommendation Supports the Biden Climate Plan:

1. The Biden Climate Plan articulates a goal of *reducing the carbon footprint of the U.S. building stock 50% by 2035*. Retrofitting public schools offers a pathway to achieve those reductions in building stock emissions.
2. The Biden Climate Plan seeks to *create well-paying union jobs* in the clean economy. The Sustainable School Corps will enliven the existing job training infrastructure to rapidly scale up our clean economy workforce delivering over 100,000 jobs in the process.
3. The Biden Climate Plan seeks *environmental justice for disadvantaged communities*. The Sustainable School Corps will focus investment in schools and workforce training in underserved communities.

Key Battleground State Activity:

The integration of this clean energy work in the public school system means that K-12 schools in all battleground states would be beneficiaries of this work.

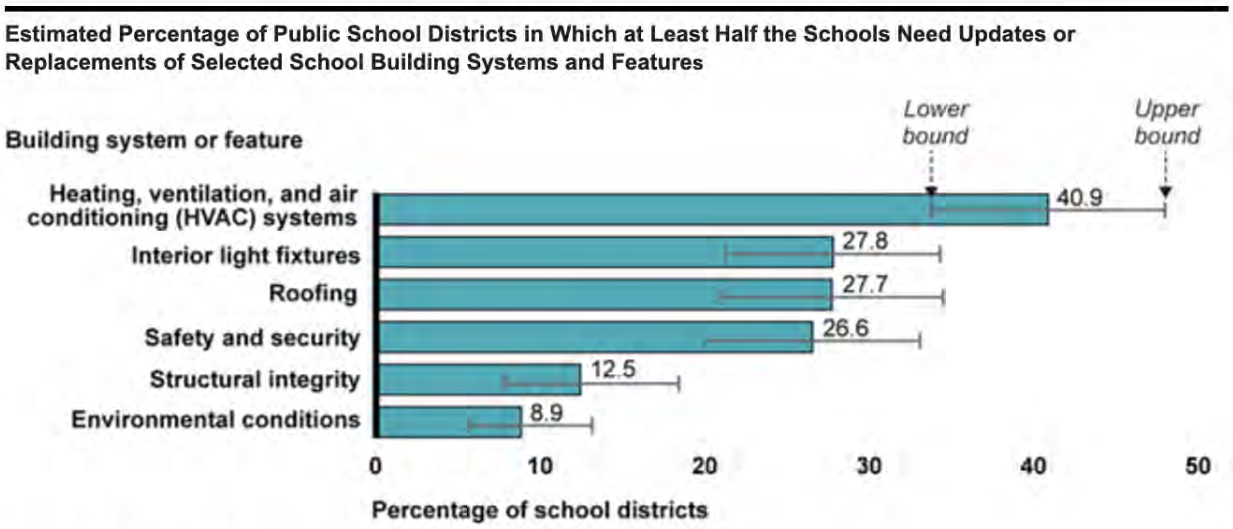
APPENDIX

Table 1. Estimates on Sustainable School Corps size

# Projects per year per crew	6		
Target # of buildings	30,000		
# of Crews needed	5000		
Apprentices		**Supervisors / Masters**	
# Apprentices per crew	20	# Supervisors / Masters per crew	3
Total # of Apprentices	100,000	Total # of Supervisors / Masters	15,000
Apprentices hourly wage	$25	Supervisor hourly wage	$75
Hours per project	120	Hours per project	140
Wages per project (indv)	$3,000	Wages per project (indv)	$10,500

Wages per project (crew)	$60,000	Wages per project (crew)	$31,500
Year-long wages (indv)	$18,000	Year-long wages (indv)	$63,000
Total wages (all buildings)	$1,800,000,000	Total wages (all buildings)	$945,000,000

Figure 1. GAO reporting on School Upgrades



Source: GAO analysis of school district survey data. | GAO-20-494

Note: GAO administered the survey from August to October 2019. Thin bars in the chart display the 95 percent confidence interval for each estimate.

Mobilizing Public and Private Investment

Fund a National Climate Bank

Opportunity/Problem:

30 million Americans are collecting unemployment benefits, and Congress hasn't spent a dollar to create new jobs and put people back to work. The US is also confronting climate and racial equity crises. President-elect Biden can put millions back to work, strengthen frontline communities, and reduce GHG emissionswith innovative public finance through the National Climate Bank.

Recommended Action(s):

- Publicly endorse the National Climate Bank Act.
- Once in office, include $35 billion in funding for the non-profit NCB as partof a climate-infrastructure and justice-oriented stimulus plan

Program Type:

√ New Program

Authority:

√ Requires Legislation

Job Benefits:

Analysis shows $35 billion for NCB creates 5.4 million jobs in 5 years. Jobs will be in every corner of the US with larger benefits for communities of color. Jobs require all kinds of skills and are suitable for Americans of all backgrounds.

Econ. Benefits:

$35B for NCB drives $500B of total investment in 5 years with private sector leverage, and nearly $2T over 20 years. Investment will build clean energy and climate projects of all types. Using "green bank" model, every project built will save on energy costs, and will support thousands of small businesses.

Equity Benefits:

Per the NCB Act, a significant portion of investment must go to "climate-impacted communities." Also, the NCB must prioritize investments in those communities, all else equal. From the ground up, NCB dollars will flow to projects that deliver environmental justice and equity benefits.

Climate Plan Tie:

President-elect Biden's climate plan willl "develop innovative financing mechanisms that leverage private sector dollars to maximize investment in the clean energy revolution." NCB is the institutional embodiment of this idea, as proven out by 15 state/local green banks that have driven $5B+ investment.

Battleground State Benefits:

These states could immediately benefit from National Climate Bank funds: OH, ME, MI, WI, PA, NC, FL, NV and CO.

Battleground State Benefits:

House passed the Act with $20 billion of funding in $1.5 trillion Moving Forward Act; Creation of National Climate Bank was recommendation by Rep. Castor's Climate Crisis Committee; bill endorsed by nearly 100 organizations, including leading environmental orgs and clean energy industry groups.

Fund a National Climate Bank

AUTHORS: Jeffrey Schub, Alex Kragie, Katherine Hamilton

DATE: September 1, 2020

Statement of Issue and Summary of Recommendations:
The Biden-Harris administration should support legislation to fund the National Climate Bank (NCB), a non-profit that will create millions of jobs through public-private investment in clean energy and climate related technologies. Built on the successful "green bank" model,[215] the NCB will spur $500 billion of private and public investment, create 5.4 million jobs in five years, and reduce GHG emissions while driving capital into frontline and environmental justice communities.[216] This bill has passed the House of Representatives twice in the 116th session of Congress. The Administration can enact this policy by including funding for the NCB in its climate and infrastructure-oriented stimulus proposals to Congress.

It is imperative that President Biden invest in job creation upon entering office, and do so in ways that specifically address three critical requirements:

1) *Investment must address the climate crisis*. The opportunity to invest in clean generation, movement, use and storage of energy using market-ready technologies is nearly boundless. Our recovery and transition to a clean and resilient energy future should be one and the same.
2) *Investment must address equity, inclusivity and climate justice*. This means using finance to lower energy costs for those overburdened, and strengthening frontline and communities of color through investment, job creation and wealth creation. This is critical because we cannot have a just climate transition without bringing everybody along and sharing in the gains.
3) *Investment must leverage multiples of private sector co-investment with each federal dollar spent*. This will make public dollars go farther, lessen the burden on taxpayers, and entice private market growth. And simultaneously, private capital will move in at greater scale with public backing.

[215] "Green banks" are mission-driven institutions that use innovative financing to mobilize public and private investment in order to accelerate the transition to clean energy, fight climate change, and support environmental justice. They are not literal banks, and are not depository institutions. Rather, they operate as speciality investment funds. For example, Michigan Saves has driven $250 million of investment to upgrade 25,000 residential and commercial buildings, delivering $65 million in energy bill savings. *See* American Green Bank Consortium, Green Banks in the United States: 2020 US Green Bank Annual Industry Report," (2020). *See also* Green Bank Network, www.greenbanknetwork.org.
[216] Vivid Economics, Bounce Back Greener: The Economic Impact Potential of a Clean Energy Jobs Fund in the USA, (June 2020).

The NCB is the tool to achieve these objectives. The National Climate Bank Act, endorsed and co-sponsored by VP-candidate Senator Harris, creates an independent, nonpartisan, nonprofit finance entity that will use a federal appropriation to mobilize private investment and make transformative change in our energy system. State and local green banks have already driven over $5B of investment, with each green bank dollar driving $3 of private co-investment.[217] The NCB will directly address climate justice needs with a mandate to prioritize investment in frontline and communities of color. And it will deliver funds through a growing network of state/local green banks, ensuring energy costs stay the same or drop through the transition.

The National Climate Bank Act was introduced by Senators Markey and Van Hollen and Rep. Dingell in 2019.[218] It was endorsed[219] and co-sponsored[220] by VP candidate Senator Kamala Harris. It passed the House twice in this session of Congress, first as part of the Moving Forward infrastructure package, and again as part of the Clean Economy Jobs clean energy package, both times with $20 billion in funding.[221] It was a recommendation of the House Select Committee on the Climate Crisis[222], as well as the Senate Democrats' Special Committee on the Climate Crisis.[223] And it is part of the Energy & Commerce Committee's CLEAN Future Act.[224] Nearly 100 organizations, including leading environmental and clean energy organizations have signed a letter of support.[225] Polling shows 7 in 10 Americans support funding the NCB, including a

[217] American Green Bank Consortium, *supra* note 215. *See also* Green Bank Network, *supra* note 215.
[218] H.R. 5416, 116th Cong. (2020).
[219] Li Zhou & Umair Irfan, *Kamala Harris's climate plan would take polluters to court*, Vox (Sept. 4, 2019), https://www.vox.com/policy-and-politics/2019/9/4/20847387/kamala-harris-2020-climate-change-policy.
[220] S. 2057, 116th Cong. (2020).
[221] Jean Haggerty, *National Climate Bank amendment added to House's pro-solar infrastructure bill*, PV Magazine (July 1, 2020), https://pv-magazine-usa.com/2020/07/01/national-climate-bank-amendment-added-to-the-houses-pro-solar-infrastructure-bill/; Press Release, Office of Senator Chris Van Hollen, Van Hollen Applauds House Passage of the Clean Economy Jobs and Innovation Act, (Sept. 25, 2020) https://www.vanhollen.senate.gov/news/press-releases/van-hollen-applauds-house-passage-of-the-clean-economy-jobs-and-innovation-act.
[222] Nick Sobczyk et al., *Here's the skinny on the Democrats' jumbo climate plan*, E&E News (July 1, 2020), https://www.eenews.net/eedaily/2020/07/01/stories/1063483561.
[223] Senate Democrats' Special Committee on the Climate Crisis, The Case for Climate Action:-Building a Clean Economy for the American People, (Aug. 25, 2020).
[224] Press Release, House Energy & Commerce Committee, E&C Leaders Release Framework of the Clean Future Act, a Bold New Plan to Achieve a 100 Percent Clean Economy by 2050, (Jan. 8, 2020).
[225] Coalition for Green Capital, *Nearly 100 Groups Mobilize to Push Congress for Clean Energy Jobs Fund in Infrastructure Bill*, (June 5, 2020), https://coalitionforgreencapital.com/nearly-100-groups-mobilize-to-push-congress-for-clean-energy-jobs-fund-in-infrastructure-bill/.

majority of Independents and Republicans.[226] And the idea of a national green bank was endorsed by multiple presidential candidates including Jay Inslee, Elizabeth Warren, Pete Buttigieg, Julian Castro, and Kamala Harris.

Opportunity / Problem Statement:
The Biden-Harris administration can put Americans back to work by building clean energy and resilient infrastructure. Much of the technology America needs for a carbon-free future already exists, but it needs to be invested in and built at an astronomical scale and pace. In the U.S., transitioning to a 100% renewable grid over 20 years requires $225 billion of new investment per year.[227] However only $78 billion of investment flowed last year.[228] The total of investment is not the only problem. Many barriers exist on a sector-by-sector basis that halt the flow of private capital, leave low-income and communities of color behind, and inhibit the growth of new businesses. These problems are rarely related to technology risk, and can be overcome with focused market development interventions and targeted use of capital.

The NCB will use a combination of financial interventions that leverage private capital and market development strategies to address this investment shortfall, and overcome barriers to equitably rebuild the economy on a clean energy platform. Leading environmental organizations, state and local leaders, clean energy industry associations, community leaders eager for economic growth, and small businesses across the country are supportive. The NCB has received consistent media coverage in many political and trade outlets.[229]

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[226] Coalition for Green Capital, *CGC Polling Results: 7 out of 10 Voters Nationally want Government to Fund the Non-Profit National Climate Bank*, (May 2020), https://coalitionforgreencapital.com/wp-content/uploads/cgc-national-climate-bank-polling.pdf.
[227] Wood Mackenzie, *Decarbonising US power grid "may cost US$4.5 trillion,"* (June 27, 2019), https://www.woodmac.com/press-releases/decarbonising-us-power-grid-may-cost-us$4.5-trillion/.
[228] Bloomberg NEF, *Clean Energy Investment Trends*, 2019, (Jan. 16 2020), https://data.bloomberglp.com/professional/sites/24/BloombergNEF-Clean-Energy-Investment-Trends-2019.pdf
[229] Maria Gallucci, *A prescription for a post-COVID economy: a national climate bank*, Salon (June 28, 2020), https://www.salon.com/2020/06/28/a-prescription-for-a-post-covid-economy-a-national-climate-bank_partner/; Nick Juliano & Catherine Boudreau, *Green banks step in*, Politico (June 3, 2020), https://www.politico.com/newsletters/morning-sustainability-preview/2020/06/03/green-banks-step-in-489405; Justine Calma, *Democrats are Pushing a National Climate Bank*, The Verge (Jan. 29, 2020), https://www.theverge.com/2020/1/29/21113300/democrats-green-bank-national-climate-change-capital-greenhouse-gases; Carolyn Fortuna, *Why You Should Care About the National Climate Bank*, CleanTechnica (Jan. 7, 2020), https://cleantechnica.com/2020/01/07/why-you-should-care-about-the-national-climate-bank-a-cleantechnica-exclusive/; Jean Haggerty, *National Climate Bank initiative could be a boon for solar*, PV Magazine (Dec. 3, 2020),

Proposed Recommendation:
Recommendation - President-elect Biden should endorse the National Climate Bank Act and include funding for it in his stimulus plan to be presented to Congress. No new agency or authority needs to be formed because the NCB is an independent non-profit. Its independence from the government is critical to its long-term viability and willingness for private actors to partner with it. Recent US history shows how federal clean energy financing programs within government can be shut down through political interference.[230] And current events in other countries with government-owned national green banks further confirm how essential it is for the NCB to be fully independent.[231] Federal financing programs placed within DOE, for example, are well suited to help advance and commercialize novel technologies. But this structure is not designed for the rapid, transformative deployment currently required. Time is essential; we cannot wait years for a new agency to be formed. With full funding, the NCB can begin financing projects, helping form and fund new state/local green banks (in whatever corporate form is expedient in each market), and funding existing state/local green banks within weeks.

The NCB will operate like a development bank, using its federal appropriation as the equivalent of an equity base. The $35 billion proposed appropriation will be used both for financing and to pay for its start-up operating costs. As loans are paid back, revenue will be used to pay for operating expenses. Over time, the NCB will build its own credit so it can borrow and increase its lending capacity. This model is different from a government-housed financing operation, which cannot borrow in capital markets, retain and reloan repaid loans, or make independent loan decisions (e.g, DOE Loan Programs office requires loan-by-loan approval of White House OMB.)

With the House already passing legislation to fund the NCB (called the Clean Energy and Sustainability Accelerator) two separate times in this current session,[232] the Biden-Harris administration can harness this legislative momentum and fund the NCB through stimulus.

Support for state and local governments & communities - The NCB supports state, local and community actors by helping form a network of green banks and then providing them the capital to finance local clean energy projects. While the most common model for green banks is

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https://pv-magazine-usa.com/2019/12/03/national-climate-bank-initiative-could-be-a-boon-for-solar/.
[230] Lisa Friedman, *Billions in Clean Energy Loans Go Unused as Coronavirus Ravages Economy*, New York Times (April 30, 2020), https://www.nytimes.com/2020/04/30/climate/clean-energy-loans-coronavirus-trump.html.
[231] Jeffrey Schub, *Australia Reminds Us Why the NCB Needs to Be Independent of Government*, Coalition for Green Capital (Aug. 31, 2020), https://coalitionforgreencapital.com/australia-reminds-us-why-the-ncb-needs-to-be-independent-of-government/.
[232] Press Release, Office of Rep. Debbie Dingell, House Passes Clean Energy and Sustainability Accelerator, (June 30, 2020).

a government-backed nonprofit,the precise form will be secondary to its function and mission. So many of the clean energy, resilience and Environmental Justice needs are local and need to be identified, shaped and prioritized by local leaders. Specific use cases for Climate Bank and green bank partners investment are, but not limited to:

- Credit support for low-to-moderate income (LMI) community solar subscription
- All-in-one financing for LMI rooftop hardening + rooftop solar + efficiency to increase resilience, lower insurance costs, and improve home comfort
- Make and aggregate loans to small businesses for net zero energy buildings in order to lower energy costs, which sometimes are the business's largest operating expense
- Heat pump and electrification financing for single family homes
- Electric bus fleet conversion with shared-savings financing and charging as a service
- Bond guarantees for wildlife management costs that offset future wildfire fighting costs

The NCB will issue requests for proposals (RFPs) to identify local partners seeking to form their green banks to receive technical assistance from the NCB. And it will also issue RFPs for specific investment use cases such as those listed above. And finally it will issue broad-based RFPs to solicit ideas, gather market intelligence and find new approaches to penetrating underserved markets. All funds deployed by the NCB, either through direct financing or through a state/local partner, will need to comply with all requirements on the use of funds. The NCB would be overseen by an independent Board of Directors, submit regular reports on its activities to Congress, and be subject to DOE inspector general review.

Private Sector Partnership - Public capital alone will not be enough to face this challenge. That is why the NCB will use the proven green bank financing mechanisms[233] that leverage multiple private dollars of investment per public dollar used. The NCB is designed to avoid "crowding out" capital, and focuses on underserved markets where good projects are left unaddressed and communities are left behind due to barriers only a public actor can overcome. The NCB uses methods to open up those markets for good, return-generating investment from private capital. These methods include acting as a first-mover to overcome collective action problems that prevent the creation of markets that generate public goods, addressing scale economy challenges by bundling smaller projects in a portfolio for resale to private investors, and mitigating real and perceived risk with credit support. New market opportunities not only mean more investment, but new businesses and jobs that come with them.

Check Boxes Below	
New	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

[233] American Green Bank Consortium, *supra* note 215. *See also* Green Bank Network, *supra* note 215.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
A recent independent expert analysis found that a NCB capitalized with $35 billion of federal funds would create 5.4 million job years in 5 years by mobilizing $500 billion of total investment into a range of clean energy technologies.[234] And these jobs would be across many sectors, in every corner of America, and would require blue and white-collar skillsets.

This investment will in turn address climate change by prioritizing those investments that have the greatest GHG emissions reduction potential per public dollar deployed. The NCB is authorized to invest in 7 sectors to alleviate the impacts of climate change: 1) renewable power generation; 2) building efficiency and electrification; 3) clean transportation; 4) industrial decarbonization; 5) grid infrastructure including transmission and storage; 6) sustainable agriculture including forestry; and 7) climate-resilient infrastructure. It is only through this flexible and broad investment scope, non-profit structure, and ability to be geographically targeted that federal funds can be used most efficiently to reduce emissions. A specific GHG reduction projection will be delivered before election day, pending a third-party analysis.[235]

The green bank model has enjoyed bipartisan support. Legislation to create the first green bank in Connecticut passed by a 36-0 margin in the State Senate and 138-9 margin in the State House. Republican Governor Brian Sandoval of Nevada also signed a green bank into law in 2018. The NCB could be lumped into any generic partisan attacks on the Green New Deal concept, but the underlying public-private tenets of the policy are consistently viewed favorably. While programs within the federal government can address early stage R&D and pilot projects, the NCB can focus on achieving transformative scale by deployment of already cost-effective clean energy technologies. With its tremendous job creation potential, the Biden Administration must not leave deployment policy out of its set of clean energy investment solutions.

How the Recommendation Supports Frontline or other Underserved Communities:
The NCB has unique capabilities to deliver benefits to frontline and communities of color, while also driving job creation, lowering energy costs and reducing emissions. As an independent non-profit with a flexible charter, it can do what hardly any other federal policy or agency can do - intentionally direct investment into underserved and targeted communities, dynamically responding to what is needed on the ground. A minimum amount of investment must go to targeted communities, and, all else equal, investment in those communities must be prioritized. In addition, the NCB will fund and work with local actors to control their own investment

[234] Vivid Economics, *supra* note 216. Per this analysis, $35 billion of federal funding can create $105 billion investment capacity, which can ultimately cause nearly $500 billion in total investment.
[235] Analysis forthcoming, also produced by Vivid Economics. *See* Coalition for Green Capital for results.

decisions to ensure benefits and wealth accrue in those communities. This also means business formation and job creation will accrue disproportionately in those targeted communities.

How the Recommendation Supports Biden's Climate Plan:
Biden's Climate Plan says that he will "develop innovative financing mechanisms that leverage private sector dollars to maximize investment in the clean energy revolution." The NCB is the institutional embodiment of this idea, as proven by 15 state and local green banks in the U.S. that have already driven over $5 billion investment each green bank dollar driving $3 of private co-investment.

More broadly, the NCB will fulfill nearly all of the pillars of Joe Biden's climate plan. First, the NCB invests in projects that reduce GHG emissions, moving us toward a 100% clean energy economy. Second, the NCB invests in climate resilience, mitigating harm to communities through technologies that will allow them to recover faster and more sustainably. Third, the NCB prioritizes investment in frontline communities, carving out funding specifically for those who need it the most. Finally, in most cases the NCB will require that project labor agreements be used and that prevailing wages be paid to workers. The NCB can also provide direct assistance to communities in transition, protecting workers and local economies that have been dependent on a singular polluting industry and are impacted by the climate transition.

Key Battleground State Activity:
Recent polling found that voters in Arizona, Colorado, Michigan, Pennsylvania and Wisconsin support the funding of a National Climate Bank by 2-to-1 margins.[236] This includes a majority of independent voters and a plurality of Republican voters, as well.

There are already green banks in Michigan,[237] Florida,[238] Colorado,[239] and Nevada,[240] and each of those entities needs more capital to address the clear investment need. And there are on-going green bank creation efforts in Wisconsin, North Carolina, Ohio, Pennsylvania and Minnesota. Each of these states could receive hundreds of millions, if not billions, of seed capital from the National Climate Bank, should it exist. And given the current fiscal condition of state and local governments, without federal support these green banks are unlikely to find the seed capital they need to support their clean energy economies and local communities. In all of these states, there are local leaders and community members already building support for the National Climate Bank and Joe Biden's election in anticipation of this policy delivering the funds their states' needs to drive job creation through clean energy investment.

[236] Coalition for Green Capital, *supra* note 226.
[237] *See* Michigan Saves, https://michigansaves.org/.
[238] *See* Solar and Energy Loan Fund (SELF), https://solarenergyloanfund.org/.
[239] *See* Colorado Clean Energy Fund, https://www.cocleanenergyfund.com/team.
[240] *See* Nevada Clean Energy Fund, http://energy.nv.gov/Resources/Nevada_Clean_Energy_Fund/.

Clean Energy Investment Credit for Deployment & Innovation in the U.S. Power Sector

Opportunity/Problem:

Congress has allowed clean energy tax credits to prematurely expire, causing job losses and uncertainty. The solar industry alone has lost tens of thousands of jobs and over half a million clean energy workers remained unemployed as of June 2020 due to the COVID pandemic.

Recommended Action(s):

The Biden-Harris administration should work with Congress to consolidate tax credits for individual clean energy and storage technologies into a single, technology-neutral, performance-based Clean Energy Investment Credit (CEIC) designed to promote rapid clean energy investment, innovation and deployment.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

The CEIC would create over 100,000 solar jobs and help reverse some of the hundreds of thousands of clean energy jobs lost as a result of the COVID crisis. Temporary refundability and extending tax incentives would save projects from failing due to tax equity unavailability, allowing installers to rehire workers.

Econ. Benefits:

Extending the Investment Tax Credit (ITC) would drive $87 billion of investment in solar alone.

Equity Benefits:

The CEIC would bring technologies directly to underserved and low-income communities, create local jobs, and accelerate retirement of fossil generators in communities. Direct-pay benefits provide access to frontline or underserved communities that may not have tax liabilities.

Tax credits generally reduce cost and expand the accessibility of clean energy for low and middle-income families and small businesses.

Climate Plan Tie:

This proposal supports the Biden Climate Plan's call to "move ambitiously to generate clean, American-made electricity to achieve a carbon pollution-free power sector by 2035," and specifically to "reform and extend the tax incentives we know generate energy efficiency and clean energy jobs."

Battleground State Benefits:

In several battleground states the clean energy industry has been among those hardest hit by the COVID-19 crisis. These include FL, NC, TX, PA, OH and MI.

Clean Energy Investment Credit for Deployment & Innovation in the U.S. Power Sector

Authors: Alex McDonough, Pierson Stoecklein, Jason Burwen

Date: September 2020

Statement of Issue and Summary of Recommendations:

Clean energy tax incentives have been a primary driver for solar, wind, fuel cells, combined heat and power, and other clean energy deployment, helping bring wind and solar to nearly 10% of U.S. energy generation.[241] By 2020, solar and wind alone reached 370,000 domestic jobs.[242] However, as a result of the COVID-19 crisis, the solar industry alone has lost tens of thousands of jobs in just a few short months and over half a million clean energy workers remain unemployed as of June 2020.[243]

The Biden-Harris administration should work with Congress to consolidate tax credits for individual clean energy and storage technologies into a single, technology-neutral, performance-based Clean Energy Investment Credit (CEIC) designed to promote rapid clean energy investment, innovation and deployment.[244] The rules should be designed to:

1) Extend and transition existing clean energy tax credits to the new CEIC;
2) Make the CEIC accessible to a broader range of early stage companies and technologies through direct-pay, refundability and/or transferability;
3) Allow CEIC to be monetized through direct-pay, refundability and/or transferability, without further Congressional action, when the tax equity market contracts; and
4) Provide a tax credit adder to projects that: (a) serve disadvantaged communities; (b) are comprised of clean energy generation technology which is first-of-a-kind or emerging;

[241] Kenneth Bossong, *Solar and wind energy provide almost 10 percent of total generation in the US in 2019*, Renewable Energy World (Oct. 28, 2019), https://www.renewableenergyworld.com/2019/10/28/solar-and-wind-energy-provide-almost-10-percent-of-total-generation-in-the-us-in-2019/#gref.
[242] American Wind Energy Association, *Wind Powers Job Growth*, https://www.awea.org/wind-101/benefits-of-wind/powering-job-growth; Press Release, Solar Energy Industries Association, COVID-19 Erases Five Years of Solar Job Growth, (May 18, 2020), https://www.seia.org/news/covid-19-erases-five-years-solar-job-growth#:~:text=Solar%20job%20losses%20due%20to,%243.2%20billion%20in%20economic%20investment.
[243] E2, *Clean Energy & COVID-19 Crisis: July 2020 Unemployment Analysis*, (Aug. 12, 2020), https://e2.org/reports/clean-jobs-covid-economic-crisis-july-2020/.
[244] Note: This paper focuses on tax credits directly related to the U.S. power generation sector (including energy storage) but does not address other clean energy tax credits such as those focused on building efficiency upgrades, plug-in electric vehicles, etc.

(c) directly replace existing fossil fuel capacity; (d) meet particular wage and labor standards; or (e) satisfy minimum domestic content requirements.

Opportunity / Problem Statement:

Congress has taken a patchwork approach to tax policy for incenting clean energy investment, including haphazardly allowing credits to prematurely expire, causing job losses and uncertainty.[245] Despite the economic downturn and job losses caused by the COVID-19 pandemic, Congress has failed to act on continuing these credits. As a result, clean energy companies are reducing their workforces to prepare for the tax credit phase down/out concurrent with a recession economy, rather than growing them to accelerate towards a net-zero carbon energy future.[246]

A technology-specific tax code inherently stifles innovation because it cannot envision or include valuable new clean energy technologies that will be developed in the future. The tax code must be reconstructed with a dynamic incentive structure that promotes worthwhile innovations as they occur. The Biden-Harris Administration should work with Congress to reform and consolidate many of the 44 clean energy tax credits,[247] and continue providing tax-based incentives to drive deployment and innovation based on carbon reduction goals. By establishing an enduring, carbon performance-based energy tax incentive structure, the Biden-Harris Administration and Congress would avoid unnecessarily picking "winners" and "losers" and the market distortions caused by inconsistent, piecemeal and unpredictable extensions of technology-specific tax credits.

Proposed Recommendation:

Check Boxes Below

[245] The PTC was originally enacted in 1992 and the ITC in 2005. The ITC was significantly expanded by the Energy Improvement and Extension Act of 2008, which extended the duration of the existing credits for solar energy, fuel cells and microturbines by eight years; increased the credit amount for fuel cells; established new credits for small wind-energy systems, geothermal heat pumps, and combined heat and power (CHP) systems; allowed utilities to use the credits; and allowed taxpayers to take the credit against the alternative minimum tax (AMT), subject to certain limitations. In late 2015, the Consolidated Appropriations Act extended the ITC for solar and PTC-eligible technologies, for which the ITC was set to expire in 2016. The Bipartisan Budget Act of 2018 retroactively reinstated the ITC for the "orphaned" technologies (including fuel cells, microturbines, combined heat and power, small hydro, geothermal, etc.), which had historically been ITC-eligible but were left out of the 2015 year-end deal.
[246] Under existing law, H.R. 1892 "Bipartisan Budget Act of 2018" by the end of 2022, the ITC is scheduled to phase out entirely or down to 10 percent, depending on the specific technology type. https://www.congress.gov/bill/115th-congress/house-bill/1892/text/
[247] U.S. Senate Committee on Finance, *Clean Energy for American Act (Summary)*, (2019) https://www.finance.senate.gov/imo/media/doc/Clean%20Energy%20for%20America%20Act%20of%202019%20-%20One%20Pager.pdf.

X	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

The following technology-neutral tax credit approach would ensure the greatest incentives are awarded to the clean energy technologies delivering the greatest emissions reductions benefits.

Temporary Transition Credits & Direct Pay

To provide transition relief and time for administrative coordination, existing clean energy credits should be restored, extended and expanded to immediately level the playing field for innovative new clean energy technologies, such as storage, not contemplated at the time that the ITC construct was originally added to the tax code. Specifically, this would include extending, through 2025, the existing ITC for solar, fuel cells, combined heat and power, small wind, and other currently eligible energy property. The credit for offshore wind should be resurrected and ITC eligibility should be further expanded to include stand-alone energy storage (e.g., rechargeable batteries, hydroelectric dams and pumped hydro facilities), waste energy recovery property, biogas production equipment, and linear generators.[248]

The Production Tax Credit (PTC), which provides a credit per kilowatt-hour generated by eligible wind projects, should be phased out in favor of the CEIC on the same timeline as the phasing out of technology-specific tax credits. Eliminating the PTC while improving and expanding access to the new CEIC will better align project economics with broader market fundamentals and create equitable, technology-neutral treatment of clean energy technologies. During the market entry of a new clean energy technology,[249] or during a recession or other economic downturn, eligible taxpayers should be able to elect a "direct-pay" option in lieu of the CEIC.[250] Instead of offsetting future income tax liability, an eligible taxpayer could receive a cash payment equal to 85 percent of the value of the credit for years 1, 2 and 3, then 50% in years 4 and 5.

Clean Energy Investment Credit - Building on the success of the PTC and ITC[251]

[248] The Moving Forward Act (H.R. 2), passed by the House in July 2020, largely mirrors this ITC proposal. H.R. 2, 116th Cong. (2020).
[249] As determined by the Secretary of the Treasury in consultation with the Secretary of Energy, and for a period of five years. As an alternative to tying availability of the direct-pay option to technology type, the direct-pay option could also be tied to each specific technology manufacturer (similar to the current ITC for plug-in electric vehicles).
[250] For purposes of this concept paper, and reference to "direct-pay" is also intended to include refundability and transferability.
[251] Although not the focus of this policy proposal, equal treatment of homeowners and businesses is recommended--homeowners that install onsite generation, including rooftop solar or small wind turbines, or energy storage technologies, should be eligible for a personal tax

The CEIC should be scaled relative to the technology's carbon emissions – measured as grams of carbon dioxide equivalents (CO2e) emitted per kilowatt hour (KWh) generated.[252]

1. **Zero emission technologies** (including those with de minimis incidental emissions) qualify for the maximum credit – a 30 percent CEIC.
2. **Technologies that emit at least 75 percent less carbon** than the current nationwide average for electricity generation can qualify for a 23 percent credit.
3. **Technologies that emit at least 50 percent less carbon** than the current nationwide average for electricity generation can qualify for a 15 percent credit.
4. **Combined heat and power systems (CHP)** qualify if the emissions rate is calculated using both electrical and useful thermal energy.[253] Qualifying microgrid systems may elect to use an avoided emissions calculation.
5. **Carbon capture equipment** installed at a power plant placed in service before January 1, 2021 and which reduces carbon emissions by at least 50 percent may claim the maximum 30 percent CEIC for those investments.
6. **Energy storage equipment** that is co-located or virtually paired with the technologies/facilities described in Items 1-4 above can claim the CEIC in an amount equal to that applicable to the paired/co-located clean energy generation technology. Energy storage includes all technologies capable of receiving an input of electricity, storing it, and re-delivering it as electricity (e.g., hydroelectric pumped storage, thermal energy storage, and batteries).
7. **Microgrids** serving critical infrastructure load with clean energy are eligible[254] that can be operated as a single and controllable entity, and have the ability to (i) connect to, disconnect from, or run in parallel with the applicable grid region, or (ii) be managed and isolated from the grid to withstand larger disturbances and supply electricity to connected critical infrastructure.

Credit Phase Out

The credits are set to phase out when emission targets are achieved: when EPA and DOE certify that the electric power sector emits 50 percent less carbon than 2020 levels, the incentives will be phased out over five years following the below schedule.

Year 1: 26%; Year 2: 22%; Year 3: 18%; Year 4: 14%; Year 5: 10%; Year 6: 0%

credit at the rates described herein, using existing [Section 25D Residential Energy Efficient Property tax credit rules]. 25 U.S.C. § 25D.

[252] The Appendix provides an alternative to the tiered approach to credit allocation and eligibility that is focused on project-specific or technology-specific emissions and affords some CEIC amount based on even modest carbon emissions reductions.

[253] Under the proposal, the British thermal units (BTUs) of useful thermal energy in a CHP system are converted to kilowatt hours using the facility's heat rate (the number of BTUs required to generate 1 KWh).

[254] Credit amount is based upon avoided emissions using the same methodology applied to standalone clean energy technologies) provided that the microgrid is subject to appropriate maximum capacity limitations.

Tax Credit Adders

Credit adders provide additional incentives, which can range in amount (e.g., from 5 to 10 percent) based upon the Biden-Harris Administration's priorities, to further promote critical practices or objectives. Examples of potential adders include but are not limited to:

- Disadvantaged Community Incentive
  - Eligibility: A qualified clean energy project located in an area in which a majority of residents have an income of less than 80% of Area Median Income.

- First-of-a-Kind/Emerging Technology Incentive (*see H.R. 5523, Sec. 3*)
  - Eligibility: A qualified clean energy project will be treated as the first-of-a-kind if it is one of the first three original demonstrations in the U.S. of a megawatt-scale electric power generation facility which generates revenue from sales of electric power to an unrelated person.

- Fossil Fuel Capacity Retirement Incentive
  - Eligibility: A qualified clean energy project must be developed pursuant to a contract with the owner of a fossil fuel power plant with 5 years or more of operating life remaining (or a state or local agency that regulates such plant), to retire the plant and to place eligible technology in service within one year.

- Labor and Wage Standards *(see S. 2185, Sec. 2(b)(3))*
  - Eligibility: (1) Prevailing wage for all skilled and/or trade laborers utilized during project construction; and (2) labor standards, including restrictions on use of contractors who are not employees, disclosure of violations of labor laws and regulations, neutrality towards collective bargaining, etc.

- Domestic Content Requirements (*see H.R. 7095*)
  - Eligibility: A qualified clean energy project for which 50% of equipment costs derive from equipment provided by companies located in the U.S.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

- **Bringing Back Lost Jobs:**
  - Temporary refundability and providing more time with tax incentives would save projects from failing due to unavailability of tax equity,[255] allow clean energy installers to rehire laid-off workers rather than cut jobs due to the phase-out of the

[255] Brian Eckhouse, *Covid Created a U.S. Clean Energy Shortfall of Up to $23 Billion*, Bloomberg Green (July 15, 2020), https://www.bloomberg.com/news/articles/2020-07-15/covid-likely-created-23-billion-shortfall-for-u-s-clean-energy.

ITC and PTC in 2021 and beyond. Extending the ITC for solar alone would create over 100,000 jobs.[256]

- **Climate Benefits:**
  - More time with clean energy tax credits would significantly reduce carbon reductions.[257]

How the Recommendation Supports Frontline or other Underserved Communities:
The proposed adders for disadvantaged communities and fossil fuel capacity retirement provide additional incentives to: (1) bring clean renewable energy technologies directly to underserved and low-income communities, empowering them with resilient local power sources and creating jobs that benefit the community; and (2) install clean energy resources that directly accelerate retirement of fossil fuel generators which are disproportionately sited in underserved and low-income communities. Direct-pay benefits provide access to those benefits to frontline or underserved communities that may not have tax liabilities; clean energy tax credits can reduce the cost and therefore the accessibility of clean energy resources, especially distributed energy resources, for low and middle-income families as well as small businesses.

How the Recommendation Supports Biden's Climate Plan:
This proposal supports the Biden Climate Plan's call to "move ambitiously to generate clean, American-made electricity to achieve a carbon pollution-free power sector by 2035," and specifically to "reform and extend the tax incentives we know generate energy efficiency and clean energy jobs."

Key Battleground State Activity:
In several battleground states, the clean energy industry has been among those hardest hit by the COVID-19 crisis. Cumulative job losses (and cumulative percentage decline) in Florida, Michigan, North Carolina, Ohio, Pennsylvania and Texas are highlighted below:[258]

Florida: 26,521; 15.8%	Ohio: 16,494; 14.2%
Michigan: 24,525; 18.4%	Pennsylvania: 18,866; 19.4%

[256]Austin Perea & Colin Smith, Impact of Solar Investment Tax Credit Extension, Solar Energy Industries Association (Sept. 2019), https://www.seia.org/sites/default/files/2019-09/Impact%20of%20Solar%20Investment%20Tax%20Credit%20Extension_Final%209-23-2019_v2.pdf.
[257] According to an analysis from the Rhodium Group, "Extending and expanding tax credits through 2025 for zero-emitting generation including wind, solar or nuclear could achieve reductions of up to 125 million tons compared to current policy in 2025. This could fill up to 25% of the gap between US emissions under current policy and its Paris commitments." John Larsen et al., *Can Tax Credits Tackle Climate?*, Rhodium Group (Sept. 26, 2019), https://rhg.com/research/can-tax-credits-tackle-climate/.
[258] *See* Ram *supra* note 2.

North Carolina: 21,214; 18.5%	Texas: 24,659; 10.0%

Environmental, Social, and Governance (ESG): A Tool to Motivate All Industries to Invest in and Use Clean Energy

Opportunity/Problem:

Without a uniform standard, reliable market structure, and federal leadership to define and measure ESG progress, both public and private sectors in the clean energy sector are missing out on a significant opportunity to help public companies seeking to improve their ESG performance through their operations and investments.

Recommended Action(s):

- Provide federal government technical assistance to small and medium-size businesses to participate in green financing programs more effectively.
- Prioritize federal government contracts that meet ESG benchmark scores through the Federal Acquisition Regulations (FAR).
- Award federal government grants to companies or national agencies which demonstrate outstanding ESG practices.

Program Type:

√ New Program

Authority:

√ Existing Authority

Job Benefits:

Setting federal ESG guidelines and incentives motivates more capital and innovators to move into the clean energy sector as well as identify the most ESG-effective enterprises to support. Greater utilization of ESG investing can also support increased deployment of job-creating renewable energy projects.

Econ. Benefits:

Setting federal standards which incentivize businesses to integrate ESG practices has been reported to strengthen business performance and employee motivation, which translates into greater productivity and output from the private sector.

Equity Benefits:

ESG addresses environmental justice issues by advocating and creating accountability on diversity and inclusion issues, corporate governance issues, and health equity issues in the private sector by creating federal standards and incentives for companies to weave these issues into their operations.

Climate Plan Tie:

ESG addresses environmental and climate issues by creating a quantifying scoring system and standards for private sector companies to benchmark upon and measure their clean energy deployment efforts, a key starting point to support clean energy investment and progress. Climate policies can incorporate and reward these private actions, leveraging private capital and actions.

Battleground State Benefits:

Minnesota, Colorado, Texas

Environmental, Social, and Governance (ESG) - A Tool for Private Enterprise to Support Clean Energy Use and Investment

Authors: Aaron Kraus, Samina M. Bharmal, Hannah Hunt, Melissa Zhang

Date: August 2020

Opportunity / Problem Statement:

Environmental, social, and governance (ESG) performance refers to measures that assess how well public companies are meeting key goals for making their operations more sustainable and more equitable. The market's growing recognition that climate change can affect a company's long-term financial performance has caused companies to identify and seek to address their environmental impacts—both direct and indirect—-- across their supply chains. In addition, major private investors and some state governments have increasingly pressured public companies doing business in the United States to address their ESG performance. With the COVID-19 pandemic, companies see in sharp relief the effects of climate change—for example, supply chain disruptions and swings in energy consumption—and ESG-focused funds have outperformed broader market portfolios.[215]

This strong market signal for major companies to use an ESG-focused path to address climate change creates a major opportunity for expansion of clean energy to address ESG performance, as well as an opportunity to focus private enterprises on incorporating environmental justice and equity into their business practices. Unfortunately, there is no reliable structure for adopting clean energy to improve ESG performance, leading to subjective attempts by market participants that complicate progress toward addressing climate change and creating economic resilience. The federal government has identified no uniform way to define and measure ESG performance, leading to a marketplace replete with a mix of approaches for defining ESG goals and demonstrating progress. At the federal level, the U.S. Securities and Exchange Commission (SEC) continues to focus on the "materiality" standard for required disclosures in annual 10-K and other periodic filings for public companies and has turned away from the SEC Advisory Committee's letter urging the agency to include ESG factors in its reporting requirements. The U.S. Department of Labor has similarly turned away from ESG, limiting fiduciaries from using ESG factors to influence investment decisions. A U.S. Government Accountability Office (GAO) Report commissioned by Sen. Mark Warner similarly described the lack of federal government leadership on this issue. Meanwhile, a number of states have passed laws requiring their state

[215] Jon Hale, *U.S. ESG Funds Outperformed Conventional Funds in 2019*, Morning Star (April 16, 2020), https://www.morningstar.com/articles/973590/us-esg-funds-outperformed-conventional-funds-in-2019.

funds to account for ESG factors, and both EU and Chinese regulators have enacted national policy requiring ESG disclosure from issuers and fund managers.[216]

Without a reliable market structure for addressing ESG performance, public companies cannot identify under what conditions turning to renewable energy can benefit their financial performance goals. Nor can companies, investors, or governments reliably compare ESG performance. Clean energy provides a ready-made solution for making progress toward addressing ESG factors, and to making companies more financially resilient. Federal leadership to develop a reliable structure for establishing ESG performance factors and measuring progress toward them will unlock new opportunities to adopt clean energy and to address justice and equity challenges.

Proposed Recommendations:

A Biden-Harris administration can leverage private capital to address climate, clean energy, and equity and justice by taking the following steps to improve the market for investments that meet ESG performance standards.

Financing Assistance for Smaller Commercial and Industrial Sectors - ESG goals must not just be about incentivizing good environmental practices for large Fortune 1000 corporations. The large and often ignored "missing middle" in the commercial and industrial sector is critical to meeting climate and equity challenges. To capture the opportunities of ESG goals in these sectors, the federal government must provide - or provide technical assistance to state and local government to provide for - tools to help these companies finance projects that meet corporate ESG goals. Federal financing assistance through a federal Green Bank or though Commercial Property Assessed Clean Energy (C-PACE) can help small and medium-size enterprises tap capital markets to support ESG-focused projects.

Federal Procurement Leadership - The federal government can also lead through its procurement of goods and services. Through the Federal Acquisition Regulations (FAR) system, the federal government can prioritize and favor contractors that meet certain ESG benchmarks and scores. This could heavily encourage the adoption of ESG practices for many firms that do business with the federal government. The ESG practices that can be encouraged

[216] These states include California, Illinois, Connecticut, Minnesota, Colorado, District of Columbia, Hawaii, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, and Washington. *See, e.g.*, CalSTRS, *Investment Policy for Mitigating Environmental, Social, and Governance Risks(ESG)*, https://www.calstrs.com/sites/main/files/file-attachments/calstrs_esg_policy.pdf?1544651199 (California's guidance); 30 ILCS 238 (Illinois's Sustainable Investing Act); Shawn T. Wooden, *Investment Policy Statement for the State of Connecticut Retirement Plans & Trust Funds*, State of Connecticut Treasurer's Office (April 10, 2019), https://www.ott.ct.gov/pensiondocs/IPStatementapproved_050819.pdf; Minnesota State Board of Investment, *SBI Investment Beliefs*, (June 14, 2018), https://www.house.leg.state.mn.us/comm/docs/a103a0e7-a90c-49ff-88ba-eb3fdcd54799.pdf.

can include environmental procedures, economic development for disadvantaged communities, and broader justice goals.

Applying ESG Standards to Federal Grants and Awards - The federal government can also award grants and other financial benefits with a lens that incorporates and prioritizes good ESG practices. For example, applicants for Community Development Block Grants from the Department of Housing and Urban Development could be prioritized if they were to include ESG practices in their application. The same could be said for New Market Tax Credit allocation to the Department of Treasury or grant applicants to the Department of Energy or any number of agencies that award these types of grants.

Improving ESG Measurement and Transparency - To help address some of the key challenges identified above - lack of consistency, clarity and transparency in ESG standards - there are a number of specific actions that the private sector can take in partnership with the government, to provide more certainty and ultimately growth to this market. For example, one strategy is for the ESG ratings agencies to develop a more transparent and less subjective (consistent) set of ratings for ESG performance and scoring. As noted in a policy whitepaper by the American Council on Renewable Energy called "ESG 2.0",[217] "This lack of uniformity can also lead to drastically different weighted ESG scores for each company relative to their respective peer groups and sectors, depending on the agency that scores them."

Such opacity in the market can hamper confidence, investment and growth - and ultimately reduce the positive climate impacts of ESG investing. As the Harvard Business Review noted, "A growing segment of the investment community is interested in those (ESG) impacts—and willing to allocate capital to firms that actively work to benefit society. The challenge for companies wishing to attract these investors is that there is currently no agreed-upon way of measuring a firm's "externalities"—the positive and negative effects of its products and services on society."[218]

To address this, the SEC could promulgate specific disclosure policies regarding ESG with the goal of adopting regulations or interpretations to harmonize ESG disclosure. In addition, modelling a bill by Rep. Vargas (D-CA) that was adopted by the House Financial Services Committee last year, the SEC could form a "Sustainable Finance Advisory Committee" within the SEC, which would make recommendations on which ESG metrics public companies should be required to disclose. This proposal also required a report to the SEC identifying challenges and opportunities for investors in sustainable finance and would recommend policy changes to encourage the flow of capital toward sustainable finance.[219]

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[217] Max Almono et al., How to Improve ESG Scoring to Better Reflect Renewable Energy Use and Investment, ACORE (Sept. 2019), https://acore.org/wp-content/uploads/2019/09/ACORE_ESG-2.0_Sept-2019.pdf.

[218] Robert G. Eccles & Svetlana Klimenko, *The Investor Revolution*, Harvard Business Review (May 2019), https://hbr.org/2019/05/the-investor-revolution.

[219] Press Release, Office of Juan Vargas, Rep. Varga's ESG Disclosure Simplification Act of 2019 Passes the Financial Service Committee (Sept. 20, 2019),

If the private sector - ideally in consultation with key government agencies, particularly the SEC - can help improve ESG reporting transparency and get the "rules of the road" right, it can help to unlock additional capital and lead to additional positive climate impacts.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Establishing ESG guidelines and implementation leadership at the federal level can significantly spur capital allocation and clean energy adoption by making ESG reporting standards more consistent. This outcome effectively encourages more operators and investors to commit resources to sustainability and helps the governments identify enterprises to support.

As McKinsey reports, paying attention to ESG factors corresponded to stronger business performance.[220] Companies are also facing increasing pressure from shareholders. BlackRock CEO Larry Fink recently stated "we will be increasingly disposed to vote against management and board directors when companies are not making sufficient progress on sustainability-related disclosures and the business practices and plans underlying them."[221] By differentiating companies which lead in ESG practices – by promoting more transparent ESG reporting – and enabling these companies to execute on their core competencies with less friction – such as reducing cost through public tax credits – this recommendation improves the long-term success of companies which could provide the most durable jobs.

Consider an apparel-maker based in Los Angeles which ships its product nationally. A strong ESG proposition can help the company create value in a multitude of ways. For example, a set of clear, consistent ESG guidelines can motivate the company to research and identify a less water-intensive way to develop fabric. As a result, the company can divest from its fossil-fuel-powered manufacturing partners, reduce costly energy and water consumption, earn sustainability subsidies, attract more customers with its brand, and boost employee motivation by strengthening its social purpose. In turn, this leads to longer-term operating success, job growth, and a positive impact on the environment.

Setting a robust set of ESG standards in financing, reporting and business practice rewards private sector participants for good ESG behavior, which translates to greater job creation and longer-term job security at the most sustainable companies. The EU has set an excellent

https://vargas.house.gov/media-center/press-releases/rep-vargas-esg-disclosure-simplification-act-of-2019-passes-the.

[220] Witold Henisz et al., *Five ways that ESG creates value*, McKinsey Quarterly (Nov. 2019), https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Strategy%20and%20Corporate%20Finance/Our%20Insights/Five%20ways%20that%20ESG%20creates%20value/Five-ways-that-ESG-creates-value.pdf.

[221] Larry Fink, *A Fundamental Reshaping of Finance*, BlackRock (2020), https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter.

precedent[222] in launching the EU taxonomy for sustainable activities in June 2020. Our country has the potential to create more impact on climate change by making sustainability considerations a measured part of business decision-making.

How the Recommendation Supports Frontline or other Underserved Communities:

ESG is one part of a broader strategy to address environmental justice issues. First, ESG can encourage better corporate diversity, equity, and inclusion practices, as well as encourage companies' efforts to address racism. As reported in an "Insights" update by Jones Day law firm, "...S&P indicated it will note a company's response to its community as a result of George Floyd's death in the scoring system for the S&P 500 ESG Index, and Calvert Research & Management, a sustainable investment firm, plans to ask companies to publicly state, among other things, their steps taken to address racism and police violence."[223]

Second, serious health conditions, including cancer and respiratory conditions are too common in frontline communities, often leading to disproportionate health impacts in communities of color. According to the American Lung Association, "The most recent EPA review of the research on the health effects of particle pollution concluded that nonwhite populations, especially blacks, faced higher risk from particle pollution."[224] ESG investment can help drive additional deployment of renewable energy, replacing polluting generation assets and improving air quality throughout the country and in frontline communities. This is particularly true if a company's decisions to add new renewable generation to the grid is consistently reflected in their ESG scores.

How the Recommendation Supports Biden's Climate Plan:

ESG goals and practices are already central and woven into every section of the Biden Climate Plan. From the discussion of inclusive labor and governance structures to the focus on the effort to "upgrade 4 million commercial buildings" to enhance energy performance. ESG strategies can be used and can act as an overall framework to meet the key environmental and clean energy goals clearly spelled out in the plan.

Key Battleground State Activity:

[222] European Commission, *EU taxonomy for sustainable activities*, https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.
[223] Margaret R. Blake et al., *Enhanced Focus on the "S" in ESG Investing*, Jones Day (June 2020), https://www.jonesday.com/en/insights/2020/06/enhanced-focus-on-the-s-in-esg-investing.
[224] American Lung Association, *Disparities in the Impact of Air Pollution,* (April 20, 2020), https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities.

Mobilizing Public and Private Investment

Clean energy development brings economic development to states. The fastest growing job in America is solar installer, followed closely by wind turbine technician.[225] Investment in clean energy creates good-paying jobs that empower communities, rebuild our economy, and clean our air and water. Companies that address ESG performance through clean energy adoption - particularly through local or regional projects - provide tangible financial commitment to their states and local communities. Federal and state decision makers can provide clear incentives and structures to accelerate ESG progress and subsequent clean energy deployment in states across the country.

Minnesota

- Last year, there were more than 61,800 clean energy jobs in Minnesota and wind power generated 19% of the state's electricity.[226]
- Ambitious ESG goals will create even more jobs. Minnesota companies 3M and Target both have 100% renewable electricity supply targets. In 2019, Minnesota Gov. Tim Walz set a 100% clean energy by 2050 target for the state.[227] Xcel Energy, the state's largest electric utility, aims to supply 85% clean energy by 2030.
- In 2017, the Minnesota State Board of Investment (SBI) adopted a set of investment beliefs to guide investments related to state employee benefit plans.[228] The beliefs include an explicit commitment to support ESG best practices when members participate in proxy voting processes. SBI noted supporting ESG issues reflects their values and is expected to add long-term value to SBI investments.

Colorado

- Last year, clean energy employed nearly 60,000 Coloradans, with clean energy workers in every county.[229]
- Gov. Jared Polis' roadmap to 100% renewable energy will continue to grow Colorado's clean energy economy and help Colorado businesses achieve their ESG goals.
- State-level decision makers have played a key role supporting ESG goals to date. The Colorado Public Employees' Retirement Association, for example, is developing an

[225] U.S. Bureau of Labor Statistics, *Fastest Growing Occupations*, (Sept. 1, 2020), https://www.bls.gov/ooh/fastest-growing.htm?view_full.
[226] Clean Jobs Midwest, *Clean Energy is Key for Economic Recovery in Minnesota* (2020), https://www.cleanjobsmidwest.com/state/minnesota.
[227] Elizabeth Dunbar, *Minnesota pledges 100 percent carbon-free energy. Is it possible?*, MPR News (March 7, 2019), https://www.mprnews.org/story/2019/03/07/minnesota-pledges-100-percent-carbon-free-energy-is-it-possible.
[228] Minnesota State Board of Investment, *SBI Investment Beliefs*, (June 14, 2018), https://www.house.leg.state.mn.us/comm/docs/a103a0e7-a90c-49ff-88ba-eb3fdcd54799.pdf.
[229] E2, *Clean Jobs Colorado 2019*, (Sept. 12, 2019), https://e2.org/reports/clean-jobs-colorado-2019/.

ESG benchmarking system to evaluate potential pension plan investments based on their ESG merits.

Texas

- Clean energy employed over 180,000 Texans in 2019.[230] In Texas, over $39 billion dollars have been invested in wind and solar energy.
- The clean energy industry in Texas has thrived thanks to smart state policy like legislation that created Competitive Renewable Energy Zones (CREZ) for wind power transmission.
- Texas is also a deregulated state with retail choice and a wholesale power market, both of which give companies more access to buy clean energy. More access means more clean energy deployment and more jobs.

[230] Jessica Corso, *Report Shows Texas 2nd in Nation for Clean Energy Jobs*, San Antonio Business Journal (Mar. 14, 2019), https://www.bizjournals.com/sanantonio/news/2019/03/14/report-shows-texas-2nd-in-nation-for-clean-energy.html.

Clean Energy Deployment Administration

Opportunity/Problem:

To achieve net-zero emissions by 2050, the United States needs to immediately, massively, and equitably deploy already commercialized clean technologies and accelerate the commercialization of innovative technologies so they can be widely deployed as soon as possible. The federal government can and must find ways to activate clean energy investment to meet the scale and pace of mid-century decarbonization by leveraging private funds for technology commercialization and deployment.

Recommended Action(s):

- In the near term, reform and reactivate the four DOE loan programs: Title XVII Innovative Energy Loan Guarantee Program (LGP), Advanced Technology Vehicle Manufacturing (ATVM) Loan Program, Tribal Energy Loan Guarantee Program (TELPG) within the Loan Programs Office (LPO), and Transmission Infrastructure Program (TIP)
- Establish a Clean Energy Deployment Administration (CEDA) to leverage significant private sector investment by incorporating the reformed DOE loan programs, developing additional financial tools, and creating a revolving fund

Program Type:

√ New Program

√ Program Modification

Authority:

√ Existing Authority

√ Requires New Legislation

Job Benefits:

If accelerated through recommended reforms, LPO's more than $40 billion in remaining loan authority[275] could help create 300,000 direct and indirect jobs. Establishing CEDA and granting CEDA loan authority from current DOE loan programs, plus an additional capitalization of $10 billion with a 10% loan loss reserve, would leverage a total of $100 billion of investment, resulting in another 750,000 jobs.

Econ. Benefits:

CEDA would employ a revolving fund, enabling long-term financing for advancing the clean energy transition and addressing climate change. By supporting innovative technology commercialization, CEDA would also help scale entirely new industries, which promise significant opportunities for economic growth and job creation.

Equity Benefits:

CEDA can implement a holistic federal strategy to prioritize investment in low-income and frontline communities and communities of color, which have historically been overburdened with industrial pollution and underserved by private sector financing.

[275] https://www.nytimes.com/2020/04/30/climate/clean-energy-loans-coronavirus-trump.html

Clean Energy Deployment Administration

Climate Plan Tie:

Establishing CEDA, and incorporating reformed DOE loan programs, would stimulate immediate new investments in clean energy projects, creating jobs in the near-term, while also helping to commercialize innovative technologies so they will be ready to deploy and contribute to economic growth, job creation, and a net-zero emissions economy in the long-term.

Battleground State Benefits:

LPO has provided loan guarantees of more than $22 billion for projects in the following battleground states: AZ, CO, GA, IL, MI, NH, NV, and OH. CEDA and reformed DOE loan programs would stimulate financing for additional projects across the nation that would aim to benefit every state.

Clean Energy Deployment Administration

Authors: Dan Reicher, Abigail Regitsky

Date: 8/22/20

Statement of Issue and Summary of Recommendations:
To achieve net-zero emissions by 2050, the United States needs to immediately, massively, and equitably deploy already commercialized clean technologies (e.g., wind and solar energy, electric vehicles, and energy efficiency) and accelerate the commercialization of innovative technologies (e.g., advanced electricity storage, clean hydrogen, carbon capture and storage, carbon removal, floating offshore wind turbines, small modular reactors, and emissions-free shipping and aviation) so they can in turn be widely deployed as soon as possible. Although these technologies have been demonstrated to be technically sound, they must rapidly scale to the size necessary to both displace fossil fuel incumbents and attract private capital of the size needed to meet our climate ambitions. The federal government can and must find ways to activate massive private sector investment[232] in clean technology commercialization and deployment to meet the scale and pace of mid-century decarbonization. Leveraging this private investment will boost our efforts to meet our climate goals and drive significant economic growth through short- and long-term job creation. Enabling private sector financing will also bring down the cost of achieving a key Biden-Harris goal of carbon-free power by 2035. Federal programs that delivered low-cost, long-term financing for housing in the early 20th Century serve as an example.

To bolster federal support for commercialization and deployment of clean energy and other decarbonization technologies needed to achieve net-zero emissions, we recommend:

- Reform and reactivate the four current DOE loan programs with more than $40 billion in available lending authority: Title XVII Innovative Energy Loan Guarantee Program (LGP), Advanced Technology Vehicle Manufacturing (ATVM) Loan Program, Tribal Energy Loan Guarantee Program (TELPG) within the Loan Programs Office (LPO), and Transmission Infrastructure Program (TIP);
- Establish a Clean Energy Deployment Administration (CEDA), a government entity that would both incorporate these existing loan programs (and their available lending authority of more than $40 billion) and develop additional flexible financing tools with a $10 billion revolving fund aimed at leveraging significant private sector investment.

Opportunity / Problem Statement

[232] *See, e.g.*, Dan Reicher et al., *Derisking Decarbonization: Making Green Energy Investments Blue Chip*, Stanford University (Oct. 27, 2017), https://energy.stanford.edu/sites/g/files/sbiybj9971/f/stanfordcleanenergyfinanceframingdoc10-27_final.pdf; L. M. Murphy & P. L. EdwardsBridging the Valley of Death: Transitioning from Public to Private Sector Financing, National Renewable Energy Laboratory (May 2003), https://www.nrel.gov/docs/gen/fy03/34036.pdf.

Mobilizing Public and Private Investment

To achieve net-zero emissions by 2050, the United States needs to immediately, massively, and equitably deploy already commercialized clean technologies and accelerate the commercialization of innovative technologies. The total investment needed to decarbonize the economy is so immense - measured in the multiple trillions of dollars over a decade in the U.S. alone[233] - that most of the capital[234] will have to come from the private sector. However, many critical new clean technologies are still too risky for major private sector investment in commercialization and deployment. The federal government can and must find ways to activate private sector clean energy investment to meet the scale and pace of decarbonization by leveraging private funds for technology commercialization and deployment.

Congress originally created the DOE Title XVII Loan Guarantee Program (LGP) to help de-risk innovative technologies so they could secure financing and achieve successful commercialization. The Advanced Technology Vehicles Manufacturing Loan Program (ATVM) was created to help finance clean advanced vehicle manufacturing. Under the DOE Loan Programs Office (LPO) and through ARRA funding, these programs have successfully financed more than 30 innovative clean energy projects with total loans and loan guarantees exceeding $30 billion,[235] but LPO has since languished. From 2009-2011 and in 2020, members of Congress have introduced bills to improve the loan guarantee program and establish a Clean Energy Deployment Administration (CEDA). Establishing a financing entity like CEDA has been recently recommended by the House Select Committee on the Climate Crisis majority staff[236] and the American Energy Innovation Council.[237]

Proposed Recommendation

Check Boxes Below

[233] *See* Mark Fulton & Reid Capalino, *Investing in the Clean Trillion: Closing the Clean Energy Investment Gap*, Ceres (Jan. 2014), https://www.ceres.org/sites/default/files/reports/2017-03/Ceres_CleanTrillion_Report_012114.pdf.
[234] *See* Reicher, *supra* note 276; International Renewable Energy Agency, *Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance*, IRENA (2016),https://www.irena.org/publications/2016/Jun/Unlocking-Renewable-Energy-Investment-The-role-of-risk-mitigation-and-structured-finance (reporting challenges to mobilizing private capital).
[235] U.S. Department of Energy Loan Programs Office, LPO Financial Performance, (Nov. 2014), https://www.energy.gov/sites/prod/files/2014/11/f19/DOE-LPO-MiniReport_Final%2011%2013%2014_0.pdf.
[236] Majority Committee on the Climate Crisis Staff, Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America House Select Committee on the Climate Crisis (June 2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.
[237] American Energy Innovation Council, Energy Innovation: Supporting the Full Innovation Lifecycle, (Feb. 2020), http://americanenergyinnovation.org/wp-content/uploads/2020/02/Energy-Innovation-Supporting-the-Full-Innovation-Lifecycle.pdf.

✔	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

A Biden-Harris administration should reform the DOE loan guarantee programs[238] and establish a new government financing entity like CEDA. This new entity has been proposed in several pieces of legislation over the last decade: the 21st Century Energy Technology Deployment Act[239], the American Clean Energy and Security Act of 2009[240] (the CEDA amendment enjoyed a 51-6 vote in the House Energy and Commerce Commerce)[241], the Clean Energy Financing Act of 2011[242] (reported out of the Senate Energy and Natural Resources Committee with strong support by current Chair Sen. Murkowski (R-AK) and then Chair Sen. Jeff Bingaman (D-NM))[243], and in July 2020, the Clean Energy Innovation and Deployment Act[244] (introduced by members of the House Energy and Commerce Committee to establish a national Clean Energy Standard (CES) which incorporates an updated version of CEDA to help commercialize key technologies important to meeting a CES).

Improvements to DOE loan programs should include:

- Expanding project eligibility to include a broader range of innovative technologies for decarbonization and resilience, their manufacture, and clean infrastructure;
- Ensuring that innovation requirements do not overly restrict financing of existing technologies that are not commercialized at scale and are not too onerous for new technologies;
- Improving the application and solicitation process, including ensuring that the credit subsidy cost does not inhibit otherwise promising applications;
- Encouraging private sector lender participation;
- Allowing projects to receive some support from other federal programs;
- Accelerating and simplifying review processes at DOE and OMB;
- Creating a secondary market and credit support for retail lenders to lower costs and create products for easily installing distributed generation and storage[245]; and
- Prioritizing support, via secondary debt markets and credit enhancements, for driving down costs for primary lenders to clean energy projects that primarily serve and benefit frontline communities

[238] This should include LGP, ATVM, the DOE Tribal Energy Loan Guarantee Program (TELGP), and the Western Area Power Authority Transmission Infrastructure Program (TIP).
[239] S. 949, 111th Cong. (2009).
[240] S. 2454, 111th Cong. (2009).
[241] *See* H.R. 137, 111th Cong. (2009)(Committee vote on amendment by Rep. Dingell).
[242] S. 1510, 112th Cong. (2011).
[243] S. 949, 21st Century Energy Technology Development Act, introduced by Mr. Bingaman for himself, Ms. Murkowski, Mr. Dorgan, Mr. Voinovich, Ms. Stabenow, Mr. Lugar, and Ms. Shaheen incorporated as Title 1. *See* S. 48, 111th Cong. (2009).
[244] H.R. 7516, 116th Cong. (2020).
[245] CEDA should create affordable debt for rooftop solar, storage, and EV purchases for retail lenders in the same way federal programs created the 30-year, fixed-rate mortgage,

Congress, working with a Biden-Harris administration, should authorize CEDA, including a revolving fund to better leverage significant private sector investment and better match financing to individual project cash flows[246]) and the authority to develop additional financing tools (e.g., direct loans, letters of credit, insurance products, other credit enhancements or debt instruments, or equity). Once set up, CEDA should assume the authorities and responsibilities of the DOE loan programs. Unlike these loan programs, CEDA should use a portfolio approach to choose, manage, and measure performance of projects to balance overall risk in the program and better support higher-risk projects. Like the original LGP, CEDA should focus on supporting technology commercialization, including full-scale commercial deployments of higher-risk technologies.

In addition to directly financing technology commercialization, CEDA could also indirectly support broader technology deployment through securitization or other means of secondary market credit enhancement, particularly for already commercialized technologies that face financing barriers to wide-scale adoption. This function of CEDA would be similar to a core function of the proposed national climate Bbank[247]. Regardless of which program leads the support of technology deployment, it is critical that the federal government support both technology *commercialization* and widespread *deployment* of clean energy technology and provide separate funds and appropriately-skilled program personnel to accomplish each of these objectives.

Similarly to the proposed national climate bank, CEDA's indirect support authority could also help fund state and local green banks and community financial institutions to attract private investment into clean energy deployment.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change

Through its financing of clean energy and clean vehicles technologies, LPO has directly supported 56,000 good-paying jobs and avoided at least 25 MMT of CO_2 emissions.[248] LPO has more than $40 billion in remaining loan authority,[249] which, if accelerated through reforms, could help create 300,000 direct and indirect jobs.[250] Establishing CEDA and granting CEDA

[246] Earlier bills capitalized CEDA with $10 billion with an initial loan loss reserve of 10%.
[247] See related policy recommendation: "Establish and Fund a National Climate Bank".
[248] Testimony of Mark A. McCall, U.S. House of Representative, (March 3, 2016), https://science.house.gov/imo/media/doc/3.3.16%20HSST%20Mark%20McCall%20Final%20Testimony.pdf.
[249]U.S. Department of Energy Loan Programs Office, https://www.energy.gov/lpo/loan-programs-office.
[250] Assuming a job multiplier of 7.5 per $1 million in spending. *See* Hauke Engel et al., *How a post-pandemic stimulus can both create jobs and help the climate*, Mckinsey & Company (May 27, 2020),

this remaining loan authority plus additional capitalization would help support even more investment and job creation by significantly leveraging private capital. For example, a $10 billion initial capitalization of a Clean Energy Investment Fund, with a 10% loan loss reserve would leverage a total of $100 billion of investment,[251] resulting in another 750,000 jobs. Fee payments made for loans (above principle and interest) would be deposited in the Clean Energy Investment Fund to be reinvested in new projects, instead of being directed back to the U.S. Treasury (as is currently required for existing DOE loan programs).

By supporting innovative technology commercialization, CEDA would also help scale entirely new industries that promise significant opportunities for economic growth and job creation. For example, scaling up a U.S. hydrogen economy could lead to about $140 billion in annual revenue and support 700,000 jobs throughout the hydrogen value chain by 2030, and $750 billion in annual revenue and up to 3.4 million jobs by 2050.[252] Similarly, U.S. demand for direct air capture equipment could reach more than $250 billion by 2050 and create up to 1.35 million jobs.[253]

How the Recommendation Supports Frontline or other Underserved Communities

TELGP has the authority to support economic development for tribes through loan guarantees for clean energy projects and activities. Improving this program will help advance the clean energy transition in often underserved tribal communities. Accelerating the commercialization and deployment of more clean energy technologies through CEDA will help communities throughout the United States transition to a clean energy economy, which will both reduce risks of climate change impacts and decrease pollution associated with fossil energy. Low-income and frontline communities and BIPOC-led companies have historically been overburdened with

https://www.mckinsey.com/business-functions/sustainability/our-insights/how-a-post-pandemic-stimulus-can-both-create-jobs-and-help-the-climate#.

[251] Dan Reicher, *The U.S. Clean Energy Deployment Administration: A Business-Driven Approach to Leveraging Private Sector Investment in Clean Energy Innovation and Commercialization*, American Energy Innovation Council (June 2020), http://americanenergyinnovation.org/wp-content/uploads/2020/06/Looking-Forward-with-a-Clean-Energy-Deployment-Administration.pdf.

[252] Road Map to a U.S. Hydrogen Economy, https://static1.squarespace.com/static/53ab1feee4b0bef0179a1563/t/5e7ca9d6c8fb3629d399fe0c/1585228263363/Road+Map+to+a+US+Hydrogen+Economy+Full+Report.pdf.

[253] John Larsen et al., *Capturing New Business: The market opportunities associated with scale-up of Direct Air Capture (DAC) technology in the US*, Rhodium Group (June 23, 2020), https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Business-Market-Opportunities-from-DAC-Scale-Up.pdf; John Larsen et al., *Capturing New Jobs: The employment opportunities associated with scale-up of Direct Air Capture (DAC) technology in the US*, Rhodium Group (June 23, 2020), https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Jobs-Employment-Opportunities-from-DAC-Scale-Up.pdf..

industrial pollution[254] and underserved by private sector financing.[255] By creating a federal financing entity for these projects, a holistic strategy can be implemented to prioritize lowering perceived risk of, and creating secondary market demand for, investment in those underserved communities. Investing in clean energy projects, infrastructure, and manufacturing will also provide economic development and jobs within these communities to break the cycle of disinvestment and lift more Americans into the middle class. Financing projects to bring energy efficiency upgrades and distributed renewable energy generation to low-income homes will also help families with the highest energy burdens[256] save money on their energy bills.

How the Recommendation Supports Biden's Climate Plan

The Biden Climate Plan aims to "put the United States on an irreversible path to achieve net-zero emissions, economy-wide, by no later than 2050…and, in the process, create millions of good-paying jobs." Reforming the DOE loan programs and establishing CEDA would stimulate immediate new investments in clean energy projects, creating jobs in the near-term, while also helping to commercialize innovative technologies so they will be ready for full-scale deployment in the long-term. Without targeted federal efforts to leverage private capital for these clean energy investments, it will be impossible to achieve our climate goals.[257]

Expanding the types of eligible projects to include the development of manufacturing facilities for clean technologies and clean energy and climate-resilient infrastructure would also support Vice President Biden's plan to "Build Back Better". These eligible projects would rebuild domestic manufacturing and infrastructure to create good-paying jobs and transform the United States into a clean energy economy.

CEDA would also help with a core element of the Biden campaign's climate and energy agenda: a national Clean Energy Standard (CES).[258] The cost of CES compliance is a major issue in

[254] American Lung Association, *Disparities in the Impact of Air Pollution*, https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities; Claudia Boyd-Barrett, *People of Color and the Poor Disproportionately Exposed to Air Pollution, Study Finds, California Health Report* (Feb. 8, 2019), https://www.calhealthreport.org/2019/02/08/people-of-color-and-the-poor-disproportionately-exposed-to-air-pollution-study-finds/.

[255] https://www.nbcnews.com/business/business-news/why-are-so-many-black-owned-small-businesses-shut-out-n1195291

[256] Andre Chung, *Why are so many black-owned small businesses shut out of PPP loans?*, NBC News (April 29, 2020), https://www.aceee.org/press-release/2020/09/report-low-income-households-communities-color-face-high-energy-burden.

[257] *See, e.g.*, Julia Zuckerman et al., *Investing at Least a Trillion Dollars a Year in Clean Energy*, The New Climate Economy (2016), https://newclimateeconomy.report/workingpapers/wp-content/uploads/sites/5/2016/05/NCE_CleanEnergy_financing_final_web-Copy.pdf.

[258] Multiple states have recently adopted Clean Energy Standards. See John Podesta and others, "State Fact Sheet: A 100 Percent Clean Future: How State Policy Successes Can Inform Federal

support for an aggressive national CES. By driving down the cost of commercialization and deployment of CES-related technologies, CEDA would be a strong complement to a national CES. A recent national CES bill, introduced by three members of the House Energy and Commerce Committee, incorporates CEDA as its first title. A bipartisan proposal by two other members of the House Energy and Commerce Committee combines "Innovation + Regulation" in advancing another version of a national CES.

Key Battleground State Activity

LPO has already supported multiple clean energy projects in key battleground states and has provided loan guarantees of more than $22 billion for projects in Arizona, Colorado, Georgia, Illinois, Michigan, New Hampshire, Nevada, and Ohio.[259] A reformed LGP and creation of CEDA would stimulate financing for additional projects across the nation that would aim to benefit every state. Commercializing new technologies could also provide economic development opportunities to particular key states, such as projects in Texas, Colorado, Michigan, Ohio, and Pennsylvania.[260]

Action on Climate Change" (Washington: Center for American Progress, 2019), available at https://www.americanprogress.org/issues/green/reports/2019/10/16/475863/state-fact-sheet-100-percent-clean-future/

[259] U.S. Department of Energy Loan Programs Office, *Portfolio Projects*, https://www.energy.gov/lpo/portfolio/portfolio-projects.

[260] U.S. Early-Stage CCUS Project Map, https://stephenjlee.github.io/catf-ccus/#/geomapfc.

Importance of Market-based Competition in Wholesale Electricity Generation to Accelerate Clean Energy Deployment and Decarbonization Solutions

Opportunity/Problem:

The climate crisis demands swift action and rapid deployment of new clean energy resources. Competition can provide opportunities for rapid on-site renewable energy deployment, system-wide efficiency, and enabling of emerging smart-building and smart-grid technologies.

Recommended Action(s):

- Replicate key market design principles from ERCOT elsewhere.
- Unbundle utilities where feasible and explore energy-only market construct. Streamline transmission costs by setting rates and funding transmission at the federal level.
- Provide easy market access and standardize platforms.

Program Type:

√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislations

Job Benefits:

With a market-based approach, we can start deploying current technologies and innovating to create new clean energy solutions and services, creating millions of jobs sooner than later.

Econ. Benefits:

A market-based approach can help expedite the innovation and investment anticipated in the transition to clean energy. Awaiting regulatory guidance can cause delays in innovation and job creation and higher costs for consumers.

Equity Benefits:

Unbundling generation from transmission and retail service, along with market expansion, creates jobs in underserved areas and improves resilience by providing opportunities for independent generation facilities and retail service providers to create a more resilient grid.

Climate Plan Tie:

Clean energy deployment supports all aspects of the Biden Climate Plan.

Battleground State Benefits:

Including markets and competition in plans to expand clean energy will facilitate the conversation in battleground states where economic growth is desperately needed and resistance to regulation is strong. Measures favorable to renewable expansion will pay additional dividends in battleground states primed for development.

Importance of Market-Based Competition in Wholesale Electricity Generation to Accelerate Clean Energy Deployment and Decarbonization Solutions

COLLABORATORS: Nisha Desai, Jesse Dickerman, Jackson Freeman, Bob King, Caitlin A. Smith, Vanessa C. Tutos, Steve Krebs, Beverly Jurenko

DATE: 9/14/2020

Statement of Issue and Summary of Recommendations: The Biden Climate Plan aggressively promotes a clean energy economy. However, the plan does not sufficiently recognize the importance of the role markets and competition can play in quickly and efficiently deploying low-cost clean energy resources across the country, while also supporting economic and job growth. Competition is not an alternative to policy or regulatory oversight; it is simply an efficient means of allocating resources and risk, so long as it is permitted within an appropriate market structure and is defined clearly by policy. Lessons from the Texas energy economy and elsewhere can be deployed expeditiously to help achieve carbon reductions at scale in a win-win approach.

Opportunity: Texas is the largest market for clean, renewable energy in the US. As a stand-alone economy, Texas would be the 5th largest market for wind in the world, supporting over 25,000 jobs and 30 gigawatts (GW) of power[261] and accounting for 28% of all global corporate renewable energy deals.[262] The Texas market has been driven not by command-and-control action, but by smart policies coupled with a highly deregulated market environment that has enabled clean energy to compete on its own merits. The Texas market has shown conclusively that renewable energy is a cost-effective energy source that can garner support from both sides of the aisle.

Check Boxes Below	
✔	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

[261] Am. Wind Energy Ass'n, *Wind Energy in Texas*, 2020. https://www.awea.org/Awea/media/Resources/StateFactSheets/Texas.pdf

[262] Karl-Erik Stromsta,*Texas is the Center of the Global Corporate Renewable Energy Market,* Greentech Media (January 28, 2020), https://www.greentechmedia.com/articles/read/texas-is-the-center-of-the-global-corporate-renewable-energy-market.

In contrast to other markets, the growth of renewable energy in Texas has resulted in lower costs to businesses and to consumers.[263] In addition, solar and wind deployments in resource-rich rural areas have created booming new local economies where slow decline had been the experience for two decades.[264] Lessons from the Texas energy economy can be deployed expeditiously to help achieve carbon reductions at scale.

Proposed Recommendations

Key to the success of renewable energy in Texas has been the role of markets and competition. The market structure in Texas has key features that should be promoted by the Biden ClimatePlan for adoption in other markets.[265]

1) Unbundle utilities to align profits with clean energy and decarbonization policy

Key to achieving a successful transition of the electricity market is assigning an appropriate role to utilities. Electric utilities can provide the future platform upon which renewable energy and distributed resources, efficiency, smart building systems, and storage can be integrated to provide clean, reliable services. When considering the importance of the electrification of buildings and transportation to meeting climate goals, the enormous opportunity for utilities to grow their investment and returns in a greening world is apparent. Obtaining the full support of utilities for the expansion of renewable energy resources, however, and particularly for the adoption of customer-side, on-site distributed resources such as roof-top solar, energy efficiency, smart energy management systems, and energy storage, will require two policy shifts.

First, utilities should be unbundled, allowing them to focus on their primary responsibility for building and managing a smart and resilient grid capable of integrating a growing array of innovative solutions. Investment in generation assets, as well as the associated risk, should be shifted to the private sector. There is no need for consumers to bear this risk, which is translated into costs and rates[266]. Private markets have proven more capable of shifting to lower-cost

[263] Christian Roselund, *Renewables Reduced Wholesale Power Costs by $5.7 Billion in Texas*, PV Magazine USA (November 6, 2018), https://pv-magazine-usa.com/2018/11/06/renewables-reduced-wholesale-power-costs-by-5-7-billion-in-texas/.

[264] Joshua D. Rhodes, *The Economic Impact of Renewable Energy in Rural Texas*, Conservative Texans for Energy Innovation (August 2020), https://www.conservativetexansforenergyinnovation.org/the-economic-impact-of-renewable-energy-in-rural-texas/,

[265] Additional references:
Chen, Jennifer, and Michael Bardee. “How Voluntary Electricity Trading Can Help Efficiency in the Southeast.” R Street , August 2020.
Gimon, Eric, Mike O'Boyle, and Et. Al. “Policies to Support a Competitive Wholesale Electricity Market in The Southeast U.S.” Energy Innovation, August 2020.
Rhodes, Joshua. “Even Renewables are Bigger in Texas.” Forbes Magazine, September 25, 2020.

[266] Lyndsey Gilpin, *Plant Vogtle Cost Rises $149 Million – And Ratepayers Could Be on the Hook*, Southeast Energy News (July 31, 2020), https://energynews.us/digests/plant-vogtle-cost-rises-149-million-and-ratepayers-could-be-on-the-hook/.

renewable resources, while utilities are largely responsible for the continued operation of uneconomic legacy coal and gas plants.[267] Texas's unbundling has allowed utilities to consider competitive retail suppliers and third-party service providers as well as end-use consumers as their customers to serve.

Second, utility revenue collection should be decoupled from sales or consumption by consumers. Historically, utilities have been compensated based on return on investments. This makes sense for companies that are primarily asset managers. However, utilities earn revenue through the setting of rates based on forecast sales. In this setting, anything likely to reduce kilowatt hours sold is threatening to utility management and their shareholders. As a result, conservation and distributed customer-side resources become anathema to those in the best position to implement such solutions. Third-party market innovation and investments threaten their business model, so utility investments in efficiency have been limited to regulatory mandates. Decoupling, adopted now by a number of states already[268], allows a utility to collect its revenue based on achieving policy goals including reliability and customer satisfaction. Goals that include successful integration of distributed resources or meeting CO_2 reduction objectives can be explicitly tied to a rate of return. This allows consumers to define in advance and then pay for what they want, rather than reviewing utility expenses and investments after the fact and paying for what they got.

2) Implement an energy-only market where feasible

The Electricity Reliability Council of Texas (ERCOT), is the independent system operator of the state's stand-alone wholesale market. As a solely intrastate regional transmission operator (RTO) it is exempt from FERC regulation. The Texas wholesale market delivers low energy prices reliably, while integrating vast volumes of renewable energy. ERCOT is essentially an energy-only market with a scarcity pricing mechanism that works to integrate over 24 GW of wind generation and increasing amount of solar (with more than 75 GW currently awaiting approval in the interconnection queue[269]). ERCOT's expertise in integrating renewable energy is recognized worldwide, and its forecasting and dispatch practices are models for managing the fluctuation of variable resources. The Texas market design supports re-dispatching every five minutes and further reduces uncertainty by sending dispatch instructions directly to resources.

Lessons learned in ERCOT should be recognized as examples for reimagining America's energy markets. Moving from capacity markets to energy-only markets might be unworkable in some regions of the country, but expansion into areas that currently lack organized markets can follow the path ERCOT has paved. With resources nearing zero marginal cost, new challenges in

[267] Jessica Dunn & Jameson McBride, *Deregulation and Decarbonization*, The Breakthrough Institute (October 10, 2018), https://thebreakthrough.org/issues/energy/deregulation-and-decarbonization.
[268] Nat'l Renewable Energy Lab'y, *Decoupling Policies: Options to Encourage Energy Efficiency Policies for Utilities, Clean Energy Policies in States and Communities*, (December 2019) https://www.nrel.gov/docs/fy10osti/46606.pdf.
[269] K Kaufmann, *Interconnection Queues Across the US are Loaded with Gigawatts of Solar, Wind and Storage*, (September 8, 2020) https://pv-magazine-usa.com/2020/09/08/interconnection-queues-across-the-us-are-loaded-with-gigawatts-of-solar-wind-and-storage/.

decarbonization, and new standards for resource adequacy, having an effective reference point for market reform and control is crucial.

3) Streamline transmission costs

The wholesale market in ERCOT has been purposefully designed with "postage stamp" rates for transmission. This means that the fees charged in rates to support the build-out and maintenance of transmission are the same regardless of location within the ERCOT grid. Legislators and regulators intentionally designed the ERCOT competitive retail market to eliminate distance-sensitive transmission pricing to ensure that the power system provides cost-effective service to retail electricity customers. ERCOT's transmission pricing has led to vigorous competition between producers on the basis of the cost to produce power, and ultimately translating to lower prices for customers in Texas.[270] This eliminates a number of unfair and illogical consequences that make it very difficult to build new transmission in most other states, and has led to Texas building more infrastructure more easily and quickly than any other state. This in turns removes market entry barriers to clean energy development.

4) Provide easy market access

The structure of a large, unified control region in the most energy-focused state promotes robust business processes and consumer products. Additionally, the market maintains sound business principles. Texas has separated the three principal sectors of the electrical industry: retail, generation, and transmission. Of these, only transmission is tightly regulated, and necessarily so. As such, Texas electricity consumers (and the rates they pay) have been largely insulated from generation overbuilds and retail electric provider mismanagement or misfortune.[271]

5) Standardize platforms, e.g. Smart Meter Texas

One key innovation of the Texas electric market is the creation of the Smart Meter Texas web portal. Although cooperative and municipal utilities are not required to participate, every investor-owned utility participating in the ERCOT market within Texas daily shares their Advanced Metering Infrastructure (AMI) meter reads with a common central platform. This makes it possible for competitive suppliers and competitive energy service technology or solution providers to integrate with the statewide portal one time to obtain any consumer's energy consumption history, or daily on-going consumption data-stream, automatically, with the knowing consent of the customer. This allows third parties to develop innovative consumer services, to validate the success or productivity of on-site solutions, and to help consumers respond to dynamic retail pricing offerings or participate and be compensated for contributions to the wholesale market.[272]

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[270] Johannes P. Pfeifenberger, et. al., *Cost Savings Offered by Competition in Electric Transmission*, The Brattle Group (April 2019), https://brattlefiles.blob.core.windows.net/files/15987_brattle_competitive_transmission_report_final_with_data_tables_04-09-2019.pdf.

[271] Peter Maloney, *Panda Temple Bankruptcy Could Chill New Gas Plant Buildout in ERCOT Market*, Utility Dive (May 15, 2017), https://www.utilitydive.com/news/panda-temple-bankruptcy-could-chill-new-gas-plant-buildout-in-ercot-market/442582/.

[272] See also Texas Fact Sheet: "Access to Grid and Consumer Energy Data"

Conclusion
The benefits of competition include the opportunity to quickly respond to consumer and policy demands, along with cost reduction and innovation. The climate change crisis demands swift action and rapid deployment of new clean energy resources. Competition can provide opportunities for on-site renewable energy deployment as well as systemwide efficiency and enabling of emerging smart-building and smart-grid technologies through new ideas and expeditious execution. However, competition is not a replacement for good policy. Smart policy can prioritize specific objectives (e.g, carbon reduction) and stimulate innovation and entrepreneurship to creative ends. Markets simply provide economic signals that ensure that resources are efficiently allocated. The Texas market design has proven its ability to let the market work, within defined policy objectives, to bring clean energy solutions to bear, and to do it in a way that has rapidly outpaced development of such resources in many other regions. Ultimately, opening up appropriate opportunities for markets to do what they do well, creates job opportunities and economic activity, and accelerates the clean energy transition.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Building clean energy projects and infrastructure will create millions of jobs.[273] With a market-based approach, we can start creating those jobs sooner rather than later and offer new opportunities in economically-stressed areas. Opportunities created by unbundling generation from transmission and retail service, along with market expansion, helps create even more jobs across the energy system.

How the Recommendation Supports Frontline or other Underserved Communities:
Many of the new clean jobs created by clean energy expansion will be available to people in underserved communities. Additionally, rapid innovation toward products and services that help reduce energy consumption and lower energy bills will have an outsized benefit to underserved areas. Furthermore, new clean energy solutions that help reduce pollution and improve resilience directly benefit communities that have historically seen disproportionate levels of pollution from fossil generation as well as extended damage and slower recovery in the wake of natural disasters.

How the Recommendation Supports Biden's Climate Plan:
Clean energy deployment inherently supports both the climate plan and economic recovery.

An additional benefit of creating RTOs where none currently exist is improved provider stability through regional scheduling and dispatch, allowing for greater reliability without the need for

[273] Sonia Aggarwal & Mike O'Boyle, *Rewiring the U.S. for Economic Recovery*, Energy Innovation (June 2020), https://energyinnovation.org/wp-content/uploads/2020/06/90-Clean-By-2035-Policy-Memo.pdf?__hstc=250831769.b98f82779f7fc71efe5ebc9ad222b7fe.1591890283999.1591890283999.1591890283999.1&__hssc=250831769.1.1591966353310&__hsfp=1092146661&hsCtaTracking=3976190d-7d4d-4022-ae72-6009387f5321%7Cc2cda486-fe34-4f70-a251-a84294e1ea0d.

additional investment[274]. This reliability is critical when addressing possible facility failures from climate-related weather events that are striking underserved and frontline communities. Development of renewable energy can improve air quality in low-income communities that face the brunt of pollution and create new opportunities for minority business development.[275]

Key Battleground State Activity: Texas, and much of the country, will not readily accept top-down regulations for clean energy. There is general resistance to regulation on business as evidence exists that some regulations, though well-meaning, can be cumbersome and often have unintended consequences that are difficult to fix. Including markets and competition in plans to expand clean energy will facilitate the conversation in battleground states where economic growth is desperately needed. Measures favorable to renewable expansion will pay additional dividends in battleground states primed for exponential development.

[274] Judy Chang, Johannes Pfeifenberger, and John Tsoukalis. *Potential Benefits of a Regional Wholesale Power Market to North Carolina's Electricity Customers*, The Brattle Group (April 2019), https://brattlefiles.blob.core.windows.net/files/16092_nc_wholesale_power_market_whitepaper_april_2019_final.pdf.

[275] Patterson, Jacqui. "Just Energy Policies: Reducing Pollution and Creating Jobs." National Association for the Advancement of Colored People. Environmental and Climate Justice Program, February 2014.

Developing Clean Transportation and Low Emissions Infrastructure

EV Charging Infrastructure for Economic, Environmental, and Social Benefit

Opportunity/Problem:

Electric Vehicles (EVs) are widely recognized as the most promising technology to reduce transportation-related greenhouse gas emissions and air pollution, all while providing benefits in vehicle performance and reduced lifetime costs for consumers. But scaling up charging infrastructure is a necessary enabler for a widespread EV transition.

Recommended Action(s):

- Build DOE programs to reduce costs and barriers facing EV charging infrastructure installation
- Form a task force with federal agencies and the private sector to support vehicle-grid integration, load management strategies, public-private co-financing approaches, and standardization of smart charging infrastructure
- Establish federal programs to subsidize charging infrastructure, invest in pooled EV vehicles/buses, and transition school buses to zero-emission alternatives within five years for frontline communities
- Champion existing legislation to expand EV charging infrastructure at highway rest areas and other key corridors
- Support infrastructure for medium- and heavy-duty vehicles
- Expand existing programs deploying charging infrastructure in federal buildings and other public facilities, including National Parks
- Transition the 3 million vehicles in the federal, state, and local fleets to zero-emission vehicles

Program Type:

√ New Program

√ Program Modification

√ Rollback of Trump Program

Authority:

√ Existing Authority

√ Requires New Legislations

√ Requires New Regulations

Job Benefits:

If $1 billion were invested in EV charging infrastructure, it would support 6,000 to 15,000 workers for a year; and reaching an aggressive level of EVs (73 million by 2035) is estimated to create 52,000 additional jobs per year.

Econ. Benefits:

Achieving 73 million EVs by 2035 is also estimated to generate $26.5 billion per year by 2035 in private and social benefits, and a $6.6 billion increase in average annual gross domestic product.

EV Charging Infrastructure for Economic, Environmental, and Social Benefit

Equity Benefits:

The lower costs of EV ownership benefits low-income/underserved/rural communities; pollution reduction helps front-line communities, whose residents suffer disproportionate health and economic effects from poor air quality. Subsidized charging infrastructure, in conjunction with ensuring priority of EV mobility options (pooled vehicles, school buses, and public buses) for front-line communities/low income/underserved/rural communities) is necessary to ensure direct benefits to these communities. In addition, investments for EV infrastructure will direct a significant portion of clean energy and sustainable infrastructure resources to historically marginalized communities to help create local jobs and reduce energy poverty.

Climate Plan Tie:

The Biden Climate Plan recommends public investment in EV infrastructure, including a commitment to build 500,000 public charging outlets in conjunction with transitioning the entire fleet of 500,000 school buses to American-made, zero-emission within five years. These recommendations illustrate how to advance on this goal. Widespread electrification of light-duty vehicles is also necessary to achieve the goal of a net-zero carbon economy by 2050.

Battleground State Benefits:

Many utilities across the U.S. are pursuing make-ready investments or direct ownership of direct-current fast chargers (DCFC) and level 2 (L2) chargers. Rate cases to develop charging infrastructure are underway

EV Charging Infrastructure for Economic, Environmental, and Social Benefit

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DATE: 9/2/2020

Statement of Issue and Summary of Recommendations:
Electric vehicles (EVs) are widely recognized[320] as the cleanest and most promising technology to reduce transportation-related greenhouse gas emissions and air pollution, all while providing benefits in vehicle performance and reduced lifetime costs for consumers. Electric drive is likely inevitable; the question is whether the U.S. will ramp up the use of EVs rapidly, allowing it to achieve significant economic recovery, create new domestic jobs, and benefit the environment and public health; or miss its chance to lead, falling behind other international market actors.

The EV market is coming of age. In 2020, there were 44 EV (plug-in hybrid and fully electric) models available,[321] and from 2018 to 2019, the EV market grew by 9% (with European market share growing by 44%).[322] While light-duty vehicles represent the most mature market segment, medium- and heavy-duty markets are also evolving quickly.[323] However, the market requires two advances to succeed: the EV market will not reach robustness without pervasive infrastructure, and charging infrastructure, which has grown significantly in recent years,[324] still requires greater EV ubiquity to achieve the required scale.

Vehicle electrification marries the opportunities and challenges of the transportation sector with those of the power sector, and therefore its development involves unique considerations: siting, grid impacts, the energy storage capabilities, electricity pricing, and new business models. Many

[320] Office of Energy Efficiency & Renewable Energy, *Reducing Pollution with Electric Vehicles*, U.S. Department of Energy, https://www.energy.gov/eere/electricvehicles/reducing-pollution-electric-vehicles.
[321] EVAdoption, *EV Models Currently Available in the US*, (Nov. 22, 2019), https://evadoption.com/ev-models/.
[322] Thomas Gersdorf et al., *McKinsey Electric Vehicle Index: Europe cushions a global plunge in EV sales*, McKinsey & Company (July 17, 2020), https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/mckinsey-electric-vehicle-index-europe-cushions-a-global-plunge-in-ev-sales#.
[323] *See* CE4B Recommendation Paper: Decarbonizing Medium- and Heavy-Duty Transportation.
[324] For example, Public DC Fast Charging (DCFC) stations have grown from 3220 in 2017 to 5,500 in 2020. Jonathon Levy et al., *The Costs of EV Fast Charging Infrastructure and Economic Benefits to Rapid Scale-Up*, EVgo (May 18, 2020), https://www.evgo.com/wp-content/uploads/2020/05/2020.05.18_EVgo-Whitepaper_DCFC-cost-and-policy.pdf.

of the challenges faced are site-specific, but the following selection of federal policy recommendations would make a critical difference in ramping up the development of charging infrastructure:

- **Reduce barriers to deployment:** Establish a rebate program to mitigate the up-front cost of charger purchase and installation, coupled with investments for purchasing 500,000 zero-emission school buses, prioritized for front-line and underserved communities; establish a "SunShot initiative" equivalent for EV infrastructure cost reduction. The rebate program will require robust wage and labor requirements.
- **Increase penetration:** Lead by example by installing charging infrastructure at federal properties and transitioning federal, state, and local government pool fleets to zero-emissions vehicles; leverage electric utility spending & utility R&D capacity; and advance vehicle-grid integration through collaboration, federal incentives, and other programs.
- **Scale up:** Incentivize the build-out of charging infrastructure where vehicles have long dwell times, reinstating programs like EV Everywhere and Workplace Charging Challenge at DOE; and incentivize charging for high-mileage drivers and medium- and heavy-duty vehicles.

Opportunity / Problem Statement:
Electrification of transportation is known to bring enormous benefits in terms of reducing climate emissions, air pollution, and reducing costs to consumers. To succeed, it requires readily available charging infrastructure. However, EV charging infrastructure can be costly to install, and often requires installation before the EV market reaches robust levels of growth, making for a challenging business model. As a result, EV markets are slowed by the lowest common denominator between new vehicle purchases and EV charging infrastructure availability, with adoption of EVs varying significantly by geography.[325] Additionally, locating, financing, siting, and permitting EV charging infrastructure all present site-specific challenges.[326]

How this infrastructure is managed is also important: if electrification is combined with strong 21st century grid management technologies, EVs could increase the use of existing grid infrastructure and lower electricity costs for all. Managed charging strategies could shift electricity use to low-cost time periods, serving as an enabler of greater utilization and integration of renewable energy sources,[327] and displace the dirtiest peak generators.

These challenges cannot all be overcome by federal policy alone - and a heavy-handed federal policy could even undermine the significant progress happening at the state level and by private

[325] Charles Satterfield & Nick Nigro, *Public EV Charging Business Models for Retail Site Hosts*, Atlas Public Policy (April 2020), https://atlaspolicy.com/wp-content/uploads/2020/04/Public-EV-Charging-Business-Models-for-Retail-Site-Hosts.pdf.
[326] Chris Nelder & Emily Rogers, *Reducing EV Charging Infrastructure Costs*, Rocky Mountain Institute (2019), https://rmi.org/insight/reducing-ev-charging-infrastructure-costs.
[327] Conner Smith & Nick Nigro, *Vehicle-Grid Integration*, Atlas Public Policy (Oct. 2019), https://atlaspolicy.com/wp-content/uploads/2019/10/Vehicle-Grid-Integration-Fact-Sheet.pdf.

sector - but supportive policy to reduce barriers to deployment, increase penetration, and scale up infrastructure deployment can accelerate the market, leveraging institutional investment and private capital and state leadership to achieve a strong national market for EVs.

Proposed Recommendation:

Check Boxes Below	
✔	Is this a new or modification of an existing program?
✔	Does this roll back a Trump Administration regulation?

Reduce barriers to deployment

1. **Rebates:** To address the upfront cost of EV charger purchase and installation, which is one of the biggest barriers to EV charging deployment[328],establish rebates for EV charging and installation, prioritized for frontline and underserved communities**.** The rebate programs will require robust wage and labor requirements. The Clean Vehicle Assistance Program, run through a partnership between the State of California's Air Resources Board (ARB) and GRID Alternatives, in which underserved, front-line, or rural communities can not only get a rebate for a new or used EV, but also get an L2 charger installed for free or take public charging credit, offers an example for the Biden-Harris administration.[329]

2. **EV Infrastructure Cost Reduction Guidance:** Modeled on the successful track record of the SunShot Initiative[330] and in collaboration with state and local governments and utility commissions, DOE will 1) establish a set of recommended best practices and model codes to empower local jurisdictions to expedite timetables and drive costs down for the review, permitting, and installation of EV charging infrastructure; and 2) incentivize innovative approaches for cost-effective installation of EV charging infrastructure through competitive grants for pilots and demonstration projects, including addressing the lack of dedicated parking for most underserved communities.

Increase penetration

3. **Lead by example by installing charging infrastructure at federal properties:** Set a strong example and facilitate EV adoption by requiring that all federal capital projects – from office buildings to National Parks – incorporate EV chargers, both with

[328] Chris Nelder & Emily Rogers, *Reducing EV Charging Infrastructure Costs*, Rocky Mountain Institute (2019), https://rmi.org/wp-content/uploads/2020/01/RMI-EV-Charging-Infrastructure-Costs.pdf.
[329] Clean Vehicle Assistance Program, *Charging Stations*, https://cleanvehiclegrants.org/charging-stations/.
[330] Office of Energy Efficiency & Renewable Energy, *SunShot 2030*, U.S. Department of Energy, https://www.energy.gov/eere/solar/sunshot-2030;

new construction and with renovations and updates to existing construction. This would be done in conjunction with the transition of the 3 million vehicles in the federal, state, and local fleets to zero-emission vehicles. Moreover, make federal workplace chargers publicly accessible when not in use by employees, particularly in high visibility public locations.[331]

4. **Leverage electric utility spending to develop smart charging infrastructure:** Coordinate with utilities, utility associations, and industry stakeholders to identify a range of utility investment approaches for funding EV charging technology and infrastructure, in a manner that aligns with equitable deployment goals. Leverage utility R&D centers to help test and experiment with new VGI technologies that optimize load and strengthen the resilience of the grid.

5. **Vehicle-Grid Integration (VGI):** Form a task force with federal agencies (e.g., National Institute of Standards and Technology, DOE), electric utilities and other industry partners regarding VGI and load management strategies (e.g., "vehicle to everything," EV rates) to minimize grid impacts and create new value streams to support the deployment of EVs. Also create federal incentives and programs to experiment with vehicle-to-grid opportunities for optimal use cases, such as electric school buses and medium-duty delivery fleets. Disseminate lessons-learned and best practices from funded projects, and consider project benefits such as grid resilience (as demonstrated by recent California rolling blackouts).[332] Finally, support the implementation of new and promising approaches to VGI, such as the development of vehicle telematics for load management and standards for open communications protocols.

Scale up

6. **Advance existing bills:** A number of bills are already in development and discussion that incentivize the construction of EV charging infrastructure in achievable contexts, including where vehicles have long dwell times and on common travel corridors. The Biden-Harris administration should enhance these bills by prioritizing investments in front-line communities and requiring robust wage and labor requirements. These proposals include:
    a. Proposals to build EV charging and hydrogen[333] refueling infrastructure along highway corridors[334];

[331] Note that charging stations intended primarily for personal use by federal employees or public use (as opposed to charging for federal fleet vehicles) are likely to require additional appropriations. To provide flexibility in this policy, it is also advisable that federal agencies be required to meet requirements through a ratio of DCFC to L2 chargers.
[332] During the 2020 wildfires in California, the potential benefits of VGI programs for grid resilience became more relevant in the context of rolling blackouts and public safety power shutoffs, which tended to impact underserved communities at the urban-wildland interface.
[333] Hydrogen fuel cell vehicles are also driven by an electric motor; a fuel pathway that is particularly important in exploring electrification of medium- and heavy-duty vehicles.
[334] *See, e.g.*, H.R. 2, 116th Cong. § 1303 (2020); S. 2302, 116th Cong. § 1401 (2020).

b. Rebates for publicly-available charging, workplace charging, commercial charging, urban and suburban DCFC (including on-street charging), and multi-family dwelling charging,[335] and other provisions included in H.R. 2;
c. Proposals to allow EV chargers to be installed at all federal highway rest stops[336];
d. Extensions and adjustments to the Alternative Fuel Infrastructure Tax Credit to enhance their stimulative impact.[337]

7. **Zero-Emission Medium- and Heavy-Duty Vehicle Infrastructure:** Support the unique electrification needs and significant grid demands[338] of zero-emission commercial vehicles by investing in infrastructure and technical assistance to reduce market barriers to private and public fleet adoption of zero-emission trucks and zero-emission buses due to infrastructure, related equipment, make-ready costs, and other electrification costs.
   a. **Trucks:** 1) Through the Department of Energy / Office of Energy Efficiency & Renewable Energy (EERE), demonstrate at the fleet level local- and regional-haul zero-emission truck charging infrastructure on a regional scale, including depot charging, on-route charging, and port electrification applications.[339] 2) Through the Department of Energy / EERE, provide State Energy Offices technical assistance and best practices for transportation electrification planning to rapidly deploy zero-emission trucks[340]; and through EERE and DOE provide technical assistance to public utility commissions and utilities on commercial vehicle electrification, including optimal rate design, incentive structures, and best practices for medium- and heavy-duty zero-emission vehicle make-ready.

[335] *See, e.g.*, H.R. 2, 116th Cong. § 33332 (2020).
[336] Note that this would require amendment of 23 USC 111 or appropriations for free charging.
[337] Carper/Doggett bills, converting to direct pay (a la "Sec. 1603") to make it truly stimulative. *See* U.S. Department of the Treasury, *1603 Program: Payments for Specified Energy Property in Lieu of Tax Credits*, https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/1603-program-payments-for-specified-energy-property-in-lieu-of-tax-credits.
[338] Medium- and heavy-duty vehicles are often considered more difficult to electrify due to their significant electricity demand, and reliance on larger, heavier batteries. However, especially in the case of short-haul medium- and heavy-duty vehicles, these larger batteries can also generate a significant storage resource, and therefore an important target for vehicle to grid integration and source of grid benefits.
[339] Note similar state incentives, including the Zero and Near Zero Emission Freight Facility (ZANZEFF) investment in California, has spurred MHD ZEV infrastructure. *See* California Air Resources Board, *CARB announces more than $200 million in new funding for clean freight transportation*, (Sept. 26, 2018), https://ww2.arb.ca.gov/news/carb-announces-more-200-million-new-funding-clean-freight-transportation.
[340] Note this could be channeled through existing DOE Office of Energy Efficiency and Renewable Energy (EERE) mechanisms, including Vehicle Technologies Office Technology Integration program in coordination with EERE's State Energy Program, but would likely require new authorizing legislation for the activity and new appropriations.

b. **Buses:** Through the Department of Transportation, provide increased funding for existing Transit Vehicle Innovation Deployment Centers[341] to support transit agency adoption of zero-emission buses into fleets of all sizes and in all geographies by addressing bus depot and enroute charging market barriers. These will be expanded to ensure transitioning of the entire fleet of 500,000 school buses to American-made, zero-emission alternatives within five years.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Electrification is likely our most powerful tool to create positive impacts for the economy and climate in the transportation sector. This includes:

- **Climate:** Widespread electrification of vehicles can reduce climate emissions by 1.5 billion metric tons of CO_2 per year in 2050.[342,343]
- **Jobs:** $1 billion in EV infrastructure investment could support the installation of 23,000 to 100,000 non-residential chargers and 6,000 to 15,000 jobs for a year,[344] and more would result from maintaining EV chargers.
- **Public health:** Reducing air pollution, health care spending, and deaths -- and increasing labor productivity and public health -- would add up to $700 billion per year in benefits in the U.S. This is far more than the cost of the energy transition.[345]
- **GDP growth:** Some of the greatest impacts of building EV charging infrastructure results from enabling EV market growth. According to modeling by the National Renewable Energy Laboratory, an "aggressive scenario," where plug-in electric vehicles reach 73 million by 2035, would generate $26.5 billion per year by 2035 in private and social benefits, create 52,000 additional jobs per year, and create a $6.6 billion increase in average annual gross domestic product (as averaged from 2015 to 2040).[346]

[341] Note this could be achieved through appropriations to an existing FTA program, as was recently done by House FY21 T-HUD Appropriations. H.R. 452, 116th Cong. at 79 (2020). *See* Center for Transportation and the Environment, *CTE-Led Transit Panel Identifies Key Needs for Zero Emission Bus Research and Deployment*, (Jan. 2020), https://cte.tv/tvidc-2020/.

[342] Nic Lutsey, *Global climate change mitigation potential from a transition to electric vehicles*, International Council on Clean Transportation (Dec. 2, 2015), https://theicct.org/sites/default/files/publications/ICCT_ghg-reduction-potential-evs_201512.pdf

[343] Keeping to the 2°C pathway over the next 50 years would, "prevent roughly 4.5 million premature deaths, about 3.5 million hospitalizations and emergency room visits, and approximately 300 million lost workdays in the US." *Hearing on "The Devastating Impacts of Climate Change on Health" Before the H. Comm. on Oversight and Reform*, 116th Cong. (2020) (statement of Drew Shindell, Distinguished Professor of Earth Sciences, Nicholas School of the Environment, Duke University), https://oversight.house.gov/sites/democrats.oversight.house.gov/files/Testimony%20Shindell.pdf [hereinafter Shindell Testimony].

[344] Claire Alford & Matt Stanberry, *Despite Pandemic Slump, EV Growth Means More Charging Stations Are Needed. The U.S. Would Gain by Investing in Them Now*, Advanced Energy Perspectives (May 21, 2020), https://blog.aee.net/despite-pandemic-slump-ev-growth-means-more-charging-stations-are-needed.-the-u.s.-would-gain-by-investing-in-them-now.

[345] *See* Shindell Testimony, *supra* note 343.

[346] Marc Melaina et al., *National Economic Value Assessment of Plug-In Electric Vehicles*, 1 NREL (2015), https://www.nrel.gov/docs/fy17osti/66980.pdf.

How the Recommendation Supports Frontline or other Underserved Communities:

The programs will be targeted to drive local economic development and will commit to directing a significant portion of clean energy and sustainable infrastructure investments to historically marginalized communities to help create local jobs and reduce energy poverty, install clean energy technologies including community solar, and build resilience. This will include investment in the education and training of underrepresented groups, including people of color, low-income Americans, women, veterans, people with disabilities, and unemployed energy workers for jobs in clean energy-related industries.

- **Long-term benefits:** Transportation costs disproportionately burden low-income and underserved consumers; a study from 2016 found the lowest-earning 20% of the population paid an average of 29% of household expenditures on transportation costs.[347] EVs cost half as much to operate as gas-powered cars, making a transition to electrification a long-term benefit for all.[348] More specifically, this proposal would advance a number of priorities targeting underserved communities, including: providing rebates for used EVs, facilitating the installation of charging stations at accessible locations (multi-family housing, on-street), prioritizing EV bus charging, and ensuring that EV infrastructure is accessible and affordable to use.
- **Air Pollution**: Air pollution, produced by the combustion of fossil fuels, causes adverse health effects and premature death, with disproportionate impacts on low-income and front-line communities of color.[349] Fully electric vehicles can provide the most significant reductions in air pollutants compared to a gasoline-fueled vehicle, including reductions of: 98% of sulfur oxides, 99% of volatile organic compounds, 90% of nitrogen oxides, and reductions in particulate matter (81% for PM2.5 and 57% for PM10).[350] This profile improves further when the electricity is generated by renewable energy.

How the Recommendation Supports Biden's Climate Plan:

- The recommendation will advance the Biden vision that federal investments in infrastructure should help cut carbon pollution, build resilience and protect

[347] Institute for Transportation & Development Policy, *The High Cost of Transportation in the United States* (May 23, 2019), https://www.itdp.org/2019/05/23/high-cost-transportation-united-states/#:~:text=The%20lowest%20income%20is%20burdened,(lack%20of)%20transport%20system.
[348] Jeff McMahon, *Electric Vehicles Cost Less Than Half As Much To Drive*, Forbes (Jan. 14, 2018), https://www.forbes.com/sites/jeffmcmahon/2018/01/14/electric-vehicles-cost-less-than-half-as-much-to-drive/#f0bad953f973.
[349] American Lung Association, *Disparities in the Impact of Air Pollution*, https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities.
[350] Southwest Energy Efficiency Project & Utah Clean Energy, *The Potential for Electric Vehicles to Reduce Vehicle Emissions and Provide Economic Benefits in the Wasatch Front*, (Jan. 2017) https://www.swenergy.org/data/sites/1/media/documents/publications/documents/2017_EV_Emissions_Update_Wasatch_Front_Jan-2017.pdf.

communities from the impacts of climate change, promote racial equity and sustainable economic development, and come with livable wages and robust labor protections that empower workers.

- The Biden Climate Plan recommends public investment in EV infrastructure, including a commitment to build 500,000 public charging outlets and transitioning the entire fleet of 500,000 school buses to American-made, zero-emission alternatives within five years, and transitioning the 3 million vehicles in the federal, state, and local fleets to zero-emission vehicles. The above policy recommendations are ready and available mechanisms – often with significant support across the industry -- to achieve this objective.

Key Battleground State Activity:

From Virginia to Nevada, VW Appendix D funds and other state programs are being deployed to support EV supply equipment build-out across battleground states. Additionally, many utilities in these states have begun preparing the energy system for zero-emission medium- heavy-duty vehicles, demonstrating that light-duty EV penetration and ZEV deployment in commercial fleets are aggressively moving forward across the United States. Rate cases are currently occurring across the midwest, including: Consumers Energy ($22.2M, PowerMIDrive and PowerMIFleet programs) and DTE ($13M, Charging Forward program) in **Michigan;** AEP ($10M) and Duke Energy ($16M, PowerForward program) in **Ohio**; Xcel Energy ($9M) in **Wisconsin;** Xcel Energy ($23.6M, Public Charging and Public Fleet programs) in **Minnesota;** and Duke Energy ($10.3M, Fast Chargers, Electric School Bus, Electric Transit, Commercial EV programs) and Indiana Michigan Power ($2.1M, EV pilot) in **Indiana.**[351]

Great examples of progress also exist at the state level. The Colorado Electric Vehicle Plan released this year provides a good model for EV infrastructure investments at the state and local government level,[352] and Florida enacted legislation this year adding EV charging infrastructure with broad bipartisan support.[353]

[351] Edison Electric Institute, *Electric Transportation Biannual State Regulatory Update,* (June 2020), https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL_ET%20Biannual%20State%20Regulatory%20Update_June%202020.pdf; CALSTART analysis.
[352] Colorado Energy Office, *Colorado EV Plan 2020*, https://energyoffice.colorado.gov/zero-emission-vehicles/colorado-ev-plan-2020.
[353] Dory Larsen, *Florida Gov. DeSantis Signs Essential State Infrastructure Bill Into Law*, Southern Alliance for Clean Energy (June 10, 2020), https://cleanenergy.org/blog/florida-gov-desantis-signs-essential-state-infrastructure-bill-into-law

Electrifying the Light Duty Sector

Opportunity/Problem:

The climate crisis demands swift action and rapid deployment of new clean energy resources. Competition can provide opportunities for rapid on-site renewable energy deployment, system-wide efficiency, and enabling of emerging smart-building and smart-grid technologies.

Recommended Action(s):

- Replicate key market design principles from ERCOT elsewhere.
- Unbundle utilities where feasible and explore energy-only market construct. Streamline transmission costs by setting rates and funding transmission at the federal level.
- Provide easy market access and standardize platforms.

Program Type:

√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislations

Job Benefits:

With a market-based approach, we can start deploying current technologies and innovating to create new clean energy solutions and services, creating millions of jobs sooner than later.

Econ. Benefits:

A market-based approach can help expedite the innovation and investment anticipated in the transition to clean energy. Awaiting regulatory guidance can cause delays in innovation and job creation and higher costs for consumers.

Equity Benefits:

Unbundling generation from transmission and retail service, along with market expansion, creates jobs in underserved areas and improves resilience by providing opportunities for independent generation facilities and retail service providers to create a more resilient grid.

Climate Plan Tie:

Clean energy deployment supports all aspects of the Biden Climate Plan.

Battleground State Benefits:

Including markets and competition in plans to expand clean energy will facilitate the conversation in battleground states where economic growth is desperately needed and resistance to regulation is strong. Measures favorable to renewable expansion will pay additional dividends in battleground states primed for development.

Electrifying Light-Duty Vehicles

AUTHORS: Natasha Vidangos, Andrew Salzberg, Kelly L. Fleming, Joel Levin, Daniel Kammen, O. Kevin Vincent, Hasan Nazar, Alice Koethe

DATE: 8/13/2020

Statement of Issue and Summary of Recommendations:

America loves cars. The American market for cars and light trucks -- the light duty sector[354] -- is massive, with over 250 million light-duty vehicles (LDVs) registered in the United States in 2017.[355] Automotive manufacturing directly employs nearly one million workers,[356] and the overall auto industry supports an estimated 9.9 million jobs.[357] Further, light duty vehicles are a lifeline to jobs, communities, and healthcare for many Americans, particularly in rural areas.

More than 95% of these vehicles run on fossil fuels,[358] making the light duty sector responsible for 60% of U.S. transportation greenhouse gas emissions.[359] The Biden campaign already recognizes the importance of the issue by advocating for tough and escalating fuel economy standards, retraining workers for electric vehicle markets, and supporting bills such as S. 674 (Senator Carper's Clean Corridors Act) and several bills incorporated into H.R. 2, the Moving Forward Act. Vehicle electrification can double fuel economy[360] and significantly reduces particulate matter and greenhouse gas emissions. EVs are already cost-competitive on a lifetime expenditures basis,[361] and battery prices, which constitute most of the vehicle cost, are falling rapidly. Other countries are moving quickly to try to take the lead, and the United States stands to fall behind.[362] The future is electric, and it's here.

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[354] Vehicles with a gross vehicle weight rating (GVWR) of less than 8,500 lbs, including cars and light trucks (e.g. SUVs).

[355] Office of Highway Policy Information, *Annual Vehicle Distance Traveled in Miles and Related Data - 2017*, Department of Transportation (March, 2019), https://www.fhwa.dot.gov/policyinformation/statistics/2017/vm1.cfm.

[356] As of July 2020, the US motor vehicles and parts manufacturing sector employed 927,000 workers. U.S. Bureau of Labor and Statistics, *National Employment* (October 13, 2020), https://www.bls.gov/iag/tgs/iagauto.htm.

[357] Auto Alliance (October 13, 2020) https://autoalliance.org/in-your-state/.

[358] *Id.*

[359] Sam Ricketts, *Evergreen Action Plan*, Medium (May 15, 2020), https://medium.com/@sam.t.ricketts/evergreen-action-plan-3f705ecb500a

[360] While the greenhouse gas emissions of an electric vehicle depend on the generation mix for electric power used to charge the vehicle, current estimates still suggest that EVs are marginally cleaner, even if charged full from coal-fired generation. Argonne National Laboratory GREET "Well to Wheel" Calculator, (last visited Sept. 1, 2018), https://greet.es.anl.gov/results.

[361] Am. Auto. Assoc., *Your Driving Costs* (2019), https://exchange.aaa.com/wp-content/uploads/2019/09/AAA-Your-Driving-Costs-2019.pdf.

[362] China is expected to host 62% of global lithium-ion battery manufacturing capacity by 2023, and the European Commission has created the European Battery Alliance to try to establish European supply

Developing Clean Transportation and Low Emissions Infrastructure

The Biden Administration has an opportunity to support the United States' leadership position and accelerate the benefits of EVs for Americans. This document offers five policy ideas to jumpstart the electrification of the light-duty sector:

- Improve the EV personal income tax credit to increase its accessibility;
- Establish a 50% Zero Emissions Vehicle (ZEV) purchase requirement for federal light duty vehicle procurements;
- Create a National Zero Emission Vehicle Mandate;
- Create a National Clean Miles Standard to reduce emissions and rapidly electrify fleets, including federal government and corporate fleets and transportation network companies (TNCs);
- Establish a feebate scheme that incentivizes electrification, improves equity, and rapidly transitions drivers to affordable electric vehicles.

Opportunity / Problem Statement:
Electrification of light-duty vehicles will create American jobs while establishing U.S. leadership in a technology that reduces climate and air quality impacts and saves consumers money in fuel and maintenance costs. However, rapid electrification is a massive challenge: the automotive industry is large, complex, and inertial, and other countries are moving decisively to capitalize on this new market. Some common challenges include:

- The U.S. has a slow (and slowing[363]) **vehicle turnover rate**, now averaging 11.8 years.[364] As a result, it would take nearly two decades to turn over the U.S. vehicle fleet even if every American's next automobile purchase is a ZEV.
- While some automakers have been making aggressive commitments to EV development and deployment, **others resist producing and marketing electric vehicles** in the current policy environment. Currently, EVs generally have smaller profit margins than gas-guzzlers, or do not generate profits at all.
- An uneven policy environment across the United States creates a **fractured market** for EVs, with some states pursuing mandates for ZEVs, and others directly penalizing electric vehicles with disproportionate registration fees to fund highway infrastructure.
- EVs currently have **higher up-front costs** than conventional vehicles, even though they lead to lifetime fuel savings. While rapidly improving battery technology and attendant price reductions is expected to close the price gap within 4-5 years, policy incentives are needed now. Research has shown that -- as the market has grown -- regular buyers are now

chains. UAW Res. Dep't., *Taking the HIgh Road: Strategies for a Fair EV Future*, United Auto Workers Int'l (2019), https://uaw.org/wp-content/uploads/2019/07/190416-EV-White-Paper-REVISED-January-2020-Final.pdf.

[363] David R. Keith et al., *Vehicle Fleet Turnover and the Future of Fuel Economy*, Env't Res. Letters (Feb. 2019).

[364] Bureau of Transportation Statistics, Average Age of Automobiles and Trucks (2019), https://www.bts.gov/content/average-age-automobiles-and-trucks-operation-united-states.

purchasing EVs, and not just early adopters.[365] Making EVs more affordable for middle-class consumers would create a multiplier effect and is critical for greater equity.

- China and Germany are aggressively subsidizing their EV and battery manufacturing sectors. If the United States delays too long, it may **lose the competition.** The automotive industry supports 9.9 million American jobs that we cannot afford to lose.[366] Policymakers must prioritize domestic EV manufacturing to add resilience to the supply chain and preserve U.S. jobs. Consider that Tesla, our largest EV manufacturer, has chosen to build assembly plants in China and Germany.

Proposed Recommendation:

Check Boxes Below	
both	Is this a new or modification of an existing program?
yes	Does this roll back a Trump Administration regulation?

The following are a selection of ***five policy recommendations*** at increasing levels of ambition, which would seek to accelerate the EV market in the United States.

Policy 1: Federal 50% EV purchase requirement for LDVs

The federal government is the single largest purchaser of LDVs. This purchasing power can be used to drive near-term demand for ZEVs and sharply affect auto manufacturer behavior and perceptions about the immediate ZEV market in the United States. This could be done through an executive order to all federal agencies in the first few days of the Biden Administration to require that 50% of all new federal light duty vehicle procurements must be ZEVs. Numerous states and cities have already taken this step with various percentage requirements. For situations where no appropriate ZEV is available, agencies can be permitted to seek a waiver of the requirement.

Policy 2: Improve the EV tax credit for greater accessibility

The primary federal consumer incentive regime for zero-emission light-duty vehicle deployment is broken, leaving America without a way to accelerate adoption of clean transportation. Policymakers should re-design the current $7,500 EV tax credit[367] to benefit more consumers and support U.S. automakers. Suggested changes include:

1. **MSRP Cap:** Research has shown that high-income individuals are not incentivized to purchase EVs based on the EV tax credit; they would have purchased the vehicle regardless. To benefit low-middle income drivers, make tax rebates available only for vehicles with

[365] Scott Hardman et al., *The Effectiveness of Financial Purchase Incentives for Battery Electric Vehicles – A Review of the Evidence*, 80 Renewable and Sustainable Energy Reviews 1100, 1100–11 (2017).
[366] *See* Industry Impact, Auto Alliance (last visited Oct. 21, 2020), https://autoalliance.org/in-your-state/.
[367] 26 U.S.C. IRC Section § 30D. .

MSRPs of $65,000 or less. By capping the MSRP, more money will be available to distribute to drivers, and automakers are incented to offer affordable EV options.

2. **Remove the 200,000 vehicle cap:** Remove the 200,000 vehicle sales limit, which penalizes U.S. first-movers (Tesla and GM), while continuing to benefit Korean, European, Japanese and eventually Chinese automakers.
3. **15% Phase-Out:** Do not phase out until EV purchases exceed 15% of LDV sales.
4. **Limit the credit to BEVs and PHEVs with an EPA range of at least 35 miles**: Long-range PHEVs can be an important part of the solution.
5. **Make the credit transferable:** This would make the credit much more valuable for moderate-income consumers who do not have a large federal tax liability. It will also make the credit point-of-sale, as buyers can sell the credit to the manufacturer or anyone else at the moment of sale. This is tremendously powerful for moderate income buyers.
6. **Extend credit for resale:** Extend the EV credit at 50% (i.e. $3750) for a single resale use on secondary EV purchases (i.e., for a used vehicle). More people purchase used vehicles than new vehicles, making this a powerful tool to increase EV access for more consumers.

Policy 3: Establish a National Clean Miles Standard to Apply to Federal, Corporate, Utility and Transportation Network Companies (TNCs) to Push Fleets to Early Adoption of EVs

Vehicle fleets -- government, corporate, utility, and TNCs -- account for a large share of the vehicles and miles driven on America's roads, contributing to greenhouse gas emissions and local air quality impacts. Corporate fleets represent 18 percent of U.S. light-duty vehicle registrations and light-duty federal government fleet vehicles drove 1.8 billion miles in 2019.[368] TNCs carry billions of riders each year and, in some cities, are now responsible for as much as 13 percent of all vehicle miles traveled (VMT), alongside traditional taxi fleets.[369] Moreover, the TNC segment has been growing quickly and trips taken by Uber and Lyft are on average more polluting than the alternatives on a per-passenger-mile basis.[370]

Many vehicle fleets are well-suited for electrification because they often perform duty cycles with a large share of stop-and-go urban driving or drive well-defined, centralized routes. One study found electrifying a TNC has three times the emissions savings of electrifying a private

[368] Fleet Leasing & Management in North America, Deloitte (2018), https://www2.deloitte.com/content/dam/Deloitte/us/Documents/consumer-business/us-cp-fleet-leasing-and-management-in-north-america.pdf; FY 2018 Federal Fleet Open Data Set, U.S. Gen. Serv's Admin. (2019), https://www.gsa.gov/policy-regulations/policy/vehicle-management-policy/federal-fleet-report.

[369] Maria Cecilia Pinto de Moura et al., *Ride Hailing's Climate Risk,* Union of Concerned Scientists (Feb. 2020), https://www.ucsusa.org/sites/default/files/2020-02/Ride-Hailings-Climate-Risks-Methodology_0.pd; Letter from Fehr & Peers to Uber & Lyft, *Estimated TNC Share of VMT in Six US Metropolitan Regions* (Revision 1) (Aug. 7, 2019), https://issuu.com/fehrandpeers/docs/tnc_vmt_findings_memo_08.06.2019.

[370] Laura Bliss, *Ride-Hailing Isn't Really Green*, Bloomberg (Feb. 25, 2020), https://www.bloomberg.com/news/articles/2020-02-25/the-other-toll-of-uber-and-lyft-rides-pollution.

vehicle because of high mileage and charging times that take advantage of the grid at its cleanest.[371] To reduce emissions from these high-potential segments in the light-duty vehicle sector and to continue building the EV market, the federal government should implement a National Clean Miles Standard (NCMS) modeled on the innovative policy pioneered by California (S.B. 1014).[372]

Specific targets, regulatory design, and compliance levers will vary by segment (government, corporate, utility or TNC), but generally a NCMS should include a **baseline fleet greenhouse gas emissions inventory**; a **national electrification target**; a **national emissions target for** fleets in terms of GHG emissions per passenger mile for TNCs and GHG emissions per vehicle mile for other fleets; and complementary **incentives and federal support** for charging infrastructure build-out and EV purchases to ensure market readiness. Regulatory design consideration should be given to supporting compliance via vehicle electrification, ridesharing (i.e., pooling), first/last-mile connections to transit and active transportation, and use of tradable credits. A national policy should also aim to harmonize with similar programs implemented at the state level.

Policy 4: Establish a National ZEV Mandate with a 100% Target by 2035

A ZEV Mandate requires automakers to sell zero emission vehicles (e.g. battery electric, hydrogen fuel cell vehicles) as a percentage of vehicle sales. The policy has been successful in California, and has been adopted by 10 other states, where it includes a transferable credit system.[373] Setting this policy at a national level -- including a target to achieve 100% ZEV penetration of new LDV sales by 2035 -- would be transformational, magnifying its impact significantly and reducing the likelihood of rollbacks or preemption issues.

Such a policy could also represent the future trajectory for the Corporate Average Fuel Economy (CAFE) standards: while fuel economy standards based on internal combustion engines can only make incremental gains in fuel economy and emissions reductions, EVs enable a leap forward. Establishing a path to electrification, therefore, is the natural next step for the U.S. to ramp up its trajectory for low-emission transportation.

Policy 5: Establish a feebate scheme that incentivizes electrification and rapidly transitions drivers to affordable electric vehicles.

The U.S. policy environment for electrification is fragmented and complex, with a variety of federal/state/local incentives and fees placed on vehicles that are often inefficient, and sometimes outright contradictory (*a comment on the Highway Trust Fund revenues is included in Appendix A*). However, a more ambitious, comprehensive, and effective approach is possible.

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[371] Alan Jenn, *Emissions Benefits of Electric Vehicles in Uber and Lyft Ride-Hailing Services*, 5 Nature Energy 520, 520–25 (2020).

[372] See, California Air Resources Board, Clean Miles Standard (last visited Oct. 21, 2020), https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard.

[373] Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont have all implemented California's standard. Colorado's regulations go into effect in 2023 and the States of Washington, New Mexico and Minnesota have announced they are adopting the ZEV Mandate and are in the process of promulgating regulations to do so.

Numerous foreign markets have implemented novel "bonus-malus" or "feebate" policies that register a vehicle's performance (CO_2 emissions or fuel consumption) and impose a fee on poor performers and a rebate to high performers. When scrappage is included, these programs incorporate a "cash-for-clunkers"-like element and accelerate turnover of the least efficient vehicles. A highly versatile policy design, feebates have proven very effective in speeding adoption of clean transportation by focusing on an objective and providing a clear and consistent market signal.[374] It also provides some political benefits: when judged on a CO_2-per-mile basis rather than a specific technology, it is technically a technology-neutral approach focused on reducing not only climate emissions but the co-pollutants that directly impact Americans' respiratory health.[375] Careful considerations around vehicle eligibility can ensure equitable application of the policy (e.g. vehicles must have an MSRP of at least $50,000 for penalties and less than $60,000 for incentives) and prevent gaming (e.g. vehicle must be purchased and registered in the U.S.). Additional policy considerations (performance, equity, scrappage, funding, and domestic manufacturing), and a case study on a feebate scheme in Italy are described in Appendix B.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

As recognized by the campaign, vehicle electrification – done right -- is a triple-win for economy, environment, and for social justice. According to modeling by the National Renewable Energy Laboratory, an "Aggressive scenario," where plug-in electric vehicles reach 73 million by 2035, would generate $26.5 billion per year in private and social benefits, and 52,000 additional jobs per year by 2035. It would also increase the average annual gross domestic product (as averaged from 2015 to 2040) by $6.6 billion.[376] In contrast, if electrification proceeds slowly in the United States, it stands to lose significant jobs and economic opportunity to other countries, such as China and a number of countries in Europe, which are aggressively building manufacturing potential and comprehensive supply chains within their regions.[377]

How the Recommendation Supports Frontline or other Underserved Communities:

Frontline and underserved communities experience the first and worst consequences of climate change, along with a litany of devastating public health impacts due in large part to fossil fuel air

[374] See generally, *Topics: Feebate systems*, International Council on Clean Transportation (last visited Oct. 21, 2020), https://theicct.org/spotlight/feebate-systems.
[375] Transportation, American Lung Association (last visited October 13, 2013), https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/transportation.
[376] Marc Melaina et al., National Economic Value Assessment of Plug-In Electric Vehicles, National Renewable Energy Laboratory (Dec. 2016), https://www.nrel.gov/docs/fy17osti/66980.pdf.
[377] Taking the High Road: Strategies for a Fair EV Future, United Auto Workers Res. Dept. (Jan. 2020), https://uaw.org/wp-content/uploads/2019/07/190416-EV-White-Paper-REVISED-January-2020-Final.pdf.

pollutants. Electrification presents a powerful avenue to reduce air pollutants – especially as the electric grid becomes cleaner over time.[378]
Frontline and underserved communities also suffer from a lack of affordable transportation access. EVs are more affordable to drive on a cost of ownership basis due to reduced fuel and maintenance costs. However, LDV EVs currently are more expensive to purchase, and require charging infrastructure that may not be available in all neighborhoods. The above recommendations, including adjusting the EV tax credit to target middle-class and lower-income communities, a national ZEV mandate, and a feebate scheme would result in market-transformational cost reductions of EVs (and may, in fact, result in lowering the cost of electricity, as utilities meet greater demand).[379] A National Clean Miles Standard for fleets could also serve to drive incentives for EV acquisition for drivers, opening a new avenue for EV ownership for TNC drivers, among others. However, the devil is in the details: electrification policy must be crafted proactively considering frontline communities' interests to ensure electrification's promise is delivered.

How the Recommendation Supports Biden's Climate Plan: Electrification is a key priority throughout multiple Biden vision statements. Specific language from vision statements at joebiden.com are highlighted and matched with specific recommendations in Appendix C.

Key Battleground State Activity:
States with vehicle and battery manufacturing deserve extra attention. There are EV manufacturing facilities in Arizona, Michigan and Ohio, and battery[380] manufacturing facilities in Nevada, and Ohio, with another planned for Georgia. Additionally, ZEV states include: California, Colorado, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont and Washington.

[378] Shelley Francis, *Electric Cars, Frontline Communities, Air Pollution: Covid-19 Mortality*, Center for the Study of Racism Social Justice & Health (May 7, 2020), https://www.racialhealthequity.org/blog/2020/5/7/electric-cars-frontline-communities-air-pollution-covid-19-mortality.
[379] Jason Frost et al., *Electric Vehicles Are Driving Electric Rates Down*, Synapse Energy Economics, Inc. (June 2019), https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf.
[380] Batteries constitute the most expensive component for EVs.

APPENDICES

APPENDIX A

Comment: Highway Trust Fund Solvency and EVs

The Highway Trust Fund, the primary source of funding for road infrastructure, is supported by a federal gas tax that has not been raised since 1993, and has not been pegged to inflation, leading to accelerating budget shortfalls. Some EV critics have successfully created a false dichotomy in which they blame EVs -- whose owners do not pay gas taxes -- for this trend, and focus the political dialogue on EVs "not paying their part." While Highway Trust Fund solvency is, indeed, a problem that requires resolution, EVs are neither the cause nor the solution for the shortfalls, and should not be considered relevant to the topic until they are directly responsible for degradation of road infrastructure.

APPENDIX B: Additional detail on Feebate Schemes

Figure 1: Design of a typical feebate scheme, noting fuel economy ranges for incentives and penalties, relative to MY21 Obama CAFE standards.

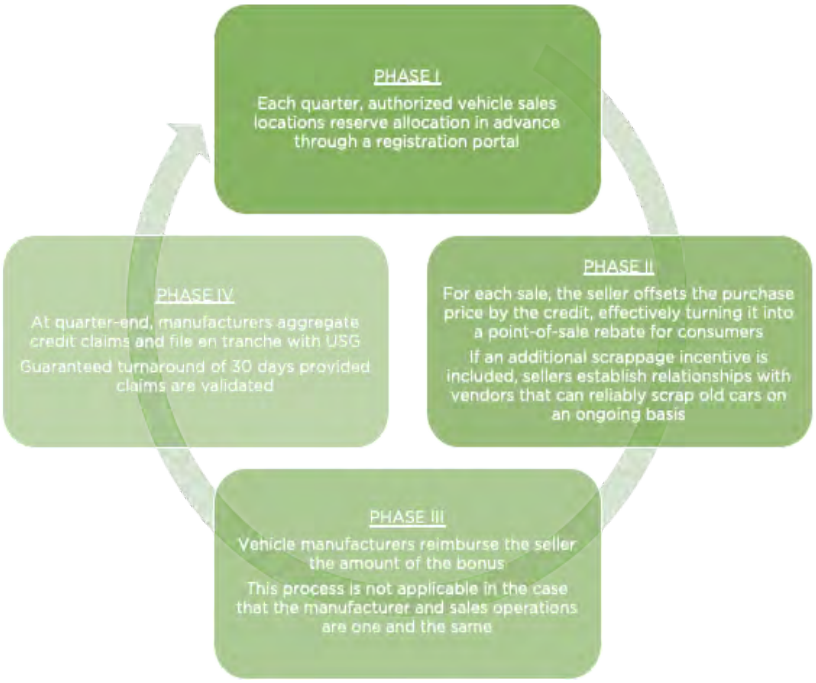
Proposed Vehicle incentive eligibility:

- Purchased and registered in the U.S.
- MSRP cap of $60,000
- New factory vehicle

Additional policy considerations

- *Scrappage*. In some jurisdictions, a bonus is applied to the incentive if an existing vehicle is turned in for scrappage. Requirements should be scoped to previous vehicle performance rather than age to optimize program efficacy.
- *Funding*. Award baseline incentives as a tax credit for vehicle distributors. For the first year of the program, appropriate a set dollar amount for scrappage component of program, with malus dollars—or receipts of other transportation-focused credit producing schemes such as LCFS or CAFE penalty receipts (provided the penalty is reinstated and perhaps even increased through regulatory fiat)—supplementing in subsequent years.
- *Domestic manufacturing*. Include either a baseline eligibility requirement or an additional bonus for American-made vehicles.

Figure 2. Phases of implementation for an example feebate scheme.



Case Study: Italian "Ecobonus" Scheme

Italy is the most recent major economy to implement a similar feebate structure. The program was implemented in 2019 on a three-year basis. ZEV adoption has increased tenfold since enactment.
The "ecobonus" regime includes scrappage incentives and has been implemented with great success since its adoption. A recent Covid-19 response package temporarily increased incentives under the program.
More details of the Italian program can be found at the European Automobile Association Tax Guide.[381]

APPENDIX C

Relevant Recommendation	**Biden Campaign Commitment**
National Clean Miles Standard	"Use federal procurement… to drive toward 100% clean and ZEV vehicles" and "increase federal procurement by $400 billion… [to

[381] 2020 Tax Guide, European Automobile Manufacturers Association (2020), https://uaw.org/wp-content/uploads/2019/07/190416-EV-White-Paper-REVISED-January-2020-Final.pdf.

	purchase] clean energy inputs like batteries and electric vehicles"
Amend the EV Tax Credit	"Biden will restore the full electric vehicle tax credit to incentivize the purchase of these vehicles." He will ensure the tax credit is designed to target middle class consumers and, to the greatest extent possible, to prioritize the purchase of vehicles made in America.
National ZEV Mandate	And, he will work to develop a new fuel economy standard that goes beyond what the Obama-Biden Administration put in place.
All recommendations	"Create 1 million new jobs in the American auto industry, domestic auto supply chains, and auto infrastructure; invest in U.S. auto workers" "…use all the levers of the federal government, from purchasing power, R&D, tax, trade, and investment policies to… position America to be the global leader in the manufacture of electric vehicles and their input materials and parts."

APPENDIX D
Additional Background on TNC Operations

TNCs--such as Uber and Lyft--have become a central feature of the transportation landscape in America's urban areas. Uber and Lyft today carry billions of riders each year, far more than the conventional taxicab services, and TNC vehicles are driving many more miles each year. In some cities, TNCs alone are now responsible for as much as 13 percent of all vehicle miles traveled (VMT). Unfortunately, not all of these miles carry passengers: TNC drivers must maneuver to pick-up new fares, sometimes driving many miles to find their next customer, in a practice known as "deadheading." While TNC vehicles tend to be newer and thus more efficient than the average car on the road today, these additional miles more than outweigh those improvements. On average, a non-pooled TNC trip emits 47 percent more CO_2 emissions per trip mile than the same journey in a personal car.

Decarbonizing Medium- and Heavy-Duty Transportation

Opportunity/Problem:

Transportation passed the energy sector as the largest domestic contributor of greenhouse gas emissions in 2016, with medium- and heavy-duty (MHD) vehicles responsible for roughly one-quarter of all transportation emissions. Federal programs have been critical in stimulating development of MHD vehicle technologies previously, and should expand their role in doing so under a Biden Administration.

Recommended Action(s):

- Increase Fuel Efficiency Standards
- Create Public Fleet Zero Emission Targets
- Transition Existing MHD Fleets
- Revamp the Diesel Emissions Reduction Act (DERA)
- Secure Permanent Funding Stream and Remove Disincentives
- Increase Funding for Zero Emission Transit Programs
- Boost Research and Development

Program Type:

√ New Program

√ Program Modification

√ Rollback of Trump Program

Authority:

√ Existing Authority

√ Requires New Legislations

√ Rollback of Trump Program

Job Benefits:

Create new clean energy jobs in vehicle manufacturing and supply chain. Buy America/Buy American provisions for federal procurement support will ensure domestic manufacturing.

Econ. Benefits:

Emissions reductions will spare the U.S. economy future damages from climate change impacts, and limit negative health impacts from poor air quality and associated medical costs. More energy-efficient vehicles will reduce fuel costs for fleet operators, and the transition to Zero-Emission Vehicles (ZEVs) will further lower operating costs.

Decarbonizing Medium- and Heavy-Duty Transportation

Equity Benefits:

Emissions from MHD vehicles disproportionately impact lower-income Americans, especially people of color. Supporting transit and school bus electrification will spread benefits of transportation electrification more equitably.

Climate Plan Tie:

Accelerate the deployment of EVs, regain leadership from China in EV technology, and reduce emissions from vehicles that contribute heavily to US GHG emissions.

Battleground State Benefits:

Significant MHD vehicle manufacturing interests in Arizona, Ohio, Michigan, Texas, Georgia, North Carolina, Minnesota, Pennsylvania and Virginia. Ports of national significance in Texas, Georgia, and Virginia.battleground states where economic growth is desperately needed and resistance to regulation is strong. Measures favorable to renewable expansion will pay additional dividends in battleground states primed for development.

Decarbonizing Medium- and Heavy-Duty Transportation

AUTHORS: Nathaniel Horadam, Tracy (Nagelbush) Tolk, Josh Cohen, O. Kevin Vincent, Kyle T. Winslow

DATE: 8/31/20

Statement of Issue and Summary of Recommendations:
Transportation passed the energy sector as the largest domestic contributor of greenhouse gas emissions in 2016, and, as of 2018, represented 28 percent of all domestic greenhouse gas (GHG) emissions. GHG emissions from on-road medium- and heavy-duty (MHD) vehicles nearly doubled between 1990 and 2018, and now comprise almost one quarter of all emissions from the on-road transportation sector.[382] The definition of MHD vehicles varies, but typically includes those weighing more than 10,000 pounds. Although classified separately from on-road vehicles in federal emissions inventories and subject to different regulations, off-road MHD vehicles must be included in any federal transportation decarbonization plan, given significant manufacturer and supplier overlap with on-road vehicles.

Due to higher weights and longer daily service requirements, many MHD vehicles have - until recently - been more challenging to electrify. As a result, most federal and state efforts over the past two decades have focused on shifting these vehicles from diesel to cleaner fuels (e.g. natural gas), or incorporating better filtration technologies to eliminate hazardous tailpipe emissions, notably their higher relative outputs of nitrous oxides (NOx) and particulate matter (PM). However, recent pilot projects such as Volvo LIGHTS demonstrate the viability of electrifying even Class 8 regional-haul freight trucks. Electric models are now available or are soon coming on the market for freight trucks, delivery vans, buses and coaches, cutaway shuttles, garbage trucks, and drayage trucks. These recent developments support shifting away from lower-carbon fossil-based fuels to zero-carbon all-electric vehicles, even for heavy-duty vehicle classes. Federal mandates, financial incentives for MHD fleet decarbonization, and investment in technology development can accelerate the transition to zero-emission vehicle (ZEV) technologies for both public sector and private vehicle fleets. We propose the following:

- **Increase Fuel Efficiency Standards**
- **Create Public Fleet Zero-Emission Targets**
- **Transition Existing MHD Fleets**
- **Revamp the Diesel Emissions Reduction Act (DERA)**
- **Secure Permanent Funding Stream and Remove Disincentives**

[382] Office of Transportation and Air Quality, Fast Facts: U.S. Transportation Sector Emissions 1990-2018, U.S. Env't Protection Agency (June 2020), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100ZK4P.pdf.

- **Increase Funding for Zero Emission Transit Programs**
- **Boost Research and Development**

Opportunity / Problem Statement:

Medium- and heavy-duty vehicles (MHD) are responsible for roughly one-quarter of all transportation GHG emissions. Air pollution from MHD vehicles disproportionately impacts low-income communities, particularly those of color, who live close to highways, ports, terminals, and other freight infrastructure due to legacy exclusionary housing practices.[383] Federal programs have been critical in stimulating development of MHD vehicle technologies, and should expand that role under a Biden Administration.

Proposed Recommendations:

- **INCREASE FUEL EFFICIENCY STANDARDS:** Increase the stringency of fuel economy standards for MHD vehicles and transition these over time toward ZEV mandates, and use the Clean Air Act to enforce stricter standards for off-road vehicles. These could be achieved through immediate regulatory changes, and do not require legislation.
- **PUBLIC FLEET ZERO-EMISSION TARGETS:** Provide grant funding for state and local public agencies to develop MHD zero-emission fleet transition plans, and require setting target dates for all fleets that receive federal funding, including US Postal Service delivery vans, transit vehicles, and other ground vehicles. These could be achieved through a combination of directives to fleet-operating agencies and legislative action. It could be built into the next surface transportation authorization.
- **TRANSITION EXISTING MHD FLEET:** Create a federal direct incentive payment program modeled off California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) and New York's Truck Voucher Incentive Program (NYTVIP) to lower the upfront cost to fleets purchasing zero-emission MHD vehicles. This would require legislation to create a new program. A direct incentive could be administered through an administrative agency, such as the Department of Energy, or as a direct grant in lieu of tax credit through IRS, in consultation with DOE.[384]
- **REVAMP THE DIESEL EMISSIONS REDUCTION ACT (DERA):** Expand funding for DERA, reform the program to incentivize ZEV purchases through increased federal cost-share, and phase out combustion engine eligibility. Increased funding would

[383] Casey Berkovitz, *Environmental Racism Has Left Black Communities Especially Vulnerable to COVID-19*, The Century Foundation (May 19, 2020), https://tcf.org/content/commentary/environmental-racism-left-black-communities-especially-vulnerable-covid-19; Press Release: *15 States and the District of Columbia Join Forces to Accelerate Bus and Truck Electrification*, California Air Resources Board (July 14, 2020).

[384] Majority Committee Staff, *Solving the Climate Crisis* at 97, House Select Committee on the Climate Crisis (June 2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.

require legislation, though diesel eligibility could be addressed through EPA regulatory action.

- **SECURE PERMANENT FUNDING STREAM AND REMOVE DISINCENTIVES:** In the short term, repeal or cap the maximum taxable amount of the Federal Excise Tax on zero-emission trucks to incentivize the purchase of new ZEVs. In the medium-term, phase out federal excise tax (FET) for all heavy-duty vehicles (HDVs), and phase in a permanent funding mechanism, such as a usage fee or fee based on vehicle miles traveled (VMT), for all HDVs. These fees should step up aggressively for diesel powered HDVs. This could be built into the next surface transportation reauthorization bill. A pilot usage fee or VMT structure has already been proposed by the Senate Environment and Public Works' surface transportation bill (S.2302), reported out of committee in July 2019.
- **INCREASE FUNDING FOR ZERO EMISSION TRANSIT PROGRAMS:** Increase funding for the Federal Transit Administration's (FTA) Low or No Emission Vehicle Program to support zero-emission transit vehicle deployments. These could be achieved through legislation. An increase of authorized annual funding from $55 million to $370 million (escalating to $500 million by FY25) has already been proposed in the surface transportation authorization title of H.R. 2.[385]
- **BOOST RESEARCH AND DEVELOPMENT:** Increase funding for DOE, DOD, and DOT grant programs that support EV innovation research, including ways in which connected and automated vehicle technologies can increase energy efficiency in MHD vehicles. These could be achieved through legislation, built into the next surface transportation and defense authorization bills. Research priorities are agency discretion.

How the Recommendations Create Jobs, Improve the Economy, and Address Climate Change:

All recommended regulations and funding programs would address climate change through greenhouse gas emissions reductions achieved by transitioning to more energy efficient and zero-emission vehicles. In the U.S., heavy-duty vehicles alone comprise only five percent of the total on-road vehicle fleet but 30 percent of on-road vehicle CO_2 emissions and 36 percent of on-road particulate emissions.[386] Emissions reductions will not only save the U.S. economy future damages from climate change impacts, but reductions in NOx and PM emissions will limit negative health impacts from poor air quality and associated medical costs. Supporting fleet operators in shifting to more energy efficient vehicles will not only increase immediate demand for manufacturing new vehicles, but also reduce fuel costs for operators. Total cost-of-ownership between battery electric MHD vehicles and diesel is rapidly approaching parity, with electricity costing anywhere from 30 to 75 percent less than diesel in fuel costs alone.[387] Domestic oil and gas firms may push back against mandates or standards that shift the

[385] Moving America Forward Act, H.R. 2, 116th Congress (2019-2020).
[386] Drew Kodjak, *Policies to Reduce Fuel Consumption, Air Pollution, and Carbon Emissions from Vehicles in G20 nations*, The International Council on Clean Transportation (May 2015).
[387] Jimmy O'Dea, *Ready For Work*, Union of Concerned Scientists (Dec. 2019).

US vehicle fleet away from consumption of their products.[388] Fleet operators support stronger fuel efficiency standards because those reduce operating costs, but are concerned about higher upfront costs[389], raising the importance of providing federal matching funds through vouchers, block grants to states, and other vehicle purchase assistance to offset ZEV transition costs. In the Environmental Protection Agency's (EPA) 2019 report to Congress, the agency noted DERA receives $5 in applications for every $1 available.[390] The FTA's Low-No Program[391] and California's HVIP are similarly heavily oversubscribed for ZEV purchases on an annual basis.[392] Any program leveraging federal funding should have strong Buy American provisions to ensure preference for domestic manufacturing and American jobs. Transit vehicles are already subject to Buy America regulations for rolling stock procurement with federal funds.

How the Recommendation Supports Frontline or other Underserved Communities:

These recommendations benefit low-income, and communities of color in two key ways. First, emissions from MHD vehicles disproportionately impact low-income and communities of color who are more likely to live in denser urban areas, near industrial zones, and major freight corridors. Blacks and Latinos are exposed to roughly 25 percent more $PM_{2.5}$ pollution from transportation sources than the national average.[393] Children in low-income households are also more reliant on school bus transportation. A 2019 Georgia State study found negative health and cognitive function impacts from diesel emissions on schoolchildren, suggesting transitioning to zero-emission school buses would reduce health and educational inequities.[394] Also, federal and state EV incentives skew towards personal vehicle ownership, though federal and state programs have steadily increased funding availability for zero-emission transit vehicles over the past few years. Because low-income Americans are more reliant on public transportation and disproportionately live in households without a car, increasing federal resources for zero-emission transit vehicles would ensure electrification benefits are distributed more

[388] Hiroko Tabuchi, *The Oil Industry's Covert Campaign to Rewrite American Car Emissions Rules*, N.Y. Times (Dec. 13, 2018), https://www.nytimes.com/2018/12/13/climate/cafe-emissions-rollback-oil-industry.html.

[389] Steven Edelstein, *Fleet Operators Favor New Rules for Fuel-Efficient Big Trucks*, Green Car Reports (Aug. 17, 2015), https://www.greencarreports.com/news/1099611_fleet-operators-favor-new-rules-for-fuel-efficient-big-trucks.

[390] DERA Fourth Report to Congress: Highlights of the Diesel Emissions Reduction Program at 5, U.S. Env't Protection Agency (July 2019), https://www.epa.gov/sites/production/files/2019-07/documents/420r19005.pdf.

[391] Press Release: Heinrich Introduces Legislation To Boost Investments In Low Or No Emission Bus Grants, Improve Application Process, Office of Sen. Martin Heinrich (Mar. 3, 2020).

[392] Press Release: Growth in Clean Truck and Bus Market Drives record Demand for Statewide Truck and Bus Incentive Program, California Air Resources Board (Nov. 1, 2019).

[393] David Reichmuth, Air Pollution from Cars, Trucks, and Buses in the US: Everyone is Exposed, But the Burdens are not Equally Shared, Union of Concerned Scientists (Oct. 16, 2019).

[394] Wes Austin, Garth Heutel & Daniel Kreisman, School Bus Emissions, Student Health and Academic Performance, 70 Economics of Education Review 109 (2019).

equitably.[395] Funding for zero-emission school and transit buses should prioritize areas with poor air quality and health outcomes.

How the Recommendation Supports Biden's Climate Plan:
These recommendations support the Biden Climate Plan on multiple fronts, including on emissions reduction, jobs creation, and national competitiveness. The Biden Climate Plan aims to accelerate deployment of EVs, and these recommendations address the need to enable that by creating new incentives for EV purchases and strengthening fuel economy standards. The plan also highlights China's growing edge in electric vehicle technologies, and need for the US to close that gap through state investment. The Biden plan aims to accelerate EV adoption for purposes of emissions reduction, both for fighting climate change and removing toxic pollutants from the air, which the plan notes disproportionately impacts Black and Latino communities.

Key Battleground State Activity:
Given the longtime strength of the Upper Midwest and Southeast in automotive manufacturing, investment to decarbonize transportation will disproportionately support manufacturing jobs in these regions and their 2020 battleground states. With growing interest in electric delivery vans and other MHD trucks, the US supply chain for EV manufacturing has started to emerge. US startup Nikola Motor sited its headquarters in Phoenix, **Arizona** and its first manufacturing facility nearby, where it plans to begin manufacturing battery electric and fuel cell electric trucks in 2023. Tesla Motors recently announced it would build its next gigafactory in Austin, **Texas**, where it plans to manufacture its Tesla Semi battery electric truck. **Michigan** and **Ohio** have maintained their strong positions in the automotive industry as it begins its EV transition. Ford and GM are manufacturing their medium-duty EVs in **Michigan**, soon to be joined by truck manufacturer Rivian, which already has a 100,000 delivery van order from logistics giant Amazon. Workhorse is manufacturing powertrains for its all-electric delivery vans in Loveland, **Ohio** and its chassis in Union City, **Indiana** (on the border with Ohio). Bollinger Motors is manufacturing its all-electric Class 3 truck in Ferndale, **Michigan**, and recently announced plans for Class 2 through 5 electric delivery vans. Nearby in Rochester Hills, **Michigan,** Navistar is utilizing an agile manufacturing approach to support its electric school bus and medium-duty electric truck production lines. LG Chem already has a battery manufacturing plant in Michigan and will build its second in **Ohio** as part of its joint venture with GM. SK Innovation is currently building two battery plants outside Atlanta, **Georgia**. Ensuring robust support for these industries through federal incentives, Buy American policies, and R&D spending will ensure existing design and manufacturing jobs remain in the US, and new ones are created.

Two of the largest **school bus manufacturers** in North America are in battleground states also featuring competitive Senate elections. Blue Bird is headquartered and manufactures its

[395] Adie Tomer & Robert Puentes, *Transit Access and Zero Vehicle Households*, Brookings Institution (Aug. 2011), http://web.archive.org/web/20120119080611/http://www.brookings.edu/papers/2011/0818_transportation_tomer_puentes.aspx.

buses in Fort Valley, **Georgia**, supporting more than 2000 jobs there. Thomas Built is headquartered and manufactures its buses in High Point, **North Carolina**, supporting more than 1400 jobs there. Both firms have recently started manufacturing battery electric school buses. Several of the nation's largest and busiest ports are in key battleground states on the Atlantic and Gulf Coasts, and will benefit from incentive programs that accelerate MHD fleet decarbonization. **Texas, Georgia, Florida,** and **Virginia** all operate major ports of national significance, and lag behind US Pacific and global competitors on decarbonization efforts.

Automated Vehicles Impacts: Emissions, Safety, and Equity

Opportunity/Problem:

A lack of federal guidance on AV policy has resulted in disjointed state policies, ranging from bans on vehicles without drivers to no policies at all, meaning any vehicle without a driver can operate on public roads. The Biden-Harris administration can regain US leadership in AV technology by enacting strong federal guidance and standards that prioritize reductions in emissions, improvements in safety, and equitable access to transportation technologies.

Recommended Action(s):

- Require all AVs be electric through EPA Clean Air Act standards
- Prioritize the use of the first AVs as transit (buses, microshuttles, shared and pooled ride hailing) with DOT grants
- Increase funding for AV innovation research and testing through DOE, ARPA-E, DOD, and DOT grant programs
- Direct NHTSA to implement enforceable AV safety standards

Program Type:

√ Program Modification

Authority:

√ Existing Authority
√ Requires New Regulations

Job Benefits:

Improves access to jobs by making transportation accessible and affordable. Creates jobs through innovative program funding, expansion of transit jobs, and just transition protections for existing jobs that can be replaced by automation.

Econ. Benefits:

Reduces the cost burden of transportation by making public transit more accessible, efficient, and affordable. Encourages the use of shared and pooled rides, reducing the cost per mile and making AVs accessible to all. Reduces traffic fatalities caused by human driver error.

Automated Vehicles Impacts: Emissions, Safety, and Equity

Equity Benefits:

Improves access to AVs mobility benefits without requiring ownership, and will improve the quality and extend the geographic reach of transit. Requiring environmental standards will improve air quality, especially along heavy transit routes.

Climate Plan Tie:

These recommendations support the climate plan to transition to zero-emission transportation by requiring all commercially available AVs be ZEVs. It meets several other requirements including empowering local and state governments to spend money to reduce transportation emissions.

Battleground State Benefits:

Battleground states are home to innovative AV pilot projects, companies, and policies. Enacting strong federal guidance will allow states and cities to plan for AVs, and give these companies better guidance for how to move forward in a competitive way.

Automated Vehicles Impacts: Emissions, Safety, and Equity

AUTHORS: Kelly L. Fleming; O. Kevin Vincent; Nathaniel Horadam, Robin Chase

DATE: August 15, 2020

Statement of Issue and Summary of Recommendations:
Automated vehicles (AVs) have the potential to improve safety, reduce emissions, and improve mobility access and equity. However, this outcome requires strong federal policies to encourage best practices. Absent guidance, AVs could result in more emissions, increased congestion, greater inequalities in the transportation system, and patchwork of safety and environmental standards across the country. The US has also fallen behind in global leadership on AV development, policies, infrastructure, and consumer acceptance. The following policies are recommended to maximize AV benefits while improving the US's innovative competitiveness:

- Require all AVs are electric through EPA Clean Air Act standards.
- Incentivize the use of AVs as transit (buses, microshuttles, shared and pooled ride hailing) with DOT grants.
- Increase funding for AV innovation research and testing through DOE, ARPA-E, DOD, and DOT grant programs.
- Increase funding for research on second order effects, including impacts on federal, state, and local revenues, land use, and labor.
- Update the New Cars Assessment Program (NCAP) by including impact on pedestrians and new technologies.
- Direct NHTSA to implement enforceable AV safety standards.

Opportunity / Problem Statement:
A lack of federal guidance on AV policy has resulted in disjointed state policies, ranging from bans on vehicles without drivers to no policies at all, meaning any vehicle without a driver can operate on public roads.[396] The Biden-Harris administration can regain US leadership in AV technology by enacting strong federal guidance and standards that prioritize reductions in emissions, improvements in safety. Enabling equitable access to transportation technologies of EV should be balanced with, and prioritized, based on consideration of non AV electrification of mass transportation vehicles.

[396] Kelly Fleming, *Technology Is Outpacing State Automated Vehicle Policy,* UC Davis Policy Institute for Energy, Environment, and the Economy (Apr. 1, 2020), https://escholarship.org/uc/item/0k85r9jv.

Proposed Recommendations:

1. **Require manufactured and commercially operated AVs to be zero-emission through EPA Clean Air Act, incentivize shared and pooled use, and strongly discourage the movement of passenger vehicles without passengers.**

Unlike vehicles with human drivers, AVs have very low marginal operating costs and therefore very low cost/benefit thresholds for use cases.[397] Research has shown that AVs have the potential to either reduce energy use by 60% (changes in route efficiency), or increase it by up to 200% (depending on their efficiency, changes in travel patterns, increased travel, and new use cases), increasing GHG emissions.[398] The House Select Committee on the Climate Crisis has proposed mandating an interagency working group with DOT and EPA focused on studying the climate implications of AVs and identifying strategies to manage them. Strategies should include a Zero-Emission Vehicle (ZEV) mandate for Society of Automotive Engineers' (SAE) Level 4 and Level 5[399] vehicles (see Appendix A) that are commercially available for private use or as fleets.

Many policies and laws that are relevant for all vehicles, are critically important to get ahead before the widespread adoption of AVs which, as noted, could dramatically increase Vehicle Miles Traveled (VMT) and therefore emissions and energy use. The Biden Administration can empower local jurisdictions through use of funding flexibility, funding for pilot programs, and expressly authorizing local action to avoid preemption arguments. Recommended policies for the state and local level are described in Appendix B.

Difficulty: Executive authority, some may require congressional action and funding.

2. **Invest in Transit Bus Automation.**

In order to extend the benefits of automation to all -- not just owners of personal (and initially very expensive) AVs -- it is important to enable the use of AVs on a per trip basis. Automation should be used to improve our public transportation system. Investments and pilot projects of AVs and non-AV electrification of mobility - particularly buses - should be prioritized in frontline communities using the EPA screening tool.

Several transit bus manufacturers have invested small amounts in automation development to date, but these investments are a tiny fraction of the tens of billions of dollars automakers and

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[397] Peter Andersson & Pernilla Ivehammar, *Benefits and Costs of Autonomous Trucks and Cars*, 9 J. of Transportation Tec. 121 (2019), https://www.scirp.org/journal/paperinformation.aspx?paperid=91048.

[398] T. S. Stephens et al., *Estimated Bounds and Important Factors for Fuel Use and Consumer Costs of Connected and Automated Vehicles*, Nat'l Renewable Energy Lab (Nov. 1, 2016), https://doi.org/10.2172/1334242; Caroline J. Rodier, *Travel Effects and Associated Greenhouse Gas Emissions of Automated Vehicles*, *UC Dav*is: National Center for Sustainable Transportation (2018), https://escholarship.org/uc/item/9g12v6r0.

[399] SAE International, *J3016A: Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles - SAE International*, 2016, https://www.sae.org/standards/content/j3016_201609/.

venture-backed firms have spent on other vehicle platforms.[400] Due to lengthy procurement cycles, heavily regulated design and testing standards, and a fiscally-constrained customer base, transit buses have traditionally relied on federal investment to support research and development. The Biden Administration and its Congressional partners should increase funding for and leverage Federal Transit Administration (FTA) programs, as well as others in USDOT and DOE, to support research and development of transit bus automation to improve safety for vulnerable road users, increase energy efficiency, accelerate zero-emission technology adoption, and boost transit's competitiveness against less-energy efficient transportation alternatives.

Difficulty: Medium. Require congressional funding and DOT FTA allocation of funds

3. Increase funding for AV innovation research through DOE, ARPA-E, DOD, and DOT grant programs.

This will increase US competitiveness in the AV "space race" where the US ranks fourth for AV readiness according to KPMG, led by individual state actions on innovative pilots and policies.[401] The US ranks 9th for policy and legislation, 8th for infrastructure, 6th for consumer acceptance, and 3rd for technology and innovation.[402] The lack of a strong national approach, deferring to state action is cited as the reason for low rankings. The Biden Administration can help the US return itself to the leading position by enacting strong national standards that give clear guidance and make investment into AV research and technology a priority. DOT's Smart City Challenge awarded cities funding for innovative pilot projects, and should be expanded now that technology is more mature. ARPA-E's NEXTCAR program should be expanded and focused to reduce emissions from AVs through battery technologies and smart charging. Both programs must include criteria that prioritize frontline communities that have disproportionately high air pollution impacts and lower income communities that rely on mass transportation.

Difficulty: Low. Bipartisan support for ARPA-E and DOE research programs, requires congressional funding support

4. Direct NHTSA to implement enforceable AV safety standards

AV technology has the potential to save hundreds of thousands of lives in the US by eliminating driver error. Researchers estimate that the sooner these vehicles are deployed, the more lives will be saved.[403] The Obama administration began the process to develop Federal safety

[400] Joshua Cregger, Elizabeth Machek & Patricia Cahill, *Transit Bus Automation Market Assessment*, John A. Volpe National Transportation Systems Center (July 2020), https://www.transit.dot.gov/sites/fta.dot.gov/files/2020-07/FTA_Report_No._0144_Update.pdf.

[401] 2019 Autonomous Vehicles Readiness Index, KPMG (2019). https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/02/2019-autonomous-vehicles-readiness-index.pdf.

[402] *Id.*

[403] Nidhi Kalra & David G. Groves, *RAND Model of Automated Vehicle Safety (MAVS): Model Documentation*, RAND Corporation (2017),

standards and guidelines, laying out roles among federal, state, and local governments.[404] The Trump administration has taken a hands-off approach, resulting in disjointed policies between states, and confusion among operators and manufacturers. The Biden-Harris administration should:

- Reassert NHTSA's authority over AV safety, resume the process to add AV safety standards to the Federal Motor Vehicle Safety Standards (FMVSS).
- Update and expand the New Cars Assessment Program, NCAP, which hasn't been updated substantively since 2010. We should divide NCAP into four parts: 1) crash worthiness; 2) crash avoidance; 3) impact on pedestrians (to catch up to EU standards); and 4) impact of new technologies. Changing NCAP would also bring requirements for AVs more in line with requirements for regular cars, which are increasingly automated, as pedestrian and cyclist fatality rates continue to rise exponentially in the US.
- Address environmental concerns by adding a ZEV requirement through EPA and NHTSA standards.

Safety standards should also address and implement data and privacy standards from OEMs and AV fleet operators through DOT guidelines and requirements, updated regularly.[405]

Difficulty: Medium - NHTSA has authority to issue AV safety standards, including standards for safety data, but legislation is probably needed to address privacy standards

5. Get Ahead of Labor Impacts

Additionally the Biden administration should assemble an interagency working group to assist in manufacturing and job impacts in long-haul trucking, delivery, and ride-hailing/taxi industries, and implement job guarantee programs for a just transition.[406] A program like this could be funded through a small tax on Transportation Network Company (TNC) driver wages (0.05%) to create a fund to support driver transitions when there is widespread deployment of AV transportation.

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https://www.rand.org/content/dam/rand/pubs/research_reports/RR1900/RR1902/RAND_RR1902.pdf.

[404] Press Release, White House: Office of the Press Secretary, *Fact Sheet: Encouraging the Safe and Responsible Deployment of Automated Vehicles* (Sept. 19, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/09/19/fact-sheet-encouraging-safe-and-responsible-deployment-automated.

[405] Mollie D'Agostino, Paige Pellaton & Austin Brown, *Mobility Data Sharing: Challenges and Policy Recommendations*, *UC Davis: Institute of Transportation Studies* (Aug. 1, 2019), https://escholarship.org/uc/item/4gw8g9ms.

[406] The Biden-Harris administration should suggest an interagency working group to address all of the labor implications and opportunities in the electric and automated transportation transition, including increased manufacturing jobs and infrastructure; *see also* America's Workforce and the Self-Driving Future, Securing America's Future Energy (June 2018). https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

Check Boxes Below	
yes	Is this a new or modification of an existing program?
no	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Employing recommended policies can reduce overall VMT, reduce tailpipe emissions through zero-emission technology, reduce congestion through eco-driving and ride smoothing connected and automated technologies, and improve access to jobs by providing a low cost alternative to shared AV transport. Robust research through an interagency working group is needed on jobs impacts in the transportation sector to ensure a just transition. Requirements for safety drivers and attendees in long-haul trucking will create job security and improve working conditions. Utilizing AV technology to improve transit and mobility will increase access to jobs and reduce cost burdens of housing and transportation.

- Manufacturing and research jobs will be created through increased funding for research and development of American AV products[407]
- The US will become a technology leader in AV innovation with increased funding through ARPA-E and competitive grant funds

Though buses account for only one percent of all US transportation emissions, the rise of dynamic shared vehicle trips combined with automation present a huge growth -- and new access -- opportunity. Automation can increase energy efficiency, mitigate range variability from driving performance, and significantly reduce capital costs through automated vehicle charging, which would allow agencies to cycle more vehicles through fewer charging units. Additionally, many benefits of the technology, including all of those related to energy efficiency and accelerating adoption, do not require removing human operators. Further DOT research should aim to assess potential impacts and mitigation strategies to ensure labor isn't adversely impacted while still reaping the technology's climate benefits. More information can be found in Appendix C and the Transit Innovation section of this report.

How the Recommendation Supports Frontline or other Underserved Communities:

Access to transportation is linked to economic mobility.[408] Improving access to transportation through incentive programs and public technology for transit will improve the quality of life for low income, rural, and underserved populations who lack access to affordable transportation. AV policies can reduce the cost per mile of travel, while also improving access to clean, safe, and

[407] BlueGreen Alliance | Clean Vehicles and Fuels (last visited Oct. 2, 2020). https://www.bluegreenalliance.org/work-issue/clean-vehicles-and-fuels/.
[408] Mikayla Bouchard, *Transportation Emerges as Crucial to Escaping Poverty*, The New York Times (May 7, 2015), https://www.nytimes.com/2015/05/07/upshot/transportation-emerges-as-crucial-to-escaping-poverty.html.

efficient transportation in underserved areas.[409] On the other hand, current lack of regulation or guidelines on AVs could further disadvantage people without access to transportation through increased travel time and emissions, displacement through gentrification, increased cost per mile of transportation, job displacement from automation, and exploitation of travel data from AV companies.

How the Recommendation Supports Biden's Climate Plan:
Executive Actions

- 100% clean energy and net-zero will require rapid transformation of transportation, so the introduction of commercially available AVs must be mandated ZEVs now.
- Improve US competitiveness and innovation in AVs to encourage the rest of the world to deploy zero emission technologies
- Prioritize job creation and access, and improved working conditions as a result of AVs rather than profit

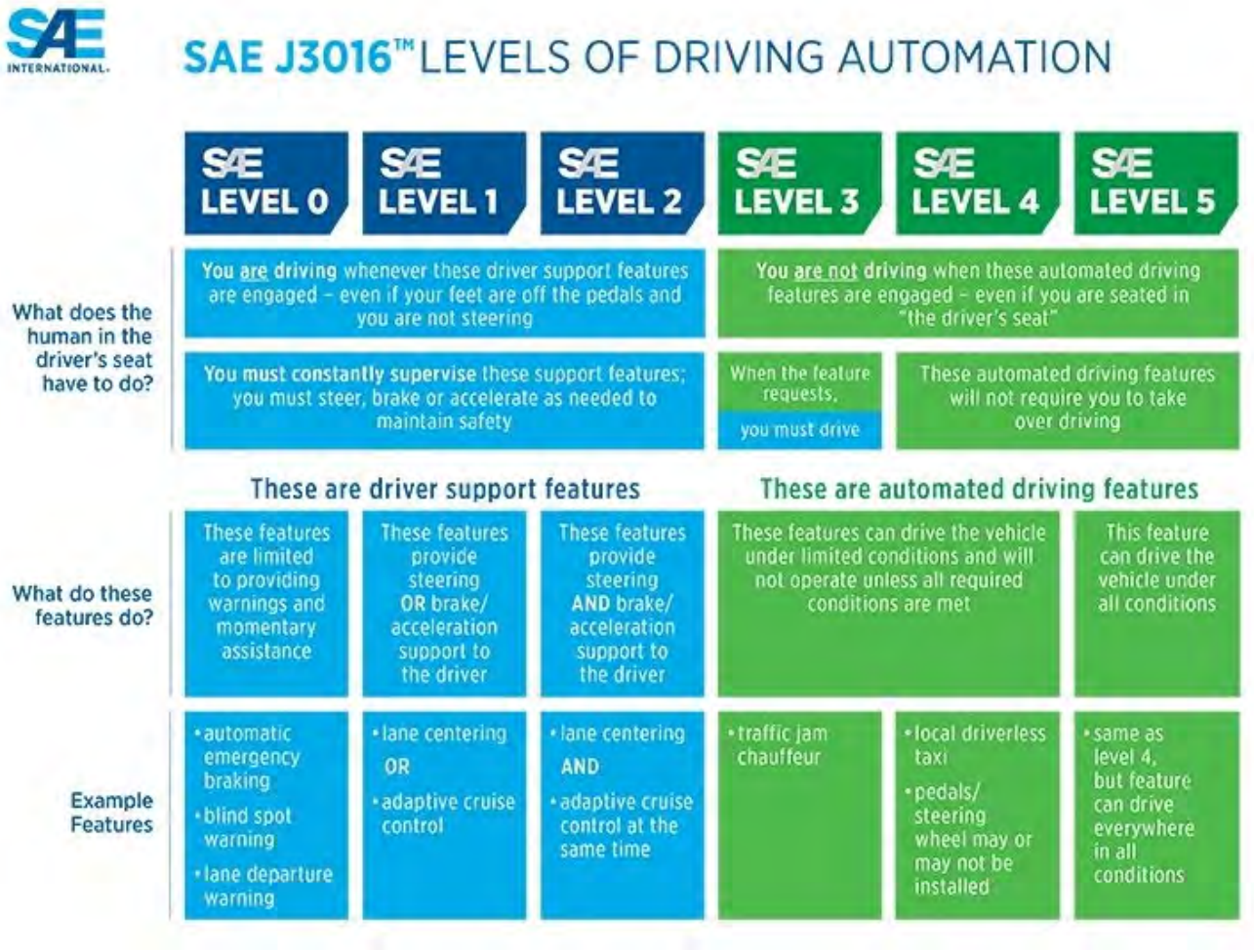
Biden's Year One Legislative Agenda

- Biden plan calls for preserving the clean air act and developing ZEV mandate - can be implemented now for AVs
- Infrastructure investments - require strong Federal guidance to help cities and states plan for AVs proactively to reduce emissions. This aligns with his plan to empower local communities to develop transportation solutions
- Shared and pooled AV incentives aligns with Biden's plan to mitigate the impact of urban sprawl, by discouraging the private use of AVs
- Ensuring federal investment in transit automation with Buy American provisions (including Buy America for rolling stock) will support domestic manufacturers and technology developers, when currently leading global competitors are foreign.

Key Battleground State Activity:
Disjointed federal policy has resulted in confusion and conflict for operators and state governments. Multiple battleground states are utilizing pilot projects and navigating with little direction. Addressing this conflict and giving clear guidelines will empower states and companies in those states to continue innovating with clear direction. See Appendix D for battleground state activity in AV pilots and programs.

[409] Kelly L. Fleming, *Social Equity Considerations in the New Age of Transportation: Electric, Automated, and Shared Mobility*, 13 J. of Science Policy and Governance 1 (2018) http://www.sciencepolicyjournal.org/uploads/5/4/3/4/5434385/fleming.pdf.

Appendix A: Society of Automotive Engineers (SAE) levels of automation



Appendix B. Policy Recommendations at State/Local Level

The Biden-Harris administration can empower local and state governments to implement the following policies to help reduce VMT and encourage pooling:

- Addressing congestion through the use of congestion pricing and time-of-day tolls.
- Instituting distance-based road user fees for all vehicles as we lessen our consumption of fossil fuels and need to pay for transportation infrastructure.
- Incentivizing and prioritizing all forms of shared and pooled transit which move more people per vehicle, through bus only or HOV 3+ corridors.
- Implement a VMT tax to replace the gas tax on automated vehicles[410]

Two key use case differences for AVs over other vehicles also demand attention:

- Because AVs do not need to park locally, using local parking policies as a means of restricting access will have no such impact on AVs.
- Because AVs do not require drivers and can travel at low marginal costs, we need to institute a zero-occupancy surcharge for miles travelled without people or freight. Zero-occupancy vehicles will continue increasing VMT and contributing to emissions and congestion in the same way that TNC vehicles do.
- Encouraging better demand management for congestion is equally important for AVs.

[410] Alan Jenn & Kelly Fleming, *A Zero-Emission Vehicle Registration Fee Is Not a Sustainable Funding Source for Maintaining California's Roadways*, UC Office of the President: University of California Institute of Transportation Studies (May 1, 2019), https://doi.org/10.7922/G29W0CPK; Robert D. Atkinson, *A Policymaker's Guide to Road User Charges*, Information Technology and Innovation Foundation (Apr. 22, 2019), https://itif.org/publications/2019/04/22/policymakers-guide-road-user-charges.

Appendix C. Transit Innovation and Labor Concerns

Buses represent one of the few vehicle platforms where the federal government directly funds procurement and has traditionally supported innovation funding. States and municipalities have focused on transit buses as early zero-emission transition targets, but battery technology is not advancing rapidly enough to address all duty cycle requirements and the capital costs associated with Electric Vehicle Supply Equipment (EVSE) procurement ($20,000-$100,000 plus installation) present major barriers to adoption.

Federal investment in transit automation, through conventional transit buses or otherwise, will ensure transit systems and their ridership reap the benefits of AV capabilities. This investment will also ensure transit remains competitive against private modes that have steadily eroded transit ridership, finances, and service footprint over the past decade at the expense of low-income communities, particularly those of color. Moreover, as more transit systems turn to bus rapid transit with platform boarding, automated precision docking will support accessibility for the elderly and disabled by eliminating potentially hazardous platform gaps.

Labor Implications:
Though labor organizations are justifiably concerned about the long-term jobs impacts of automating transit buses, the quality, convenience, and low cost nature of automated shared shuttles/buses has the potential to dramatically expand the number of vehicles used. Personal cars are largely fueled, cleaned, and maintained with unpaid personal labor, transitioning from trips in personal cars to shared-AV trips will require payment for these services and create new jobs to service the increased number of shared vehicles.[411] COVID-19 presents a challenge as the public is now justifiably concerned about sharing small spaces with strangers. More research will need to be dedicated to addressing issues of disease transmission in shared vehicles, and encouraging use of transit with proper air flow.

To preserve transit jobs, DOT regulations can require a licensed driver on-board to provide service to disabled riders, provide information, and be present in case of emergency. One way to do this is to continue requiring commercially licensed drivers behind the wheel for safety and guidance to riders, but operate the AVs on routes that will provide energy efficiency benefits, increase on-road and off-road safety, reduce capital costs for battery electric buses, and provide operator quality of life improvements.

[411] America's Workforce and the Self-Driving Future, Securing America's Future Energy (June 2018), https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf.

Appendix D: Battleground State AV Pilots and Programs

Michigan	FCA, Toyota and Ford are all developing AVs in the State bringing jobs, May Mobility is a small start-up testing autonomous shuttles in the state. Governor Whitmer just announced the first Connected and Automated Transportation Corridor between Detroit and Ann Arbor.
Florida	Florida is one of the most aggressive states in inviting AV companies to test and deploy AVs and has enacted legislation that allows AVs to operate with few restrictions. Beep, a small AV start-up is testing AVs manufactured by NAVYA. Voyage is another AV start-up testing in-state. Ford and Waymo are also testing in Florida.
Arizona	Arizona was the site of the first fatal crash in the United States in connection with the testing of AVs. The crash was the subject of a scathing report by the National Transportation Safety Board that criticized Uber (which was testing the AV), as well as NHTSA and the State of Arizona for lax oversight of AV testing. Nevertheless, numerous companies are continuing to test in Arizona including Waymo, Nuro, Cruise Automation, udelv, and TuSimple.
Texas	Texas is also a leading state inviting companies to test their AVs with little regulation by the State. Nuro, Ford, Aurora, Waymo, Uber, udelv, and TuSimple are all conducting testing in Texas.
Colorado	EasyMile is testing its autonomous shuttle in Colorado
Virginia	EasyMile, Local Motors, Optimus Ride and Perrone Robotics are conducting test pilots in Virginia.
Ohio	Ohio hosts the Smart Mobility Corridor -- a 35-mile segment of Route 33 available for AV testing. EasyMile is conducting a pilot project in Columbus as part of the DOT Smart Cities Program.
Pennsylvania	Pittsburgh is a hub for development of AVs with 4 companies (Uber ATG, Aurora, Argo AI, and Aptiv) plus Carnegie Mellon University based in the city and conducting testing in the Pittsburgh area.

Multiple battleground states, notably Texas, Florida, Ohio, Pennsylvania, and Michigan, are participating in the recently announced AV TEST Initiative sponsored by DOT. These states plus the battleground states of Arizona, Iowa and Virginia have invested heavily in developing automated vehicle test grounds, and stand to benefit from expanded federal investment in the technology.

Healthy, Low-Cost, Sustainable Transport for All: Active Mobility to Get America Moving.

Opportunity/Problem:

In the U.S., our transportation policy created a nation of car-dependent households. At the same time, our transportation sector contributes to global climate change, local environmental degradation, injuries and deaths, and associated comorbidities like obesity. Few people have access to a safe walking and cycling network. Pedestrian and bicyclist fatalities have risen in recent years. Improving the safety of active mobility options will improve access, air quality, and health, as well as provide people with real mobility options.

Recommended Action(s):

- Focus on moving people and not vehicles, transforming federal funding & policy to access metrics instead of car speeds (level of service).
- Give state, regional, and local agencies more guidance and flexibility to use transportation funds for active transportation projects
- Require collection and reporting of quantitative active transportation data as a step towards performance- and needs-based funding.

Program Type:

√ New Program

√ Program Modification

Authority:

√ Requires New Legislation

√ Requires New Guidance

Job Benefits:

Infrastructure for people walking and cycling creates jobs. Pedestrian and cycling infrastructure projects can create up to 11 jobs per million dollars spent. Of all infrastructure types, road construction creates the fewest jobs per dollar spent. In lower income communities of color, walking and bicycling can increase economic activity at local businesses.

Econ. Benefits:

Transportation is the second highest household expenditure after housing. Many trips are under five miles, a distance feasible by many on active modes. Making walking and cycling safer and more available will save Americans money and direct more spending to local communities. Further, walking and cycling require less physical space and far less costly infrastructure to build and maintain. In addition, walking and cycling would improve health.

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Equity Benefits:

Low-income populations spend disproportionate amounts - as much as 30 percent - of their household income on transportation, especially when living in locations with poor active transportation infrastructure and public transportation, because they are often forced to own a car. Similarly, people of color are exposed to higher amounts of transportation pollution, leading to higher incidences of asthma and heart disease. Those that do walk or bike are injured or killed due to automobiles at disproportionately high rates due to a lack of infrastructure in their communities compared to wealthier, whiter neighborhoods. In order to maintain these equity benefits, robust community engagement and addressing disparities in benefits from Federal funds must be considered.

Climate Plan Tie:

The Biden Climate Plan notes that "Communities across the country are experiencing a growing need for alternative and cleaner transportation options" and promises to "transform the way we fund local transportation, giving state and local governments, with input from community stakeholders, more flexibility to use any new transportation funds to build safer, cleaner, and more accessible transportation ecosystem."

Battleground State Benefits:

Battleground states account for nearly half of the top 10 states for pedestrian deaths. The building of a safe and secure network for pedestrians and vehicles of all kinds is beneficial and desirable for all Americans: rural, suburban, and urban.

Healthy, Low-Cost, Sustainable Transport for All: Active Mobility to Get America Moving

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DATE: 8/18/20

Statement of Issue and Summary of Recommendations: Years of prioritizing automobiles over other transportation modes have contributed to a number of adverse climate, environmental, economic, and health outcomes. Walking, cycling, and other forms of "micromobility" can also be dangerous due to a lack of safe infrastructure, which deters people from using these modes, decreasing safety in numbers, and perpetuating an auto-centric mobility system that prevents access, burdens household budgets, and promotes ill health. The poor climate, environmental, safety, and public health outcomes of automobile use are disproportionately borne by marginalized communities, and they are more likely to have underlying health conditions that are exacerbated by auto emissions, more likely to live in areas with unsafe transportation infrastructure, and more likely to dedicate a disproportionate amount of household spending toward transportation.[412] In crafting a bold infrastructure agenda for the United States, the Biden-Harris administration has an opportunity to *Build Back Better* by investing in an additional transportation network that's safe, equitable, and good for the environment.

In recent years a number of American cities have begun to recognize the importance of prioritizing mobility of *people* over cars, spurring efforts to eliminate traffic fatalities and severe injuries while increasing safe, healthy, and equitable mobility by investing in safe infrastructure for active transportation and calming dangerous roadways, such as through Vision Zero policies. The 2020 coronavirus pandemic has made apparent the ability of localities to lead on creating safe conditions for active mobility. The push for safer streets may increase because active modes allow for physical distancing; in the early months of the pandemic there was a dramatic increase in bicycle purchases and a number of U.S. cities created "slow streets" to encourage active, clean, distanced mobility.[413] In order to incentivize and prioritize spending for active transportation, funding should be made available to measure volumes of people walking and bicycling and to

[412] Lara P. Clark, Dylan B. Millet & Julian D. Marshall, *Changes in Transportation-Related Air Pollution Exposures by Race-Ethnicity and Socioeconomic Status: Outdoor Nitrogen Dioxide in the United States in 2000 and 2010*, 125 Env't Health Perspectives 9 (2017); Institute for Transportation & Development Policy, *The High Cost of Transportation in the United States* (May 23, 2019), https://www.itdp.org/2019/05/23/high-cost-transportation-united-states/#:~:text=The%20lowest%20income%20is%20burdened,(lack%20of)%20transport%20system.

[413] Christina Goldbaum, *Thinking of Buying a Bike? Get Ready for a Very Long Wait*, The New York Times (May 18, 2020), https://www.nytimes.com/2020/05/18/nyregion/bike-shortage-coronavirus.html; Smart Growth America, Complete Streets + COVID-19 (last visited Oct. 21, 2020), https://smartgrowthamerica.org/program/national-complete-streets-coalition/covid-19-how-is-your-community-responding/.

assess safety and develop crash modification factors, which measure expected crashes after countermeasures are put in place.[414]

Policy recommendations:

- Facilitate legislative and regulatory parity for active transportation and other modes in federal funding & policy.
- Give state, regional, and local agencies more guidance and flexibility to use transportation funds for active transportation projects.
- Require collection and reporting of quantitative active transportation data as a step towards performance- and needs-based funding.

Opportunity / Problem Statement: Transportation accounts for the largest domestic contributor of greenhouse gas emissions, surpassing energy production in 2016. Unfortunately, our transportation system prioritizes carbon intensive transportation rather than making our cleanest modes safe and easy.

Recommendation 1: Facilitate parity for active transportation in federal funding & policy.

The status quo of commuter benefits has been to prioritize automobiles, thus putting more cars and congestion on the road by providing "free" parking. The cost to taxpayers of commuter parking benefits amounts to over $700 million per year, and eliminating commuter parking benefits would remove nearly 70,000 cars from the road, avoiding over 370 million vehicle miles traveled (VMT) per year.[415] Providing benefits to bicycle commuters would help to reduce VMT.

In 2016, American taxpayers claimed $375 million in tax credits for electric vehicle purchases, and the overwhelming majority of beneficiaries (78%) made over $100,000 per year.[416] E-bikes are affordable for far more Americans, and are more efficient than electric cars.[417] Each e-bike purchased could reduce VMT and decrease CO_2 emissions by 225 kg per year.[418]

- Limit or remove commuter parking benefits and restore the bicycle commuter tax benefit
  - Proposed legislation: Bicycle Commuter Act of 2019 (H.R. 1507); GREEN Act of 2020 (H.R. 7330)
- Revise the two-wheel plug in tax credit to include electric bicycle purchases
  - Proposed legislation: Extend the plug-in electric drive motor vehicle credit under § 30D of the Internal Revenue Code, and revise battery capacity requirements to include electric bicycles.

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[414] Federal Highway Administration, *Crash Modification Factors*, U.S. Department of Transportation (last visited Oct. 21, 2020), https://safety.fhwa.dot.gov/local_rural/training/fhwasa14083/cmf.pdf.
[415] Tony Dutzik, Elizabeth Berg, Alana Miller & Rachel Cross, *Who Pays for Parking? How Federal Tax Subsidies Jam More Cars into Congested Cities, and How Cities Can Reclaim Their Streets*, TransitCenter and Frontier Group, September 2017.
[416] Molly F. Sherlock, Cong. Research Service, The Plug-in Electric Vehicle Tax Credit (May 14, 2019).
[417] John MacArthur et al., *A North American Survey of Electric Bicycle Owners*, Transportation Research and Education Center (Mar. 2018), https://doi.org/10.15760/trec.197.
[418] Michael McQueen, John MacArthur & Christopher Cherry, *The E-Bike Potential: Estimating Regional E-Bike Impacts on Greenhouse Gas Emissions*, 87 Transportation Research Part D: Transport and Environment, 102482 (Oct. 2020).

- Exempt bikes, e-bikes, and their components from Section 301 tariffs.[419]

Modification	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Increasing local access to active transportation modes and routes can help boost spending at local businesses to bolster the economy and encourage local patronage, and pedestrian and cycling infrastructure can create up to 11 jobs per million dollars spent.[420]

How the Recommendation Supports Frontline or other Underserved Communities:

Only about a third of American commuters benefit from the status quo commuter parking benefits, and many more are harmed by these programs through increased congestion, reduced safety due to the presence of motor vehicles, and subsidies of car commuting for wealthy commuters.[421] In addition, current electric vehicle subsidies overwhelmingly benefit wealthy Americans.[422] Targeting eligibility should provide criteria that take into account frontline and underserved communities to address the disparity of mobility and access, as well as take into account communities that are disproportionately impacted by air pollution

How the Recommendation Supports Biden's Climate Plan:

Increasing transportation mode share for active mobility options will help move the U.S. toward a 100% clean energy economy, net zero emissions and decrease vehicle miles traveled.

Key Battleground State Activity:

Several battleground states have been listed among the top ten states for pedestrian deaths in recent years: Florida, Georgia, Arizona, Texas, and Nevada. Improving safety for vulnerable road users would help to increase active transportation mode share, improving climate and environmental outcomes.[423]

Recommendation 2: Give state, regional, and local agencies more guidance and flexibility to use transportation funds for active transportation projects

[419] People for Bikes, Section 301 Exclusion Process (last visited Oct. 21, 2020), https://peopleforbikes.org/exclusions/.

[420] Kelly J. Clifton, Sara Morrissey & Chloe Ritter, *Business Cycles: Catering to the Bicycling Market*, *TR News 280* (May-June 2012); Heidi Garrett-Peltier, *Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts*, Political Economy Research Institute (June 2011); Darren Flusche, *Bicycling Means Business: The Economic Benefits of Bicycle Infrastructure*, League of American Bicyclists (July 2012).

[421] Tony Dutzik, Elizabeth Berg, Alana Miller & Rachel Cross, *Who Pays for Parking? How Federal Tax Subsidies Jam More Cars into Congested Cities, and How Cities Can Reclaim Their Streets*, TransitCenter and Frontier Group, September 2017.

[422] Molly F. Sherlock, Cong. Research Service, The Plug-in Electric Vehicle Tax Credit (May 14, 2019).

[423] Nat'l Highway Traffic Safety Admin., 2018 Ranking of State Pedestrian Fatality Rates, https://www-fars.nhtsa.dot.gov/States/StatesPedestrians.aspx.

Developing Clean Transportation and Low Emissions Infrastructure

More than 11% of Americans walk or cycle to work. However, only 2% of federal transportation spending is allocated for cycling and walking infrastructure, and Federal design guidance for transportation facilities focuses heavily on infrastructure for motorized vehicles.[424] This emphasis on motorized vehicles and fast motor vehicle speeds instead of safety has resulted in an increase in fatalities involving pedestrians and cyclists despite an overall decrease in motor vehicle fatalities.[425] Projects are planned at the local level, so the federal government should encourage the use of funds on active transportation projects.

- Direct states and metropolitan planning organizations to establish technical assistance and grant programs for "Complete Streets", which require streets to be planned and operated to maintain safe, comfortable travel for all users regardless of mode of transportation.
    - Proposed legislation: Complete Streets Act (H.R. 3663/S. 2077) of 2019; Sections 1107 and 1309 of the Moving Forward Act (H.R.2) of 2020
- Include and integrate more guidance for active transportation facility design in the Manual of Uniform Traffic Devices (MUTCD)
- Increase the budget authorization for the Transportation Alternatives (TA) program to equal 10% of the Surface Transportation Block Grant Program; revise the Transportation Alternatives program to provide dedicated funds that require that all projects address addition or enhancement of dedicated or shared right-of-way for active transportation
    - Proposed legislation: Transportation Alternatives Enhancements Act (H.R. 5231, S. 1098) of 2019

Modification	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
Investing in sidewalks and cycling infrastructure empowers local communities. Allowing communities to expand walking and cycling will reduce emissions, improve public health, save lives, and save Americans money. Walking and cycling infrastructure require far less routine maintenance than roadways. Between 2009 and 2017, U.S. roadways in poor condition jumped from 14 to 20 percent, and it is estimated that it would require $169 billion per year to keep roads in a state of good repair.[426] A 2013 analysis indicates that the external cost of bicycling and walking was two cents or less compared to an external cost of 29 cents attributed to automobiles.[427] When more people can safely walk and cycle, taxpayers benefit.

[424] Angie Cradock, Jessica Barrett, Tony Hull & Billy Fields, *Evidence to Inform a Cycling and Walking Investment Strategy*, Prevention Research Center on Nutrition and Physical Activity at the Harvard T.H. Chan School of Public Health (Apr. 2019).
[425] Nat'l Highway Traffic Safety Admin., 2018 Fatal Motor Vehicle Crashes: Overview (Oct. 2019), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812826.
[426] Rayla Bellis, Beth Osborne & Stephen Lee Davis, *Repair Priorities*, Transportation for America and Taxpayers for Common Sense (2019).
[427] Todd Litman, *Whose Roads? Evaluating Bicyclists' and Pedestrians' Right to Use Public Roadways*, Victoria Transport Policy Institute (Dec. 11, 2013); Tony Dutzik, Gideon Weissman & Phineas Baxandall,

How the Recommendation Supports Frontline or other Underserved Communities:
Lower income households spend a larger share of their total income on transportation than other Americans.[428] Providing better access to bicycles and infrastructure for walking and bicycling can help provide safe, healthy, cost efficient transportation options for short trips and to access public transportation. Improving infrastructure will also benefit underserved communities, and community engagement to plan and design according to community needs without residents fearing being priced out of their homes is key. Persons of color are far more likely to be injured or die while walking and more likely to be harmed by air pollution from automobiles.[429] The pedestrian fatality rate for Black Americans is nearly twice as high as the rate for white Americans, and for Native Americans it is nearly five times as high.[430] Infrastructure to separate vehicles from people using active transportation will save lives.

How the Recommendation Supports Biden's Climate Plan: Providing states and metropolitan planning organizations with funds to develop and implement "Complete Streets" programs will enable local jurisdictions to use transportation funds to build safer, cleaner, and more accessible multimodal transportation systems that include active transportation. Following Boulder, Colorado's efforts to implement Complete Streets, the reduction in car trips in the city led to a cut in a half million pounds in carbon dioxide emissions annually.[431]

Key Battleground State Activity: In a ranking of 2018 Complete Streets policies, Smart Growth America lists communities in Ohio, Iowa, and Florida among those with strong approaches. All battleground states have had specific communities adopt Complete Streets policies but only some, like Nevada and North Carolina, have incorporated it into state-level decision-making.[432]

Recommendation 3: Require collection and reporting of quantitative active transportation data as a step towards performance- and needs-based funding.
Creating a federal program for active transportation data and performance reporting would enable data-driven decision-making about infrastructure needs as well as fair funding allocation. Data sets such as the National Household Travel Survey and the American Community Survey and decennial Census provide valuable mode choice travel information, but do not include frequent longitudinal and local level data collection on personal miles travel

'*Who Pays for Roads' How the 'Users Pay' Myth Gets in the Way of Solving America's Transportation Problems*, U.S. PIRG and Frontier Group (2015).
[428] Institute for Transportation & Development Policy, *The High Cost of Transportation in the United States* (May 23, 2019), https://www.itdp.org/2019/05/23/high-cost-transportation-united-states/#:~:text=The%20lowest%20income%20is%20burdened,(lack%20of)%20transport%20system.
[429] Lara P. Clark, Dylan B. Millet & Julian D. Marshall, *Changes in Transportation-Related Air Pollution Exposures by Race-Ethnicity and Socioeconomic Status: Outdoor Nitrogen Dioxide in the United States in 2000 and 2010*, 125 *Environmental Health Perspectives* 9 (2017).
[430] Smart Growth America, Dangerous by Design 2016 (Jan. 2017), https://smartgrowthamerica.org/dangerous-by-design/.
[431] Smart Growth America & National Complete Streets Coalition, Complete Streets Fight Climate Change (last visited Oct. 21, 2020), https://smartgrowthamerica.org/dangerous-by-design/.
[432] Smart Growth America, The Best Complete Streets Policies of 2018 (May 2019), https://smartgrowthamerica.org/resources/the-best-complete-streets-policies-of-2018/. .

using active transportation. Crash data are collected through the Fatality Analysis Reporting System. However, these data tend to under-report crashes among people walking and cycling.

The National Transit Database (NTD) is a good example of a Federally-required self-reporting data that facilitates improved asset management and benchmarking for transit ridership and service. Other than the number and rate of non-motorized serious injuries and fatalities reported by Metropolitan Planning Organizations to states,[433] there are no Federally-mandated or supported databases for active transportation. Such a database, similar in ways to the NTD, would help state and local governments improve their active transportation policies and programs with data on asset management, and safety.

- Require states and local transportation agencies to improve safety in areas that pose high risk to bicyclists and pedestrians
    - Proposed legislation: Safe and Friendly for the Environment (SAFE) Streets Act (H.R. 3040); Section 1209 of the Moving Forward Act (H.R.2) of 2020

New	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
Improved data collection and performance measurement can help state and local governments better understand active transportation trends and spend money more efficiently.

How the Recommendation Supports Frontline or other Underserved Communities:
Low income people, people of color, and frontline workers account for a disproportionate percentage of people that walk, cycle, or take transit to work. Creating a safe environment to walk or cycle will provide more people the freedom to choose to walk or cycle. Further, low-income people of color are over-represented in traffic deaths.[434] Understanding baseline conditions among frontline and underserved communities helps to inform decision-making and funding allocation.

How the Recommendation Supports Biden's Climate Plan: As part of his plan to "build a stronger, more resilient nation", Biden emphasizes local access to relevant science, data, information, tools, and training.

Key Battleground State Activity: As previously mentioned, fatalities among vulnerable road users (i.e. bicyclists and pedestrians) are prevalent in battleground states.

[433] Moving Ahead For Progress in the 21st Century, Pub. L. No. 112-141, 126 Stat. 405.
[434] Smart Growth America, Dangerous By Design (Jan. 2019), https://smartgrowthamerica.org/dangerous-by-design/.

Appendix A. Tax Benefits and Credits

Relative cost of bicycle commuter benefits compared to other modes

Compared to other clean commute benefits, extending commuter benefits to people who walk and bicycle would be a relatively low-cost program to incentivize clean commuting. According to an analysis of annual modal tax expenditures by the League of American Bicyclists, an estimated 85 percent goes toward car parking ($7.3 billion), 15 percent goes toward transit ($1.3 billion), and 0.2 percent goes toward bicycling ($5 million). In addition, a similar amount is spent on average nationwide subsidizing car parking ($700 million) as is spent combined on biking and walking infrastructure ($759 million).[435]

[435] Ken McLeod, *Bike Commuter Benefit and Tax Reform*, The League of American Bicyclists (last visited Oct. 21, 2020), https://bikeleague.org/sites/default/files/BikeBenefit&TaxReform.pdf.

Appendix B. Overview of Vision Zero

Vision Zero is a transportation policy intended to eliminate serious injuries and deaths on roadways. The term "Vision Zero" was first used in Sweden to describe that country's national transportation strategy.[436] Vision Zero is part of a growing number of transportation practices based on the *Safe Systems* approach. The Safe Systems approach stipulates that the opportunity for serious and fatal crashes must be designed out of the transportation system. While different countries apply different means to design out risk, two principles underlie each Safe Systems policy:

1. People make mistakes.
2. Human beings are vulnerable and are not designed to withstand the force transferred in traffic crashes.

Thus, Vision Zero policies assume that drivers will occasionally make mistakes or break the rules, resulting in crashes. Therefore, road designs are created so that when crashes do happen, they transfer as little force as possible.

In the United States, transportation safety practices are reactive and do not accommodate for mistakes. For example, the National Highway Traffic Safety Administration regularly cites "human behavior" as the cause of 94% of traffic crashes.[437] In addition, safety problems tend to be addressed only after an extraordinary number of serious or fatal crashes have occurred. Vision Zero is thus an effort to fundamentally reconsider the American approach to transportation safety.

In the United States, Vision Zero has primarily been adopted by city governments. Since Chicago first established a goal to eliminate traffic deaths in 2012, more than 40 U.S. cities have adopted Vision Zero policies.[438] However, a Vision Zero policy is not simply a goal to eliminate all serious traffic crashes and deaths. Instead adopting a Vision Zero policy suggests that a city is prepared to fundamentally change their approach to transportation safety.

[436] Vision Zero Network, A Primer on Vision Zero: Advancing Safe Mobility for All (May 2018), https://visionzeronetwork.org/wp-content/uploads/2018/05/What-is-VZ_FINAL.pdf
[437] Nat'l Highway Traffic Safety Administration, Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey (Feb. 2015), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115.
[438] Vision Zero Network, Vision Zero Communities (last visited Oct. 21, 2020), https://visionzeronetwork.org/resources/vision-zero-cities/.

National Low Carbon Fuels Standards: Supply-side Clean Transportation Policy Beyond "Electrify Everything"

Opportunity/Problem:

Transportation now represents the largest source of emissions in the US. The transportation electrification represents one mitigation pathway but air travel, heavy-duty trucking, and large-scale maritime rely on high-energy-density liquid fuels and present difficult technical challenges to electrification. As a result, it is desirable to enact policy structures beyond electrification to ensure that hard-to-electrify sectors are still decarbonized if batteries and associated technologies do not advance fast enough to impact these segments.

Recommended Action(s):

- Implement a National Low Carbon Fuel Standard, replacing the expiring Renewable Fuel Standard, using successful state programs as a model

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

LCFS protects and expands jobs in rural and agricultural communities that have traditionally been the hub of the biofuels sector and expand benefits to urban areas by reducing landfills

Econ. Benefits:

Protects existing biofuel sector jobs put at risk by the RFS expiration and Trump regulatory actions, plus expects infrastructure and investment benefits from new facilities converting undesired waste into low carbon fuels.

Equity Benefits:

Protects low-income communities through cost containment with an at-the-pump cost less than the federal gas tax. Low carbon fuels also have reduced criteria pollutant emissions vs. fossil petroleum.

Climate Plan Tie:

The LCFS supports the Climate Plan objective of:

- "Reducing greenhouse gas emissions from transportation – the fastest growing source of U.S. climate pollution"
- "Doubling down on the liquid fuels of the future, which make agriculture a key part of the solution to climate change. Advanced biofuels are now closer than ever as we begin to build the first plants for biofuels, creating jobs and new solutions to reduce emissions in planes, ocean-going vessels, and more."

Battleground State Benefits:

The constituency for an LCFS includes the existing biofuel economy in Colorado, Iowa, Michigan, Minnesota, Nebraska, Ohio, and Wisconsin. In addition, the LCFS should appeal to national security constituencies focused on decreasing dependence on foreign oil and coastal climate-motivated constituents may also make the LCFS popular in states at the nexus of climate change, agriculture, and military installations (Florida, North Carolina, Georgia, Virginia).

National Low Carbon Fuel Standards: Supply-side Clean Transportation Policy Beyond "Electrify Everything"

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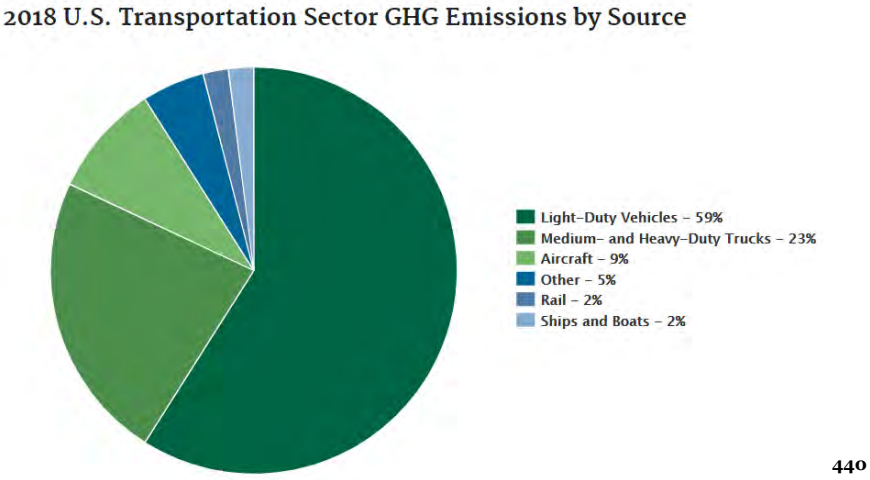
DATE: September 13, 2020

Opportunity / Problem Statement:
Transportation now represents the largest single source of carbon emissions in the United States, having surpassed the electricity sector.[439] The electrification of the transportation sector represents one pathway to mitigate carbon emissions, but air travel (beyond small, short-hop routes), heavy-duty trucking, and large-scale maritime (shipping) rely on the high energy density of liquid fuels to operate and present difficult technical challenges that currently inhibit electrification. As a result, it is desirable to enact policy structures, in addition to programs aimed at full electrification, to ensure that hard-to-electrify sectors are still decarbonized if batteries and associated technologies do not advance fast enough to impact these segments. A Low Carbon Fuel Standard (LCFS) modeled on current successful state-level programs in California and Oregon represents a promising market-based structure that decarbonizes the transportation fuel supply, protects and expands upon the existing 88,000+ biofuel jobs in the agricultural heartland, converts wastes (human and animal manure, agricultural residues, forest slash, and municipal garbage) that often burden low income communities and communities of color, and is complementary with other policies
aimed at full electrification.

[439] Transportation Replaces Power in U.S. as Top Source of CO2 Emissions, Yale Environment 360 (Dec. 4, 2017), https://e360.yale.edu/digest/transportation-replaces-power-in-u-s-as-top-source-of-co2-emissions.



[440]

The combined emissions from air, rail, marine, and medium- & heavy-duty trucking--all sectors that rely on energy-dense liquid fuels and are exceptionally difficult to electrify--are 40% of transportation emissions. A Low Carbon Fuel Standard provides an insurance policy to ensure decarbonization of these sectors if electrification is not as rapid as envisioned in the Biden campaign's Clean Energy Plan.

Proposed Recommendation: National Low Carbon Fuel Standard (LCFS)

A Low Carbon Fuel Standard (LCFS) is a supply-side transportation fuel policy that sets a cap on the carbon intensity (CI) of transportation fuels that is reduced over time. It is an incentive program to drive low-carbon fuels, including electricity, into transportation. A LCFS creates a compliance market between clean and dirty fuel producers, who buy and sell credits, but the government never touches the funds since the credits are traded between the regulated entities. In this way, LCFS is not a new tax and is revenue-neutral. A LCFS would require new legislation (modeled on current programs in California, Oregon, and Washington) and could be implemented by EPA. Since the Renewable Fuel Standard will functionally expire[441] at the end of 2022, some action will be required to avoid an abrupt regulatory and market cliff. The LCFS would serve as a functional replacement.

Key attributes of a LCFS include:

1. **Technology- and Fuel- agnostic:** The LCFS permits all technology and fuel options by using lifecycle analysis to calculate a CI score that accounts for the total global warming impact of fuel production and usage. The lower the CI score, the less CO_{2e}

[440] Fast Facts on Transportation Greenhouse Gas Emissions, Green Vehicle Guide, U.S. Env't Protection Agency (last visited Oct. 21, 2020), https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.
[441] Kelsi Bracmort, Cong. Research Service, *The Renewable Fuel Standard (RFS): Waiver Authority and Modification of Volumes* (Aug. 3, 2020), https://crsreports.congress.gov/product/pdf/R/R44045.

emitted from production and usage of a fuel, and therefore the greener the fuel. All fuels, including electricity, can be judged on this basis so that the best, greenest fuel wins.

2. **Market based:** An LCFS program uses a credit trading system that requires fossil fuel blenders to procure credits from clean fuel producers. The LCFS policy signals a long-term commitment to decarbonization, giving capital providers the necessary confidence to invest in new clean fuel projects.

3. **Avoids technology lock-in:** Unlike the Renewable Fuel Standard, the LCFS does not guarantee a quota for a particular fuel type. This feature avoids technology 'lock in' as technology progresses.

4. **Follows the pace of innovation:** The CI score is regulated to steadily decrease over time to increase decarbonization. The speed of the decrease can be increased to match technology development if new technologies rapidly emerge with drastically lower CI scores. Similarly, the LCFS program includes a credit price cap, providing cost containment and avoiding undesirable spikes in fuel prices.

5. **Succeeding in-practice today:** California, Oregon, British Columbia, and parts of Washington already have long-standing LCFS programs which can serve as models for a national program.

What are the advantages of a LCFS?

1. **Focus on difficult-to-decarbonize applications:** The LCFS targets transportation, which is a challenging sector to decarbonize, and works across all fuels to impact challenging sub-sectors like marine, aviation, heavy trucking, and rail that don't have obvious near-term pathways to electrification.

2. **Complementary to electrification:** The LCFS is an incentive program to drive low-carbon fuels, including electricity, into transportation. Since it's a market-based mechanism, it will support the lowest-cost, lowest-carbon option. If transportation electrification progresses as quickly as hoped, then the LCFS market will be dominated by electricity as the low carbon fuel of choice. But if electrification is slower than hoped or does not address all market segments, the LCFS will support other technologies that effectively decarbonize those sectors including advanced biofuels, carbon capture and storage, hydrogen, and renewable natural gas. In this way, the LCFS serves as an insurance policy to stand-alone electrification policies by ensuring transportation will decarbonize through some other means.

3. **Protects low-income communities through cost containment:** LCFS passes the costs of decarbonization on to the end-customer through increased fuel prices. To avoid a regressive policy that disproportionately impacts low-income communities, LCFS credit values have a price ceiling, limiting the maximum cost to consumers. In California,

the LCFS (currently near its price cap) amounts to ~$0.17/gallon,[442] less than the federal gas tax. Further, the LCFS would replace the Renewable Fuel Standard which currently adds ~$0.08/gallon. As a result, the gas premium from the LCFS would be mostly offset by the RFS premium being eliminated. If LCFS credit prices fall, the CI score cap can be tightened to accelerate decarbonization without increasing the cost to consumers.

4. **Innovation-focused:** The LCFS incentivizes the production of game-changing transportation fuels, including with zero or even negative carbon emissions (*i.e.* carbon removal). Since market participants are aware that the CI threshold will decrease over time, investment flows toward the lowest-CI solutions. In California's LCFS program,[443] this has led to first-of-a-kind facilities that convert wastes (human and animal manure, agricultural residues, forest slash, and municipal garbage) into fuels, creating a co-benefit for communities who would otherwise have been disproportionately impacted by the negative environmental and societal impacts of waste disposal. Similarly, California's LCFS has supported the deployment of electric charging infrastructure for private cars and commercial fleets, which directly eliminates tailpipe emissions of criteria pollutants. Further, many of these projects have *negative* CI scores, meaning the production and utilization of these fuels actually removes warming gases from the atmosphere.

5. **Strong, bi-partisan political constituencies:** The existing transportation fuel supply policy, the Renewable Fuel Standard (RFS), has support from 1) rural agricultural communities who benefit economically from biofuel production facilities and the associated demand for biomass feedstocks, and 2) national security constituencies who desire oil independence and wish to minimize oil imports and the associated geopolitical implications of oil trading. These diverse constituencies yield bipartisan Congressional support.[444] An LCFS program provides similar promise to these two typically-conservative constituencies while also attracting support from climate activists who seek to decarbonize transportation while decoupling federal fuel policy from ethanol production.

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[442] 1 gallon gasoline emits 19.64 lbs of CO2. *See* U.S. Energy Information Administration, Frequently Asked Questions (Apr. 25, 2014), http://www.patagoniaalliance.org/wp-content/uploads/2014/08/How-much-carbon-dioxide-is-produced-by-burning-gasoline-and-diesel-fuel-FAQ-U.S.-Energy-Information-Administration-EIA.pdf. California's current LCFS has a 10% emissions reduction and credits are ~$200/metric ton, for $0.17/gallon. *See* Tani Colbert-Sangree, *The Low Carbon Fuel Standard Has Succeeded, But How Does it Work?*, GHG Management Institute (Jan. 22, 2020), https://ghginstitute.org/2020/01/22/the-low-carbon-fuel-standard-has-succeeded-but-how-does-it-work/.

[443] California Air Resources Board, Low Carbon Fuel Standard (last visited Oct. 21, 2020), https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard.

[444] Helena Tavares Kennedy, *More Than 40 House Members in Bipartisan Defense of Renewable Fuel Standard*, Biofuels Digest (June 14, 2020), https://www.biofuelsdigest.com/bdigest/2020/06/14/more-than-40-house-members-in-bipartisan-defense-of-renewable-fuel-standard/.

6. **Solves problems associated with the Renewable Fuel Standard:** The RFS, created in 2005 and reformed in 2007, faces significant uncertainty in 2022 when the legislated biofuel volume quotas lapse. While the problems associated with the RFS are well known, letting the program lapse without a suitable replacement would leave sizable holes in heartland agricultural economies.. The LCFS provides an opportunity to replace the RFS with a new program that avoids the immediate loss of existing bioeconomy jobs while decoupling federal fuel policy from ethanol, and supports the decarbonization of the nation's fuel supply from any and all technological solutions.

7. **Avoids technology lock-in and does not "pick winners":** The LCFS is technology-and fuel-agnostic. Rather than setting quotas for particular feedstocks or fuel types as in the Renewable Fuel Standard, the LCFS puts all fuels on a level playing field by calculating their lifecycle emissions (encompassed in a CI score). As the lowest-cost, lowest-CI fuel changes over time, the LCFS adapts, avoiding technology lock in.

8. **Increases decarbonization ambition over time:** LCFS programs are designed such that the threshold CI score for fuels decreases over time, continuously raising the decarbonization ambition. The ceiling on LCFS credit prices protects consumers if technology cannot keep up with the declining CI threshold since a shortage of LCFS credits due to insufficient low-CI fuel leads to credit prices at the ceiling.

Check Boxes Below	
Y	**Is this a new or modification of an existing program?** A National Low Carbon Fuel Standard would be a new program that likely requires legislation. It functionally replaces the Renewable Fuel Standard.
N	**Does this roll back a Trump Administration regulation?** Replacing the RFS with the LCFS would be a change of policy but not a rollback of any specific Trump Administration action.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: LCFS would protect the 88,000+ (circa 2018)[445] existing jobs in rural and agricultural heartland communities that are the center of today's biofuel industry, and that would be at risk if the RFS were to lapse without a replacement supply side policy. Increasing the production of clean alternative transportation fuels and continuous innovation to lower the CI of existing biofuels is expected to create more jobs. Most biofuels are produced in rural and/or agricultural communities that have historically suffered from a lack of investment and higher unemployment.

[445] U.S. Report Highlights Key Employment Trends in Biofuels, Biofuels Int'l (Mar. 28, 2019), https://biofuels-news.com/news/us-report-highlights-key-employment-trends-in-biofuels/.

How the Recommendation Supports Frontline or other Underserved Communities:

- Alternative- and bio-fuels burn cleaner than their fossil equivalents, reducing criteria pollutant emissions--the emissions that are most locally destructive to human health. Reducing the use of fossil petroleum is key to modifying the fuel supply to reduce criteria pollutants.
- Low income communities are protected from program costs by cost containment. At-the-pump costs for California's program are less than the federal gas tax.
- Suggestion: The LCFS should be designed to prevent disproportionate impacts to frontline communities.[446]

How the Recommendation Supports Biden's Climate Plan:

The LCFS is an incentive program to drive low-carbon fuels, including electricity, into transportation.

- An LCFS program ensures that hard-to-electrify sectors (heavy duty trucking, rail, marine, air) are still decarbonized if electrification does not advance fast enough to impact these segments.
- LCFS explicitly connects transportation fuel supply to its carbon emissions, and is complementary to programs aimed at full electrification. LCFS supports the lowest-cost, lowest-carbon option, including electrification.
- The carbon baseline lowers over time to green the fuel supply as technologies mature and scale. Legislation and/or regulation can mandate that the CI baseline can only be lowered, never raised, to prevent backsliding. Existing state programs operate in this way.

The LCFS supports the Biden Climate Plan objective of:

- "Reducing greenhouse gas emissions from transportation – the fastest growing source of U.S. climate pollution"
- "Doubling down on the liquid fuels of the future, which make agriculture a key part of the solution to climate change. Advanced biofuels are now closer than ever as we begin to build the first plants for biofuels, creating jobs and new solutions to reduce emissions in planes, ocean-going vessels, and more."

Key Battleground State Activity:

The constituency for an LCFS includes the existing biofuel economy in Colorado, Iowa, Michigan, Minnesota, Nebraska, Ohio, and Wisconsin. In addition, the LCFS should appeal to national security constituencies focused on decreasing dependence on foreign oil and coastal climate-motivated constituents may also make the LCFS popular in states at the nexus of climate change, agriculture, and military installations (Florida, North Carolina, Georgia, Virginia).

[446] *See* Low Carbon Fuel Standard Statement of Principles, California Air Resources Board (Feb. 19, 2008), https://www.arb.ca.gov/lists/lcfs-policy-ws/7-lcfs_principles_-_final_-_2-19-08.pdf (Recommendation by environmental groups on how to design an equitable LCFS).

NextGen Highways

Opportunity/Problem:

In his Build Back Better plan, Biden highlights that we must "mobilize American ingenuity to build a modern infrastructure and an equitable, clean energy future." Under this premise, we propose a national infrastructure plan, termed NextGen Highways, which will serve to co-locate the transport of vehicles, energy, and information. The proposed infrastructure system will enable decarbonization of the power and transportation sectors, support environmental justice, bridge the digital divide, create hundreds of thousands of jobs, and result in new technologies and services that can be exported globally.

Recommended Action(s):

- New federal regulations that allow transmission, broadband, and 5G infrastructure, if buried, to be located within an interstate right of way
- Incentivize investments in transmission, broadband, and 5G infrastructure (e.g., by providing an investment tax credit)
- Fund research into DC power conversion technologies

Program Type:

√ New Program

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

NextGen Highways will create hundreds of thousands of construction, trade, and professional service jobs. Just the transmission-related jobs will exceed 100,000 according to NREL's Jobs and Economic Development Impact model.

Econ. Benefits:

The energy cost savings from a national HVDC grid are estimated at $47 billion annually. A Dig Once policy for broadband would reduce the digital divide while also generating tens of billions in savings from shared trenching costs. Last but not least, NextGen Highways will enable the United States to re-establish global leadership in electric vehicles, HVDC power transmission and 5G technology.

Equity Benefits:

NextGen Highways would enable transportation electrification, which will dramatically decrease the transportation sector's particulate emissions. These emissions disproportionately affect the health of people of color and low-income communities. Additionally, NextGen Highways would reduce the digital divide through deployment of broadband and/or 5G technology.

Climate Plan Tie:

This proposal pushes forward a vision of American ingenuity and labor to significantly decarbonize the power generation and transportation sectors, which combined make up over 50% of American GHG emissions.

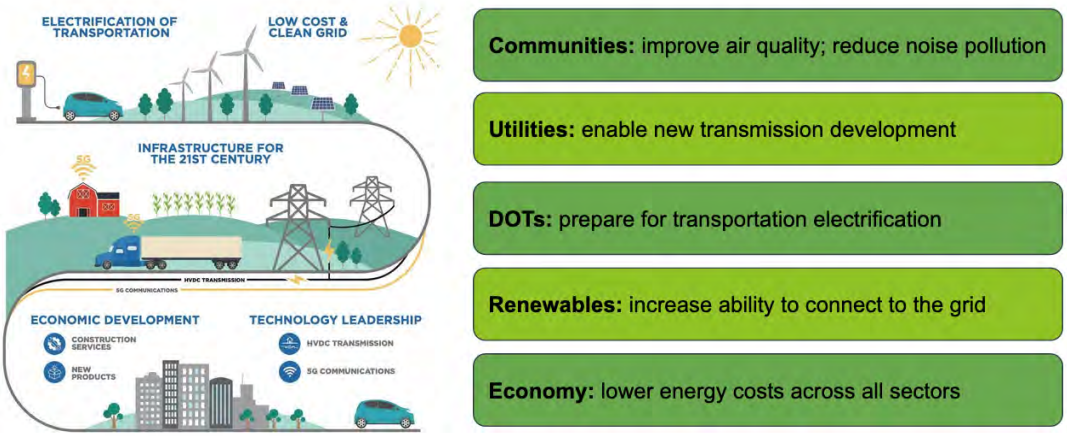
NextGen Highways

AUTHORS: Morgan Putnam, Kevin Miller, Davis Strobridge, Dan Lipschultz

DATE: August 31, 2020

Statement of Issue and Summary of Recommendations:
In his Build Back Better plan, Biden highlights that we must "mobilize American ingenuity to build a modern infrastructure and an equitable, clean energy future." Under this premise, we propose a national infrastructure plan, termed NextGen Highways, which will serve to co-locate the transport of vehicles, energy, and information. The proposed infrastructure system will enable decarbonization of the power and transportation sectors, support environmental justice, bridge the digital divide, create hundreds of thousands of jobs, and result in new technologies and services that can be exported globally. NextGen Highways offer a range of benefits to a number of different stakeholders and interests, as illustrated in Figure 1.

Figure 1. Illustration of benefits arising from the construction of NextGen Highways.



In order to effectively and efficiently implement the proposed plan, we suggest the following general policy solutions:

1. New federal policy that guarantees transmission, broadband, and 5G infrastructure, if buried, can be located within an interstate right of way
2. Incentivize investments in transmission, broadband, and 5G infrastructure (e.g., by providing an investment tax credit)
3. Fund research into DC power conversion technologies

Developing Clean Transportation and Low Emissions Infrastructure

Opportunity / Problem Statement:
A national transmission grid is needed to continue the ongoing shift to renewable power generation.[447] Separately, transmission and distribution grid investments are needed to enable transportation electrification in key transportation corridors.[448] NextGen Highways address both of these needs by burying new transmission within the existing right of way of the federal interstate system. Specifically, NextGen Highways would create a national High Voltage Direct Current (HVDC) grid using a portion of the federal interstate and would add Alternating Current (AC) transmission beneath the beltway loops in major metropolitan areas. Additionally, NextGen Highways would incorporate existing Dig Once legislation. Dig Once legislation is focused on reducing broadband and/or 5G deployment costs to address the 'digital divide'. Lastly, NextGen Highways would increase transportation safety through the deployment of 5.9 GHz infrastructure. Note, to reduce any unintended negative consequences from NextGen Highways, they would be developed with local input, especially from low-income, indigenous, and minority communities as highlighted in Biden's climate plan.

Proposed Recommendation:
Figure 2 illustrates a hypothetical deployment of the NextGen Highways infrastructure. The black lines are the high voltage direct current (HVDC) grid that was studied in the NREL Interconnection Seam Study. According to NREL's study, for every dollar invested in a national HVDC grid, American households and companies would receive one-to-two dollars of net benefits through lower electricity costs.[449] The blue lines are the parts of the existing federal highway system that could be used for the construction of a nearly equivalent HVDC grid. As can be seen from the figure, there is a strong overlap between the two.

In order to realize this proposed infrastructure, we recommend the following actions from the Biden administration:

1. **Issue an executive order** allowing power transmission to be sited in the right of way of any federal interstate. FHWA guidance to this effect already exists.
2. **Issue an executive order** requiring FERC to plan and implement a national HVDC grid.

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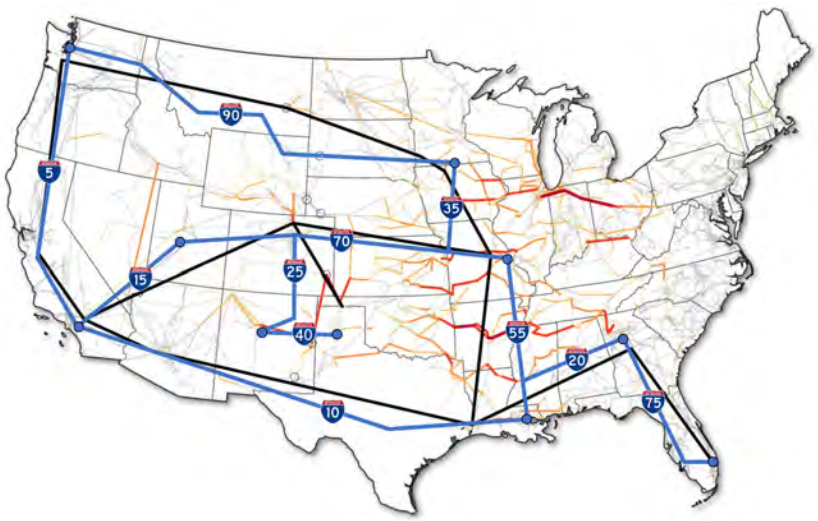
[447] See Interconnections Seams Study, Nat'l Renewable Energy Laboratory (last visited Oct. 21, 2020), https://www.nrel.gov/analysis/seams.html; Sammy Roth, Want Jobs and Clean Energy? This Overlooked Technology Could Deliver Both, L.A. Times (July 1, 2020), https://www.latimes.com/environment/story/2020-07-01/want-jobs-and-clean-energy-this-overlooked-technology-could-deliver-both.
[448] See generally West Coast Clean Transit Corridor Initiative (last visited Oct. 21, 2020), https://westcoastcleantransit.com/.
[449] Armando L. Figueroa-Acevedo et al., *Design and Valuation of High Capacity HVDC Macrogrid Transmission for the Continental U.S.*, Institute of Electrical and Electronics Engineers (Mar. 11, 2019), http://home.engineering.iastate.edu/~jdm/WebJournalPapers/Seams_TransPowerSystems_ALF_Mar-11-2019.pdf.

3. **Develop federal policy** to amend the Federal Power Act to clarify that FERC may exercise backstop siting authority for interstate transmission within a National Interest Electric Transmission Corridor (per the House Select Committee on the Climate Crisis).
4. **Support federal policy (170 FERC ¶ 61,204)**[450] to incentivize transmission investments.
5. **Support proposed legislation (S. 3107)** to establish a transmission investment tax credit.
6. **Support proposed legislation (H.R. 7205; H.R. 2) and policy (FHWA NPRM)**[451] to deploy broadband/5G and 5.9 GHz infrastructure along federal interstates.
7. **Support proposed legislation (H.R. 5558)** to ensure that the United States becomes a global leader for electrification of light, medium, and heavy-duty vehicles.
8. **Increase ARPA-E funding** for DC power conversion research and development.[452]
9. **Encourage the Federal Permitting Improvement Steering Council** to utilize the NEPA process for the development of NextGen Highways.

Figure 2. Alignment of existing federal highway system with the national HVDC grid evaluated in NREL's Interconnection Seam Study. This figure is modified from Figure 5 of the Seams Paper.[5]



[450] Electric Transmission Incentives Policy Under Section 219 of the Federal Power Act, 85 Fed. Reg. 18784 (proposed Apr. 2, 2020), https://www.federalregister.gov/documents/2020/04/02/2020-06321/electric-transmission-incentives-policy-under-section-219-of-the-federal-power-act.
[451] Broadband Infrastructure Deployment, 85 Fed. Reg. 49328 (proposed Aug. 13, 2020), https://www.federalregister.gov/documents/2020/08/13/2020-17525/broadband-infrastructure-deployment.
[452] Breakers, ARPA-E (last visited Oct. 21, 2020), https://www.arpa-e.energy.gov/?q=arpa-e-programs/breakers; Circuits, ARPA-E (last visited Oct. 21, 2020), https://arpa-e.energy.gov/?q=arpa-e-programs/circuits.

Check Boxes Below	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy & Addresses Climate Change:

Implementation of NextGen Highways will have wide sweeping impacts including significant job creation and re-establishing American technical leadership for energy and information technologies required for equitable, clean economies.

- **Jobs**: The hypothetical deployment in the figure above requires ~9400 miles of HVDC transmission. According to NREL's Jobs and Economic Development Impacts (JEDI) model the proposed HVDC transmission would create >100,000 jobs during the installation period.[453] Similarly, the deployment of broadband and 5G communications infrastructure and the associated deployment of EV charging infrastructure would result in significant job creation.
- **Economy**: The energy cost savings from a national HVDC grid are estimated at $47 billion annually.[454] Successful deployment of NextGen Highways would enable the United States to re-establish a competitive advantage in HVDC power transmission, information (e.g, broadband, 5G), and automobile safety (e.g., 5.9 GHz) technologies. These technologies will be required globally as the world experiences the same transition, providing export opportunities of this American technology and ingenuity. In addition, smart "dig once" policies have the capability to effectively bridge the digital divide while also generating billions in savings from shared digging costs.[455]
- **Climate Change**: NextGen Highways will significantly reduce greenhouse gas (GHG) emissions by enabling higher penetrations of (i) renewable energy generation and (ii) light, medium, and heavy-duty electric vehicles across the transportation industry. The NREL Interconnection Seam Study found that a federal macrogrid could enable renewables to achieve 85% grid penetration with minimal deployment of new thermal generation resources. By comparison, grid operation challenges are expected at 50-60% renewable penetration without significant transmission development. NextGen Highways will enable the required transmission expansion, thereby enabling an additional 30% of GHG-free electricity. Regarding transportation electrification, NextGen Highways will ensure that medium and heavy-duty vehicles, which account for

[453] Kevin Miller (Aug. 2020) (utilizing the Jobs and Economic Development Impacts (JEDI) Transmission Line Model, Nat'l Renewable Energy Laboratory, https://www.nrel.gov/analysis/jedi/transmission-line.html#:~:text=The%20Jobs%20and%20Economic%20Development,Transmission%20Line%20Type).

[454] Macro Grid Initiative, American Council On Renewable Energy (last visited Oct. 21, 2020), https://acore.org/macro-grid-initiative/.

[455] Tyler Cooper, *Dig Once: The Digital Divide Solution Congress Squandered and Policy that Could Save $126 Billion on Broadband Deployment*, BroadBand Now (Aug. 7, 2019), https://broadbandnow.com/report/dig-once-digital-divide/.

6% of all U.S. GHG emissions,[456] can electrify. In addition, we expect NextGen Highways will also further encourage broad electrification of light-duty vehicles as well, which account for over 15% of American GHG emissions.

How the Recommendation Supports Frontline or other Underserved Communities:
NextGen highways will reduce climate impacts on frontline and underserved communities through the GHG reductions identified in the previous section. NextGen Highways will also significantly improve air and noise quality in these communities. In nearly every major country, while heavy-duty vehicles make up less than 5% of all vehicles, they produce 40-60% of the transportation sector's nitrous oxide and particulate pollution,[457] and this pollution has disproportionate impacts in high poverty neighborhoods.[458] NextGen Highways will proactively strengthen the grid in transportation corridors so that heavy-duty trucking can be electrified, thereby improving air and noise quality in frontline and underserved communities. Additionally, implementation of NextGen highways will incorporate input from local community groups and governments to maximize positive impacts for frontline and underserved communities.

The digitalization of the US and global economy is a clear trend that will continue with time. As that trend continues, individuals, communities, and companies will increasingly require access to the digital economy to utilize and deliver public and private services, from banking to health care to logistics. It is for these reasons that there is a growing concern around the digital divide in both rural and urban areas. The ramifications of this digital divide have been rapidly amplified by the current pandemic as many of us are now completely reliant upon a strong internet connection for work, education, health care, and simply connecting with family and friends. As discussed above, a primary goal of this proposal is to help facilitate the deployment of broadband and 5G infrastructure to reduce the digital divide. By combining siting and permitting with the construction of other infrastructure (highways and/or power transmission), NextGen Highways will reduce deployment costs and generally facilitate deployment of broadband and 5G infrastructure.

How the Recommendation Supports Biden's Climate Plan:
NextGen Highways is a holistic proposal which will make significant progress toward each of Biden's five climate goals. This proposal pushes forward a vision to significantly decarbonize the power generation and transportation sectors, which combined make up over 50% of American

[456] Fast Facts on Transportation Greenhouse Gas Emissions, Green Vehicle Guide, U.S. Env't Protection Agency (last visited Oct. 21, 2020), https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.
[457] Vance Wagner & Dan Rutherford, *Survey of Best Practices in Emission Control of In-Use Heavy Duty Diesel Vehicles*, Int'l Council on Clean Transportation (Aug. 2013), (https://theicct.org/sites/default/files/publications/ICCT_HDV_in-use_20130802.pdf.
[458] Iyad Kheirbek et al., *The Contribution of Motor Vehicle Emissions to Ambient Fine Particulate Matter Public Health Impacts in New York City: A Health Burden Assessment*, 15 Env't Health 89 (2016), https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0172-6.

GHGs.[459] Implementing this proposal will (i) create hundreds of thousands of construction, trade, and professional service jobs, (ii) push America to again become a world leader on innovative technology (e.g., grid modernization, 5G, 5.9 GHz) and combating climate change, and (iii) improve the health of and digital access for underserved communities. NextGen Highways will specifically rely on Biden's desire to "*take advantage of existing rights-of-way – along roads and railways – and cut red-tape to promote faster and easier permitting*."

Key Battleground State Activity:
According to NREL's JEDI model, the initially proposed NextGen Highways (see figure 2) would create 33,000+ transmission jobs in eight battleground states (see table below). The authors roughly estimate that thousands of communications jobs would also be created in these states.

Battleground State	AZ	CO	FL	GA	IA	MN	NV	TX	Total
Miles of Transmission	382	704	482	310	217	159	123	874	**3,251**
Transmission Jobs	4,075	7,122	5,004	3,065	2,285	1,932	1,253	8,302	**33,038**

[459] *See* U.S. Primary Energy Consumption by Source, 2019, U.S. Energy Information Admin. (last visited Oct. 21, 2020), https://www.eia.gov/energyexplained/us-energy-facts/.

Transit Innovation

Opportunity/Problem:

US transit systems are badly in need of modernization, and without robust federal transit innovation funding, other investment is unlikely to materialize. American economic competitiveness depends on developing and implementing public transit innovations to 1) create domestic manufacturing jobs and 2) improve service to incentivize mode shift away from personal vehicles, reduce congestion, and shorten travel times, leading to reduction in emissions and increased economic activity.

Recommended Action(s):

- Increase Section 5312 Funding for FTA Research and Innovation
- Direct Other Competitive Programs to Incentivize Innovative Transit Projects
- Incentivize Domestic Manufacturing of Rolling Stock

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Every $1 billion invested in transit supports and creates 50,000 jobs. More than 435,000 Americans work directly for public transportation agencies, and investment to keep transit competitive supports these jobs. Transit innovation investments have previously launched new domestic manufacturers and shifted the industry to clean energy jobs. Creation of a new domestic rail rolling stock manufacturer would also create new jobs.

Econ. Benefits:

Every $1 invested in public transportation generates $5 in economic returns. New technologies for trip planning, vehicle tracking, and ride hailing integration can improve and increase mobility options, which incentivizes local economic activity.

Equity Benefits:

Low-income Americans, particularly those of color, disproportionately depend on public transit service. Transit innovation supporting faster transition to zero-emission technologies would improve air quality for low-income individuals. Innovation in trip planning, tracking, routing, and integrated service would improve mobility for Americans with disabilities in both urban and rural communities.

Climate Plan Tie:

Transit innovation funding will accelerate EV adoption for purposes of emissions reduction, both as a tactic for fighting climate change and removing toxic pollutants from the air, which the plan notes disproportionately impacts Black and Latino communities. Growing the domestic zero-emission transit market will support the national transition to clean energy jobs, both in manufacturing and operations, and help the US close its EV technology gap with China.

Battleground State Benefits:

All states, battleground or otherwise, rely on federal transit funding to support their urban and rural transportation systems. Multiple battleground states have major cities in the process of major transit system expansions, including Georgia, Wisconsin, North Carolina, Arizona, and Florida.

Clean Energy Recovery Recommendation

Transit Innovation

AUTHORS: Nathaniel Horadam, Alex Beckmann, Alice Grossman

DATE: 9/1/20

Statement of Issue and Summary of Recommendations:
Transit innovation investment in the United States has long been a responsibility of federal agencies due to fiscal constraints of manufacturers and transit agencies, and the national benefits from public transportation funding. Though public transit benefits from well-funded roads and other transportation infrastructure, the necessary dedicated right-of-way, rolling stock, and other multi-modal public transit service elements are increasingly underfunded, especially for the size and economic contribution of the population it serves. Agencies lack the financial wherewithal to experiment with new service models and technologies on their own. Domestic bus manufacturers are profitable, but the market is not large enough to justify increasingly expensive technology development without federal support. The U.S. has not had a viable rail transit rolling stock manufacturer in decades, and agencies instead rely on foreign manufacturers complying with Buy America procurement rules for U.S. manufacturing. Recent legislation restricting use of Chinese rolling stock points to a national interest and bipartisan support for bolstering domestic sources. With increasing competition from ridehailing, persistently low gas prices, the urgent need to address climate change, and the COVID-19 pandemic, pressure on transit systems to modernize and adopt emerging technologies, including electrification, automation, and mobile device integration, has grown considerably.

Transit agencies in the United States currently receive more than $15 billion in federal funding annually to procure new vehicles and infrastructure, maintain states of good repair in their systems, and support operations, but the Federal Transit Administration (FTA) receives only around .3 percent of that for development and demonstration of new transit technologies and service models.[460] Given its direct investment in local transit systems, the federal government maintains strong interest in ensuring effective use of those dollars to procure and support state-of-the art technologies. The FTA's primary funding mechanism for innovation, Section 5312, receives a mere $28 million/year in authorized funding under the Fixing America's Surface Transportation (FAST) Act, with annual appropriations boosting that figure only slightly. This budget has to accommodate research and demonstration programs for all transit modes, including rail, bus, paratransit, and mobility-on-demand concepts.[461] It also includes

[460] *See* Budget Estimates Fiscal Year 2020, Federal Transit Administration (Mar. 2019), https://www.oig.dot.gov/sites/default/files/files/OIG%20FY20%20CONG%20Budget-508-3-14-19.pdf.
[461] Mobility On Demand (MOD): Transform the Way Society Moves, U.S. Dep't of Transportation (last visited Oct. 21, 2020), https://www.its.dot.gov/factsheets/pdf/MobilityonDemand.pdf.

research around digital fare payment and integration, transit-oriented development, and integration with active transportation modes. Increasing federal transit innovation funding and rethinking its objectives to reflect advances in technology and travel behavior would modernize the US transit industry and expand access for the disability community, low income and communities of color (especially essential workers); boost the financial resilience of transit systems; create new secure, well-paid, public sector training opportunities, internships, and jobs for the working class; and address climate change. We propose the following solutions:

- **Increase Section 5312 Funding for FTA Research and Innovation**
- **Direct Other Competitive Programs to Incentivize Innovative Transit Projects**
- **Incentivize Domestic Manufacturing of Rolling Stock**

Opportunity / Problem Statement:
US transit systems are badly in need of modernization, and without robust federal transit innovation funding, other investment is unlikely to materialize. This leaves transit at a disadvantage against competing urban transportation modes, namely ridehailing companies, that continue to see significant private investment and drive higher greenhouse gas (GHG) emissions[462], at a time when racial and socioeconomic inequality is growing across the country. American economic competitiveness depends on developing and implementing public transit innovations to 1) create domestic manufacturing jobs and 2) improve service to incentivize mode shift away from personal vehicles, reduce congestion, and shorten travel times, leading to reduction in emissions and increased economic opportunities.

Proposed Recommendations:

- **INCREASE SECTION 5312 FUNDING FOR FTA RESEARCH AND INNOVATION**: Increase authorized funding for Section 5312 to $100 million in the next surface transportation bill to support both transit vehicle technology and transit service model research and innovation programming. Funding should also be made available under Section 5312 for transit agencies to test improvements to make transit and paratransit service more useful and attractive to riders, including improvements such as dedicated bus lanes, automation and advanced driver assistance capabilities, transit signal prioritization, fare collection modernization like off-board and mobile fare collection, bus network redesigns, heavy rail asset management improvements, on-demand paratransit options, and multi-modal trip planners and fare integration.[463] The Biden Administration should work with Congress to increase Section 5312 funding and facilitate other important policy changes in the next surface transportation authorization bill. It can direct Section 5312 spending priorities once appropriated.

[462] 2018 Base-year Emissions Inventory Report, California Air Resources Board (Dec. 2019), https://ww2.arb.ca.gov/resources/documents/2018-base-year-emissions-inventory-report.

[463] Competitive Funding Opportunity: Accelerating Innovative Mobility (AIM) Challenge Grants, 85 Fed. Reg. 15558 (Mar. 18, 2020), https://www.federalregister.gov/documents/2020/03/18/2020-05611/competitive-funding-opportunity-accelerating-innovative-mobility-aim-challenge-grants.

- **DIRECT OTHER INNOVATION PROGRAMS TO INCENTIVIZE TRANSIT PROJECTS:** Create incentives in Federal Highway Administration (FHWA) competitive grant programs to incorporate transit platforms and service models, either through proposal selection criteria, minimum quotas for transit projects selection, or percentage of funding allocation. This would enable a multimodal approach, breaking down silos at DOT and improving the economic, environmental, and safety performance of our national transportation system by shifting mode share to transit. FHWA annually funds hundreds of millions of dollars worth of competitive and innovation grants (e.g. BUILD and ATCMTD) that incentivize incorporation of innovative technologies, much of which goes to connected and automated vehicle technologies, highways, and freight infrastructure. Though these are important focus areas for domestic technology development, the Biden Administration should ensure these programs are also supporting transit innovation, which can and should interface in a multimodal context. Similarly, the Department of Energy (DOE) can allocate more grant funding toward transit vehicle technologies, or multimodal technologies versus cars and trucks, and the ARPA-E program. The Biden Administration can direct program criteria and quotas through agency discretion, and does not require Congressional action.
- **INCENTIVIZE DOMESTIC MANUFACTURING OF ROLLING STOCK** As highlighted by LA Metro CEO Phil Washington in his testimony before the House Transportation and Infrastructure Committee in May 2019, there is no current domestic rail rolling stock manufacturer in the U.S. (Appendix A). Federal agencies should work with transit agencies to pool their resources to fund the creation of new American transit manufacturers, including an American manufacturer of rail rolling stock. By creating a steady stream of contracts through a large pool of orders, the amount of funding would be large enough for a new company to be profitable while creating domestic jobs and decreasing dependence on foreign companies. The Biden Administration can direct the FTA and Federal Rail Administration to work with transit agencies on agreements to pool federal grant funding and create procurement opportunities large enough to incentivize creation of US transit manufacturers and US supply chains.

How the Recommendations Create Jobs, Improve the Economy, and Address Climate Change:

According to the American Public Transportation Association (APTA), every $1 invested in public transportation generates $5 in economic returns, and every $1 billion invested in it supports and creates 50,000 jobs.[464] More than 435,000 Americans work directly for public transportation agencies.[465] Moreover, transit provides significant transportation savings over personal vehicle ownership and use, with disproportionate benefits to low-income households. During the COVID-19 pandemic, essential workers have relied heavily on transit for

[464] Public Transportation Facts, American Public Transportation Association (Oct. 6, 2020), https://www.apta.com/news-publications/public-transportation-facts/.
[465] 2020 Public Transportation Fact Book, American Public Transportation Association (Mar. 2020), https://www.apta.com/wp-content/uploads/APTA-2020-Fact-Book.pdf.

transportation to and from hospitals, grocery stores, and job sites.[466] New technologies for trip planning, vehicle tracking, and ridehailing integration can improve mobility options for people who cannot drive, especially in areas where transit service is less frequent. It can also incentivize the use of public transportation in lieu of private on-demand mobility options, which are more expensive to the rider and have controversial labor practices.[467] Transit labor unions have not opposed transit innovation measures to date, but the Biden Administration should push for additional Section 5314 funding to support industry workforce development programs that ensure transit jobs evolve alongside new technologies, minimizing any negative labor impacts.

While transit represents a small portion of overall vehicle emissions, federal funding already directly supports vehicle acquisition, and the Biden Administration can increase federal impact by investing in technology development to increase transit's competitiveness versus single-occupancy vehicles (SOVs). Supporting mode shift to transit can reduce emissions. According to the FTA, heavy rail produces 76 percent fewer GHG emissions per passenger mile than an average SOV. Even prior to the transition to zero-emission technologies, transit buses were producing 33 percent fewer emissions by the same metric.[468] Transit innovation funding can accelerate the transition to zero-emission buses. For example, federal transit innovation investments through the National Fuel Cell Bus Program launched a new US electric bus manufacturer and catalyzed the entire domestic zero-emission bus industry. The California Air Resources Board's recent Innovative Clean Transit regulation requiring all transit fleets in the state to fully transition to zero-emission vehicles by 2040 is expected to eliminate 19 million metric tons of GHG from 2020 to 2050.[469] As California represents roughly 13 percent of the national transit vehicle fleet,[470] transitioning the whole country would remove at least an additional 120 million metric tons of GHG over the same period.

How the Recommendation Supports Frontline or other Underserved Communities:

Low-income Americans, particularly those of color, disproportionately depend on public transit service to access to jobs, education, healthcare, and other essential services. Sixty percent of all U.S. zero-vehicle households are low-income, below the 80 percent median income threshold in their communities.[471] Additionally, more than 14 million people of color live in counties with

[466] Robert Puentes, *COVID's Differing Impact on Transit Ridership*, Eno Center for Transportation (Apr. 24, 2020), https://www.enotrans.org/article/covids-differing-impact-on-transit-ridership/.
[467] Katie J. Wells, Kafui Attoh & Declan Cullen, *The Uber Workplace in D.C*, Georgetown University: Kalmanovitz Initiative for Labor and the Working Poor (2019).
[468] Transit's Role in Environmental Sustainability, Federal Transit Administration (Dec. 14, 2015).
[469] Press Release: California Transitioning to All-Electric Public Bus Fleet by 2040, California Air Resources Board (Dec. 14, 2018), https://ww2.arb.ca.gov/news/california-transitioning-all-electric-public-bus-fleet-2040.
[470] 2020 Public Transportation Fact Book, American Public Transportation Association (Mar. 2020), https://www.apta.com/wp-content/uploads/APTA-2020-Fact-Book.pdf.
[471] Adie Tomer & Robert Puentes, *Transit Access and Zero Vehicle Households*, Brookings Institution (Aug. 2011), http://web.archive.org/web/20120119080611/http://www.brookings.edu/papers/2011/0818_transportation_tomer_puentes.aspx.

high air pollution,[472] which has devastating health effects and kills more than 100,000 Americans annually.[473] Poor air quality exacerbates health impacts of COVID-19 infection and increases probability of death if infected (see Eliminating pollution/improving health and resistance to COVID-19 section).[474] Transit is cleaner than SOVs, especially as bus fleets across the country continue to electrify, and leveraging innovative technologies to increase its mode share can help reduce the number of Americans who die from air pollution every year. App-based services and technology integration can also revolutionize paratransit, which serves millions of trips annually. Paratransit is notoriously expensive for transit agencies and users alike, and often has low reliability, with "on-time" requirements allowing for 20 to 60 minute windows.[475] Trip planning is often cumbersome, and real-time tracking of vehicles only exists in select areas. Innovations in trip planning, tracking, routing, and integrated service would improve mobility for Americans with disabilities in both urban and rural communities.

How the Recommendation Supports Biden's Climate Plan:
The recommendations in this paper support the Biden Climate Plan on multiple fronts, including strengthening transit alternatives to personal vehicle use, emissions reduction, jobs creation, and national competitiveness. The plan aims to accelerate deployment of EVs, and these recommendations address the need to continue development of zero-emission technologies for transit vehicles. The plan also highlights China's growing edge in electric vehicle technologies, and need for the US to close that gap through federal investment. Unfortunately, the U.S. is already at risk of falling behind in key transit innovation areas. China has built a large lead over the United States in electric bus technology, with more than 400,000 deployed in the country and growing exports to Europe, Australia, and Latin America. U.S. agencies conversely have deployed or are in the process of deploying barely more than 2,000 zero-emission buses total as of October 2019.[476] Though all transit buses procured with federal dollars require Buy America compliance, including final assembly in the U.S., technology gaps between the two countries remain significant, and will not close without federal investment in domestic technology development. The plan also aims to accelerate EV adoption to fight climate change and remove toxic pollutants from the air, which the plan notes disproportionately impacts Black and Latino communities. Finally, growing the domestic zero-emission transit market will also support the national transition to clean energy jobs, both in manufacturing and operations.

[472] Anuradha Varanasi, *Over 14 Million People Of Color In The U.S. Live In Counties With High Air Pollution*, Forbes (Apr. 27, 2020), https://www.forbes.com/sites/anuradhavaranasi/2020/04/27/over-14-million-people-of-color-in-the-us-live-in-counties-with-high-air-pollution/#393f219a5301.
[473] Alan Neuhauser, 100,000 Americans Die from Air Pollution, Study Finds, US News & World Report (Apr. 8, 2019), https://www.usnews.com/news/national-news/articles/2019-04-08/100-000-americans-die-from-air-pollution-study-finds.
[474] Navin Singh Khadka, Air Pollution Linked to Raised Covid-19 Death Risk, BBC (Apr. 20, 2020), https://www.bbc.com/news/health-52351290.
[475] Alice Grossman & Katherine Idziorek, *Towards Universal Access: A Case Study in Los Angeles and Puget Sound*, Eno Center for Transportation (Forthcoming 2020).
[476] Fred Silver, John Jackson & Bryan Lee, *Zeroing in on ZEBs*, Calstart (Oct. 17, 2018), https://calstart.org/stateofzebs/.

Developing Clean Transportation and Low Emissions Infrastructure

Key Battleground State Activity:
All states, battleground or otherwise, rely on federal transit funding to support their urban and rural transportation systems. With aging populations and a growing national focus on addressing racial inequality, ensuring transit agencies are equipped to adapt to technological and demographic changes is a message that can resonate in all states. Cities in battleground states like Atlanta, GA (MARTA), Charlotte, NC (Lynx Light Rail), Phoenix, AZ (Valley Metro Light Rail), Miami, FL (Tri-Rail), and Milwaukee, WI (Milwaukee Streetcar) have recently expanded their transit systems and all have future expansions planned. Many swing states have manufacturing or other jobs tied to the transit industry (**Appendix B**).

APPENDIX A: Railcar Manufacturing

The last American railcar manufacturer, the Pullman Car Company, an American icon, went bankrupt in 1981. American transit agencies have to rely on American subsidiaries of European companies like Siemens or Alstom or more worrisome as highlighted elsewhere in this paper, Chinese State Owned Enterprises like CRRC, for building rail rolling stock. Additionally, only in the past 15 years or so has the bus rolling stock market seen the establishment of two strong domestic players in Proterra, which is based in California, and New Flyer, which is a Canadian company that has a strong manufacturing presence in Minnesota and Alabama.

The Federal Government, acting through the Federal Transit Administration (FTA) and the Federal Railroad Administration (FRA), should expand upon what Mr. Washington is doing in Los Angeles and leverage federal grant dollars (and other state and local monies) to incentivize the creation of domestic supply chains for rail rolling stock and other transit parts. Some transit agencies, like the Metropolitan Transit Authority (MTA) in New York, already require winners of rolling stock contracts to assemble the rolling stock in the state or region of the transit agency.

The current examples of domestic companies Proterra, Gillig, and ENC that build electric buses (also Canada's New Flyer and Nova Bus that sell in the US) show the potential for profitable business models.

This model has seen success elsewhere in the federal government and the private sector. The Defense Department consistently works to keep the American defense manufacturing base strong by ensuring that enough manufacturers get defense contracts so they can stay in business and keep the defense supplier community diversified. The Defense Department also requires that key military parts are made in the United States and Congress has strengthened those requirements over the years. Today, the United States has by far the strongest domestic defense manufacturing of any country, due in part to these requirements. Another successful example of this strategy in the private sector is in Upstate South Carolina where a robust automotive parts manufacturing cluster was formed in 1992 when BMW was incentivized by the State of South Carolina to set up a manufacturing plant in Spartanburg. South Carolina then used that BMW plant to incentivize auto parts manufacturers to colocate near the BMW plant and retooled their local community colleges and other educational institutions to provide the skilled workforce BMW and these other auto parts manufacturers needed to stay competitive. Today, over 40 Tier 1 auto parts suppliers[477] are located in Upstate South Carolina and the industry has an annual economic impact of more than $27 billion for the State.[478]

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[477] Greenville Area Development Corporation, Target Industries-Automotive (last visited Oct. 21, 2020), https://www.greenvilleeconomicdevelopment.com/target-industries/automotive/#1534351812589-f943ace0-ce83.

[478] South Carolina Department of Commerce, Automotive Industry (last visited Oct. 21, 2020), https://www.sccommerce.com/industries/automotive-industry#:~:text=With%20an%20annual%20economic%20impact,part%20of%20the%20state's%20economy.&text=More%20than%20two%20decades%20later,a%20leader%20in%20automotive%20manufacturing.

APPENDIX B: EXAMPLES OF TRANSIT-RELATED MANUFACTURING HEADQUARTERS

Transit related manufacturing and research has many nexuses to key areas of the country, The Federal Transit Administration's leading bus research and testing center is located in the key swing state of Pennsylvania in Altoona.[479] This center is responsible for testing all potential new bus models for FTA certification. Additionally, The Ohio State University in Columbus, Ohio is one of two research centers funded by the FTA in 2017 to do research on how to advance low or zero (Lo-No) emission buses and create the next generation of Lo-No buses.[480] More funding for FTA's 5312 program, as proposed in this paper, will support and expand critical innovation centers like the ones in Altoona and Columbus.

New Fyer's main manufacturing facilities are located in Crookston, Minnesota and Anniston Alabama. Proterra's main manufacturing facility is in Greenville, South Carolina.

APPENDIX C: SECTION 5312 PROGRAMMING

In recent years, Section 5312 has funded the popular Mobility-on-Demand Sandbox, Integrated Mobility Innovation (IMI), and Accelerating Innovative Mobility (AIM) programs to explore ways in which transit systems can leverage automation, microtransit, ridehailing integration, and other capabilities to improve transit service for both urbanized and rural communities. These innovation programs have leveraged millions of dollars of local and private funds to provide safer and more accessible mobility options. Before the launch of these programs, a 2015 US Department of Transportation Inspector General audit of FTA's Research and Innovation programming criticized it for lack of ambition, noting the agency had shifted priorities toward deployment and away from forward-thinking initiatives.[481] This shows FTA's ability to learn from evaluation of its programs and adapt to changing needs.

[479] LTI Bus Research and Testing Center, PennState College of Engineering (last visited Oct. 21, 2020), https://www.altoonabustest.psu.edu/.
[480] Press Release: Federal Grant Supports Low and No Emission bus Research at Ohio State (Jan. 20, 2017), https://news.osu.edu/federal-grant-supports-low-and-no-emission-bus-research-at-ohio-state/.
[481] Office of Inspector General, Audit Report: FTA's Transit Research Program Plan Is Outdated, U.S. Dep't of Transportation (Jan.13, 2015).

Transportation Justice: Access and Mobility as a Human Right

Opportunity/Problem:

Lack of, and poor access to transportation disproportionately affects low-income, communities of color, and the disability community. This leads to barriers to access to jobs, services, goods and recreation. The Biden Administration can implement policies to make clean transportation accessible and equitable, while lowering GHG emissions.

Recommended Action(s):

- Create and invest in more accessible, well-maintained transportation options for disabled, native, and low-income communities and communities of color
- Address the relationship between housing and transportation needs for those with disabilities, BIPOC communities, and low-income populations
- Increase community consultation and representation on decision-making bodies for frontline, low-income, and communities of color

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

Improving transportation access and infrastructure quality will also improve access to jobs across sectors, and lower transportation cost burdens. Improving infrastructure for EVs, transit, and active mobility will create jobs associated with clean energy. Engagement and planning with communities provides an opportunity for paid consultations within those communities raising their voices and engagement levels while also providing economic benefits. Improved transportation options also increase access for disadvantaged populations to reach more potential jobs, creating better physical connections between the workforce and job opportunities.

Econ. Benefits:

Economic opportunity is directly linked to transportation mobility. Providing access to goods and services as well as job centers will stimulate local businesses, give people more income stability, and improve access to critical goods and services.

Equity Benefits:

Improving transportation access provides more economic mobility by reducing time and cost burdens presented by long communities with limited options. Reducing emissions in low-income, disability and BIPOC communities will improve public health.

Climate Plan Tie:

This plan directly helps communities most affected by climate change. It also empowers local governments to improve their transportation systems to better serve communities, while reducing vehicle miles traveled (VMT), and improving access to clean technologies that will lower greenhouse gas emissions (GHG)s.

Battleground State Benefits:

This plan supports programs and proposals from Congress in battleground states like Colorado, Ohio, Florida, Texas, and Georgia.

Clean Energy Recovery Recommendation

Transportation Justice: Access and Mobility as a Human Right

AUTHORS: Kelly L. Fleming, Alice Grossman, Christina Bowman, Daniel Kammen, Brianne Eby, Richard Ezike, Julia Hustwit, Hana Creger

DATE: Sept. 27, 2020

Statement of Issue and Summary of Recommendations:
The legacy of investing in (and relying on) a polluting, car-centric mobility system in the U.S. has resulted in transportation that is inequitable. Racist policies like redlining led to a racially segregated transportation system. There are few public transportation options in many low-income communities, and even fewer efficient mobility options for people with physical disabilities; and there has been limited consultation with low-income, disability, and BIPOC communities when planning transportation systems. Furthermore, those who are lower income are increasingly pushed to live far from job centers, requiring that they spend a disproportionate amount of their income on transportation. Many of these same communities also reside next to highly trafficked highways and are exposed to greater concentrations of mobile source emissions, resulting in poor air quality. The consequences of our car and fossil-fuel dependent transportation system has resulted in poor health, environmental, and economic outcomes for BIPOC communities. To work toward improving social, racial, economic, and environmental equity and justice in transportation, this paper recommends that the Biden Administration implement the following recommendations:

- Create more accessible, safe, and well-maintained transportation options for BIPOC, the disabled, Native Americans, senior citizens, immigrants, and low-income communities;
- Reduce the housing and transportation costs;
- Increase community consultation and representation on decision-making bodies for frontline, low-income, and communities of color.

Opportunity / Problem Statement: Our current transportation system exacerbates inequality, contributes to local air pollution, and is physically unsafe, especially in communities of color and low-income neighborhoods. Redesigning the transportation system to prioritize the needs of senior citizens, the disabled, Native Americans, communities of color, and low-income populations through the expansion of clean, accessible, and efficient modes of movement will provide better access to opportunity, improve public health, curb adverse climate and environmental effects, and improve quality of life. The House Transportation & Infrastructure Committee's Moving Forward Act, which passed the House in July 2020,[482] shows momentum

[482] H.R. 2, 116th Cong. (2020).

for equitable mobility through legislative proposals that require assessments of environmental justice, the overall equity impacts of transportation projects, and more effective community engagement.[483]

Proposed Recommendations:

- **Create a new Department of Transportation (DOT) program to provide funds for transportation for communities of color and low-income populations.** $287 million of Federal formula funding supported Section 5310 for mobility for seniors and people with disabilities in 2019.[484] There are also programs to fund Native and Tribal land transportation. Creating a new formula program for other transportation for underserved populations would minimize existing inequities in both urban and rural communities. Funds could be used for expanding mass transit options, new affordable multimodal services, providing free or reduced transit fares, expanding bus services to help cover last-mile uses, or infrastructure capital or maintenance needs.
- **Prioritize a portion of section 5312 Federal Transit Authority funds[485] to serve areas that are underserved by transit.** Programs funded through 5312 have historically included projects in transportation underserved communities, and ones that focus on increasing access to transit for people of all physical abilities, improving fixed route bus and paratransit systems, and increasing access to programs for people who are un- and under-banked. These elements can further be prioritized in the 5312 project selection process.
- **Improve accessibility of transit and new mobility for unbanked households and those without mobile data plans or internet access through grant pilot programs on universal payment systems.** Pre-paid and cash payment on transit and clean new mobility options can give unbanked and low-income households more mobility options and access.[486]
- **Prioritize affordable housing, rent control protections, and investment in community-based transportation infrastructure.**
    - Reimplement HUD's Affirmatively Furthering Fair Housing (AFFH) rule,[487] which directs grantee jurisdictions to consider the structural causes of segregation and disinvestment in communities of color when those grantees are engaged in urban planning;

[483] Brianne Eby, *Increased Focus on Environmental Justice in Federal Transportation Policy Proposals*, Eno Center for Transportation (August 14, 2020), https://www.enotrans.org/article/increased-focus-on-environmental-justice-in-federal-transportation-policy-proposals/
[484] 49 U.S.C. § 5310. Formula grants for the enhanced mobility of seniors and individuals with disabilities.
[485] 49 U.S.C § 5312. Public transportation innovation.
[486] Richard Ezike, *How Transit Agencies Can Transition Contactless Payment Without Leaving Anyone Behind*, Urban Institute (July 2, 2020), https://www.urban.org/urban-wire/how-transit-agencies-can-transition-contactless-payment-without-leaving-anyone-behind
[487] Liz Ryan Murphy, *Understanding AAFH: What it is and How Does it Work*, Alliance for Housing Justice (July 29, 2020), https://www.allianceforhousingjustice.org/post/understanding-affh

- Fully enact HUD's Federal Register Notice FR 5891-F-02,[488] which requires grantee jurisdictions to consider climate resilience when engaged in urban planning;
- Refund and update HUD's Location Affordability Index (LAI),[489] which provides a standardized estimate of housing affordability, including transportation costs, for every US census block-group;
- Expand HUD's Housing Choice Voucher Mobility Program,[490] which allows low-income families to access housing in high-opportunity neighborhoods with good schools, jobs, and resources. Incentivize the use of Low-Income Housing Tax Credits (LIHTC)[491] for Transit-Oriented and Net-Zero Developments.

Pairing housing and land use policies with transportation planning will reduce commute lengths while making housing affordable and reducing vehicle miles traveled. Existing transit-oriented development (TOD) programs, such as those under Section 5309, and affordable housing programs should complement each other and include more robust engagement of disabled, communities of color, and low-income populations, especially to safeguard against problematic gentrification.[492] [493] The administration can also utilize climate adaptation plans in cities to increase affordable infill housing and TOD.

- **Engage community-based organizations in DOT initiatives to center and mitigate transportation equity problems and prioritize improving air quality.** Some existing DOT programs, like Accessible Transportation Technologies Research Initiative (ATTRI),[494] or the Greenlining Institute's Mobility Equity Framework,[495] can provide frameworks and examples of involving stakeholders in research, report development, programming, and outreach and dissemination. These lessons should be applied to *all* DOT programs with a focus on programs centering on mobility access and the environment. Concerted efforts should be made to engage members and organizations that are part of and familiar with underserved communities such as people from low-income communities and communities of color, senior citizens, immigrants, and people with disabilities.

[488] HUD, *Modernizing HUD's Consolidated Planning Process to Narrow the Digital Divide and Increase Resilience*, Federal Register (December 16, 2016), https://www.federalregister.gov/documents/2016/12/16/2016-30421/modernizing-huds-consolidated-planning-process-to-narrow-the-digital-divide-and-increase-resilience
[489] HUD Exchange, *Location Affordability Index*, https://www.hudexchange.info/programs/location-affordability-index/
[490] HUD, *Housing Choice Voucher (HVC) Mobility Demonstration*, https://www.hud.gov/program_offices/public_indian_housing/programs/hcv/mobilitydemo
[491] 26 U.S.C. § 42. Low-income housing credit.
[492] TransitCenter, *Mobility Performance Metrics for Integrated Mobility and Beyond*, Federal Transit Administration (February 2020), https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/147791/mobility-performance-metrics-integrated-mobility-and-beyond-fta-report-no-0152.pdf (document to be updated with Volume III, which will have the relevant Appendix A, in 2020)
[493] Federal Transit Administration, *Transit-Oriented Development*, https://www.transit.dot.gov/TOD
[494] Department of Transportation, *Accessible Transportation Technologies Research Initiative*, https://www.its.dot.gov/research_archives/attri/index.htm
[495] Greenlining, *Mobility Equity Framework: How to Make Transportation Work for People*, Greenlining (March 21, 2018), https://greenlining.org/publications/2018/mobility-equity-framework/

- **Direct the CEQ to consider cumulative health impacts from pollution in implementation of environmental laws.** Previously, for environmental impact statements, project sponsors were required to consider the incremental and cumulative impacts of actions. This language was removed in a July 2020 change to National Environmental Policy Act regulations by the Trump Administration.[496]
- **Use financial incentives to make zero emission vehicles (ZEVs) affordable to low-income communities, including increased EV tax rebates, second-hand ZEV incentives, and ZEV ridesharing pilot programs.** Include incentives to build EV charging infrastructure, such as utilizing electricity connectivity to light poles and providing utility subsidies for public charging.[497] Mandate and fund zero-emissions school buses and transit buses, prioritizing areas with poor air quality and health outcomes. Extend tax incentives and buyback programs for low-income drivers to buy affordable EVs.

Check Boxes Below	
yes	Is this a new or modification of an existing program?
yes	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Reducing the transportation burden on households who have been priced out of job centers due to high housing and transportation costs will give financial flexibility. This will allow households to spend more in the local economy. Creating more infill, transit-oriented, and affordable housing could also give people more employment options to match the available workforce with available jobs. Simple infrastructure additions, maintenance, transit, and new mobility pilot programs and expansion will create more jobs in transportation, and improve safe and efficient accessibility to jobs as well as goods and services to stimulate local economies. A combination of infrastructure improvements and operating funds can help decrease bus route frequencies and increase reliability. Making clean transportation technology, like electric vehicles more accessible to low-income households will have a greater reduction on emissions, as low-income households tend to have longer commutes and drive less fuel efficient vehicles (see LDV electrification paper).

[496] Council on Environmental Quality, *Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act,* Federal Register (July 16, 2020), https://www.govinfo.gov/content/pkg/FR-2020-07-16/pdf/2020-15179.pdf

[497] Daniel Kammen, *How Electric Vehicles Can Help Advance Social Justice*, The San Francisco Chronicle (June 21, 2020) https://www.sfchronicle.com/opinion/article/How-electric-vehicles-can-help-advance-social-15351293.php

However, adding more clean and affordable mobility options can exacerbate gentrification especially in dense urban areas.[498] Prioritizing transportation projects and investment in low-income communities and including robust, inclusive community engagement beyond placation by actually empowering communities is paramount.[499] Simple interventions to build sidewalks, fix drainage systems, and pave roads can be used to install climate-friendly infrastructure and create jobs while increasing safety and efficiency in communities and creating equitable infrastructure conditions without focusing on gentrifying. Instead of focusing 5312 funds on bringing in new, sometimes unproven technologies, innovations to improve existing transit bus service or increase access to more transportation modes would benefit the climate and the economy while focusing on known community transportation needs.

How the Recommendation Supports Frontline or other Underserved Communities:
Transportation costs are a growing problem for income inequality across the country, with many families paying more than 70% of their income total on combined transportation and housing costs.[500] Housing that is located in dense, transit-oriented neighborhoods can reduce both transportation emissions and cost burdens on underserved communities.[501]

Further, emissions from transportation disproportionately impact BIPOC communities, resulting in health burdens like asthma, heat islands, and noise pollution. These communities also have higher fatality rates for people bicycling and walking, including where roadway and sidewalk infrastructure is non-existent or not well maintained. Freight routes and major throughways should be examined for disproportionate air quality (or pipeline risk) impacts.

Improving the entire transportation system will help improve air quality, reduce disproportionate health burdens on these communities, and provide access to jobs, goods, and services. It will also reduce the cost burdens by increasing mode alternatives and reducing travel distance, cost per mile, and travel time. Most importantly, all policy interventions will be accompanied by inclusive and effective community engagement with stakeholders.

How the Recommendation Supports Biden's Climate Plan:
These recommendations help to *stand up to the abuse of power by polluters who disproportionately harm communities of color and low-income communities*. Marginalized communities are disproportionately harmed by poor environmental outcomes and inaccessible transportation. A just transportation system would right the wrongs of our historic and current system by providing accessible, clean, and efficient transportation that will enable those who have historically been left behind to have access to jobs, goods, and other critical services.

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[498] Jeff Turrentine, *When Public Transportation Leads to Gentrification*, NRDC (June 1, 2018),https://www.nrdc.org/onearth/when-public-transportation-leads-gentrification.
[499] Sherry Arnstein, *A Ladder of Citizen Participation*, Journal of the American Institute of Planners, 1969.
[500] The Center for Neighborhood Technology, *The H+T Affordability Index*, https://htaindex.cnt.org/
[501] Steven Higashide, et al., *A Green New Deal for City and Suburban Transportation*, TransitCenter (March 2020).

Key Battleground State Activity:
In its 2019 Freeways Without Futures report, the Livable Cities nonprofit Congress for New Urbanism listed freeways in Florida, Texas, and Colorado as examples that, when they were built, created physical barriers separating African American neighborhoods from white neighborhoods. Recent past editions of the report series have listed freeways in Georgia, Ohio, and Michigan.[502]

Under the Obama administration, the DOT implemented the "Ladders of Opportunity" program. This program connected local, state, and federal governments to make transportation infrastructure prioritize improvements to job access and affordable options. The program worked to connect transit agencies with resources, partner organizations, and other resources. States that implemented pilot programs include Georgia, North Carolina, Arizona, and Virginia.[503] Projects often used grant funding to increase access to transit, increase mobility options to job centers.

[502] Congress for New Urbanism, *Freeways Without Futures*, (2019).
[503] InfrastructureUSA, *Ladders of Opportunity: Transportation Empowerment Pilot*, InfrastructureUSA: Citizen Dialogue About Civil Infrastructure (December 26, 2016), https://www.infrastructureusa.org/ladders-of-opportunity-transportation-empowerment-pilot/.

APPENDIX A: Necessary Considerations for Enforcement and Policing in Tandem with Transportation and Energy Policies

Transportation has also been weaponized by police forces to disproportionately ticket and arrest those with lower economic status through transit policing, jaywalking laws, parking and other non-moving violation ticketing, and traffic stops. Making transportation more accessible and affordable will eliminate the need for this type of enforcement and improve safety for everyone.

Making new transportation technology accessible, like electric vehicles, ridesharing, micromobility, and innovative transit will provide co-benefits. For example, disproportionate police violence directed at BIPOC is often a result of traffic violations related to expired registration, failed smog tests, malfunctioning vehicles. Making EVs more accessible will reduce these encounters. Making public transportation more affordable by reducing fare, and reducing police presence will also help reduce police violence.

Appendix B. Native Populations And Other Opportunities for EV Infrastructure
Federal-state and federal-local partnership opportunities to enable state and local EV fleet purchases and leases. These build market pull, but also are opportunities for immediate jobs via the installation of public charging installations.

With more COVID-19 cases in the Navajo Nation than in several states combined, the fragility of public transit options there highlights a larger issue where EV mobility, both smaller vans for low population density areas and for family (and family bubble) transport could be of significant help for many Native Americans. Low-cost rent and rent to own programs could bring EV vehicles and subsidized (and free) stand-alone solar charging (and home / business electrification) to many of 15,000 Navajo, for example, who do not have electricity connections.

Appendix C. Examples to look at in setting up new DOT programs
New programs will be relatively easy to set up, as Sections 5307 and 5311 already incorporate percent of low-income households into FTA formula funding, thus making a new program using the same data relatively easy to set up. The Tribal Transportation Program (TTP) is also of note to examine and expand upon.

A Flight Path To Carbon Neutral Aviation

Opportunity/Problem:

Aviation has accounted for approximately 11 percent of US transportation GHG emissions. It has also suffered significant losses and job cuts during the COVID pandemic. Aviation should build back better with engine performance standards, sustainable fuels, and a cap on emissions tied to the climate plan.

Recommended Action(s):

- Legislation: declining cap on domestic aviation emissions; implementation of international cap; inclusion of aviation in climate plan enforcement mechanism; investments in sustainable fuel R&D, loan guarantees, and subsidy regime; investments in next generation aviation technology through NASA and DOE.
- Diplomacy: strengthen global standards and instruments; negotiate climate provisions in bilateral air services agreements.
- Administrative Action: rollback/strengthen engine performance standards; multiagency sustainable fuel R&D coordination and purchasing commitments; optimize aviation routing for emissions.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

- Sustainable fuels can create jobs (e.g., growing feedstock).
- Next-generation aviation technology creates jobs in the aircraft and avionics manufacturing industry.

Econ. Benefits:

- Tying stimulus funding and research investments to climate policies will allow aviation to build back better and maintain the global competitiveness of US manufacturers.

Equity Benefits:

- Low-carbon-intensity biofuel will support sustainable agriculture in many rural and underserved communities. Proposed measures also improve air quality and protect aviation jobs in frontline communities.

Climate Plan Tie:

These recommendations align with the Climate Plan's commitment to target airline emissions, update aircraft standards, incentivize creation of new, sustainable fuels, and advance innovation in aircraft technology and air traffic management. Including aviation in economy-wide carbon pricing supports the Plan's enforcement mechanism for the 2050 goal.

Battleground State Benefits:

Florida, Georgia, and Ohio are home to thousands of aerospace companies that employ hundreds of thousands of workers, and midwestern battleground states are candidates for biofuel research, development, and production. Supporting clean aviation will benefit these states' economies.

A Flight Path to Carbon Neutral Aviation

AUTHORS: Carol A. ("Annie") Petsonk, Jennifer Macedonia, Carl Lenox, Madison Freeman, Nikita Pavlenko

Statement of Issue and Summary of Recommendations:

Aviation is a vital part of the American economy. Before the COVID-19 pandemic, it was responsible for 5.2 percent of GDP and 11 million jobs.[504] Aviation emissions are forecasted to consume a substantial portion of the allowable atmospheric budget if Paris Agreement temperature goals are to be met.[505] A significant and growing contributor to greenhouse gas (GHG) emissions in the US, aviation accounted for 11 percent of GHGs from transportation - the highest emitting sector - and three percent of total US emissions in 2016.[506] Pre-COVID, international aviation's carbon emissions were forecasted to triple over the next two decades.[507] Aviation, the most carbon intensive form of transportation, also causes potentially significant non-CO_2 climate impacts from contrails, radiative forcing, and other pollutants at high altitudes.[508]

After air travel declined in March 2020, Congress allocated $25 billion in stimulus funding to the airline industry. Absent a new infusion of money, massive job cuts are expected when funds expire as global demand for aviation is not expected to recover to pre-pandemic levels until 2024.[509] Further federal support for the industry will likely be necessary and may provide an opportunity to include requirements and funding allocations that reduce emissions intensity. A

[504] Federal Aviation Administration, *The Economic Impact of Civil Aviation on the US Economy* (Jan. 2020), https://www.faa.gov/about/plans_reports/media/2020_jan_economic_impact_report.pdf.
[505] DavidS. Lee, *International aviation and the Paris Agreement temperature goals* (Dec. 2018), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/813343/international-aviation-paris-agreement.pdf
[506] U.S. Environmental Protection Agency, EPA 430-R-16-0002, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014*, p.1052 (Apr. 15, 2016), https://www.epa.gov/sites/production/files/2017-04/documents/us-ghg-inventory-2016-main-text.pdf.
[507] International Civil Aviation Organization, *ICAO Global Environmental Trends-Present and Future Aircraft Noise and Emissions* (A40-WP/54, July 5, 2019), https://www.icao.int/Meetings/a40/Documents/WP/wp_054_en.pdf
[508] United Nations Environment Programme, *2017 Emissions Gap Report*, DEW/2136/PA, p. 18-19 (Nov. 2017), https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf?sequence=1&isAllowed=y; David S. Lee, et. al. *The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018*, Atmospheric Environment (Sept. 3, 2020), https://doi.org/10.1016/j.atmosenv.2020.117834.
[509] Niraj Chokshi & Ben Casselman, *Airline Job Cuts Could Pressure Congress and Trump on Stimulus*, New York Times (Aug. 25, 2020), https://www.nytimes.com/2020/08/25/business/american-airline-furlough-19000.html; International Air Transport Association, *IATA Air Passenger Markets Analysis* (June 2020), https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-monthly-analysis---june-20202/.

revitalized and strengthened US commitment to decarbonize aviation will result in significant economic, environmental, employment, and diplomatic benefits.

Recommended policy solutions include:

- **Cap aviation emissions**; integrate aviation in the climate enforcement mechanism.
- **Strengthen global standards and instruments** and bilateral air services agreements.
- **Improve operational performance** with stronger engine standards and routing reforms.
- **Accelerate adoption of low and zero carbon Sustainable Aviation Fuel (SAF).**
- **Accelerate advanced low emissions air mobility** through R&D funding programs.

Opportunity / Problem Statement:

Passenger airlines have suffered dramatic, sustained reductions in demand during the pandemic (air cargo less so). Short-haul air travel is expected to begin to recover soon,[510] with associated GHG increases. Aviation is an important part of the US economy and a federal responsibility, and the Biden Administration should help aviation build back better. This paper recommends executive actions and legislation that will stimulate new industries and create jobs, improve air quality, mitigate climate change, and repair America's standing on the world stage.[511]

The Obama Administration issued a GHG reduction plan for domestic aviation, and in 2016 EPA found that GHGs from aviation contribute to climate change, endangering public health and welfare.[512] The US led a diplomatic initiative at the International Civil Aviation Organization (ICAO) to adopt a global cap, at 2019-2020 levels, on the net carbon emissions of international flights and adopt policies--performance standards and carbon offsetting--to meet that cap.[513] Efforts languished under the Trump Administration, which belatedly proposed a new engine

[510] International Air Transport Association, *Recovery Delayed as International Travel Remains Locked Down*, (July 28, 2020), https://www.iata.org/en/pressroom/pr/2020-07-28-02/.
[511] For an additional set of recommendations, see House Select Committee on the Climate Crisis: Majority Staff Report, 116th Cong., Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America (June 2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.
[512] United States Greenhouse Gas Emissions Reduction Plan, submitted to ICAO June 2015, https://www.icao.int/environmental-protection/Lists/ActionPlan/Attachments/30/UnitedStates_Action_Plan-2015.pdf; Environmental Protection Agency,Final Rule, Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare, 81 Fed. Reg. 54,422 (Aug. 15, 2016), https://www.govinfo.gov/content/pkg/FR-2016-08-15/pdf/2016-18399.pdf.
[513] *See ICAO, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA),* https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx. Both domestic and international aviation emissions are subject to national obligations under the UNFCCC and Paris Agreement, but pending effective action in ICAO to regulate international aviation emissions, most Parties have, to date, included only domestic aviation emissions in their Paris pledges.

CO_2 standard[514] that only meets the minimum and already outdated ICAO requirements.[515] As US aircraft manufacturers cannot sell aircraft abroad unless EPA certifies they meet minimum ICAO standards, Boeing had pressed the Trump Administration to issue standards.

California kick-started the domestic SAF industry with a low carbon fuel standard (LCFS), on top of the federal Renewable Fuel Standard (RFS2),[516] which gives producers who opt in one of the world's strongest financial incentives for producing low-carbon fuels.[517]

Proposed Recommendations:

Check Boxes Below	
X	Is this a modification of an existing program?
X	Does this roll back a Trump Administration regulation?

Cap aviation emissions**:** The Administration should propose and work with Congress to (a) enact a declining, enforceable cap on the absolute net climate-damaging emissions of domestic aviation, reaching net zero by 2050, with ambitious interim targets, and (b) implement the ICAO cap on international emissions, so that both domestic and international aviation are required to be on trajectories that are compatible with the Paris Agreement temperature goals. Aviation should be included in the enforcement mechanism called for by the Biden-Harris Climate Plan i.e., carbon pricing (cap and trade or tax with a performance backstop). Airline requests for stimulus funding could be a leverage point for achieving these policies.

Strengthen global standards and instruments: The Administration should press for accountability mechanisms in ICAO's cap on international aviation emissions - the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) - and in the Paris Agreement Article 6.4 rules. It should work to increase CORSIA's ambition, enhance CORSIA's sustainability requirements and strengthen ICAO's performance standards to be consistent with strengthened US standards (see below). It should engage cooperatively with the EU, China, and

[514] 85 Fed. Reg. 51,556 (Aug 20, 2020) https://www.govinfo.gov/content/pkg/FR-2020-08-20/pdf/2020-16271.pdf.
[515] Margo Oge, *EPA's Proposed Aircraft CO2 Standard is Already Obsolete*, Forbes (July 22, 2020), https://www.forbes.com/sites/margooge/2020/07/22/epas-proposed-aircraft-co2-standard-is-already-obsolete/#7909867b47c4. As US aircraft manufacturers cannot sell aircraft abroad unless EPA certifies they meet minimum ICAO standards, Boeing had pressed the Trump Administration to issue standards.
[516] *See* Press Release, California Air Resources Board 18-52, CARB amends Low Carbon Fuel Standard for wider impact (Sept. 27. 2018), https://ww2.arb.ca.gov/news/carb-amends-low-carbon-fuel-standard-wider-impact.
[517] Tani Colbert-Sangree, *The Low Carbon Fuel Standard Has Succeeded, but How Does it Work?*, GHG Management Institute (Jan. 22, 2020), https://ghginstitute.org/2020/01/22/the-low-carbon-fuel-standard-has-succeeded-but-how-does-it-work/.

others to negotiate bilateral air services agreements with climate provisions that go beyond ICAO requirements.

Improve operational performance**:** Using existing authority under Clean Air Act section 231, EPA should replace the Trump administration's proposed aircraft engine standard with more ambitious near and long-term technology-forcing standards for both new and in-use engines. Additional reforms to improve routing efficiency including direct routing will reduce fuel consumption from conventional aircraft operations and enable the maximum utilization of next-generation zero emissions aircraft with ideal characteristics for point-to-point operations between smaller airports.

Advance Sustainable Aviation Fuel: The Biden administration should support development, production scale-up and adoption of low- and zero-carbon SAF that meets ICAO standards, emits at least 80% less carbon on a lifecycle basis, and can replace and be blended with Jet Fuel (Jet A/Jet A1). Advances in next-generation low-carbon fuels will be critical to reach decarbonized mid- and long- range flight, for which there are currently no paths to realistic alternatives to liquid fuels. Potential policy levers to address the cost differential with conventional jet fuel and support their development include mechanisms to support rapid scale-up of supply, thereby lowering costs; and stimulation of demand, including mechanisms to achieve SAF cost parity with conventional fuel for air carriers. (See Appendix 2 for policy details)

Accelerate advanced low-emissions air mobility technologies**:** The Biden administration should rollback Trump's investments in and support of inefficient supersonic passenger aircraft. The new administration should instead mobilize federal funding to accelerate advanced low-emissions aviation technologies and help American companies achieve technology leadership. Through NASA, ARPA-E, and the new ARPA-C, the US should fund development and commercialization of aircraft and propulsion systems that can leverage next-generation fuels and energy carriers, including hydrogen and electricity. In addition, the administration should clarify and expand regulatory pathways for new technologies through the FAA to encourage the development of zero-emission flight. The US should also convene a working group with frontline community groups to ensure that advanced air mobility won't further disadvantage low income and Black, Indigenous, and People of Color (BIPOC) communities.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Reducing the aviation sector's significant and growing emissions footprint will be imperative to mitigating climate change. Accelerating decarbonization offers an opportunity to create jobs and drive economic activity in a sector which has been badly damaged by the pandemic. Failing to do so would inevitably result in a massive reduction in aviation sector economic activity.

Updated performance standards for in-service engines will drive fleet renewal, new markets for US manufacturers, and the creation of high-quality jobs. Advanced air mobility could revitalize America's historically significant light aircraft manufacturing industry and seize a technology

lead in an emerging, internationally contested new market. Investment in low- and zero-emission large passenger aircraft is critical to ensure the continued competitiveness of major US aircraft and engine manufacturers against international rivals, particularly Airbus which is strongly supported in this area by the EU.[518] Federal support for decarbonizing aviation could also help the agricultural sector, as low-carbon biofuel-based SAFs could open a significant new market for America's farmers. Some of the lowest-carbon SAFs can be produced from crop by-products, improving farm incomes by creating demand for what today is waste. Longer term, synthetic fuel, including so-called "electrofuels" synthesized from waste or atmospheric carbon dioxide and green hydrogen may be attractive, stimulating additional demand to build green hydrogen and associated renewable electricity production capacity.

With innovative financing via public and private sector initiatives to bring down cost and speed deployment, electric air mobility might have the added benefit of more robustly linking smaller and mid-size communities to each other and to large urban centers by providing lower-cost short-distance travel, creating stronger regional networks and associated economic activity.[519]

How the Recommendation Supports Frontline or other Underserved Communities:

Climate change jeopardizes aviation's license to operate. Proposed measures provide aviation with a path to a more sustainable future and protect jobs in frontline communities in the process. Provided it meets stringent sustainability standards[520] to ensure that fuels do not displace food, production of low-carbon-intensity biofuel can help build or rebuild a sustainable agriculture based economy in many rural and underserved communities, including First Nations, while decreasing the fossil fuel production and refining that disproportionately harms low-income and BIPOC communities. Furthermore, some alternative fuels have the potential to significantly reduce the air emissions that diminish local and regional air quality and compound the pollution burden faced by vulnerable communities.[521]

How the Recommendation Supports Biden's Climate Plan:

Biden's Climate Plan recognizes that greenhouse gas emissions from aviation would continue to increase without action, and few low-carbon technologies or fuels are available for the dramatic

[518] Jens Flottau, *Airbus Presents Three Hydrogen-Powered Aircraft Concepts*, Aviation Week Network (Sept. 20, 2020), https://aviationweek.com/aerospace/airbus-presents-three-hydrogen-powered-aircraft-concepts.
[519] Linda Lacina, *The next big disruption is coming. How cities can prepare for 'flying cars'*, World Economic Forum (Sept. 15, 2020), https://www.weforum.org/agenda/2020/09/flying-cars-are-the-next-big-disruption-how-cities-can-prepare/.
[520] *See* ICAO Sustainability Theme 12 (Food Security), in ICAO Doc 10126, CAEP/11 (published by decision of the Council 2019).
[521] R. Miake-Lye et al., *White Paper on Air Quality* (2016), https://www.icao.int/environmental-protection/Documents/ScientificUnderstanding/EnvReport2016-WhitePaper_LAQ.pdf.

reductions needed to achieve the goal of a 100% clean energy economy and net-zero emissions by 2050. These recommendations align with the Biden Plan's commitment to target airline emissions, update aircraft standards, incentivize creation of new, sustainable fuels, and pursue measures to advance innovation in aircraft technology and air traffic management. In addition, the proposed recommendation to include aviation in economy-wide carbon pricing legislation supports the Plan's enforcement mechanism for the 2050 goal.

Key Battleground State Activity:

Several battleground states are tied to the aerospace industry. More than 2000 aerospace and aviation companies employ over 82,000 employees in Florida. Georgia is home to over 800 major aerospace companies.[522] Ohio is the top state for suppliers to Boeing, supporting an estimated 34,000 jobs in Ohio in 2019.[523] Several struggling, but significant, American light aircraft manufacturers with strong potential to develop advanced aviation technologies are located in battleground states, including Piper in Florida and Cirrus in Minnesota and Texas. If decarbonization of the US aviation sector is perceived to threaten the air transport industry and the market for new aircraft, voters in these states may be inclined to oppose such policies. However, if this is understood to be necessary for American aircraft manufacturers to compete effectively in a global market, and to achieve technology leadership in emerging sectors of the aviation industry, support aimed at transforming the sector is more likely to be embraced.

Bio-based SAFs can support economic development in farm communities across the country, many of which are battleground states. In the Obama administration, the USDA considered aviation to be a key strategic partner and market for accomplishing its goals of promoting bioenergy production and supporting rural development.

Appendix 1: Supplemental History of Industry and Government Activities on Aviation

On September 11, 2020, the thirteen members of American Airlines' One World Alliance pledged to reach net zero emissions by 2050.[524] Government mandates to ensure all airlines meet this target would level the playing field.

It should be noted that the aviation industry has dodged climate regulation for a quarter century. In the UNFCCC, the question of limiting aviation emissions was put on the table in 1995. But nations couldn't agree on how to assign responsibility for the emissions of flights

[522] Industry Today, 2019 Aerospace Manufacturing Attractiveness Rankings, https://industrytoday.com/2019-aerospace-manufacturing-attractiveness-rankings/.

[523] **Ohio ranks among top states for aerospace manufacturing, *Cincinnati Business Courier* (Aug. 2, 2019),** https://www.bizjournals.com/cincinnati/news/2019/08/02/ohio-ranks-among-top-states-for-aerospace.html.

[524] *Thirteen Global Airlines Commit to 2050 Net Zero Emissions*, Carbon Pulse (Sept. 11, 2020), https://carbon-pulse.com/108820/.

between countries, so in 1997 they turned the issue over to ICAO.[525] In 2008, after a decade of inaction in ICAO, the EU enacted a law capping the emissions of all flights landing or taking off from European airports. The industry, recognizing it couldn't fight something with nothing, adopted a three-pronged approach. First, in 2009 airlines adopted wholly voluntary "aspirational" goals of a 1.5% improvement in fuel efficiency per year, "carbon neutral growth from 2020" (meaning an emissions cap set at 2020 levels and offsets for emissions above that cap), and a 50% cut in net emissions from 2005 levels by 2050.[526] They proposed a "four pillar strategy" to meet these goals, i.e., technology, operations, alternative fuels, and market-based measures (offsets) to fill the gap. Second, US carriers sued EU governments to block the law (they lost).[527] Third, US carriers got Congress in 2012 to enact S.1956, authorizing the Secretary of Transportation to ban US carriers from complying with the EU law and imposing trade sanctions on European airlines if the EU enforced its cap.[528] S.1956 authorized the Executive Branch to seek a solution in ICAO. To give the ICAO process one more chance, the EU paused the application of its law for flights to and from non-EU countries (the law remains in effect for within-Europe flights). In 2016, ICAO adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), capping the net emissions of international flights at the average of 2019-2020 levels.[529] But when COVID-19 hit, the airlines convinced ICAO's governing council to effectively suspend CORSIA for at least three years by revising its baseline,[530] cementing 28 years (1995-2023) of dodging carbon limits. The EU is now considering next steps.[531] And while the Trump Administration promulgated voluntary guidance for airlines to

[525] See Kyoto Protocol Article 2.2, United Nations (1998), https://unfccc.int/resource/docs/convkp/kpeng.pdf

[526] Press Release, IATA, Halving Emissions by 2050 - Aviation Brings its Targets to Copenhagen (Dec. 8, 2009), https://www.iata.org/en/pressroom/pr/2009-12-08-01/.

[527] *Air Transport Association of America v. Secretary of State for Energy and Climate Change*, 2011 E.C.R. C-366/10, http://climatecasechart.com/non-us-case/air-transport-association-of-america-v-secretary-of-state-for-energy-and-climate-change/?cn-reloaded=1

[528] European Union Emissions Trading Scheme Prohibition Act of 2011, S. 1956, 112th Cong. (2012), https://www.govtrack.us/congress/bills/112/s1956/text#:~:text=To%20prohibit%20operators%20of%20civil,Scheme%20Prohibition%20Act%20of%202011%20.

[529] ICAO, *What is CORSIA and how does it work?*, https://www.icao.int/environmental-protection/Pages/A39_CORSIA_FAQ2.aspx; ICAO, Resolution A39-3: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Global Market-based Measure (MBM) scheme, https://www.icao.int/environmental-protection/Documents/Resolution_A39_3.pdf.

[530] ICAO, *ICAO Council agrees to the safeguard adjustment for CORSIA in light of COVID-19 pandemic* (June 30, 2020), https://www.icao.int/Newsroom/Pages/ICAO-Council-agrees-to-the-safeguard-adjustment-for-CORSIA-in-light-of-COVID19-pandemic.aspx.

[531] *European Commission invites feedback on revisions to the EU ETS ahead of a public consultation*, Green Air Online (July 8, 2020), https://www.greenaironline.com/news.php?viewStory=2716; EU emissions trading system - updated rules for aviation, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12494-Revision-of-the-EU-Emission-Trading-System-Directive-concerning-aviation-.

report their international CO_2 emissions in compliance with ICAO,[532] it has championed one of President Trump's pet projects - bringing back noisy, high-polluting supersonic aircraft[533]- and neutered the Interagency Group on International Aviation (IGIA), which had provided policy input since 1960.[534]

Section 742 of the FAA Reauthorization Act of 2018, passed by the 115th Congress, directs FAA, in coordination with NASA, to conduct a technology review of research on the use of advanced aircraft technologies, innovative materials, alternative fuels, additive manufacturing, and novel aircraft designs, to increase aircraft fuel efficiency. Section 743 CLEEN Aircraft and Engine Technology Partnership directs the FAA to enter into a cost-sharing cooperative agreement to carry out a program for the development, maturation, and testing of certifiable CLEEN aircraft and engine technologies (i.e., continuous lower energy, emissions, and noise technology), as well as jet fuels for civil subsonic airplanes.[535]

Appendix 2: Policy Levers for Sustainable Aviation Fuels[536]

Supply

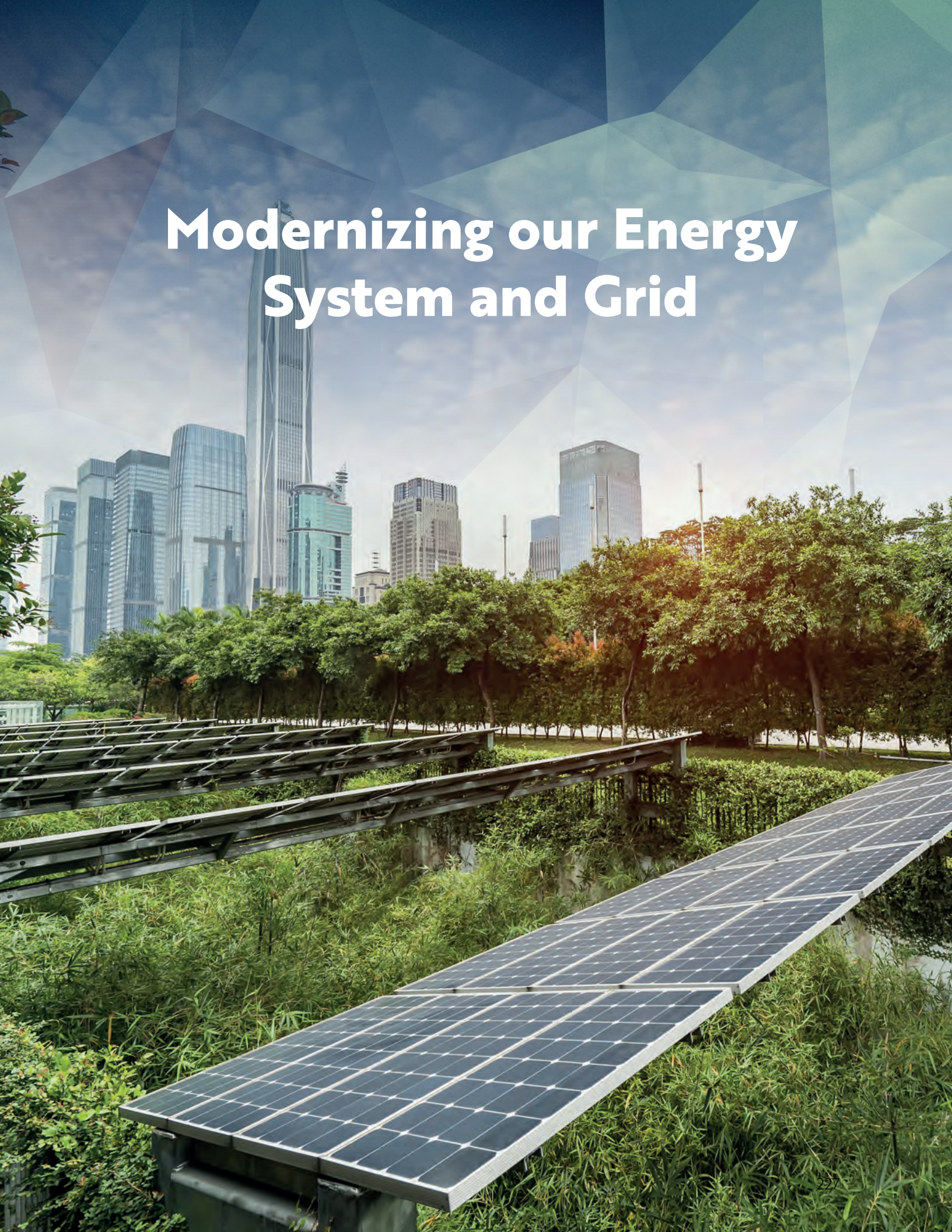
- Stimulate large-scale production with either legislative changes to the RFS to create a stronger incentive for advanced low or zero-carbon fuels, such as cellulosic SAFs, or a national LCFS that incentivizes alternative fuels proportionally to their carbon savings.
- SAF incentives should incentivize *new* net production.[537]
- Supply loan guarantees and grants for new, large-scale next generation biofuel production facilities utilizing novel or emerging conversion technologies.
- Direct federal multi-agency coordination providing RD&D support for scale-up of advanced aviation biofuels production technologies, and development and validation of less mature sustainable aviation fuels such as electrofuels. Numerous Obama-Biden era programs across DOE including ARPA-E, DoD, FAA, NASA, and USDA could be

[532] *See* Federal Aviation Administration, Notice of CORSIA Monitoring, Reporting, and Verification Program (Mar. 6, 2019), https://www.faa.gov/about/office_org/headquarters_offices/apl/research/environmental_policy/media/corsia_mrv_program_statement.pdf.
[533] 85 Fed. Reg. 20,431 (Apr. 13, 2020), https://www.govinfo.gov/content/pkg/FR-2020-04-13/pdf/2020-07039.pdf?utm_medium=email&utm_campaign=subscription+mailing+list&utm_source=federalregister.gov.
[534] Aviation Impact Reform, *FAA History: 1960* (Last Accessed Oct. 10, 2020), http://aireform.com/resources/faa-history-pages/faa-history-1960/.
[535] *See FAA Reauthorization Act of 2018, H.R. 302, 115th Cong.(2018),* https://www.congress.gov/bill/115th-congress/house-bill/302/text?q=%7B%22search%22%3A%5B%22FAA+Reauthorization%22%5D%7D.
[536] Note that some of these have been included in H.R. 2, which passed the House in July 2020. Moving Forward Act, H.R. 2, 116th Cong. (2020), https://www.govinfo.gov/content/pkg/BILLS-116hr2eh/pdf/BILLS-116hr2eh.pdf.
[537] *See* Nikita Pavlenko & Anastasia Kharina, *Policy and Environmental Implications of Using HEFA+ for Aviation*, International Council on Clean Transportation (Mar. 21, 2028), https://theicct.org/sites/default/files/publications/Green-Diesel-Aviation_ICCT-Working-Paper_20180321_vF.pdf.

revitalized and expanded with a specific focus on highly decarbonized SAFs, and ARPA-C could also be tasked with a new program in this area.
- Provide a federal backstop guarantee for large-scale forward purchase commitments by operators.
- Building on and exceeding ICAO standards, create strict definitions of low- and zero-carbon SAF based on full life cycle analysis, utilize these as a qualification requirement for any support, and implement robust enforcement mechanisms.

Demand
- Ensure that airlines can use quantified emission reductions from SAF, measured on a lifecycle basis building on ICAO standards, to comply with emission reduction obligations.
- Implement a durable regime to incentivize SAF production and use (e.g., declining emissions cap, tax credit, excise tax exemption, and/or LCFS-like rebate) based on emission reductions achieved on a lifecycle basis, building on ICAO standards.
- Provide substantial direct purchase support commitments by federal agencies, including the DoD, to catalyze the market and improve national security through access to a sustainable domestically produced aviation fuel supply.

Modernizing our Energy System and Grid



Energy Storage

Opportunity/Problem:

Energy storage is at the heart of the transition to a clean energy economy, offering a path to more cost-effective, more resilient, and more equitable electric-power and transportation systems. Whether in stationary battery packs, in electric vehicles, or in novel forms of long-duration storage, energy storage enables the deployment of high penetrations of variable renewable resources while reducing costs and environmental impacts and increasing resiliency. With the proper incentives and regulatory structures, and driven by continued innovation and a strong domestic supply chain, the American energy storage industry will support many jobs, and can be built and operated in a way that maximizes its social benefit where it's needed most.

Recommended Action(s):

- Establish electricity market designs that value and compensate for the flexibility that energy storage and distributed energy resources can provide.
- Promote domestic energy storage supply chain and innovation.
- Promote electric system resilience.
- Supply equity and environmental justice, by targeting storage deployments where they can have the greatest social benefit.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

Energy storage design, manufacturing, and deployment represents a rapidly growing new industry, and one that can be significantly boosted by a combination of investments and regulatory/policy changes.

Econ. Benefits:

Energy storage has demonstrated itself to be a key enabler of a lower-cost, more-efficiently-run, more resilient electric grid, and a resource that can be deployed at many different locations throughout the system and provide multiple benefits. Building a domestic supply chain for energy storage offers substantial job opportunities.

Equity Benefits:

Replacing our highest-emitting power plants with energy storage and renewables provides significant public-health benefits, particularly in disadvantaged communities facing disproportionately-high pollution burdens. Distributed energy storage offers resiliency benefits to frontline communities most impacted by climate-change-driven natural disasters.

Energy Storage

Climate Plan Tie:

Achieving a 100% zero-carbon electric grid by 2035, which is one of the top-level goals of the Biden Climate Plan, requires new flexibility resources such as energy storage to ensure that supply and demand of electricity match up. Encouraging energy storage R&D and manufacturing also helps support the Clean Cars Standard by reducing the cost of electric vehicles.

Battleground State Benefits:

Energy storage helps enable a stable, low-cost, and clean electricity grid in battleground states such as AZ, NV, CO, TX, FL, and VA that are adding large amounts of renewables to their grid fuel mix. This plan also encourages domestic storage manufacturing, which could bring benefits to the industrial Midwest.

Energy Storage

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DATE: Sept 25, 2020

Opportunity / Problem Statement: The path towards a carbon-free electric grid relies heavily on renewable generation such as wind and solar.[1] To accommodate these variable resources while maintaining reliability, the [power grid requires energy storage resources to shift renewable energy to when it is needed most and to balance supply and demand.[2] Energy storage technologies include thermal storage, pumped hydro, compressed air, flywheels, and batteries, as well as other technologies that are still in early commercialization or under active research and development. Energy storage is an enabling technology that supports Biden's Climate Plan in several ways:[3] i) Integrating higher shares of variable renewables, as well as facilitating the electrification of transportation; ii) Providing backup power to frontline communities during outages to help mitigate the threat of extreme climate events like heat waves, wildfires, and hurricanes; iii) Lowering peak demand on power systems, thus reducing energy bills for homes and businesses while also reducing the grid's reliance on fossil-fuel peaker plants often located in disadvantaged communities; iv) Serving as a foundation for a new US-based industry with a large international export market, creating new jobs and investment in a clean energy economy.

Proposed Recommendations:

ESTABLISH MARKET DESIGNS THAT VALUE AND COMPENSATE FLEXIBILITY

Energy storage is a fast-acting and flexible resource that can provide grid stability, making it a critical technology for integrating variable generation such as solar and wind onto the grid.[4] Energy storage can provide these services both at the bulk power-system level ("grid-scale"), as well as at the distribution level if it is deployed on the distribution

[1] *Renewable Electricity Futures Study*, M.M. Hand et al., eds, 4 vols. National Renewable Energy Laboratory (2012), https://www.nrel.gov/analysis/re-futures.html.
[2] Union of Concerned Scientists, *How Energy Storage Works* (Feb. 19, 2015).
[3] Energy Storage Association, Benefits of Energy Storage (Last Accessed Oct. 10, 2020)..
[4] Harnessing the Potential of Energy Storage: Storage Technologies, Services, and Policy Recommendations, Edison Electric Institute, (May 2017), https://www.eei.org/issuesandpolicy/generation/Documents/EEI_HarnessingStorage_Final.pdf.

grid or at an end customer site.[5] However, power markets were designed for older, slow-acting, centralized power plants, and their legacy market rules and structure can prevent storage resources from being able to provide some or all of their benefits to the grid.[6] Markets can also fail to fully reward energy storage resources for the benefits they provide to the grid.[7]

Federal leadership can drive the market design changes needed to enable energy storage and distributed energy resources (DERs) to participate in wholesale markets on a level playing field with large centralized generators, and to compensate resources appropriately when they provide flexibility. As new legislation, we recommend Congress to amend the Public Utility Regulatory Policies Act (PURPA) to create Qualifying Facility (QF) eligibility for storage and determine QF capacity based on net capacity. Under the Biden-Harris administration, FERC should explore market designs for procurement of flexible resources, establish a framework to utilize storage to provide transmission-related services, and reform capacity markets to reduce barriers to market entry for energy storage. More details and other specific recommendations on market design are included in the Appendix, as well as in the DER issue paper.

PROMOTE DOMESTIC ENERGY STORAGE SUPPLY CHAIN AND INNOVATION

The energy storage industry is a fast-growing sector in the U.S. that employs over 70,000 people.[8] Advancements in energy storage technology support power grid decarbonization and electrification of transportation, as well as adjacent industries of robotics and consumer devices. While lithium-ion battery energy storage remains the best substitute for gas peaker plants in the near term[9], additional energy storage technologies are under development to displace combined cycle gas and other fossil-fuel power generation.[10] A combination of demand-pull and supply-push policies can drive the accelerated development and deployment of storage in competition with fossil fuel

[5] Mandel G. Fitzgerald G, Mandel et al., *The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid*, Rocky Mountain Institute (Oct. 2015),.
[6] Sonia Aggarwal et al., *Wholesale Electricity Market Design for Rapid Decarbonization: Vision for the Future*, Energy Innovation (June 2019).
[7] Madison Cordon et al., *Managing the Future of Energy Storage*, Institute for Policy Integrity (Apr. 2018).
[8] Environmental and Energy Study Institute, Fact Sheet - Jobs in Renewable Energy, Energy Efficiency, and Resilience, Environmental and Energy Study Institute, (Jul. 23, 2019).
[9] Paul Denholm et al., *The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States*, National Renewable Energy Laboratory. NREL/TP-6A20-74184 (June 2019).
[10] Energy storage: Tracking the technologies that will transform the power sector, Deloitte Development LLC (2015).

supply while also creating manufacturing, construction and engineering jobs in the U.S. and simultaneously preventing reliance on overseas suppliers for critical infrastructure storage products.

President-elect Biden should support legislation to make standalone energy storage eligible for the clean energy Investment Tax Credit with requirements to ensure net annual greenhouse gas reduction, appropriating $5 billion to the DOE budget to provide grants for domestic battery manufacturing, recycling and other supply chain promotion, and allocating $500 million for grid energy storage technology demonstration projects. Under existing authority of the administration, we recommend the DOE to establish a program to drive soft-cost reductions in energy storage, and to create a Research, Development, and Deployment program to improve processes for battery reuse, recycling, and minerals reclamation ("mining from waste"), and to expand the Energy Storage Grand Challenge[11] with a specific initiative for longer-duration storage technologies. More details on these recommendations and other recommendations are in the Appendix.

PROMOTE EQUITABLE ELECTRIC SYSTEM RESILIENCE

Energy storage is a key reliability tool to support a more dynamic grid and provide resiliency during unexpected grid disturbances, including those driven by wildfires, extreme heat waves, and storms.[12] These kinds of power disturbances can also disproportionately impact disadvantaged and minority communities (see below).[13] To create a more reliable and resilient energy system, there is a continued need for innovation in technology and market design to value storage as a reliability solution.[14] To that end, we recommend Congress to expedite resilience efforts contained in the 2021 National Defense Authorization Act[15] and to reauthorize $5 billion for Energy Efficiency and Conservation Block Grant program[16] while adding resilience as an explicit objective. In addition, we recommend that all government agencies identify federal and

[11] U.S. Department of Energy, Energy Storage Grand Challenge, https://www.energy.gov/energy-storage-grand-challenge/energy-storage-grand-challenge.

[12] Securing the 21st-Century Grid: The Potential Role of Storage in Providing Resilience, Reliability, and Security Services, Electricity Advisory Committee (June 25, 2018).

[13] Sonal Jessel et al., *Energy, Poverty, and Health in Climate Change: A Comprehensive Review of an Emerging Literature*. Front. Public Health (Dec. 12, 2019), https://www.frontiersin.org/articles/10.3389/fpubh.2019.00357/full.

[14] Sky Stanfield & Amanda Vanega, Deploying Distributed Energy Storage: Near-Term Regulatory Considerations to Maximize Benefits, Interstate Renewable Energy Council (Feb. 2015).

[15] National Defense Authorization Act for Fiscal Year 2021, S. 4049, 116th Cong. (2020).

[16] Office of Energy Efficiency & Renewable Energy, About the Energy Efficiency and Conservation Block Grant Program, https://www.energy.gov/eere/wipo/about-energy-efficiency-and-conservation-block-grant-program.

military facilities with the highest resilience needs and deploy onsite storage as part of their emergency response and recovery plan. See the Appendix for more detailed recommendations.

SUPPORT EQUITY AND ENVIRONMENTAL JUSTICE IN STORAGE DEPLOYMENTS

Clean energy solutions such as distributed solar and storage have historically not been widely adopted in low-income communities due to their high capital costs, lack of access to low-cost financing, and split-incentive issues that discourage adoption of such solutions by both renters and landlords. At the same time, disadvantaged communities are disproportionately affected by emissions from fossil fuel based power plants[17] and are threatened by increasingly frequent and disruptive weather events caused by climate change[18]. These frontline communities lack the resources and infrastructure to mitigate risks and recover from these events. See the DER issue paper for additional recommendations. In addition, we recommend Congress to direct $1B of holistic community environmental justice grants to deployment of DERs, especially community-based microgrids, in low-income and environmental justice communities, including tribal, rural, and other disadvantaged communities with disproportionate resilience needs.[19] We also recommend the Dept. of Education to allocate additional funding to the TRIO programs[20], including Upward Bound and Veterans Upward Bound, to provide mentorship and career guidance for clean energy careers.[21] See the Appendix for other relevant recommendations.

How the Recommendation Creates Jobs and Improves the Economy:

The energy storage industry will account for over $1 billion in economic activity in 2020, rising to $6B annually by 2024 under current trends[22], with approximately 77,000 people employed in the energy storage industry as of 2019.[23] A robust U.S. energy storage industry that achieves 35 GW of additional storage by 2025 could result in

[17] P.S. Thind Manider et al., *Fine Particulate Air Pollution from Electricity Generation in the US: Health Impacts by Race, Income, and Geography*, 53 *Environmental Science & Technology* 14010 (2019), https://doi.org/10.1021/acs.est.9b02527.
[18] Rachel Cleetus et al., Surviving and Thriving in the Face of Rising Seas: Building Resilience for Communities on the Front Lines of Climate Change, Union of Concerned Scientists (Nov. 2015).
[19] For more details, specifically on federal funding for climate resiliency projects in frontline communities, *see* CE4B Issue Paper: Reduce energy burden.
[20] Federal TRIO Programs: https://www2.ed.gov/about/offices/list/ope/trio/index.html
[21] For more details, *see* "CE4B Issue Paper: Bringing clean energy jobs to underserved communities".
[22] Press Release, Wood Mackenzie, US energy storage market sees strong first quarter despite coronavirus (June 2, 2020), https://www.woodmac.com/press-releases/us-energy-storage-market-sees-strong-first-quarter-despite-coronavirus/.
[23] *See* Figure 75 in *2020 US Energy & Employment Report*, available at https://www.usenergyjobs.org/.

167,000 domestic jobs associated with energy storage system integration, facilities construction, and operations alone.[24] Significant domestic manufacturing promotion could create additional several tens of thousands of jobs; Tesla's "Giga Nevada" factory alone is expected to reach 10,000 employees at full capacity (based on a public investment of approximately $1 billion in tax incentives), as well as build local tax bases. Furthermore, U.S. firms have the potential to serve the growing international need for grid-scale storage, which has projected potential for $25 billion or more in annual revenue and nearly 20 GW of annual deployments by 2025.[25] Failure to further develop the domestic storage industry cedes key manufacturing and service jobs and expertise to other nations.

How the Recommendation Supports Frontline or other Underserved Communities:

The recommendations herein to promote electric system resilience, particularly the deployment of solar-plus-storage for emergency response and the addition of energy storage to school modernization programs, would greatly benefit communities that are at the highest risk of climate impacts. Directing $1 billion in holistic community environmental justice grants would vastly improve the accessibility of solar-plus-storage systems to disadvantaged communities, and are also in line with the environmental justice priorities reflected throughout the Biden Climate Plan. Our recommendations support this priority by using energy storage to reduce emissions at peaking power plants, focusing career investments through programs like Upward Bound and Veterans Upward Bound[26], and directing grants for the deployment of distributed storage and microgrids in low-income and environmental justice communities.

How the Recommendation Supports Biden's Climate Plan:

Significant investment and deployment of energy storage will be necessary to reach the clean electricity standard proposed in the Biden Climate Plan, which calls for 100% zero-carbon resources by 2035. Energy storage can help reduce grid costs associated with high penetrations of renewables by reducing the need to over-invest in generation and transmission and distribution capacity.[27] Promoting domestic energy storage supply

[24] See Energy Storage Association, 100x30: A Vision for Energy Storage, https://energystorage.org/about-esa/our-plan/35x25-a-vision-for-energy-storage/.
[25] Anissa Dehamna et al., IFC - Energy Storage Market Report, Navigant (Jan. 9, 2016), https://www.esmap.org/sites/default/files/esmap-files/IFC%2BEnergy%2BStorage%2BReport%2B-%2BSummary%2Bof%2BKey%2BFindings.pdf.
[26] Federal TRIO Programs: https://www2.ed.gov/about/offices/list/ope/trio/index.html.
[27] Dharik Mallapragada et al., *Long-run system value of battery energy storage in future grids with increasing wind and solar generation*, 275 Applied Energy (Oct. 2020), https://doi.org/10.1016/j.apenergy.2020.115390

chains and innovation directly support the goal in the Biden Climate Plan to enact a national strategy to develop a low-carbon manufacturing sector in every state that includes ensuring workers have access to new skills. In addition, establishing DOE programs to advance domestic storage manufacturing will also serve to reduce the cost of grid-scale storage as targeted under the Biden Clean Energy Plan's ARPA-C proposal. Recommendations that expand the domestic supply chain and reduce manufacturing costs will help the U.S. export clean technologies, including to the small island states in the Pacific and Caribbean that are demonstrating climate leadership in the face of existential threats to their territorial homelands, as described in the Biden Climate Plan. Energy storage, when paired with solar, has immediate, urgent value for these island states that rely on expensive imported diesel for their power needs, opening them up to vulnerabilities for spills as recently seen in Mauritius.[28]

How the Recommendation Benefits Battleground States:
Several battleground states, such as AZ, NV, CO, TX, FL, and VA, are adding large amounts of renewables to their grid mix; for instance, Texas is expected to see record additions of both solar and wind.[29] Adding an appropriate level of energy storage would help ensure a clean, low-cost and stable electric grid in those areas. The policies listed in this issue paper also encourage a strong domestic storage manufacturing base, which could help bring benefits to the industrial Midwest. As mentioned above, Nevada has emerged as a leader in energy storage manufacturing jobs[30] with the construction of Tesla's Giga Nevada site.

[28] World Bank, Energy storage roadmap for the Maldives (2019) https://acelerex.com/highlights/energy-storage-roadmap-for-the-maldives/.
[29] ERCOT, Resource Adequacy, http://www.ercot.com/gridinfo/resource.
[30] Jason Hidalgo, *Panasonic expanding at Tesla Gigafactory, plans to add 100 workers, exec confirms*, Reno Gazette Journal (Sept. 7, 2020), https://www.rgj.com/story/news/money/business/2020/09/07/panasonic-tesla-gigafactory-expansion-confirmed-ev-battery/5718477002/.

Appendix

ESTABLISH MARKET DESIGNS THAT VALUE AND COMPENSATE FLEXIBILITY

Requires New Legislation

- Amend PURPA to create explicit qualifying facility (QF) eligibility for storage, including hybrid generation-plus-storage facilities that pair storage and renewable and/or traditional generation at a single location. Potential modifications could include exempting hybrid QFs from the "one-mile rule" (which treats all resources within a mile of one another as the same QF), and determining QF capacity based on net capacity, rather than aggregated capacity (i.e. subtracting the storage capacity rating from the generation capacity rating, rather than adding the two together).

Existing Authority

- Federal Energy Regulatory Commission (FERC)
    - Open a docket to explore markets designs for procurement of flexible resources (e.g. imbalance reserves, flexible ramping products) and ensure energy storage and DERs are eligible.
    - Start rulemaking to establish a framework for storage-as-a-transmission-asset (SATA) to establish practices for utilizing storage to provide transmission-related services and receive corresponding compensation.
    - Expedite rulemaking on hybrid resources following the recent technical conference on Docket AD20-9-000[31], with a focus on allowing storage to be added to projects already in wholesale market interconnection queues without triggering material modification.
    - Open a docket to review wholesale distribution access fees and eliminate inappropriate demand charges.
    - Open a docket to review resource adequacy constructs, and to reform capacity markets to reduce barriers to market entry for energy-limited resources such as energy storage, including ensuring storage resources of various durations can all be correctly valued as capacity resources.
- Power Marketing Administrations (PMA) and Tennessee Valley Authority (TVA)
    - Urge the agencies' Board of Directors, who are appointed by the President, to mandate energy storage targets for the agency.

[31] Federal Energy Regulatory Commission, Technical Conference regarding Hybrid Resources (Docket No. AD20-9-000) https://www.ferc.gov/news-events/events/technical-conference-regarding-hybrid-resources-docket-no-ad20-9-000-07232020.

- Use these agencies as a means to test new storage technologies.
- Direct all public utilities to stop building new gas peaker plants, and instead direct the agency to replace all 6.2 GW of its existing gas peakers (which emitted nearly 2.5 million tons CO_2 in 2018) with storage technologies by 2028.

PROMOTE DOMESTIC ENERGY STORAGE SUPPLY CHAIN AND INNOVATION

Requires New Legislation from Congress

- Make energy storage eligible for clean energy Investment Tax Credits (ITC) as a standalone asset (see S. 1142[32] / H.R. 2096[33]) with requirements that ensure net GHG emissions reduction on an annual basis.
- Extend the clean energy ITC and include ITC "adders" for projects meeting specific US manufacturing, living wage, workforce diversity, environmental justice impact, and resilience end-use criteria (see CE4B topic paper: *Technology-Neutral Clean Energy Tax Incentives for Deployment and Innovation*).
- Appropriate $5 billion to DOE's Energy Efficiency and Renewable Energy Office[34] to provide grants for domestic battery manufacturing, recycling, and other supply chain promotion.
- Re-establish refundable tax credits ("Section 48C"[35]) for building new manufacturing facilities or retooling existing facilities for energy storage systems and components.
- Appropriate $500 million for cost-shared grid energy storage technology demonstration projects, emphasizing longer-duration storage (see S. 1602[36] / H.R. 2986[37]).
- Include onsite energy storage as an eligible asset in all federal programs and funds promoting electric vehicle charging infrastructure and transportation electrification.
- Adopt an expanded version of the CLEAN Future Act's[38] Clean Energy Workforce Program, with at least $100 million per year to fund a portion of costs to train

[32] Energy Storage Tax Incentive and Deployment Act of 2019, S.1142, 116th Cong. (2019).
[33] Energy Storage Tax Incentive and Deployment Act of 2019, H.R.2096, 116th Cong. (2019).
[34] Office of energy Efficiency & Renewable Energy, https://www.energy.gov/eere/office-energy-efficiency-renewable-energy.
[35] Qualifying advanced energy project credit, 26 U.S. Code §48C.
[36] Better Energy Storage Technology ("BEST") Act, S.1602, 116th Cong. (2019).
[37] Better Energy Storage Technology Act (BEST") Act, H.R.2986, 116th Cong. (2019).
[38] Committee on Energy & Commerce, Summary of the Climate Leadership and Environmental Action for our Nation's (CLEAN) Future Act (Jan. 2020).

individuals to work in clean energy-related jobs. The program should ensure that energy storage is an eligible job category.

Existing Authority

- DOE: 1) Establish a program to drive soft-cost reductions in energy storage, similar to the SunShot initiative led by the DOE's Office of Energy Efficiency and Renewable Energy (EERE). 2) Establish a Research, Development, and Deployment (RD&D) program to improve processes for battery reuse, recycling, and minerals reclamation ("mining from waste"), including related workforce development. 3) Expand the Energy Storage Grand Challenge[39], establishing a specific initiative for longer-duration storage technologies needed for high-renewables futures, including pilots and grid-connected demonstrations with an emphasis on, and incentives for, resilience in rural and frontline communities.
- Department of State: Require mineral deals between battery component manufacturers and foreign nations be subject to appropriate controls to avoid trade of conflict minerals:
- Department of Interior & Environmental Protection Agency (EPA): Co-develop rules that minimize pollution when mining for resources for battery supply chains.

PROMOTE EQUITABLE ELECTRIC SYSTEM RESILIENCE

Requires New Legislation from Congress

- Direct $2 billion in appropriations to electric sector resilience investments and mandate states to set storage procurement targets.[40] Use CA and NY as a model to include policy that addresses equity, such as specifying a certain percentage of the storage target to directly benefit underserved communities and setting up incentives to offset the additional cost of financing projects in underserved communities .
- Expedite and provide Executive Branch emphasis on resilience efforts contained within the Senate markup of the 2021 National Defense Authorization Act[41].

[39] U.S. Department of Energy, Energy Storage Grand Challenge, https://www.energy.gov/energy-storage-grand-challenge/energy-storage-grand-challenge.
[40] *See* appropriations for Office of Electricity, US Department of Energy, *in* Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021, H.R. 7617, 116th Cong. (2020), https://www.congress.gov/bill/116th-congress/house-bill/7617.
[41] National Defense Authorization Act for Fiscal Year 2021, S.4049, 116th Cong. (2020), https://www.congress.gov/bill/116th-congress/senate-bill/4049?s=1&r=1.

- Reauthorize the Energy Efficiency and Conservation Block Grant program[42] at $5B and add resilience as an explicit objective, with energy storage as an eligible investment.

Existing Authority

- Department of Homeland Security (DHS): Develop a plan for deploying solar-plus-storage DERs as a part of emergency response and recovery, prequalifying a set of vendors.
- Department of Defense: 1) Invoke Defense Production Act Title III[43] to direct at least $1 billion into battery manufacturing promotion as part of the defense-critical industrial base. 2) Identify military installations with highest resilience needs, deploy onsite energy storage for mission assurance and reduce reliance on diesel gensets.
- Department of Education: Include resilience and service as emergency facilities in school renovation and modernization funds, expanding available funds by $1 billion.[44]
- General Services Administration (GSA): Identify federal facilities with the highest resilience needs, deploy onsite storage and reduce reliance on diesel gensets.

SUPPORT EQUITY AND ENVIRONMENTAL JUSTICE IN STORAGE DEPLOYMENTS

- The EPA should expand Best Available Control Technology applicability[45] and eligibility to include hybrid systems featuring energy storage paired with clean energy generation.
- The EPA should also apply stricter emission standards on all power plants, especially low capacity factor peaker plants within 3 miles of disadvantaged populations, and promote peaker plant replacement by energy storage.[46]
- Establish economic development zones around existing fossil-fired power plants to accelerate the transition to clean energy and target storage deployments, with emphasis on providing local economic development, including hiring local

[42]Office of Energy Efficiency & Renewable Energy, About the Energy Efficiency and Conservation Block Grant Program, https://www.energy.gov/eere/wipo/about-energy-efficiency-and-conservation-block-grant-program.
[43]Department of Defense, Industrial Policy, Defense Production Act (DPA) Title III. https://www.businessdefense.gov/Programs/DPA-Title-III/.
[44] Open Back Better Act of 2020, S. 4060, 116th Cong. (2020), https://www.congress.gov/bill/116th-congress/senate-bill/4060.
[45] U.S. Environmental Protection Agency, Best Available Control Technology (BACT) Applicability, https://www.epa.gov/nsr/best-available-control-technology-bact-applicability.
[46] Energy Storage Peaker Plant Replacement Project, PSE Health Energy.

installers, encourage the use of project labor agreements, ensure fair wages and benefits, and support worker training programs.[47]

[47] How to Ensure Energy Storage Policies are Equitable, Union of Concerned Scientists, (Nov. 2019).

Energy Efficiency and Demand Flexibility in the Built Environment

Opportunity/Problem:

Energy efficiency is simultaneously the largest job creator in the clean energy sector and the single most effective solution for climate change, while also delivering enormous benefits in promoting equity, reducing energy costs and improving public health. Achieving these benefits requires substantial investment and carefully crafted policy, particularly as COVID-19 has devastated the sector, with 360,000 jobs lost.

Recommended Action(s):

- Launch new programs using federal investment, incentives and public-private partnerships to spur retrofitting of homes and buildings while creating strong worker training programs focused on underserved communities.
- Ensure new homes and products are as efficient as possible through smart appliance and equipment standards and strengthened building energy codes.
- Enable a smarter grid and demand response implementation through broadband, advanced metering, data access and interoperability.

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

With more than 2 million jobs - nearly 70% in construction and manufacturing - efficiency is the largest and fastest-growing job creator in the clean energy economy.

Econ. Benefits:

Without post-1980 efficiency gains, the U.S. would require 60% more energy, costing businesses and consumers $800 billion. Small businesses are the backbone of efficiency , 80% of the 361,329 U.S. energy efficiency companies have fewer than 20 workers.

Equity Benefits:

Energy efficiency reduces the disproportionate energy cost burden on low-income families while sharply reducing pollutants - including greenhouse gas emissions - that disproportionately impact public health and air quality in low-income neighborhoods.

Climate Plan Tie:

This proposal aligns well with the campaign climate plan for efficiency, with an emphasis on building retrofits, weatherization assistance, efficiency incentives, etc.

Battleground State Benefits:

Energy efficiency is unique in the clean energy sector in that it creates jobs and economic activity in every part of the country. Battleground states are among the largest and fastest-growing states for efficiency jobs.

Energy Efficiency and Demand Flexibility in the Built Environment

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DATE: 9/21/2020

Statement of Issue and Summary of Recommendations:
Energy efficiency is arguably the most important energy resource we have. Widely recognized as the cheapest, fastest, and most effective solution for our energy and environmental challenges, energy efficiency has the power to deliver tremendous economic, social, climate, resiliency and health benefits. Efficiency is by far the largest job creator in the clean energy sector with more than 2 million workers,[48] nearly 70 percent of which are in construction and manufacturing. The International Energy Agency (IEA) reports that building on existing efficiency policies alone could deliver nearly half[49] of the greenhouse gas emissions reductions needed to meet the goals of the Paris climate accord. Efficiency can be a powerful tool for advancing equity and environmental justice by reducing pollution and improving public health,[50] strengthening community resilience,[51] and reducing the energy cost burden, particularly on low-income households who spend an outsized share of income on energy.[52] The devastating impact of the COVID-19 pandemic on the efficiency workforce - nearly 360,000 jobs lost,[53] by far the largest in the energy sector - should make it a high priority for economic recovery efforts.

Traditional energy efficiency is also rapidly evolving with new technology for demand flexibility, significantly expanding its impact by responding to the needs of the grid as a

[48] NASEO & EFI, 2020 U.S. Energy & Employment Report Executive Summary, https://bit.ly/2ZqpagP.
[49] IEA, *Energy efficiency is the cornerstone for building a secure and sustainable energy system* (Oct. 19, 2020).
[50] Juanita Constible, *Energy Efficiency Saves Lives, Avoids Huge Health Costs*, NRDC (Feb. 22, 2018).
[51] Grace Relf, *How energy efficiency can boost resilience*, ACEEE (Apr. 16, 2018).
[52] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, DOE/GO-102018-5122, Low-Income Household Energy Burden Varies Among States - Efficiency Can Help In All (Dec. 2018).
[53] E2, *Clean Energy Unemployment Claims in COVID-19 Aftermath, July 2020*, (Aug. 12, 2020), https://e2.org/reports/clean-jobs-covid-economic-crisis-july-2020/.

resource rather than simply reducing energy use.[54] This is enabling a smarter grid that integrates efficiency, building electrification, energy storage, renewable energy resources, and demand response. Optimizing all of these tools together with new capabilities and strategies is essential to modernizing the grid to enable ambitious levels of clean power, while keeping costs low and ensuring energy equity. This is without question the future of the electric grid. The U.S. has the opportunity now to lead this global transition to affordable, equitable, resilient, and clean energy, while creating the next boom in American innovation and jobs.

Opportunity / Problem Statement: Without the energy efficiency gains made since 1980, the U.S. would need 60 percent more energy,[55] resulting in massive amounts of additional carbon emissions and weighing down American consumers and businesses with nearly $800 billion in added energy costs. Energy efficiency is also a massive job creator and economic development engine that has seen massive losses due to the pandemic. For perspective, the nearly 360,000 job losses in the efficiency sector are nearly twice the size of the entire coal industry workforce,[56] roughly equivalent to the combined wind and solar workforces,[57] and more than three times the number of COVID-related oil and gas industry job losses.[58] Recent analyses[59] of various energy efficiency stimulus investments have found that they would create hundreds of thousands of jobs while sharply reducing greenhouse gas emissions and energy costs.

Proposed Recommendation:

Check Boxes Below	
Both	Is this a new or modification of an existing program?
Yes	Does this roll back a Trump Administration regulation?

[54] *See* CE4B Paper "Unlocking Demand: Valuing DERs and Demand Response to Deploy & Integrate Clean Energy."
[55] ACEE et al., Energy Efficiency Impact Report (2020), https://energyefficiencyimpact.org.
[56] NASEO & EFI, 2020 U.S. Energy & Employment Report Executive Summary, https://bit.ly/2ZqpagP.
[57] *Id.*
[58] Paul Takahashi, *U.S. lost more than 100,000 oil and gas jobs in coronavirus-driven bust*, Houston Chronicle (June 12, 2020).
[59] E2 &E4TheFuture, Build Back Better, Faster: How a federal stimulus focusing on clean energy can create millions of jobs and restart America's economy, https://bit.ly/CleanEnergyStimulus (Last Accessed Oct. 11, 2020); Lowell Unger et al., *Growing a Greener Economy: Job and Climate Impacts from Efficiency Investments*, ACEEE (Sept. 2, 2020).

Modernizing Our Energy System and Grid

The following policy recommendations are near-term solutions that the Biden White House could begin implementing from Day One, while we also urge the campaign to look closely at opportunities to speed the implementation of emerging technologies around demand response:

1) **Demonstrate a national commitment to prioritize energy efficiency:** The Trump Administration has worked to undermine energy efficiency at regulatory,[60] policy,[61] and even cultural levels.[62] The Biden Administration should renew a strong commitment to energy efficiency, reestablishing it as a foundational tool to address the nation's energy priorities and making it a centerpiece of the Administration's energy policy platform. The Administration should ensure the federal government leads by example while directing federal agencies to work with government, industry, and public interest leaders to identify mechanisms to accelerate its deployment. We recommend the following:

    a) Issue an **Executive Order** reestablishing strong requirements for energy intensity reductions across federal agencies, energy optimization goals[63] and annual reporting on reduced energy consumption and resulting net taxpayer savings, while expanding public-private partnerships leveraging private capital.
    b) Launch a national campaign for **modernizing critical public facilities** at the local, state and federal levels to better prepare for future disasters, including through performance contracts that leverage cost savings from energy efficiency to draw private investment. This campaign - modeled on the Open Back Better Act[64] - could leverage $20 billion in public funding to draw $80 billion in private investment for renovations to schools, hospitals, community centers, airports, federal facilities and other buildings to improve safety, efficiency, resilience, and flexibility in responding to disasters and public health crises.
    c) Increase **federal investments in efficiency grants to local communities**, including through programs such as the State Energy

[60] John Schwartz, *Trump Administration Blocks Energy Efficiency Rule for Light Bulbs* NY Times (Dec. 20, 2019).
[61] Dino Grandoni, *Trump wants to make dishwashers great again*, Washington Post (Jan 17, 2020).
[62] Chris Riotta et al., *Trump news - live: President makes bizarre comments about his hair and lightbulbs*, The Independent (July 16, 2020).
[63] Jason Reott, One Year After Executive Order On Efficiency, White House Roadmap Takes Us In Wrong Direction, Alliance to Save Energy (June 18, 2019), https://bit.ly/32dGUhg.
[64] Lisa Blunt Rochester, Press Release, Blunt Rochester, U.S. Senator Tina Smith Introduce Plan to Make Public Facility Infrastructure Better Prepared for Public Health Emergencies (June 24, 2020),https://bit.ly/2Zpa6jn.

Program, the Energy Efficiency and Conservation Block Grant Program[65] and others that help small businesses and disadvantaged communities reduce energy use and utility bills.

d) Increase investment in **research, development and deployment** of efficiency technologies at the Energy Department, national labs, and other agencies, including in demand response, fuel switching, and other emerging fields.

2) **Establish robust workforce training programs.** Energy efficiency in recent years has been among the fastest-growing employment sectors in the energy economy. Nearly 80 percent of energy efficiency companies are small businesses employing fewer than 20 people,[66] and employers consistently cite a lack of trained workers as a primary obstacle to growth. The Administration should develop a nationwide workforce training program modeled after the Blue Collar to Green Collar Jobs Act of 2019 that is dedicated to providing job training and pathways to employment in the clean energy economy for people of color and other underrepresented groups, including:

   a) Providing grants to businesses to pay a living wage as workers train for jobs in energy efficiency, grid modernization and renewable energy sectors.
   b) Provide funding to educational institutions such as community colleges and workforce development organizations to improve hiring opportunities
   c) To bolster access, the administration should create robust online training for residential efficiency workers, such as is proposed in the HOPE for HOMES Act of 2020.

3) **Scale-up retrofits of homes and buildings**. Homes and buildings account for nearly 40 percent of U.S. energy consumption and a similar share of greenhouse gas emissions.[67] Deep retrofits not only create good-paying jobs but also are critical for addressing climate change and reducing energy cost inequities faced by underserved communities. To most effectively expand the scope of retrofits throughout the country, we recommend:

[65] 42 U.S.C. §§ 17151-58
[66] E4The Future: Energy Efficiency Jobs in America: 2.3 Million Americans Work in Energy Efficiency (Sept. 2019).
[67] U.S. Department of Energy, *Increasing Efficiency of Building Systems and Technologies*, Quadrennial Technology Review: An Assessment of Energy Technologies and Research Opportunities (Sept. 2015), https://bit.ly/2RcF5uF.

a) Significantly expand the Weatherization Assistance Program to help low-income households permanently reduce energy bills, gradually phasing in increased funding over four years to ensure effective implementation.
    i) Ensure that those who can least afford high energy bills receive services by expanding flexibility for states to use a larger portion of funding on non-energy-related repairs that often stand in the way of weatherization for the most vulnerable households, while maintaining cost-effective weatherization as the core funding purpose.
    ii) Better coordinate repair and weatherization work between the Office of Housing and Urban Development and the Department of Energy's weatherization office.
b) Launch a national campaign to retrofit 4 million commercial buildings, returning a portion of energy cost savings to state and local governments.
c) Modernize and expand tax incentives and/or rebates for efficiency improvements in homes and buildings, with significantly increased incentive levels to encourage more private investment in appliances, insulation, windows, etc., as suggested in the Home Energy Savings Act or HOPE for HOMES Act of 2020.
d) Create rebates for performance-based home energy efficiency improvements, such as outlined in the HOPE for HOMES Act of 2020.
e) Drive market demand for efficiency by supporting benchmarking and otherwise improving transparency of energy consumption in homes and buildings, including using federal policy to encourage inclusion of expected home energy costs and/or efficiency scores in real estate listings. This could include approaches such as the Sensible Accounting to Value Energy (SAVE) Act.

4) **To ensure that the next generation of homes and buildings are highly efficient:**
    a) Ramp up investments in high-efficiency affordable housing and modernize the building code process to provide more resources and incentives for states to adopt modern codes, while considering efficiency requirements to federal affordable housing funding.
    b) Improve the implementation and adoption of model building energy codes, providing greater transparency and federal support for code development and implementation. DOE and the national labs should support code adoption nationwide by providing "carrots" such as

increased technical assistance and resources for states that choose to adopt model codes.

5) **Strengthen appliance and equipment standards and expand voluntary partnerships.** These unsung programs are among our most effective climate policies, and they also protect consumers from energy-guzzling products that drive up utility bills.To improve on them, DOE and EPA should:

    a) Reverse recent rollbacks, including those governing lightbulbs, showerheads and washers, and get back on track with a regularly updated appliance and equipment standards, prioritizing high-impact products.
    b) xpand voluntary partnerships, such as ENERGY STAR and BETTER BUILDINGS, to encourage efficiency in the market.
        i) Double the budget of ENERGY STAR to allow expansion of its Portfolio Manager building efficiency benchmarking program and the ENERGY STAR Most Efficient program, among other changes.
        ii) ENERGY STAR already saves consumers and businesses more than $35 billion annually and reduces carbon emissions by 330 million metric tons[68] - all with a modest budget of about $40 million.

6) **Deploy Digital Tools That Make Energy Demand More Flexible.** Investing in new energy technologies is a proven economic stimulus solution that can deliver key ancillary benefits for clean energy and climate. Many states took advantage of ARRA funding to invest in Advanced Metering Infrastructure (AMI), and it is starting to pay dividends - even if utilities are just now cracking key use cases.[69] AMI allows energy to be quantified and priced based on time of use and location of delivery, making it key to unlocking the flexibility benefits of using energy efficiency and other demand-side resources to modify energy usage in response to grid needs. When unlocked, AMI data infrastructure will allow private market actors to match customer needs with grid value.[70] [71] Development of these technologies should include:

[68] U.S. Environmental Protection Agency, *Energy Star: By the Numbers 2019* (Apr. 2020), https://bit.ly/33dpZe8.
[69] Jeff St. John, Why Most US Utilities Are Failing to Make the Most of Their Smart Meters, Greentech Media (Jan. 10, 2020), https://bit.ly/33eWvfU.
[70] Kara Saul Rinaldi et al., Residential Grid-Interactive Efficient Building Technology and POlicy: Harnessing the Power of Homes for a Clean, Affordable, Resilient Grid of the Future, NASEO (Oct. 2019), https://bit.ly/2FpmtEW.
[71] Matt Golden et al., Decarbonization of Electricity Requires Procurable Market-based Demand Flexibility, 32 The Electricity Journal (Aug. 2019).

a) **Establish a new GEB Block Grant Program:** Grid-interactive efficient buildings (GEBs) use smart technologies and on-site distributed energy resources to provide demand flexibility while co-optimizing for energy cost, grid services, and occupant needs in a continuous and integrated way.[72] GEBs improve upon the benefits of energy efficiency and demand response by enabling demand management strategies such as load shedding, load shifting, modulation and generation.[73] These strategies deployed at scale can help grids recover from emergencies and help reliably integrate more renewable energy onto the grid.
b) **Establish Presidential Award for GEBs:** Competition spurs innovation. Recognizing outstanding advancements in demand flexibility will encourage large electricity consumers to invest in grid services. A presidential award would complement the campaign's Zero Net Energy commitment, as well as existing competitions such as GSA's Proving Ground Program and DOE's L Prize.
c) **Carbon Accounting Hub:** The Federal Energy Regulatory Commission, the Department of Energy, system operators and state utility commissioners should explore a carbon accounting hub, which would increase transparency in monitoring the carbon intensity of grids nationwide and enable grid-interactive efficient buildings to be more responsive to grid conditions.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: The energy efficiency sector is by far the largest employer in the clean energy sector and among the largest in the entire energy economy.[74] As new technologies expand opportunities for growth, there is enormous potential for good-paying jobs in construction, engineering, IT, software, manufacturing and other fields. A recent analysis by ACEEE[75] found that a stimulus package similar to - but more limited than - the proposals recommended in this paper would create 1.3 million jobs, generate $120 billion in energy cost savings for consumers and businesses, and drive more than 900 million tons of carbon emission reductions.

[72] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Grid-Interactive Efficient Buildings (Last accessed Oct. 11, 2020).
[73] Grid-interactive Efficient Buildings Technical Report Series: Overview of Research Challenges and Gaps (Dec. 2019), https://www1.eere.energy.gov/buildings/pdfs/75470.pdf.
[74] NASEO & EFI, 2020 U.S. Energy & Employment Report Executive Summary, https://bit.ly/2ZqpagP
[75] Lowell Unger, *Create jobs and protect the climate? Analysis shows these investments would deliver*, ACEEE (Sept. 2, 2020).

How the Recommendation Supports Frontline or other Underserved Communities: Energy efficiency is the most cost-effective solution for addressing climate change, which we know poses a disproportionate threat to underserved communities[76]. The recommendations in this paper would not only put us on a path to meeting the goals of the Paris accord but also directly help underserved communities in the following ways:

- **Reducing energy bills:** Low-income households, both rural and urban, spend three times more of their income on energy - often 10% to 15% of their income - despite using far less than many wealthier households.[77] Initiatives such as appliance standards, weatherization assistance and improved housing codes would significantly reduce that burden.
- **Creating economic opportunity:** This paper calls for bold investments that will create hundreds of thousands of local jobs, complemented by strong workforce training programs aimed directly at helping underserved communities and people of color fill those jobs.
- **Improving public health:** The reduction in energy consumption delivered by these proposals would substantially improve public health and reduce environmental hazards faced most acutely by low-income and minority populations. In 2017 alone, reduced air pollution from efficiency gains yielded $540 million in public health benefits, including avoided heart attacks and asthma exacerbations.[78]

How the Recommendation Supports Biden's Climate Plan:
These recommendations were designed to align with and build on the Biden clean energy proposals for reducing carbon emissions, which prominently feature energy efficiency, including a strong focus on building retrofits, weatherization assistance and high-efficiency affordable housing, incentives for home efficiency improvements and modernized building energy codes[79].

Key Battleground State Activity: According to jobs analysis by E4TheFuture, the top 10 states for energy efficiency jobs include Texas, Florida, North Carolina, Michigan,

[76] U.S. Global Change Research Program, Fourth National Climate Assessment Volume II: Impacts, Risks, and Adaptation in the United States, National Climate Assessment (2018).
[77] Marilyn A. Broan et al., Low-Income Energy Affordability: Conclusions from a Literature Review, Oak Ridge National Laboratory ORNL/TM-2019/1150 (Mar. 2020).

[78] ACEE et al., Energy Efficiency Impact Report:Co-Benefits with Energy Savings (2020).
[79] Biden Plan to Build a Modern, Sustainable Infrastructure (2020), https://joebiden.com/clean-energy/#.

Ohio and Virginia - all with at least 75,000 jobs.[80] Additionally, the four states with the fastest energy efficiency employment growth were New Mexico, Arizona, Oklahoma and Colorado, respectively.

[80] E4The Future: Energy Efficiency Jobs in America: 2.3 Million Americans Work in Energy Efficiency (Sept. 2019).

Policies to Support Cities' Climate Goals

Opportunity/Problem:

For years, cities have been leading ambitious carbon policy agendas and bringing environmental justice issues to the forefront. Now facing crushing public health and economic impacts, cities are ripe for investment in efficient, electric buildings and transportation powered by clean energy, creating jobs and climate resilience.

Recommended Action(s):

- Power buildings with clean energy and make them more efficient.
- Modernize our transportation sector through electrification.
- Create cleantech innovation hubs in underserved communities.
- Help at-risk areas and communities adapt to changing realities.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Jobs created with building retrofit programs are by nature local and cannot be outsourced. Industrial communities can be revitalized by putting people back to work building the clean energy economy, retraining construction professionals in green building techniques and retrofit strategies and transitioning to the manufacture of electrified transportation fleets.

Econ. Benefits:

Energy-efficient, all-electric buildings save money, reduce environmental impact, and facilitate the transition to renewable energy. Electrified transportation reduces air pollution and improves public health. Innovation hubs can counter underinvestment in communities with high unemployment rates and environmental hazards from manufacturing processes.[81] A standardized resilience index can provide substantial financial payback by facilitating private insurance for climate risks.[82]

Equity Benefits:

Building retrofit programs are job and opportunity creators, particularly when focused on underserved communities. All-electric buildings improve indoor air quality, directly benefiting frontline communities.

Climate Plan Tie:

Targeting retrofit and efficiency dollars to cities aligns with Biden's building efficiency standards and reduction of US building stock carbon footprint 50% by 2035. Climate disclosure from the real estate and insurance industries supports the Plan's goal of requiring public companies to disclose climate risk.

Battleground State Benefits:

Many industrial and post-industrial cities in swing states have suffered from disinvestment and the impacts of globalization. Innovation hubs and workforce training programs promote industrial renewal and will create jobs in these swing states. Residential retrofits lower energy costs, putting money back in the pockets of lower and middle income families.

[81]Tord Kjellstrom et al., Urban Environmental Health Hazards and Health Equity, 84 J. Urban Health 86 (Apr. 21, 2007),https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1891648/.
[82]Matthew E. Kahn, How the Insurance Industry Can Push Us to Prepare for Climate Change, Harvard Business Review (Aug. 28, 2017), https://hbr.org/2017/08/how-the-insurance-industry-can-push-us-to-prepare-for-climate-change.

Policies To Support Cities' Climate Goals

AUTHORS: Véronique Bugnion, Nicole Pavia, Michelle Malanca Frey, Brianne Eby

DATE: August 15, 2020

Statement of Issue and Summary of Recommendations:
As the federal government abdicated its climate and clean energy leadership role over the last four years, cities took up the mantle by pushing ambitious policy agendas, forming domestic and international coalitions, and bringing environmental justice issues to the forefront. Cities and underserved neighborhoods have been particularly affected by the COVID pandemic: commercial buildings are quasi-empty, cycling has boomed and crowded public transport needs to be re-evaluated.

The Biden Administration can create a policy environment that rebuilds relationships,[83] supports and expands best practices and holds cities accountable to the administration's goal of cutting the carbon footprint of our national building stock in half by 2035. These policies should promote innovation and workforce development within cities, and share locally-developed building, transport, resilience and disaster management, and land-use best practices, such as the proposals suggested below:

- Undertake a comprehensive program to decarbonize the buildings sector by supporting and expanding city and state building performance standard initiatives, retrofit programs, and all-electric buildings policies. Lead with a building performance standard for federal buildings.
- Pilot energy-efficient retrofits in frontline and underserved communities while shielding tenants from retrofit costs.
- Expand clean, shared transportation options through safe infrastructure for active and micromobility options, dedicated rights of way for public transportation, and investments in vehicle electrification.
- Support industrial communities and workers by promoting cleantech hubs and decarbonizing industrial processes.

[83] National League of Cities, Rebuild With Us: Guiding Principles & Asks to Congress (Feb. 2, 2019), https://www.nlc.org/resource/rebuild-with-us-guiding-principles-asks-to-congress.

- Develop and mandate resilience assessments for building acquisitions in areas with natural hazard risks.
- Invite cities to join expert panels advising the Biden administration and facilitate knowledge sharing on all topics with city and local leaders.[84]

Opportunity / Problem Statement:
Cities have taken a creative leadership role in forging new decarbonization policies and bringing environmental justice to the forefront. Recent COVID related challenges in urban centers also offer opportunities for innovation in transportation policies. This paper emphasizes how existing federal programs can grow to support these municipal efforts, as well as identifying where new policies are needed to reduce emissions and increase resilience in infrastructure and innovation policies.

Proposed Recommendation:

Check Boxes Below	
Existing	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

Recommendation #1: Make Buildings Cleaner & More Efficient

Reducing the carbon footprint of the 5.6 million commercial buildings and 138 million housing units in the United States requires:

- an economy-wide shift away from fossil fuels towards increasingly clean electricity and
- tamping down the amount of energy used in buildings by improving their efficiency.

Retrofit programs, which target building insulation, leaky ducts, old energy systems, and appliances, can be tremendous job creators, particularly in urban areas.[85]

Benchmarking and Building Performance Standards for Existing Commercial Buildings: Thirty-five cities require commercial buildings to report

[84] Climate Mayors and C40 Cities can be leveraged. Champions of Change for Climate Equity can be reinstated.
[85] Heidi Garrett-Peltier, Employment Estimates for Energy Efficiency Retrofits of Commercial Buildings, Political Economy Research Institute (June 2011), https://www.peri.umass.edu/fileadmin/pdf/research_brief/PERI_USGBC_Research_Brief.pdf.

their building energy consumption. This *benchmarking* effort is the starting point for setting targets on building emissions and should be supported and encouraged by the Department of Energy's Better Buildings Program. A half-dozen municipalities including DC, New York, Reno, as well as Washington State, are going further by setting limits on building energy consumption or emissions. These limits become more stringent over time and form a city's *building performance standards*.[86]
A voluntary federal building performance standard for adoption by state and local authorities would provide a much-needed framework to promote minimum building efficiency. Such a standard can start by leveraging and strengthening the Fossil Fuel-Generated Energy Consumption Reduction rule,[87] which aims to eliminate fossil-fuel use in all new and renovated federal buildings by 2030. In leading by doing, the federal government can then use legislative means to set minimum efficiency standards for commercial buildings across the country.

Residential Homes: By mandating energy cost disclosure at the time of listing or sale of a home, as is the case in Portland, Montpelier, Austin or Minneapolis, the energy features of the home become part of a buyer's decision matrix, creating significant incentives for efficiency improvements.[88] The DOE's Building Technologies Office can support R&D into innovative building energy efficiency solutions and facilitate access to home retrofit solutions.

New Buildings: The Biden administration should adopt the Zero-Carbon Building Standard proposed by Gov. Inslee[89] to mandate that all new construction be net-zero emissions by 2023. This plan can only be implemented in partnership with local governments. The government should provide incentives for cities and states to strengthen local building codes, support the move to all-electric buildings, starting with new construction, and assist in the development of stretch codes to reflect ambitious building standards.

[86] Steven Nadel & Adam Hinge, Mandatory Building Performance Standards: A Key Policy for Achieving Climate Goals, ACEEE (June 22, 2020), https://www.aceee.org/white-paper/2020/06/mandatory-building-performance-standards-key-policy-achieving-climate-goals.
[87] 42 U.S.C. §6834.
[88] Reuven Sussman, Valuing Efficiency by Clicking on Energy Efficient Real Estate Listings: A Controlled Experiment, ACEEE (Aug. 6, 2020), https://www.aceee.org/research-report/b2002.
[89] Jay Inslee's 100% Clean Energy for America Plan (Last Accessed Oct. 11, 2020), https://www.jayinslee.com/issues/100clean/text/Inslee_100CleanPlan_2.pdf.

Financial Programs to Support Building Retrofits: To leverage financial mechanisms that facilitate building energy improvements, the federal government should:

- Facilitate C-PACE (Commercial Property Assessed Clean Energy) across all states.[90]
- Support state Green Infrastructure Banks. If needed, create a federal Green Bank to fund and support building and infrastructure projects, green building retrofits and new net-zero energy construction with priority given to affordable housing.
- Increase funding to the Energy Savings Performance Contract (ESPC) program and expand the program to include private buildings. Prioritize access to ESPC federal funds for frontline communities.
- Scale up access to the green mortgage products offered by Fannie Mae[91] and Freddie Mac which permit additional borrowing to improve a home's energy features by facilitating lending terms and offering financial incentives. These programs will lower borrowers' default risk once they are no longer saddled with high home operating costs.

Recommendation #2: Modernize our Transportation Sector

The coronavirus has pushed many individuals to look at bicycles and e-bikes as safer and healthier alternatives to public transportation. European cities, such as those in Denmark[92] and the Netherlands,[93] have shown that bike commuting rates upwards of 50% are viable. The Biden administration should expand federal programs, such as the Clean Cities Coalition Network[94] and the Energy Efficiency and Conservation Block Grant program, to fund bike lane and bike parking initiatives. These programs should

[90] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Commercial PACE Working Group (Last Accessed Oct. 11, 2020), https://www.energy.gov/eere/slsc/commercial-pace-working-group.
[91] Fannie Mae, HomeStyle Energy Mortgage: Help borrowers get a comfortable, efficient and resilient home (Last Accessed Oct. 11, 2020), https://singlefamily.fanniemae.com/originating-underwriting/mortgage-products/homestyle-energy-mortgage; Freddie Mac, GreenCHOICE Mortgages (Last Accessed Oct. 11, 2020), https://sf.freddiemac.com/working-with-us/origination-underwriting/mortgage-products/greenchoice-mortgages.
[92] Cycling Embassy of Denmark, Facts About Cycling in Denmark (Last Accessed Oct. 11, 2020), http://www.cycling-embassy.dk/facts-about-cycling-in-denmark/statistics/
[93] Lucas Harms & Maarten Kansen, Cycling Facts: Netherlands Institute for Transport Policy Analysis, Ministry of Infrastructure and Water Management (Apr. 2018), https://www.government.nl/binaries/government/documents/reports/2018/04/01/cycling-facts-2018/Cycling+facts+2018.pdf.
[94] U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy,Clean Cities Coalition Network: Partnerships and Projects (Last Accessed Oct. 11, 2020), https://cleancities.energy.gov/partnerships/.

provide research support and facilitate no-emissions commutes from underserved communities, whether by rail, electric bus, or bicycle.

Fleet conversion to electric transport must accelerate, with priority funding for school buses, higher education transport, elder and hospital transport, and public transport buses. This transformation must be paired with the planning and rollout of electric charging centers, particularly where private, permanent parking is not available. The DOT's Better Utilizing Investments to Leverage Development (BUILD) grants can grow to support these efforts. State building codes need to support electric vehicle charging in buildings.

Recommendation #3: Create Innovation Hubs

American cities have rich histories of innovation and industry. However, underinvestment in many industrial and post-industrial communities has contributed to high unemployment rates and environmental hazards from manufacturing processes. The Biden administration should direct the DOE's Advanced Manufacturing Office to partner with cities to create innovation hubs[95] and provide resources for workforce training in industrial centers undergoing revitalization.[96] Increasing investment in industrial process decarbonization, part of the wider climate plan, would also improve environmental conditions near factories and plants. HUD can facilitate these efforts by helping design and finance the cities of the future.

Recommendation #4: Help At-Risk Areas and Communities Adapt

Many urban areas face acute exposure to climate risks such as sea-level rise and increased risk of floods to worsening storms. Leveraging infrastructure spending to increase resilience in cities is both a necessary and fruitful investment:[97] every $1 spent on resilience efforts yields $4 in economic benefits, not including lives saved and livelihoods protected.[98]

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[95] EIT Climate - KIC, EIT Climate-KIC announces partnership with Silicon Valley innovation hub (Mar. 19, 2019), https://www.climate-kic.org/news/partnership-with-prospectsv/.

[96] Robert D. Atkinson et al., The Case for Growth Centers: How to Spread Tech Innovation Across America, Brookings (Dec. 2019), https://www.brookings.edu/wp-content/uploads/2019/12/Full-Report-Growth-Centers_PDF_BrookingsMetro-BassCenter-ITIF.pdf.

[97] C40 Cities, Climate Action Planning Framework (Last Accessed Oct. 11, 2020), https://resourcecentre.c40.org/climate-action-planning-framework-home.

[98] Danielle Baussan & Cathleen Kelly, 3 Strategies for Building Equitable and Resilient Communities, Center for American Progress (Oct. 17, 2016), https://www.americanprogress.org/issues/green/reports/2016/10/17/146243/3-strategies-for-building-equitable-and-resilient-communities/.

To best inform property buyers, provision of federal resources such as FEMA and the National Flood Insurance Program can be made contingent on adequate risk disclosure at time of building sale. Current state-level flood and natural hazard disclosure requirements are piecemeal and insufficient. Disclosure requirements of both climate risk and risk mitigation activities taken by home and business owners, municipalities, states, and federal agencies must be standardized with the help of federal guidelines. This effort requires updating FEMA's flood maps and developing a multi-hazard resilience disclosure index, leveraging work by the Rockefeller Foundation,[99] the U.S.A.C.E, the IFC[100] and HUD under the Obama administration. A standardized resilience index can provide substantial financial payback by facilitating private insurance for these risks.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Upgrade and retrofit programs create local jobs that cannot be outsourced. Industrial communities can be revitalized by putting people to work building the clean energy economy: retraining construction professionals in green building techniques and retrofit strategies.[101]

How the Recommendation Supports Frontline or other Underserved Communities:

Building retrofit programs are job and opportunity creators. They can be designed to promote environmental justice by focusing on underserved areas while providing tremendous co-benefits. By scaling the HUD ESPC programs[102] to fund retrofits targeted at public housing, schools, community centers, and hospital buildings, the energy costs in these buildings could go down by as much as 70%. A successful implementation of retrofit programs in low-income communities requires a mechanism to shield tenants from increases in rents: HUD backed ESPC contracts should have requirements that tenants not suffer disproportionately. An estimated 200,000 homes on tribal land are in need of deep retrofits; the Indian Housing Block Grant and the native Hawaiian Housing Block Grant can achieve equity and energy goals. People living in homes with

[99] Rockefeller Foundation, City Resilience INdex (Dec. 2015), https://www.rockefellerfoundation.org/report/city-resilience-index/.
[100] Building Resilience Index (Last Accessed Oct. 11, 2020), https://www.resilienceindex.org/.
[101] Heidi Garrett-Peltier, Employment Estimates for Energy Efficiency Retrofits of Commercial Buildings, Political Economy Research Institute (June 2011), https://www.peri.umass.edu/fileadmin/pdf/research_brief/PERI_USGBC_Research_Brief.pdf.
[102] U. S. Department of Housing and Urban Development, Office of Public and Indian Housing, NOTICE: PIH-2011-36 (HA) (July 8, 2011), https://www.hud.gov/sites/documents/11-36pihn.doc

gas stoves have a significantly increased risk of developing asthma, wheezing, and other lung illnesses,[103] making the switch to all-electric homes improves indoor air quality. This transition is critically important in underserved communities, which are also more likely to be impacted by poor outdoor air quality.[104] Eliminating gas-fired plants contributes to improved outdoor air in frontline communities where a many gas-fired plants are located.[105]

How the Recommendation Supports Biden's Climate Plan:
Supporting city initiatives directly promotes the goals of VP Biden's Climate Plan. Targeting retrofit and efficiency dollars to areas where building density is highest and building energy use is most intense aligns with the effort to reduce the carbon footprint of the US building stock 50% by 2035.[106] Expanding electric vehicle adoption should be a process inclusive of low-income, urban communities. Cities, whether currently reliant on or lacking in public transportation, should be empowered to fund transportation options that are most efficient for them. Encouraging climate disclosure from the real estate and insurance industries meets the Plan's goal of requiring public companies to disclose climate risk. Finally, as cities have been leading the way over the past four years, city leaders should join the Biden Administration's expert panels to share best practices.

Key Battleground State Activity:
Many industrial and post-industrial cities across the Midwest, such as Flint, Michigan, Youngstown, Ohio and Pittsburgh, Pennsylvania, have suffered from disinvestment and the impacts of globalization. Directing the DOE's Advanced Manufacturing Office to support development of innovation hubs and workforce training programs in these states promotes industrial renewal and will get people back to work in these swing states. Residential retrofits lower energy costs, putting money back in the pockets of lower and middle income families.

[103] Rachel Golden, Pollution from Gas Appliances Endangers Our Health. Going Electric Can Help, Sierra Club (Apr. 27, 2020), https://www.sierraclub.org/articles/2020/04/pollution-gas-appliances-endangers-our-health-going-electric-can-help.
[104] Anjum Hajat et al., Socioeconomic Disparities and Air Pollution Exposure: A Global Review, 2 Current Environmental Health Reports 440 (dec. 2015), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4626327/
[105] Mark Specht, No, Natural Gas Power Plants Are Not Clean, Union of Concerned Scientists (Nov. 9, 2018), https://blog.ucsusa.org/mark-specht/natural-gas-power-plants-are-not-clean.
[106] The Biden Plan for a Clean Energy Revolution and Environmental Justice (2020), https://joebiden.com/climate-plan/#.

Key Links to Clean Power: An American Supergrid

Opportunity/Problem:

An American Supergrid would tie the nation's complementary renewable resource areas together, while Super Distribution Systems would unleash the full capabilities of distributed energy resources. It would also service the energy demand created by the Internet of Things while forming a "Grid of Things" that shares power and reliability from homes and businesses with the community and entire grid.

Recommended Action(s):

- Form a Supergrid Power Marketing Administration and Build Initial Links by 2025
- Connect Renewable Energy Zones to Major Population Centers Using EPAct 2005 Section 368 Energy Right-of-Way Authority & Section 1221 National Interest Electric Transmission Corridors (NIETCs) and Backstop Siting Authority
- Support State & Regional Transmission & Super Distribution System Planning
- Establish a Refundable and Transferable Electric Transmission & Distribution Investment Tax Credit (ET&D-ITC)
- Establish a Research, Development and Rapid Deployment Grant Program for Advanced Grid & Distribution System Technologies, and a Loan Program for Transmission & Distribution Along Highways and Rails
- Direct FERC to Revise Transmission Planning and Cost Allocation to Support Interregional Transmission
- Build Super Distribution Systems by Developing Retail and Wholesale Markets for DER Aggregations

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Requires New Legislation

Job Benefits:

The Super Distribution Grid could create hundreds of thousands of solar and battery installation jobs, building on over 90,000 existing jobs in solar alone.

Econ. Benefits:

Employment gains, mitigated impacts of fossil generation, and avoided energy costs for families.

Equity Benefits:

- Supports frontline and other underserved communities by enabling job creation in rural and hard-to-reach communities.
- Lower income families are disproportionately impacted by energy bills.
- Provides greater control over energy costs, resiliency during blackouts, and empowers communities with local resources that can replace polluting fossil peaker plants near urban areas.

Key Links to Clean Power: An American Supergrid

Climate Plan Tie:

Directly supports the Biden Climate plan which calls for "Leveraging existing infrastructure and assets" by "building the next generation of electric grid transmission and distribution, and prioritizing re-powering of lines that already exist with new technology."

Battleground State Benefits:

These recommendations can be a comprehensive grid strategy that benefits rural, urban and suburban alike, and every state would be a participant. Urban and suburban areas would especially benefit from the distributed energy recommendations, and hard-to-access renewables in Texas, Arizona, Nevada and other locations would benefit from the supergrid.

Key Links to Clean Power: an American Supergrid and Super Distribution Systems

AUTHORS: Rob Gramlich, Arthur Haubenstock, Alex McDonough

DATE: 8/15/2020

Statement of Issue and Summary of Recommendations: The United States has exceptional clean energy potential distributed regions across the nation. While China, Europe and other areas have invested billions in advanced transmission to tap into their own renewable and clean energy resource potential, our nation's infrastructure has been aging, sparking dangerous and damaging wildfires and costing billions in economic disruption from power outages. At the same time, climate change and electrification of the transportation, building and other economic sectors are increasing electric demand, and increasing pressure on our already-strained transmission and distribution systems, and deterring deployment of electric vehicle chargers, distributed storage, and other distributed energy resources (DERs). An American Supergrid[107] would tie the nation's complementary renewable resource areas together, while Super Distribution Systems would unleash the full capabilities of DERs -- including energy demand connected through the Internet of Things to form a "Grid of Things" -- to deliver power and reliability from homes and businesses to the community and entire grid. Together, the Supergrid and Super Distribution Systems would create a robust delivery system for the reliable, cost-effective energy we need to power our economy for decades to come -- while making great strides towards climate protection. Building out the Supergrid, and in doing so opening renewable resource areas for development, would create tens of thousands of construction jobs -- many of them in rural, frontline and vulnerable areas that have borne some of the heaviest burdens of the economic crisis. Similarly, building out Super Distribution Systems would provide local jobs in every community across the nation.

[107] *See* Move Towards a National Supergrid, in Solving the Climate Crisis, Majority Staff Report, House Select Committee on the Climate Crisis, p. 51 (June 2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf*; see also* Discussion Draft, Climate Leadership and Environmental Action for our Nation's Future Act' (the "CLEAN Future Act"), sec. 211, National Policy on Transmission, 116th Cong. (2020), https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/0128%20CLEAN%20Future%20Discussion%20Draft.pdf.

We recommend the following actions:

1. Form a Supergrid Power Marketing Administration and Build Initial Links by 2025
2. Connect Renewable Energy Zones to Major Population Centers Using EPAct 2005 Section 368 Energy Right-of-Way Authority & Section 1221 National Interest Electric Transmission Corridors (NIETCs) and Backstop Siting Authority
3. Support State & Regional Transmission & Super Distribution System Planning
4. Establish a Refundable and Transferable Electric Transmission & Distribution Investment Tax Credit (ET&D-ITC)
5. Establish a Research, Development and Rapid Deployment Grant Program for Advanced Grid & Distribution System Technologies, and a Loan Program for Transmission & Distribution Along Highways and Rails
6. Direct FERC to Revise Transmission Planning and Cost Allocation to Support Interregional Transmission
7. Build Super Distribution Systems by Developing Retail and Wholesale Markets for DER Aggregations, and directly invest in DER access in disadvantaged communities

Opportunity / Problem Statement:

America's transmission and distribution systems are antiquated, have not been well maintained, and were never designed for the throughput or reach required to tap into the nation's best clean energy resources nor for two-way flows of energy to and from energy consumers. Put simply, our existing systems simply aren't ready to meet today's challenges, let alone those to come, and are not capable of taking advantage of advanced network or distributed energy supply capabilities. Symptoms of this problem include Western wildfires; the 2020 brownouts and blackouts; and unnecessarily high energy costs while world-class renewable resources and innovative DERs go undeveloped for lack of markets and utilities that facilitate participation of DER aggregations on their system. Balkanized transmission and distribution system planning and approval processes, and well-intentioned but short-sighted cost allocation mechanisms, have defeated previous attempts[108] to enable the nation's energy delivery system to repeat the success of the national highway system, which is largely credited with ushering in the extraordinary prosperity of the 50s and 60s. In the meantime, competitor nations are doubling down on their energy delivery infrastructure, creating a platform to power

[108] *See, e.g.*, Energy Policy Act of 2005, sec. 1221, Pub. Law 109-58 (Aug. 8, 2005), https://www.govinfo.gov/content/pkg/PLAW-109publ58/pdf/PLAW-109publ58.pdf.

their economies with great reliability and at low cost.[109] While the need grows, U.S. investment in energy delivery systems has instead been falling.[110]

An American Supergrid could allow Southwestern solar, Midwestern land-based wind, New England and Western off-shore wind and other regional clean energy sources to offer least-cost power across the nation. Similarly, Super Distribution Systems that have a framework to value and easily allow participation of aggregated distributed energy resources to meet local and network needs would avoid costly and highly emitting peaker plants and deliver low cost reliability solutions that mitigate and even avoid blackouts and brownouts. A national, coordinated system would enable disparate resources across a wide geography to balance each other through local and regional variations in generation and demand patterns, further reducing unnecessary costs for high reserve margins. In short, the combination of an American Supergrid and Super Distribution Systems would enable a cleaner, more reliable energy future for decades to come, creating jobs and stimulating investment in transmission and generation resources now, powering a thriving, competitive economy that will create far more jobs into the future, and allowing all Americans to meaningfully contribute to a brighter energy future and the fight against climate change.

Check Boxes Below	
Yes	Is this a new program?
Yes	Is this a modification of an existing program?
Yes	Does this roll back a Trump Administration regulation?

Proposed Recommendations:

1. Form a Supergrid Power Marketing Administration and Build Initial Links by 2025

[109] *See, e.g.*, *China's Embrace of a New Electricity-Transmission Technology Holds Lessons for Others*, The Economist (Jan. 14, 2017), https://www.economist.com/leaders/2017/01/14/chinas-embrace-of-a-new-electricity-transmission-technology-holds-lessons-for-others.
[110] Jason Lehman, *Energy: Electric Transmission And Distribution Capital Expenditure Outlook*, S&P Global Market Intelligence (May 30, 2019), https://www.spglobal.com/marketintelligence/en/news-insights/research/electric-transmission-and-distribution-capital-expenditure-outlook.

An "American Supergrid," i.e. a nation-wide HVDC network, would provide resilience against severe weather, enable access to least cost solar, wind and other clean resources, enhance reliability by allowing resources to balance each other, and reduce reserve margin and reliability costs. Initial links could be built by 2025; many links are far along and could be completed by then, but have been stalled by the failure to monetize long term public benefits. Existing Power Marketing Administrations (PMAs) offer permitting authority beyond that available to private developers (either currently, or likely to be authorized). A new national PMA solely focused on the American Supergrid could successfully build the links most challenging for private developers and utilities, partnering with them where possible, and allowing developers and utilities to focus on building links within existing rights-of-way and increasing the efficiency of the existing network with advanced transmission operations technologies (see recommendations below on the grant program).

2. Connect Renewable Energy Zones to Major Population Centers Using EPAct 2005 Section 368 Energy Right-of-Way Authority & Section 1221 National Interest Electric Transmission Corridors (NIETCs) and Backstop Siting Authority

The issues with siting and permitting transmission serving national policy and economic needs has long been a concern. Authorities adopted in the 2005 Energy Policy Act (EPAct) showed promise, but were ultimately not well utilized. The Administration should create Task Forces, made up of state authorities and stakeholders, including frontline community organizers. Their goal would be to build on lessons learned from prior collaborative energy planning processes and establish the transmission lines needed for our future system. The Task Forces would be charged with identifying solutions to mitigate community impacts, such as relocation incentives, increased school funding, local hiring requirements, etc. DOE should link its authority to designate of rights-of-way on federal lands under EPAct Section 368[111] to solar and wind resource planning, including identification of renewable resource zones and priority corridors on federal lands. It should update and publish its West Wide Corridors study, and begin a new study for zones in other regions. DOE should also delegate its National Interest Electric Transmission Corridor (NIETC) backstop siting and eminent domain authority under EPAct Section 1221[112] to FERC, which should focus on narrow linear designations informed by project-specific applications and the Interconnection Seam Study, rather than pre-designating broad geographic areas. New legislation should add access to clean energy and renewable resource areas to the list of NIETC triggering criteria; require states to consider regional benefits in considering permitting for

[111] 42 U.S.C. § 15926.
[112] 16 U.S.C. § 824p(a)(2).

interstate transmission lines; expressly provide that failure by states to act within a reasonable time is sufficient to trigger backstop authority;[113] and amend Section 41 of the Fixing America's Surface Transportation Act (FAST) Act to provide greater accountability and clear, transparent timelines with respect to interstate transmission.[114]

3. Support State & Regional Transmission and Distribution System Planning

DOE should increase its technical and funding support for state and regional transmission planning, review and approval. Transmission and distribution system planning and permitting is complex in engineering, politics and diplomacy. DOE support can help ensure sound and successful processes, including engagement of state and local authorities and key stakeholders. Funding state involvement can bring them into the process constructively and cooperatively. DOE should also restart and release the NREL Seam Study, available at https://cleanenergygrid.org/interconnections-seam-study/, which has been blocked by the Trump administration.

4. Establish a Refundable and Transferable Electric Transmission & Distribution System Investment Tax Credit (ET&D-ITC).

An Investment Tax Credit (ITC) can help transmission in the same way that tax credits have helped establish wind and solar energy as significant elements of our energy system, and enabled them to sharply reduce their cost. Similar to Senator Heinrich's ITC bill, S.3107, an Electric Transmission and Distribution System ITC (ET&D-ITC) would make the up-front investments for transmission and distribution projects more affordable, and enable leveraging of private capital. With a 30%-50% ED&D-ITC, more transmission would meet grid operators' cost-benefit tests and be constructed, and distribution system upgrades needed for bidirectional energy, provision of reliability services from DERs, and increasing electrification of our economy to meet state and local cost-effectiveness thresholds. For transmission, the ET&D-ITC should apply solely to high-voltage lines (345 kV or above), enabling long distance delivery (either 200 or more circuit miles, connecting different ISO/RTO regions, or connecting three asynchronous interconnections). For distribution systems, the ET&D ITC should apply to advanced technologies that enable DERs to offer grid services. The ET&D ITC can have clear start- and placed-in-service timelines, with a clear safe harbor provision. It

[113] Reversing Piedmont Envtl. Council v. FERC, 558 F.3d 304, 314 (4th Cir. 2009).
[114] 42 U.S.C. § 4370m et seq.

has been well established that a refundable and transferable tax credit is more efficient and efficacious than non-refundable and non-transferable credits.[115]

5. Establish a Research, Development and Rapid Deployment Grant Program for Advanced Grid & Distribution System Technologies, and a Loan Program for Transmission & Distribution Along Highways and Rails

HVDC lines and other emerging grid and distribution system technologies have the potential, with R&D support, fall down the cost curve just as wind, solar, and storage have, increasing dramatically the amount of load that can be served by renewables and DERs, reaching new renewable resource areas and reducing the cost of clean energy. Currently only $200 million is spent on DOE delivery R&D while $4 billion goes to generation sources. Funding priorities should change to reflect the fact that the constraints to high renewable penetration are now more in delivery cost, not generation costs. The delivery R&D budget should be at least $2 billion. The DOE Loan Guarantee Program should be expressly funded for loans for deployment of advanced grid and distribution system technologies. In addition, the Department of Transportation (DOT) Transportation Infrastructure Finance and Innovation Act (TIFIA) credit program should be amended to require highway and rail recipients to consider incorporation of transmission and distribution system elements, and to allow credit mechanisms to apply to those elements.

6. Direct FERC to Revise Transmission Planning and Cost Allocation to Support Interregional Transmission

The Administration should support passage of the Heinrich inter-regional transmission planning, as in S.3109 & H.R.5511, and DOE should draft a Notice of Proposed Rulemaking for submission to FERC, intended to lead to a FERC rulemaking to reevaluate cost allocation for transmission that crosses state boundaries, connects different ISO/RTO regions, or connects more than one asynchronous interconnections; the lack of incorporation of public policies into transmission plans; the compartmentalization of reliability/economic/public policy projects; failure to incorporate utility decarbonization goals; and the disconnect between interconnection queue processing and transmission planning.

7. Build Super Distribution Systems by Developing Retail and Wholesale Markets for DER Aggregations

[115] *See, e.g.,* Lily L.Batchelder et al, *Efficiency and Tax Incentives: The Case for Refundable Tax Credits*, 59 Stanford Law Review 23 (2006), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=941582#

This recommendation would build stronger and more resilient distribution systems by aggregating and harnessing clean energy generation and storage in communities on homes and businesses. It would also allow costly polluting peaker plants to be replaced early by aggregations of local solar, storage and other clean resources. FERC should find that aggregated generation and storage systems owned by individuals and third parties which deliver energy directly to the distribution system, provide local resilience benefits, and can be aggregated to provide capacity and other grid services are a valuable grid resource and finalize rules to facilitate their participation and prohibit existing barriers. Furthermore, DOE should invest in technical assistance work to facilitate state regulators, policymakers, grid operators, load serving entities and DER developers develop mechanisms to value DER aggregations in order to deliver both distribution level and grid scale resources/ benefits.

Finally, DOE or the U.S. Department for Housing and Urban Development should either use existing authorities, or Congress should pass new authorities, to develop grant programs that may be administered by state and/or local governments, to provide rebates and financing assistance to expand access in low income and disadvantaged communities to DERs, especially those that are designed to deliver local resiliency, reliability as well as capacity and other grid services to the distribution and transmission grids.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

The recommendations would create construction jobs in transmission and distribution as well as in renewable and other clean generation. They would provide long-term economic benefits by lowering the cost of clean energy and compliance with climate objectives, enhancing day-to-day reliability, lowering the cost and need for large reserves, providing resilience against extreme weather events and reducing wildfire events and easing integration of renewables and DERs. They would advance climate protection by increasing the penetration of renewables and other clean energy sources, enable the cost-effective electrification of the transportation and other sectors without increasing energy sector emissions, and enable reliability standards to be met with clean energy resources.

Scaling up distributed resources could create enormous job growth. 56% of the 162,000 project development jobs in the solar industry are residential solar installations and

25% is in commercial.[116] In total, solar makes up roughly 2% of U.S. generation.[117] Major growth and development of these sectors could add hundreds of thousands of jobs.

How the Recommendation Supports Frontline or other Underserved Communities: The recommendations would help support frontline and other underserved communities by enabling economic development and job creation in rural and other hard-to-reach communities that have untapped renewable energy potential; enabling all customers, including those in priority communities for whom energy is a disproportionately large expenditure, to have greater control over their energy costs and even receive revenue for modifying their energy use or using DERs to provide energy and reliability; enhancing resilience and reducing wildfire risk; and lowering the cost of energy, which disproportionately impacts underserved communities. Additionally, replacing peaker plants with clean energy generation would largely benefit frontline communities, where peaker plants are often located.

How the Recommendation Supports Biden's Climate Plan: These recommendations would enable more rapid, reliable and cost effective deployment of clean energy, consistent with the Biden Climate Plan's clean energy components.

Key Battleground State Activity: These recommendations would enable economic development, job creation and access to lower cost, more resilient, more reliable clean energy for battleground states, particularly those with significant potential for renewable energy development.

[116] 10th Annual National Solar Jobs Census 2019, The Solar Foundation, p.12 (Feb. 2020), https://www.thesolarfoundation.org/wp-content/uploads/2020/03/SolarJobsCensus2019.pdf.
[117] U.S. Energy Information Administration, What is U.S. electricity generation by energy source? (Last Updated Feb. 27, 2020), https://www.eia.gov/tools/faqs/faq.php?id=427&t=3.

Improving the resilience of the U.S. electricity grid.

Opportunity/Problem:

Our nation's electricity grid is facing the mounting pressure of increasingly severe storms and wildfires, aging equipment, and cyber and physical threats. At the same time, we are expecting the grid to do more: more to meet our ever growing demand, more to incorporate new distributed energy resources, and more to charge the vehicle fleets of the future. In order to protect our economic recovery, the U.S. needs a resilient energy system that can quickly respond to and recover from major events to keep the power flowing to American homes and businesses.

Recommended Action(s):

- Create a grant program, data hub and presidential award supporting energy resilience.
- Focus these elements on the areas of grid modernization, cyber security, microgrids, and restorative behaviors of energy users.

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Keeping the energy flowing is critical to businesses and will be an important part of our economic recovery. What's more, energy resilience projects are, by their very nature, local and should result in a jobs focus in denser urban areas where new jobs will be most impactful.

Econ. Benefits:

Energy outages (both short and long) have a huge impact on our economy as major weather events can shut down huge portions of the economy for days or even weeks. A focus on energy resilience is an insurance policy against major blows to the U.S. economy.

Equity Benefits:

When the lights go out, those with the least are the hardest hit. They don't have the resources to simply relocate until the power is back on and loss of power can result in lasting damage to their community like the loss of grocery stores and pharmacies.

Climate Plan Tie:

A smarter grid that incorporates microgrids is much better equipped to incorporate and optimize renewable energy and energy storage technologies on the grid.

Battleground State Benefits:

Extreme weather events like hurricanes in the southeast and ice storms in the rust belt deprive voters of power and hamper business activities. The need for reliable energy has only become more acute during COVID. A more resilient energy system would help these voters and there are plenty of recent examples to remind them of just how much.

Improving the Resilience of the US Electricity Grid

AUTHORS: Corinne A. Allen, Ryan J.S. Baxter, Tim Callahan, Brian Levite, Michael Panfil, and Alex Rakow

Statement of Issue and Summary of Recommendations: There is a reason why 'resilient' is in the first line of Joe Biden's energy plan. Access to resilient, reliable, affordable energy is, more than ever, a must for the American economy. A resilient energy system is one that can withstand and quickly recover from the impacts of disruptive external events. Our nation's electricity grid is facing the mounting pressure of increasingly severe storms and wildfires, aging equipment, and cyber and physical threats. The U.S. Department of Energy determined that, between 2003 and 2012, weather-related outages are estimated to have cost the U.S. economy an inflation-adjusted annual average of $18 billion to $33 billion.[118] Research from the National Academy of Sciences shows that the economic impacts of natural disasters are increasing.[119] At the same time, we are expecting the grid to do more to meet our ever growing demand, incorporate new distributed energy resources, and to charge the vehicle fleets of the future. Our current energy infrastructure is not resilient enough to meet these new challenges, and continue to serve as the backbone of our economy. While utilities have been working diligently toward modernization, their efforts are not keeping up with the reality of the threats we face.

This paper proposes specific policies that can serve as the basis of the Biden administration plan for energy resilience, focused on the following four areas:

- Creating a modern, self-healing smart grid;
- Protecting the grid from cyber attack;
- Fostering a series of microgrids to create local energy resilience and
- Incentivizing restorative behaviors from large electricity consumers.

To address these four areas, the authors of this piece suggest a Biden Administration draft and push through Congress the American Energy Resilience Act. The first aspect of this Act would be to **create a federal energy resilience grant program**, covering different aspects of resilience throughout the energy system. This program, an expanded successor to the Smart Grid Investment Grant[120] from the American Reinvestment and

[118] *Economic Benefits of Increasing Electric Grid Resilience to Weather Outages* at 3, Executive Office of the President (Aug. 2013), https://www.energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf.
[119] Matteo Coronese et al., *Evidence for Sharp Increase in the Economic Damages of Extreme Natural Disasters*, Proceedings of the Nat'l Academy of Sciences for the U.S. (Oct. 22, 2019), https://www.pnas.org/content/116/43/21450.
[120] *See* Smart Grid Investment Grant, U.S. Dep't of Energy (last visited Oct. 18, 2020) https://www.smartgrid.gov/recovery_act/overview/smart_grid_investment_grant_program.html.

Recovery Act, would help fund transformational efforts in all four major areas, with prioritization on projects that impact multiple areas. These grants could be managed federally, through grants to state energy regulatory agencies or even directly to utilities.

The second element would be **creating an energy resilience data hub**. This hub, hosted by the Energy Information Administration (EIA) and the Office of Cybersecurity, Energy Security and Emergency Response (CESER), would collect and organize information from around the country that could foster a better understanding of energy threats, responses and best practices.

Finally, the Act would **establish a Presidential Award** in each of these four areas to be awarded annually. This award (coordinated between the White House and CESER) would highlight the year's best energy resilience efforts as a means of raising awareness of the issue and encouraging ambitious action.

Opportunity / Problem Statement: The Biden Administration has the opportunity to make the Nation's power system more resilient and cleaner by creating a modern, self-healing smart grid, protecting the grid from cyber attack, fostering a series of microgrids to create local energy resilience and incentivizing restorative behaviors from large electricity consumers.

Proposed Recommendations:

Check Boxes Below	
Yes	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

- **Creating a modern, self-healing smart grid.** The electricity grid itself is shifting from an analog, uni-directional machine to one capable of digital, multi-directional flows of information and energy. This shift to a 'smart grid,'[121] built upon the latest technological innovations, can provide far-reaching benefits including lower electricity bills[122] and a cleaner energy mix.[123] A well-designed smart grid provides additional resilience benefits[124] including redundancy,

[121] Grid Modernization and the Smart Grid, U.S. Dep't of Energy (last visited Oct. 19, 2020), https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid.
[122] Estimating the Costs and Benefits of the Smart Grid, Electric Power Research Institute (Mar. 2011), https://www.smartgrid.gov/files/documents/Estimating_Costs_Benefits_Smart_Grid_Preliminary_Estimate_In_201103.pdf.
[123] How the Smart Grid Promotes a Greener Future, U.S. Dep't of Energy (2008), https://www.energy.gov/sites/prod/files/oeprod/DocumentsandMedia/Environmentalgroups.pdf.
[124] Advanced Metering Infrastructure and Customer Systems, U.S. Dep't of Energy (Sept. 2016), https://www.energy.gov/sites/prod/files/2016/12/f34/AMI%20Summary%20Report_09-26-16.pdf.

reduced outage times, faster identification of grid failure, and the ability to shape demand and reroute power flow to minimize impacts.

- **Energy resilience grant program:** A second generation smart grid investment grant program would build upon prior investment and activity to grow a smart electricity grid. The new Smart Grid Investment Grant program should evaluate each grantee to ensure that new systems maximize cost-savings, improve reliability and resilience and reduce carbon emissions.
- **Energy resilience data hub:** Grid operators should collect information about threats, current operations, and opportunities for improvement. These specific opportunities can then drive technology development in the private sector and project planning among grid owners. For this effort, the EIA and CESER can work together to determine what information should be made public to speed up the smart grid transition without compromising national security.
- **Energy resilience Presidential Award:** This presidential award could go to a grid operator who innovates beyond their regulatory requirement, thereby making Americans safer. Highlighting these efforts will draw the attention of utilities, regulators and customers alike on what true energy resilience leadership looks like.

- **Protecting the grid from cyber attack:** While advanced technologies will create optimization and resilience, they will also increase our vulnerability to cyber-attacks. These threats are not theoretical. In 2016, a malware-based cyber-attack shut down one-fifth of Ukraine's electrical grid, in what investigators have called a "dry run" for future attacks. The U.S. still lacks a nationally recognized and federally supported standard for implementing cyber security measures in electricity generation, transmission and distribution. The North American Electric Reliability Corporation (NERC) has established cyber security standards but is not able to lead a U.S. strategy to meet and exceed those standards. The GAO recently reported that The Federal Energy Regulatory Commission (FERC) "has approved mandatory grid cybersecurity standards. However, it has not ensured that those standards fully address leading federal guidance for critical infrastructure cybersecurity."[125] What is needed is a cross-agency, forward-looking plan that will identify cyber threats and coordinate

[125] Report to Congress, *Critical Infrastructure Protection: Actions Needed to Address Significant Cybersecurity Risks Facing the Electric Grid* at 2, Government Accountability Office (Aug. 2019), https://www.gao.gov/assets/710/701079.pdf.

industry-wide adoption of the hardware, software, and protocols to defend against cybersecurity threats.

- **Energy resilience grant program:** The Department of Energy has dozens of programs focused on cybersecurity of energy infrastructure, including the Cybersecurity for Energy Delivery System (CEDS). Grants and loans under this program would specifically address this gap between FERC regulations and the utilities' state of operations by providing capital to support the adoption of necessary safeguards and new resilience codes and standards. A special focus should be placed on capitalizing rural and smaller utilities for system upgrades and ensuring adequate tracking and compliance.
- **Energy resilience data hub:** Currently, FERC, NERC, DOE, NIST and other organizations all have a hand in identifying cyber threats and devising countermeasures. A single governing authority, and subsequent data repository, could provide clarity in a fragmented regulatory environment. DOE should empower CESER to coordinate a data hub focused on new vulnerabilities created by the advanced technology used in the smart grid of today and the future. This hub should include contributions from federal intelligence agencies, energy generators, and transmission/distribution system operators. While each utility and grid owner is unique, this datahub would allow them to learn from each other based on similarities in size, technology adoption, infrastructure, or business model.
- **Energy resilience Presidential Award:** An award in cybersecurity could go to the utility which made the most progress in adopting resilience protocols and contributed to NIST's Cybersecurity Framework. Awarding utilities that support the broader dissemination of best practices may incentivize others to step up and lead the charge.

- **Fostering a series of microgrids to create resilience locally.** When the energy grid fails, factories stop, hospitals and first responders switch to limited (and highly polluting) backup generators, local businesses can't process transactions, and remote workers and students are kicked offline. Generating energy locally allows pockets of resilience to exist while utility systems are repaired or rerouted. Microgrids[126] generate and supply energy in their

[126] Elisa Wood, *Microgrids 101: A Non-Geek Definition of Microgrid*, Microgrid Knowledge (Oct. 30, 2015), https://microgridknowledge.com/definition-of-microgrid/.

communities all year round, lowering stress on the system[127] and making the maximum possible use of local renewables. When the utility grid is down, these systems 'island' themselves and serve local needs with onsite energy resources. These kinds of systems can even be incorporated within established utility networks, creating a community energy source for a specific neighborhood or set of facilities. While the microgrid market has been growing, there are considerable roadblocks to fully leveraging the energy resilience provided by these systems, such as expensive project financing, a lack of regulatory clarity around ownership models and a lack of transparency on the part of utilities.

- **Energy resilience grant program:** The grant program should be open to microgrid projects that are 1) larger in scope (over three megawatts) 2) replicable and 3) contribute to community energy resilience beyond just the served facilities. A federal grant to accelerate microgrid projects will create lessons learned and examples that will allow the deployment of future projects to be better, faster, and cheaper. This program builds off of previous smart grid initiatives from DOEs Office of Electricity, Delivery, and Energy Reliability.[128]
- **Energy resilience data hub:** The data hub would become a repository of energy resilience project data. For federal projects, the database would include technology designs, project timelines and cost data. This information would inform and drive improvement in projects both for government and non-governmental entities. Private commercial projects would also be tracked (with less granular data) to better understand where the U.S. has local resilience resources and what critical areas are lacking these resources.
- **Energy resilience Presidential Award:** The presidential award should highlight local energy resilience projects that best protect Americans when the grid is down and help the grid to get back up and running quickly.
- ***Additional Idea:*** **Require all mission-critical[129] federal facilities with loads over 2MW to evaluate deployment of an on-site**

[127] The 10 Microgrid Value Streams, Microgrid News (Oct. 10, 2015), http://microgridmedia.com/microgrid-value-streams/.
[128] *See* Dan T. Tom & Merrill A. Smith, *The U.S. Department of Energy's Microgrid Initiative*, The Electricity Journal (Oct. 2012), https://www.energy.gov/sites/prod/files/2016/06/f32/The%20US%20Department%20of%20Energy%27s%20Microgrid%20Initiative.pdf.
[129] Critical Facilities and Higher Standards, Fact Sheet, Federal Emergency Management Agency (last visited Oct. 19, 2020), https://www.fema.gov/media-library-data/1436818953164-4f8f6fc191d26a924f67911c5eaa6848/FPM_1_Page_CriticalFacilities.pdf.

microgrid. The federal government should lead the way by examining microgrids as an option for federal facilities. This effort would be a natural expansion of the Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS) program to support microgrid deployment at U.S. military installations.[130] This program could be managed by the General Services Administration in partnership with the Department of Energy.

- **Incentivizing restorative behaviors from large electricity consumers**. Efficient, responsive buildings help us do more with less energy. Buildings that can react to system conditions and problems allow us to engage the supply side part of the solution when the grid is stressed. The technologies used to engender efficiency, demand response, and load shedding help the grid during an outage event, but they also create a more optimized grid year-round.
    - **Energy resilience grant program:** Grid-Interactive Efficiency Buildings (GEBs) use smart technologies and on-site DERs to provide demand flexibility while co-optimizing for energy cost, grid services, and occupant needs in a continuous and integrated way. GEBs improve upon the benefits of energy efficiency and demand response by enabling demand management strategies, such as load shedding, load shifting, modulation, and generation.[131] These strategies, deployed at scale, can help grids recover from emergencies and reduce the need for renewable curtailment.
    - **Energy Resilience Data Hub:** As load shifting strategies proliferate, so too will the ability to change the timing of electricity use. A publicly accessible hub for real-time grid stresses and carbon intensity would enable GEBs to be more responsive to grid conditions in the absence of time of use pricing structures.
    - **Energy resilience Presidential Award:** Competition spurs innovation. By recognizing outstanding advancements in demand flexibility, large electricity consumers will gain more justification for investing in grid services. A presidential award would complement VP Biden's Zero Net Energy commitment as well as existing competitions

[130] Office of the Secretary of Defense Recognizes SPIDERS Project with 2015 JCTD "Team of the Year Award," U.S. Dep't of Energy (last visited Oct. 19, 2020), https://www.energy.gov/eere/femp/spiders-jctd-smart-cyber-secure-microgrids.
[131] Monica Neukomm et al., Grid-Interactive Efficient Buildings Technical Report Series: Overview of Research Challenges and Gaps, U.S. Dep't of Energy Office of Energy Efficiency & Renewable Energy (Dec. 2019), https://www1.eere.energy.gov/buildings/pdfs/75470.pdf.

such as GSA's Proving Ground Program,[132] DOE's L Prize,[133] Mission Innovation's Global Cooling Prize,[134] and NYSERDA's Buildings of Excellence.[135]

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Every function of our economy depends on reliable access to energy. The digitization of everything from banking to education means that now more than ever, power outages have the potential to grind our society to a halt. When public health and emergency services lose power, they lose the ability to respond to the very disasters that cause power outages. The DOE estimates that weather related power outages alone cost the US economy $18 billion to $33 billion per year.[136] These estimates were made before the recent years of wildfires and public safety power shut-offs in California.

Every upgrade we make to the grid, from the installation of smart meters to the deployment of microgrids, will not just protect our economy from the effects of outages but also create jobs. As price pressure and climate necessity force the retirement of fossil fuel infrastructure, the jobs that are lost can be replaced with construction of a cleaner, smarter, and more resilient grid.

The energy resilience measures described in this policy will also help to fight and adapt to climate change. A smart grid that includes microgrids can better integrate and leverage renewable energy generation, reduce waste from long-range transmission and reduce the use of the dirtiest peaker plants. These systems will also dramatically improve and accelerate our responses to damaging storms, floods and wildfires.

How the Recommendation Supports Frontline or other Underserved Communities: Those with the lowest incomes are hardest hit by energy outages.[137]

[132] About GSA's Proving Ground, U.S. General Services Admin. (last visited Oct. 19, 2020), https://www.gsa.gov/governmentwide-initiatives/sustainability/emerging-building-technologies/about-gsas-proving-ground-gpg.
[133] L Prize Competition, U.S Dep't of Energy (last visited Oct. 19, 2020), https://www.energy.gov/eere/ssl/l-prize-competition.
[134] About the Global Cooling Prize, Mission Innovation (last visited Oct. 19, 2020), https://globalcoolingprize.org/about-the-global-cooling-prize/.
[135] Buildings of Excellence, New York State Energy Research and Development Authority (last visited Oct. 19, 2020), https://www.nyserda.ny.gov/All-Programs/Programs/Multifamily-Buildings-of-Excellence.
[136] *Economic Benefits of Increasing Electric Grid Resilience to Weather Outages* at 3, Executive Office of the President (Aug. 2013), https://www.energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf.
[137] Joaquin Palomino & Cynthia Dizikes, *Power Outages Hit Some of State's Poorest Communities Hard*, San Francisco Chronicle (Nov. 3, 2019), https://www.sfchronicle.com/california-wildfires/article/Power-outages-hit-some-of-state-s-poorest-14804853.php.

They lack the resources to simply relocate until the outage is past or replace food that has spoiled. The loss of energy can lead to business closure, creating food deserts and reduced access to services in low-income communities. Furthermore, lack of energy services can have severe or life threatening consequences for medically vulnerable individuals,[138] particularly seniors and people with disabilities. Maintaining access to healthy food, health services, and refrigerated medicines is critical for underserved communities. Energy resilience investments protecting local businesses and vulnerable populations while driving local economic development would be an excellent way to meet Vice President Biden's commitment to delivering 40% of the overall benefits from clean energy investments to disadvantaged communities.

First responders are also greatly benefitted by improved energy resilience. Backup generators at hospitals and fire stations typically require reduced operational capability and only have fuel for 72 hours at that. Improved energy resilience means that our hospitals, police, fire, and other first responders don't have to worry about keeping the lights on -- they can focus on saving lives.

Finally, investment in microgrids and energy storage will also help to reduce the need to operate "peaker plants" in times of highest demand. These plants are often the dirtiest generation resources, and are disproportionately located near low income communities and communities of color.[139]

How the Recommendation Supports Biden's Climate Plan: A focus on energy resilience can catalyze Biden's commitment to "smart infrastructure investments to rebuild the nation and to ensure that our buildings, water, transportation, and energy infrastructure can withstand the impacts of climate change."

For example, the Plan calls for deploying innovation and technology, such as batteries and more efficient controls and sensors, cybersecurity improvements, and investment in infrastructure and communities in the context of resilience. This paper provides specific strategies for pursuing these goals, including support for microgrids, energy storage, improved cybersecurity, and investment at the community and local level.

[138] Noell Angelique M. Mollarni et al., *Who's at Risk When the Power Goes Out? The At-Home Electricity-Dependent Population in the United States*, J. Public Health Manag. Pract. 2017 Mar-Apr 2012, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5007208/.
[139] Elena M. Krieger et al., *A Framework for Siting and Dispatch of Emerging Energy Resources to Realize Environmental and Health Benefits: Case Study on Peak Power Plant Displacement*, 96 Energy Policy 302 (2016), https://www.sciencedirect.com/science/article/abs/pii/S0301421516302798.

Key Battleground State Activity: States like Florida, Texas, and North Carolina have all experienced increasing severity of Atlantic storms[140] -- with a rising number of named storms.[141] While utilities in these states are taking action to improve resilience, much more needs to be done to safeguard these economies from turbulent storm activity. The impact of extreme weather events on industrial activities in the Midwest and Rust Belt is increasing as our manufacturing activities are automated and increasing reliance on consistent electricity supply.[142]

[140] Daniel Levitt & Niko Kommenda, *Is Climate Change Making Hurricanes Worse?*, The Guardian (Oct. 10, 2018), https://www.theguardian.com/weather/ng-interactive/2018/sep/11/atlantic-hurricanes-are-storms-getting-worse.
[141] James P. Kossin et al., *Global Increase in Major Tropical Cyclone Exceedance Probability Over Past Four Decades*, Proceedings of the National Academy of Sciences of the U.S. (May 18, 2020), https://www.pnas.org/content/117/22/11975.
[142] 2020 State of Commercial & Industrial Power Reliability Report, S&C Electric Company (June 1, 2020), https://www.sandc.com/globalassets/sac-electric/documents/sharepoint/documents---all-documents/technical-paper-100-t125.pdf?dt=637324285913868871.

Unlocking Demand: valuing DERs and demand response to deploy & integrate clean energy

Opportunity/Problem:

Our nation needs cleaner, more equitable, and more resilient energy. If properly supported and valued, distributed energy will lower energy costs while deploying large quantities of clean resources, delivering wholesale services to prevent the grid from failing, and providing resilient power to communities.

Recommended Action(s):

- Ensure broad and equitable access to DER and DR to drive large-scale deployment
- Modernize wholesale market design to accelerate the move of our electric services sector to cleaner and more cost-effective delivery of energy
- Standardize and streamline DER interconnection and permitting

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

With expansion in line with Biden's climate plan, distributed solar alone could grow from today's workforce of 200,000 to 600,000 stable jobs across the nation with additional direct job contributions from other types of DERs. In addition, significant indirect job growth can be expected through the economic benefits of DERs.

Econ. Benefits:

By 2030, DR and flexibility alone can achieve more than $15B in annual savings [143] for Americans, with distributed PV contributing approximately an additional $2B[144] annual direct savings to households and businesses. This does not account for many other similarly significant benefits of DERs, including resiliency, reduction in local air pollution related economic impacts, and cost savings to utilities.

Equity Benefits:

Communities of color pay higher energy bills, in large part due to how energy in low-income housing is provided and billed, and distributed energy will play a key role in ensuring those communities pay lower bills and participate in the clean energy revolution. Those resources will also accelerate the removal of the highest-emitting peaking plants by reducing coincident peak demand, which are often located in communities of color. Rural communities which have been historically underserved by the energy system.

Climate Plan Tie:

The recommendations will help the US achieve a 100% clean energy economy, by accelerating the deployment of clean distributed energy and providing the supporting tools - such as frequency regulation and flexible ramping - to integrate grid-scale renewables. They will build a stronger, more resilient electric system, which can better withstand the increasing nature of extreme weather events in a changing climate.

Battleground State Benefits:

The recommendations will deliver clean resources & jobs to each state of the nation, whether under wholesale markets or vertically-integrated utilities. In Florida the reforms would unlock utility restrictions on the clean energy residents and businesses can install; in PJM (covers Ohio, Pennsylvania and Virginia) it would unlock widespread market access for DERs and help states meet their clean energy targets.

[143] Ryan Hledik, et al., The National Potential for Load Flexibility, The Brattle Group (June 2019), https://brattlefiles.blob.core.windows.net/files/16639_national_potential_for_load_flexibility_-_final.pdf.

[144] The authors were not able to find an authoritative source due to time constraints. This estimate is based on tripling the installation rate of distributed solar to 15 GW / year from 2021, reasonable assumptions on yield (1200 kWh / kW) and conservative assumptions on net savings of $0.013 / kWh on average (utility bill savings less financed cost of PV solar).

Unlocking Demand: Valuing Distributed Energy Resources and Demand Response to Deploy and Integrate Clean Energy

AUTHORS: Peter J. Cavan, Dana Guernsey, Carl Lenox, Cathleen Colbert, Claire Woo, Nick Scherer, Thomas Lee

DATE: 9/4/2020

Statement of Issue and Summary of Recommendations:

Distributed energy resource (DER) and demand response (DR) technologies - ranging from solar photovoltaics (PV), battery storage, and managed electric vehicle (EV) charging, to smart thermostats, simple price-based load response, and advanced curtailment - will form a key part of an energy system that is significantly cleaner, as well as being cost-effective, reliable, and resilient, if we make the right policy choices over the next four years. DERs are the "key to a clean energy transition, without which the promise of renewable energy lacks the reliability needed to ensure its widespread adoption," according to former Federal Energy Regulatory Commission (FERC) Chairman Jon Wellinghoff.

The recommendations described in this memo will ensure that DERs are widely affordable, valuable, and usable. It is essential to ensure that all communities have equitable access to DERs, which can be unlocked with direct federal support and low-cost financing. Distributed energy, typically delivered in the form of microgrids, can play a large role in avoiding wide-scale blackouts during natural and man-made challenges and it can help grid operators recover grid operations more quickly after a power disruption occurs. Consumers deserve to have cost-effective and reliable choices for clean energy; DERs and the policies herein will enable those choices.

Beyond financing needs, there are regulatory barriers to DER adoption that need to be addressed. For example, interconnection and permitting costs are too high, and achievable reductions could deliver a similar impact to a 30% Investment Tax Credit[145]. In addition, interconnection and permitting timelines in most states are far too long.

[145] Susannah Parsons & Nick Josefowitz, *A No-Cost Rooftop Solar Stimulus*, SPUR (July 2020), https://www.spur.org/sites/default/files/publications_pdfs/a_no_cost_rooftop_solar_stimulus.pdf

The federal government can and should be a standard bearer and establish best approaches. Finally, utilities and their regulators need help to plan for and integrate DERs so that utilities can design the distribution systems of the future around the DERs that homes and businesses are already deploying.

DERs must have the same ability to sell capacity, energy, and ancillary services in wholesale markets as any other resource in the country. The full potential value of DERs will be squandered unless they are given fair access to wholesale markets and are fairly compensated for the services they provide. By following a market-based approach, greater clean and distributed energy resources will be deployed in the locations and the ways in which they are most valuable to the grid.

Recommendations:

1. **Ensure broad and equitable access to DER and DR to drive large-scale deployment**

Although they provide large cost savings over time, many DERs require significant upfront financial investment to deploy.. Private financing innovation has successfully addressed this challenge for some technologies, but there are remaining barriers to qualify for such financing, particularly for lower-income families and small businesses. Reducing the cost of capital has a profound effect on the competitiveness of DER, so increasing access to low-cost financing is another high priority.

The National Climate Bank is a concrete model of this approach that is supported by the Advanced Energy Management Alliance.[146] The National Climate Bank was introduced in the House and Senate; passed in the Moving Forward Act in the House; and is a key tool in Chairman Pallone's CLEAN Future Act, the House Select Committee on the Climate Crisis' Action Plan, and the Senate Democrats' Special Committee on the Climate Crisis' Report. This non-profit financing institution would fund aggregated regional projects, as well as state and local entities deploying DERs, focusing in large part on low-income and frontline communities.

We also recommend that DER and beneficial electrification equipment incentive requirements, as well as federal procurement requirements, include the capability to be

[146] Advanced Energy Management Alliance (AEMA) is a group of DER providers and consumers that advocates for opening markets for DERs in states and federally. Advanced Energy Management Alliance, *About AEMA*, https://aem-alliance.org/about/.

remotely dispatched and controlled as a grid asset while meeting cybersecurity requirements that are appropriate for the type of equipment.

Ensure that access to DERs for frontline and disaster-impacted communities is prioritized to improve resilience in the face of climate change

DERs in the form of backup power systems and microgrids can provide homes, businesses, communities, and critical facilities with power for extended periods during power interruptions. These blackouts are often more widespread than the impact of the event that precipitates them, and in many cases are preventative in nature. Continued access to energy during such events can be lifesaving for vulnerable populations and is a critical part of reducing the economic impacts of such events on communities. The federal government should establish minimum resilience standards for all federal facilities, which are critical for community support as climate change increases the likelihood and severity of extreme weather events.[147]

2. Modernize wholesale market design to accelerate the move of our electric services sector to cleaner and more cost-effective delivery of energy

For DERs to reach their full potential and for all consumers to fully benefit from the value they can provide, DERs must have fair market access. Sales of energy, capacity, and ancillary services from consumer-owned DERs into wholesale electric markets can not only provide a revenue stream back to those consumers and lower their energy bills (or finance the DER itself), but those services will also lower the costs to all consumers by lowering costs to stabilize the grid and integrate higher levels of low-carbon renewable resources into the system.

FERC recently passed a landmark rule on this topic - Order 2222 - but that is only the end of the beginning. The real work begins now to ensure that wholesale market operators, states, and utilities deliver on that promise. For example, implementation must ensure that all resources are allowed to participate in both wholesale markets and provide retail services, while ensuring flexibility in commitment periods and bid requirements, and allowing reasonable accounting treatment to avoid double payment for the same service delivered in the same time period.

[147] See report on resilience of DERs for consumers. Katherine Hamilton, *AEMA Releases Whitepaper on Consumer Resilience*, AEMA (February 11, 2020), https://aem-alliance.org/aema-releases-whitepaper-on-consumer-resilience/.

DERs outside of today's wholesale markets also deserve market access. Recent modeling[148] from Vibrant Clean Energy finds that a Regional Transmission Organization (RTO) across seven Southeast states would save $384 billion by 2040 and create 285,000 jobs. Those benefits come in large part from providing a value stream to both grid-scale and distributed energy. Currently proposed H.R. 2, the Moving Forward Act, contains a provision to make wholesale markets a requirement throughout the country. Absent legislative action, FERC has the authority to require that wholesale electric markets be implemented in all areas of the country under its jurisdiction. This would greatly enhance DER adoption across all consumer economic sectors.

Thousands of megawatts (MWs) of untapped demand response capability exist today, but are unable to benefit wholesale markets because of the historic regulatory treatment that allows states to ban their participation. Our recommendation is to remove the state opt-out capability (from FERC Order 719/719A) that allows states to block demand response resources from participating in wholesale markets. There is precedent for this action with the treatment of energy efficiency (docket EL17-75), energy storage (Order 841), and aggregated DER (Order 2222).

3. Standardize and streamline DER interconnection and permitting

A major challenge to the deployment of many DERs is the complexity involved in completing multiple permitting and interconnection processes with local building departments, distribution utilities, and wholesale market operators.

In some states, this multi-step process includes building permits, utility interconnection agreements and net energy metering agreements, and wholesale participation agreements, which are often separate processes that are unique to each authority having jurisdiction. There is no standardization in requirements or procedures across states, utilities, and municipalities, which creates delays and raises costs for DER customers. We recommend following models for standardization such as the Interstate Renewable Energy Council (IREC) Model Interconnection Procedures[149], which reflect best practices to facilitate higher penetration of DERs while maintaining grid safety and reliability. The IREC Model includes ways for FERC to update the Small Generator Interconnection Procedure.

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[148] Energy Innovation, *Economic And Clean Energy Benefits Of Establishing A Southeast U.S. Competitive Wholesale Electricity Market*, (August 25, 2020), https://energyinnovation.org/publication/economic-and-clean-energy-benefits-of-establishing-a-southeast-u-s-competitive-wholesale-electricity-market/.

[149] Interstate Renewable Energy Council, *2019 IREC Model Interconnection Procedures Released*, IREC (September 12, 2019), https://irecusa.org/2019/09/2019-edition-released-irecs-model-interconnection-procedures/

In addition, Independent System Operators (ISOs) and RTOs have notoriously long interconnection queues[150], and the costs and time required to gain permission to participate in wholesale markets are particularly burdensome. To ease this barrier, we recommend directing DOE to create an online permitting system (or support the National Renewable Energy Laboratory's upcoming SolarAPP), a model expedited permit-to-build protocol system, and a voluntary national inspection protocol[151]. DOE should also work with partners (FERC, NERC, NARUC, and industry) to create national interconnections and operating standards for DERs that simultaneously support distribution and wholesale grid operations, including requirements for smart meters, smart inverters, remote communication and control, and multi-market interoperability.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: The distributed solar industry alone has created more than 200,000 jobs, compared to 150,000 jobs in oil & gas extraction in 2019 based on the National Solar Jobs Census[152] NAICS statistics.[153] Biden's Climate Plan implies an approximate tripling of the current rate of solar deployment.[154] If the ratio of distributed to centralized solar remains proportional, distributed solar deployment alone could account for about 600,000 direct, stable, 'boots on the ground' jobs over the next decade. Other areas such as distributed storage, managed EV charging, and smart load response would also have significant direct and indirect job and economic stability benefits if the above recommendations were adopted.

How the Recommendation Supports Frontline or other Underserved Communities: Communities of color pay higher energy bills,[155] in large part due to the way that energy is provided and billed in low-income housing Distributed energy will play a key role in lowering utility bills for low-income communities and helping them participate in the clean energy revolution. Those resources will also accelerate the

[150] Himali Parmar & Surhud Vaidya, *Is the Grid Ready for Tremendous Renewable Energy Growth*, ICF (November 7, 2018), https://www.icf.com/insights/energy/renewable-energy-next-generation.
[151] These recommendations were called for by the American Energy Opportunity Act of 2019 (H.R. 5335) introduced by Rep. Paul Tonko (D-NY). H.R. 5335, 116th Cong. (2019).
[152] The Solar Foundation, *Solar Jobs Census 2019*, (February 2019), https://www.thesolarfoundation.org/wp-content/uploads/2020/03/SolarJobsCensus2019.pdf.
[153] United States Census, *North American Industry Classification System,* https://www.census.gov/eos/www/naics/
[154] Julian Spector, *Can the Clean Energy Industry Deliver on the Biden-Sanders Climate Plan?*, Greentech Media (July 9, 2020), https://www.greentechmedia.com/articles/read/is-the-clean-energy-industry-ready-for-the-biden-sanders-climate-plan.
[155] Constantine E. Kontokosta, et al., *Energy Cost Burdens for Low-Income and Minority Households*, 86 Journal of the American Planning Association, 89 (2020).

removal of the highest-emitting peaking plants - often located in communities of color[156] - by reducing coincident peak demand. Rural communities, which have been historically underserved by the energy system in terms of price, reliability and resilience, will be helped to deploy local energy solutions.

How the Recommendation Supports Biden's Climate Plan: The recommendations will help the U.S. achieve a 100% clean energy economy by accelerating the deployment of clean distributed energy and providing the supporting tools - such as frequency regulation and flexible ramping - to integrate grid-scale renewables. These recommendations will build a stronger, more resilient electric system, which can better withstand the increasing number of extreme weather events in a changing climate. The most common cause of power outages are on the distribution system[157], and distributed energy is uniquely positioned to keep the lights on or restore power when it fails.

Key Battleground State Activity: The recommendations will deliver clean resources and jobs to each state of the nation, whether under wholesale markets or vertically-integrated utilities. In Florida, these reforms would remove utility restrictions[158] on the clean energy that residents and businesses can install. In the Pennsylvania New Jersey Maryland Interconnection Power Pool, (includes Ohio, Pennsylvania and Virginia) these reforms would unlock widespread market access for DERs and help states meet their clean energy targets.

[156] Food & Water Watch, *Pernicious Placement of Pennsylvania Power Plants*, (June 20, 2018), https://www.foodandwaterwatch.org/insight/pernicious-placement-pennsylvania-power-plants
[157] John Larsen, et al., *Electric System Reliability: No Clear Link to Coal and Nuclear*, Rhodium Group (October 23, 2017), https://rhg.com/research/electric-system-reliability-no-clear-link-to-coal-and-nuclear/ ("It is clear that factors related to and impacting the electric distribution system — not a loss of electric supply — were the cause of most customer outages").
[158] Ivan Penn, *Florida's Utilities Keep Homeowners From Making the Most of Solar Power*, NY Times (July 7, 2019), https://www.nytimes.com/2019/07/07/business/energy-environment/florida-solar-power.html

Leveraging the Texas Expanded Transmission Model to Accelerate Clean Energy Deployment Nationwide

Opportunity/Problem:

There are abundant clean energy resources across the U.S. in places where the transmission grid is not equipped to use them. Further, the U.S. has isolated power grids that provide suboptimal capacity transfer across the regional grids, preventing access to our most abundant and inexpensive renewable resources.

Recommended Action(s):

- Develop a bold national transmission plan through stakeholder-identified clean energy corridors to access the abundant clean energy potential across the U.S., expanding upon internationally recognized lessons learned in Texas.
- Deploy federal funding to resolve cost-allocation issues for new transmission projects.
- Connect the isolated power grids serving the eastern and western regions of the U.S.

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

The construction process would put people to work on infrastructure right away. New renewable energy project development and operations would create additional jobs.

Econ. Benefits:

Transmission access would benefit rural communities with renewable resources to be deployed – including vast swaths of America's heartland – and yield millions of dollars in private investment and tax revenue to those communities. With projected growth in electric vehicles and additional electrification, the U.S. will need 70 GW to 200 GW of new power generation by 2030.[159] Additionally, NREL demonstrated that linking our isolated power grids with point-to-point HVDC lines or a connected HVDC overlay would unlock renewable energy at scale, saving consumers up to $47 billion per year and returning more than $2.50 for every dollar invested.

Equity Benefits:

Some of the oldest and most polluting generators are located in close proximity to underserved communities. Building a more robust transmission infrastructure will allow such generators to be replaced by cleaner, healthier and less expensive renewable energy generators.

Climate Plan Tie:

The climate value of deploying America's untapped renewable resources is well-documented.

Battleground State Benefits:

Battleground states of Arizona, Colorado, Iowa, Minnesota, and Nevada are rich in solar and wind energy resources. Expanding the transmission grid would enable these states to benefit from increased investment in solar and wind energy projects, creating jobs and tax revenue for rural communities in these states.

[159] See https://wiresgroup.com/wp-content/uploads/2020/05/2019-03-06-Brattle-Group-The-Coming-Electrification-of-the-NA-Economy.pdf

Leveraging the Texas Expanded Transmission Model to Accelerate Clean Energy Deployment Nationwide

AUTHORS: Caitlin A. Smith, Diana Rivera, Vanessa C. Tutos, Mike Sloan, Sam Porter

DATE: 9/16/2020

Statement of Issue and Summary of Recommendations:
There are abundant clean energy resources across the U.S. in places where the transmission grid is not equipped to use them. We recommend enhancing existing transmission infrastructure to move clean energy resources to consumption centers and utilizing existing railways/pipelines/rights of way where possible to develop robust new clean energy corridors between rural "energy production" areas and traditional load centers.

The U.S. has three isolated power grids that serve the eastern region, the western region, and Texas. Higher capacity transfer across the regional grids would increase access to our most abundant and inexpensive renewable energy resources. Texas provides important justification for the investment, based on the tremendous economic benefits the state gained from expanding its transmission. The Competitive Renewable Energy Zone (CREZ) transmission lines, built between 2008 and 2013, connected the state's windiest areas with larger cities and yielded significant job creation, allowing Texas to power its economy with low-cost electricity.[160] Texas now leads the nation with more wind energy consumption and employment than the next three states combined.[161]

We recommend leveraging the successful CREZ model in Texas with new funding mechanisms, including new avenues for federal funding, to plan and pay for additional transmission. We recommend a national program that draws on the successes of the Electric Reliability Council of Texas (ERCOT) CREZ process to harvest an array of benefits nationally while maintaining ERCOT's independence from Federal Energy Regulatory Commission (FERC) jurisdiction through the use of direct current (DC) interface with the eastern and western interconnections.

[160] Powering Texas, Transmission & CREZ Fact Sheet (2018), https://poweringtexas.com/wp-content/uploads/2018/12/Transmission-and-CREZ-Fact-Sheet.pdf.
[161] American Wind Energy Ass'n, State Fact Sheets (Apr. 2020), https://www.awea.org/resources/fact-sheets/state-facts-sheets.

Opportunity / Problem Statement:
Texas – more than any other state – offers a realistic roadmap for the Clean Energy Revolution. In this quintessential oil and gas state, the opportunity for clean energy is staggeringly compelling. More than 94% of resources seeking to join the Texas grid are now solar, wind, and batteries (less than 6% are fossil fueled), per Generation Interconnection Reports from ERCOT.[162] There is no doubt that renewable resources are ready today to deploy throughout the U.S. at extremely high levels. However, Texas' problem is one that the rest of the country will come to recognize. Inadequate electric infrastructure prevents most clean energy projects from advancing, and, for virtually all others, confounds the pace of deployment, through congestion in West Texas. The 2019 "State of the Market" ERCOT report[163] illustrates that CREZ reduced West Texas congestion initially, but that congestion has grown in recent years with substantial additions of low-cost wind and solar power.

Proposed Recommendation:
Develop a bold national transmission plan through stakeholder-identified clean energy corridors to access the abundant clean energy potential across the United States, expanding upon internationally recognized lessons learned in Texas.[164] We recommend a national proposal for a new high voltage direct current (HVDC) overlay network akin to the National System of Interstate and Defense Highways, conceived with an urgency of timeline and scale to facilitate the drastic actions needed to address the climate emergency.

We recommend leveraging the CREZ model to elevate the importance of improving and building new large-scale transmission, and to explore new ways of funding, including:

- Deploy federal funding.
    - Explore congressional appropriation of funds allocated to the U.S. Department of Defense, noting the national security imperative of a secure electric grid.
- Connect the isolated power grids serving the eastern and western regions of the U.S.

[162] *See* ERCOT, GIS Report (Aug. 2020), http://mis.ercot.com/misapp/GetReports.do?reportTypeId=15933&reportTitle=GIS%20Report&showHTMLView=&mimicKey.
[163] Potomac Economics, 2019 State of the Market Report for the ERCOT Electricity Markets (May 2020), https://www.potomaceconomics.com/wp-content/uploads/2020/06/2019-State-of-the-Market-Report.pdf.
[164] Humzah Yazdani, *Why Transmission and Distribution Are the Clean Energy Transition's Secret Weapons*, World Economic Forum (July 16, 2020), (https://www.weforum.org/agenda/2020/07/transmission-distribution-clean-energy-transition/.

    - Build HVDC transmission lines or back-to-back terminals at grid seams so renewable energy can be shared across these markets and grids that operate on different frequencies.
- Release the National Renewable Energy Laboratory's (NREL) Interconnections Seam Study which demonstrates that linking our isolated power grids would unlock renewable energy at scale and pay for itself.
- Include investment in Texas, despite ERCOT's independence from FERC, as the state's independence from federal electricity regulation allows for flexibility and faster innovation, which can inform broader energy policy.[165]
    - We believe that in ERCOT, new transmission investment is appropriate due to the remote locations of the clean energy generation assets. Grid stability and resilience will be improved by adding new transmission lines, rather than upgrading existing facilities.
- Utilize existing right-of-way along roads and railways to cut down on procedural time and costs and encourage eventual merchant build of generation.
- Identify opportunities for innovation.
    - Looking ahead to the scale of transmission investment needed, new models and players should be envisioned. It may be practical to consider a hybrid approach that is partially public, utility, and merchant (interstate highways with toll roads are an example of the merchant model).

It has been more than 40 years since the U.S. commissioned an onshore HVDC line for renewable energy.[166] It required leadership from President Kennedy, but the Pacific Intertie still moves low-cost hydropower from the Pacific Northwest to the LA basin. As the U.S. lags, China leads in building HVDC lines to move both renewable and coal power across its country.[167] With lessons learned deploying HVDC technology from ABB and Siemens, China is now exporting their HVDC experience, developing projects in

[165] In the deregulated, competitive ERCOT market, generation resources are developed and operated by entities that are independent of the transmission asset owners. Transmission is built by investor-owned utilities, under economic cost tests under the guidance of the Public Utility Commission. Those transmission companies then rate-base transmission costs and receive a regulated rate of return. The costs of generation projects and interconnecting transmission are borne by the generators and not ratepayers.

[166] U.S. Energy Information Admin., Assessing HVDC Transmission for Impacts of Non-Dispatchable Generation (June 2018), https://www.eia.gov/analysis/studies/electricity/hvdctransmission/pdf/transmission.pdf.
[167] Michael Cembalest, *Eye on the Market: High Voltage Direct Current Lines: China Leads U.S. Lags*, J.P. Morgan Annual Energy Report (Apr. 2018), https://www.jpmorgan.com/jpmpdf/1320745265823.pdf.

Egypt, Brazil and Pakistan, and to connect itself to Mongolia, Russia, South Korea, and Japan.[168]
The U.S. struggles to connect its eastern and western power grids and the Trump administration would prefer to leave the nation divided. The middle of the U.S. could launch the country into the forefront of the global clean energy race if we could simply unlock its potential.

Check Boxes Below	
Yes	Is this a modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
NREL's Interconnections Seam Study demonstrated that linking our isolated power grids with point-to-point HVDC lines or a connected HVDC overlay would unlock renewable energy at scale, saving consumers up to $47 billion per year and returning more than $2.50 for every dollar invested.[169]

The U.S. has few existing HVDC lines and only seven converter stations linking the eastern and western grids. The stations have the combined capacity to share 1,300 megawatts, or just 0.1 percent of the more than 950 gigawatts (GW) of power installed, and transect the most plentiful and effective wind and solar resources in the U.S. The challenge is transporting these abundant clean energy sources long distances to areas of high demand -- similar to the challenge of transporting agricultural products from these areas to higher demand markets. Kansas alone could generate more than 3.1 million GWh of wind energy per year,[170] which is enough to power 79% of U.S. electricity consumption.[171]

With projected growth in electric vehicles and additional electrification, the U.S. will need 70 GW to 200 GW of new power generation by 2030. Distributed solar generation will meet some of the incremental load, but utility-scale solar and wind power,

[168] Ashley Feng & Sagatom Saha, *China's Power Move*, Scientific American (Mar. 7, 2018), https://blogs.scientificamerican.com/observations/chinas-power-move/.
[169] Nat'l Renewable Energy Lab'y, Interconnections Seams Study (last visited Oct. 21, 2020), https://www.nrel.gov/analysis/seams.html.
[170] Anthony Lopez et al., Nat'l Renewable Energy Lab'y, U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis (July 2012), https://www.nrel.gov/docs/fy12osti/51946.pdf.
[171] *See* Energy Information Admin., Table 7.6: Electricity End Use (Sept. 2020), https://www.eia.gov/totalenergy/data/monthly/pdf/sec7_19.pdf.

supported by energy storage and transmission, will be critical for electric reliability, resilience, and cost effectiveness.[172]

How the Recommendation Supports Frontline or other Underserved Communities:
Large-scale transmission deployment would provide multiple benefits to underserved communities:
The infrastructure construction process would create immediate jobs. The transmission access would benefit rural communities with renewable resources to be deployed - including vast swaths of America's heartland - and yield millions of dollars in private investment and tax revenue for those communities.

- Some of the oldest and most polluting generators are located in close proximity to underserved communities. Building a more robust transmission infrastructure will allow such generators to be replaced by cleaner, healthier, and less expensive renewable energy generators.

How the Recommendation Supports Biden's Climate Plan:
The climate value of deploying America's untapped renewable resources is well-documented.

Key Battleground State Activity: Due to Texas having a self-contained electricity grid, ERCOT (not under FERC jurisdiction), there have been several recent concerns with the lack of new transmission, specific to Texas.

- In ERCOT, clean energy resources have become increasingly frustrated with lack of transmission to the Panhandle and to West Texas, where solar and wind assets are already in operation or in active development. Lack of transmission limits the ability of clean energy resources to get to load at a price that supports the private capital that was invested in the renewable facilities.

Battleground states of Arizona, Colorado, Iowa, Minnesota, and Nevada are rich in solar and wind energy resources. Expanding the transmission grid would enable these states to benefit from increased investment in solar and wind energy projects, creating jobs and tax revenue for rural communities in these states.

[172] Dr. Jurgen Weiss, J. Michael Hagerty & Maria Castaner, *The Coming Electrification of the North American Economy: Why We Need a Robust Transmission Grid*, The Brattle Group (Mar. 2019), https://wiresgroup.com/wp-content/uploads/2020/05/2019-03-06-Brattle-Group-The-Coming-Electrification-of-the-NA-Economy.pdf.

Deploying Electric Vehicle Charging infrastructure that supports the grid

Opportunity/Problem:

The U.S. needs a resilient energy system that can quickly respond to and recover from major events to keep power flowing to American homes and businesses. EV infrastructure provides a solution.

Recommended Action(s):

- Provide Section 48 Investment Tax Credit directly to energy storage systems used in EV charging, including systems capable of bi-directional charging
- Incentivize 25% of EV charging stations to have resilient charging
- Provide cash incentives (non-competitive grants) for EV charging stations on a "per kW of installed charging capacity"
- Require all EV chargers, whether or not they take advantage of any incentive program, to be free or to allow credit card payment without an app

Program Type:

√ New Program
√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Creates domestic manufacturing and construction jobs, as well as new companies innovating in the space.

Econ. Benefits:

Increases local grid resilience, reducing downtime and economic costs after natural and manmade disasters. Encourages innovations and cost reductions for EV charging, increasing charger access for all people.

Equity Benefits:

Promotes affordable EV charging in underserved communities and reduces traffic pollution. Generates employment opportunities. Reduces carbon emissions.

Climate Plan Tie:

The distribution grid will be able to accept more distributed generation and further electrification of end-use energy, directly contributing to CO_2 reductions.

Battleground State Benefits:

Infrastructure investment across the country will accelerate the adoption of EVs, creating auto industry and EV charging jobs. Auto industry jobs are located in several battleground states (e.g., Michigan, Pennsylvania) and some E-mobility startups are located in the midwest. Other states (e.g., Georgia, Texas) already have efforts underway to increase EVs and EV chargers. States like Texas and Pennsylvania have skilled workforces that can be retrained for EV jobs.

Deploying Electric Vehicle Charging Infrastructure that Supports the Grid

AUTHORS: Jeff Wolfe, Brian Zelis, Vanessa C. Tutos

DATE: 9/19/2020

Statement of Issue and Summary of Recommendations
EVs and charging infrastructure will be key to decarbonizing the American economy. Current technology has made inroads, but it will take policy leadership to encourage greater adoption of the technology, ensuring that the charging infrastructure will serve the dual purpose of convenience (for drivers) and reliability for the electric grid.

Opportunity / Problem Statement:
EV charging infrastructure is expensive and time-consuming to install because of antiquated utility power distribution infrastructure, resulting in unprofitable EV charging stations. To accelerate the electrification of transportation, charging stations must be profitable and better able to leverage America's existing infrastructure instead of building an entirely new infrastructure.

Proposed Recommendations:
1. MODIFICATION OF EXISTING TAX POLICY:
   a. Direct that any energy storage system utilized in an EV charging system is acceptable under existing (or revised) tax code to be eligible for the Section 48 Investment Tax Credit (ITC) regardless of how the energy storage is charged.

b.
2. MODIFICATION TO EXISTING TAX POLICY:
   a. Direct that any EV charging system capable of bi-directional charging is acceptable under existing (or revised) tax code to be eligible for the Section 48 Investment Tax Credit (ITC) regardless of how the energy storage is charged. Create a "manufactured in the US tax incentive" which allows a ramp up in US manufactured content to allow time to build factories without stopping progress.
   b. Include an incentive for any products that are deployed on an EV charging station, including EV chargers, energy storage, and supporting structures.
   c. Provide a small incentive for all manufacturers to employ former oil & gas workers without unfairly incentivizing oil & gas companies over new technology companies to help impacted companies and workers in the energy transition.

Many employees will not require much retraining, and this would give them an opportunity to upskill, benefiting current oil & gas employees and related industries that are declining in many states.

3. Incentivize EV charging stations to have energy storage for resilient charging. Just as gas stations need generators, charging stations need to provide power during a blackout.
    a. Target incentives based on location, including town centers and marked evacuation routes
    b. Set a goal of number of stations and amount of resilience needed along each selected route or area and provide sufficient rolling funds as EVs increase to incentivize the required amount of resilient EV charging
    c. Limit the incentives to chargers with more than 50 kW in charging capacity
    d. Base the incentive level on kWh available per kW of charging capacity
    e. Further incentivize bidirectional charging in these EV charging stations to make it easier to temporarily add storage during disasters

4. Provide cash incentives (non-competitive grants) for EV charging stations on a "per kW of installed charging capacity" basis instead of incentivizing the pieces (does not replace the tax credits in #1, 2, & 3 above).
    a. Do not individually incentivize:
        i. Utility connection work, either in front of or behind the meter
        ii. EV charging equipment
        iii. Energy storage equipment
    b. Set the "per kW" level based on:
        i. A set base incentive of percentage of total installed cost, with a cap. Exclude the cost of any utility work in front of the meter (similar to solar)
        ii. An adder for "Made in America"
            1. An adder to "Made in America" if employing former oil & gas or disadvantaged community employees
        iii. An adder for bi-directional charging capabilities

5. Provide an additional incentive for EV charging stations to have bi-directional charging capabilities associated with on-site storage. This allows a small on-site storage facility to be infinitely expanded by bringing in bidirectional vehicles to feed power into the system, leave to recharge at another location miles away, and return to repeat. Just as we need gas stations to have generators, we need charging stations to

have power during a blackout. This approach allows us to create local resilient sites without having to spend large amounts of money on each site for stationary batteries that are rarely used.

a. We recommend incentivizing additional costs for adding bi-directional functionality at 75% of the added cost (above non-bidirectional charging station costs).
b. The goal is to incentivize equipment and systems capable of bi-directional charging over standalone charging stations that are not capable of bi-directional charging. Coupled with either EV charging or distributed energy resources (DER)s, the capability to use mobile (vehicle) storage as part of the distribution grid creates value.

6. Provide higher incentives (+10%) for charging stations that are available to the public during all operating hours vs. stations that have restricted access (e.g., in a gated community,, in a parking garage with paid parking, at a restricted workplace lot) Public chargers could be located on private land, but they need to allow all users without special access or any cost beyond the cost of the charging.

7. Require all EV chargers, whether or not they take advantage of any incentive program, to be either:
    a. Free to use, OR
    b. Allow credit card payment without an app

Check Boxes Below	
No	Is this a modification of an existing program?
No	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

Recommendations #1 & #2 create construction jobs and pull for equipment which may create manufacturing jobs.[173]

[173] Deployment of energy storage has been largely limited to very large systems and to systems coupled with solar to achieve the Investment Tax Credit. Smaller systems are less economical, but help to unlock additional, non-monetized, benefits at the grid edge. Providing the ITC for energy storage that is not coiled with sufficient storage such as on EV charging stations) will accelerate the deployment. Most storage deployments in the US are currently limited to states with good incentives. Most BGS do not have

Recommendation #3 increases resilience (natural and manmade disasters, electrical, cyber security, and financial) and security in diverse communities.

- By decreasing the cost grid connection requirements for high-speed EV charging, it becomes easier for stations to be installed in DACs which typically have a lower-capacity, weaker, electric utility grid.
- These jobs are necessary to quickly put American know-how to work in reducing EV charging station installed costs and to create new financial models to accelerate EV charging station deployment and profitability. All of this accelerates manufacturing in America to create the products to be deployed[174]
- By providing energy storage at the grid edge in diverse and underserved communities, we can transform grid capabilities in terms of local resilience. Coupling bi-directional charging into existing energy storage-enabled EV charging sites opens up tremendous opportunities for resilience, monetization of available EVs and on-site distributed generation during peak hours, and new commercial models (school buses, off-hour parcel delivery). Incentivizing bi-directional charging stations allows new business models to be created.[175], [176]

Recommendation #4 allows innovation to create the best solution. Typical EV charging incentive programs incentivize utilities to upgrade their existing distribution system in traditional ways. We need to incentivize non-wires alternatives (e.g.,energy storage at charging stations) using the above recommendations. Energy storage at the grid edge also allows more distributed generation to be installed more easily.

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any incentives. Battery market size. Marian Willhun, *Battery Storage Market Will be Worth 13 Billion By 2023*, PV Magazine (May 6, 2019), https://www.pv-magazine.com/2019/05/06/battery-storage-market-will-be-worth-13-billion-by-2023; Robert Wlaton, *Energy Storage Poised to Tackle Grid Challenges From Rising EVs as Mobile Chargers Bring New Flexibility*, UtilityDrive (May 18, 2020), https://www.utilitydive.com/news/energy-storage-poised-to-tackle-grid-challenges-from-rising-evs-as-mobile-c/578106/

[174]" Department of Energy, *Enhancing Grid Resilience with Integrated Storage from EVs*, (June 25, 2018), https://www.energy.gov/sites/prod/files/2018/06/f53/EAC_Enhancing%20Grid%20Resilience%20with%20Integrated%20Storage%20from%20EVs%20%28June%202018%29.pdf.

[175] Douglas Alfaro, *Is the Future of EV Charging Bidirectional?*, Renewable Energy World (April 30, 2020), https://www.renewableenergyworld.com/2020/04/30/is-the-future-of-ev-charging-bidirectional/

[176] Andy Colthorpe, *Microgrids for EV Charging Are a Low Carbon, Resilient, Economically Viable Opportunity*, Energy Storage News (April 30, 2020), https://www.energy-storage.news/news/microgrids-for-ev-charging-are-a-low-carbon-resilient-economically-viable-o.

Recommendation #5 provides incentives to create the ability to integrate mobile (vehicle) batteries into the utility grid to create additional resilience and revenue streams. This will increase the ability to serve underserved communities, further decrease the cost of resilience, and provide additional revenue streams for both EV charging station owners and vehicle owners.[177][178]

Recommendation #6 helps to ensure that stations will be installed where the most vehicle owners will be able to use them and encourages installation in public areas. This will result in higher utilization for deployed stations and can potentially reduce the number of stations needed, as fewer will be installed in restricted areas.[179]

Recommendation #7 facilitates easier access to all chargers for all people and does not require an additional incentive.[180]

How the Recommendation Supports Frontline or other Underserved Communities:

It is imperative that affordable charging facilities be installed in frontline communities, low-income communities, and communities of color that have been underserved. The companies creating the jobs to expand EV infrastructure must ensure recruitment efforts are inclusive. The reduction in traffic pollution and the impact of reducing carbon emissions will greatly benefit underserved communities for well-documented reasons, including the fact that underserved communities are disproportionately sited along our largest highways, ports, and other areas of concentrated vehicle movement.[181]

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[177] Grand View Research, *Electric Vehicle Charging Infrastructure Market Worth $111.75 Billion By 2027*, (February 2020),https://www.grandviewresearch.com/press-release/global-electric-vehicle-ev-charging-infrastructure-market

[178] Kelly McCoy, *WoodMac: 54,000 Electric Trucks on US Roads by 2025*, Greentech Media (August 11, 2020),f https://www.greentechmedia.com/articles/read/woodmac-the-us-will-have-54000-electric-trucks-by-2025

[179] Amanda Meyers, *California Won't Achieve Its New Zero Emission Vehicle Goal Until Multi-Unit Dwellers Can Access Electric Vehicle Charging*, Forbes (September 28, 2020), https://www.forbes.com/sites/energyinnovation/2020/09/28/california-wont-achieve-its-new-zero-emission-vehicle-goal-until-multi-unit-dwellers-can-access-ev-charging/#2f752f9d5ff2

[180] Miles Muller, *California Moves to Make Paying for EV Charging Easier*, NRDC (August 12, 2019), https://www.nrdc.org/experts/miles-muller/california-moves-make-paying-charging-easier

[181] Claudia Boyd-Barrett, *People of Color and the Poor Disproportionately Exposed to Air Pollution Study Finds*, California Health Report (February 8, 2019), https://www.calhealthreport.org/2019/02/08/people-of-color-and-the-poor-disproportionately-exposed-to-air-pollution-study-finds/; Ihab Mikati, et al., *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*,108 American Journal of Public 480 (2018); Chris Ogden, *Poor Most Exposed to Air Pollution Caused by Rich, Study Finds*, Air Quality News (June 19, 2019), https://airqualitynews.com/2019/06/19/poor-most-exposed-to-air-pollution-caused-by-rich-study-finds/.

How the Recommendation Supports Biden's Climate Plan:
The recommendation supports multiple portions of Biden's Climate Plan. Specifically, these recommendations will make the electricity grid more resilient, while also accelerating the adoption of EVs of all sizes to reduce transportation carbon emissions. These recommendations will create thousands of new jobs to manufacture, deploy, and maintain millions of charging points.
This recommendation targets two first-page bullet points:

- Drive to 100% clean and zero-emissions vehicles for the federal government
- Reducing greenhouse gases from transportation

It further targets items in Section I under "Incentivize the deployment of clear technology throughout our economy.":

- "Accelerating the deployment of electric vehicles"
- "Empowering local communities to develop transportation solutions"
- "Enacting a national strategy to develop a low-carbon manufacturing sector in every state, accelerating cutting-edge technologies and ensuring businesses and workers have access to new technologies and skills, with a major focus on helping small and large manufacturers upgrade their capabilities to have both competitive and low-carbon futures"

This recommendation further aligns with Biden's Climate Plan by including significant workforce retraining and redeployment into high-paying clean energy jobs.

Enhancing and expanding the role of EV technology, while also modifying the utility distribution grid to accept more distributed generation and further electrifying end-use energy directly contributes to the nation's economic recovery and its long-term economic and environmental future. The above steps facilitate faster adoption of EV and other electrification strategies than standard utility upgrades.

Key Battleground State Activity: As previously noted, several battleground states are key auto manufacturing states where the auto manufacturers are working to convert to electric vehicles. Those manufacturers need a robust, nationwide EV charging system in order to sell more vehicles. Georgia was an early leader in EV adoption. A return of a reasonable tax credit for EVs would re-energize that market overnight. Houston, Austin, and Dallas are all working to bring more EVs to Texas, as well as more EV manufacturing (as with the new Tesla plant in Austin). EV charging station manufacturing is very similar to the work performed by many oil and gas equipment manufacturers, so can assist with their transition in oil and gas states including Texas, Colorado and Pennsylvania.

off shroeFostering Innovation and Bringing Technologies to Market

Fostering Innovation and Bringing Technologies to Market

Launching a National Energy Innovation Mission and Tripling Federal Funding for Clean Energy Innovation to Fight Climate Change and Support A Million Long-Term Jobs

Opportunity/Problem:

To confront the climate crisis while also building tomorrow's world-leading industries here in the U.S., Vice President Biden should propose tripling annual federal funding for clean energy research, development, & demonstration (RD&D) to $25 billion by 2025, laying the groundwork for at least one million jobs over the long term. This memo summarizes a new book from Columbia University, *Energizing America*[182], which lays out a detailed five-year roadmap and a 100-day plan for the next administration to jumpstart a National Energy Innovation Mission.

Recommended Action(s):

- The federal government should raise clean energy RD&D funding to $25 billion by 2025 (Fiscal Year 2026), or roughly 0.1% of GDP.
- In the first 100 days, President-elect Biden should issue a Presidential Policy Directive (PPD) launching a National Energy Innovation Mission. (See Appendix for draft PPD). The President-elect's first budget proposal to Congress (for fiscal year 2022) should increase funding for clean energy RD&D by 30 percent to $11.7 billion (a detailed breakdown is in the Appendix)

Program Type:

√ Program Modification

Authority:

√ Requires New Legislation

Job Benefits:

Tripling federal funding for clean energy RD&D can support at least a million jobs over the long run. Overall, federal RD&D investments create 2.7 indirect jobs for every direct job funded, and the average income across all jobs induced by federal RD&D spending is $77,000 per person.

[182] Varun Sivaram,et al., Energizing America: A Roadmap to Launch a National Energy Innovation Mission, Columbia University Center on Global Energy Policy (2020), https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/EnergizingAmerica_FINAL_DIGITAL.pdf.

Launching a National Energy Innovation Mission and Tripling Federal Funding for Clean Energy Innovation to Fight Climate Change and Support A Million Long-Term Jobs

Econ. Benefits:

Investments in clean energy innovation have a proven track record of delivering long-term economic growth. Decades of federal funding for wind energy RD&D have produced economic benefits that outweigh costs by a factor of 18. Public grants to innovative energy startups have increased their patenting activity, revenue, and survival rate. Public investments in clean energy innovation are better for the economy than those in dirty technologies such as coal power; in fact, investments in some clean energy technologies such as carbon capture can deliver a bigger return to the U.S. economy than investments in biotechnology and artificial intelligence.

Equity Benefits:

As the productivity of a workforce rises as a result of innovation spending, wages for less-skilled workers rise twice as fast as those of high-skilled workers.

Climate Plan Tie:

The Biden Climate Plan calls for a $400 billion investment in clean energy innovation over ten years. This plan is entirely consistent with that pledge and would invest $90 billion over five years in clean energy RD&D.

Battleground State Benefits:

Investments in clean energy innovation will benefit economic development in MI, WI, PA, NC, AZ, and FL by supporting demonstration projects such as carbon capture, use, and sequestration technology, boosting funding for national laboratories, and supporting advanced manufacturing and local economies.

Launching a National Energy Innovation Mission and Tripling Federal Funding for Clean Energy Innovation to Fight Climate Change and Support A Million Long-Term Jobs

AUTHORS: Varun Sivaram

DATE: September 17th, 2020

Statement of Issue and Summary of Recommendations:
To confront the climate crisis while also building tomorrow's world-leading industries here in the U.S., Vice President Biden should propose tripling annual federal funding for clean energy research, development, & demonstration (RD&D) to $25 billion by 2025, laying the groundwork for at least one million jobs over the long term. This memo summarizes a new book from Columbia University, *Energizing America*, which lays out a detailed five-year roadmap and a 100-day plan for the next administration to jumpstart a National Energy Innovation Mission.[183]

Investing in clean energy innovation is the primary way that the U.S. can promote clean energy transitions around the world, which is critical given that U.S. emissions alone account for less than 15 percent of the global total. Moreover, the U.S. risks losing out to China and other countries in the global race to capture market share of growing clean energy technology markets. Investments in innovation at home can boost U.S. competitiveness abroad.

Recommendations for a Biden Administration

- **100-Day Plan**
  - **President-elect Biden should issue a Presidential Policy Directive** (PPD) launching a National Energy Innovation Mission (see Appendix for draft PPD).

[183] Varun Sivaram,et al., *Energizing America: A Roadmap to Launch a National Energy Innovation Mission*, Columbia University Center on Global Energy Policy (2020), https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/EnergizingAmerica_FINAL_DIGITAL.pdf.

  - The PPD should **establish a White House Task Force** on Energy Innovation to develop a National Energy Innovation Strategy and speed implementation.
  - The President-elect's first budget proposal to Congress (for fiscal year 2022) should **increase funding for clean energy RD&D by 30 percent** to $11.7 billion (a detailed breakdown is in the Appendix).
  - The Biden-Harris Administration should **reassert U.S. international leadership in energy innovation** by recommitting to Mission Innovation and strengthening bilateral collaboration with key partners.
- **Five-year Roadmap**
  - The federal government should **raise clean energy RD&D funding to $25 billion by 2025** (Fiscal Year 2026), or roughly 0.1% of GDP.
  - This National Energy Innovation Mission should **prioritize ten Technology Pillars**, detailed in this memo, that each meet a critical decarbonization need.
  - Policymakers should **diversify funding** across topics, stages of innovation, federal agencies, research partners, and regions of the U.S.

Opportunity / Problem Statement:
Without new and improved clean energy technologies, the world will not meet the ambitious climate targets set out in the Paris Agreement. Although renewable energy is growing rapidly around the world, 40 out of 46 critical clean energy technologies are "not on track."[184] Half the needed reductions for a swift transition to net-zero emissions must come from technologies that are not yet commercially available.[185]

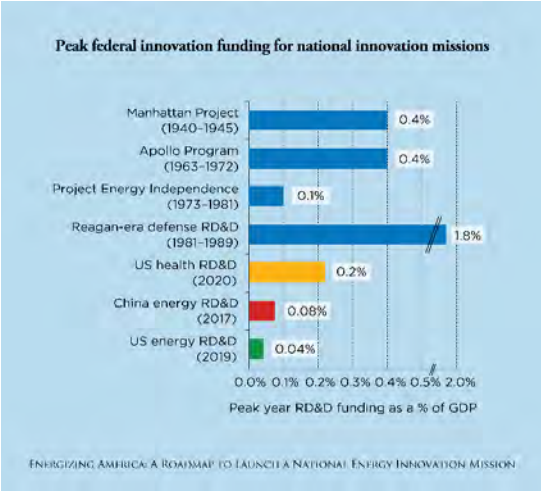
The various energy-using sectors of the economy need innovative technologies. In electricity, clean power from solar and wind farms is growing rapidly, but the sector will need improved storage and grid technologies to integrate vast amounts of intermittent renewable energy. Outside of electricity, which accounts for only a quarter of U.S. greenhouse gas emissions,[186] other sectors need even more innovation. In transportation, electric passenger vehicles that can be powered by renewable energy are increasingly cost-competitive, but heavy trucks, ships, and planes need new clean fuel technologies. In industry, carbon capture and hydrogen technologies will be critical to cleaning up industrial processes. We will also need new technologies to remove carbon dioxide directly from the atmosphere, including direct air capture and advances in

[184] International Energy Agency, *Tracking Clean Energy Progress*,, (2020), https://www.iea.org/topics/tracking-clean-energy-progress.
[185] International Energy Agency, *Energy Technology Perspectives, 2020*, (September 2020), https://www.iea.org/topics/energy-technology-perspectives.
[186] Environmental Protection Agency, Sources of Greenhouse Gas Emissions, 2018, https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.

agriculture. We will require advanced digital technologies and artificial intelligence to operate the complex clean energy systems of the future—from power grids to smart cities.

Today, the U.S. federal government invests less than $9 billion per year on clean energy innovation, less than a quarter of what it invests in health innovation, and less than a tenth of what it invests in defense innovation. As a percentage of GDP, the U.S. government spends just half of what China's government does on clean energy RD&D, and China is rapidly increasing its investments to capitalize on growing economic opportunities (Figure 1).

Figure 1[187]:



The current level of funding leaves glaring gaps for critical technologies, innovators, and stages of the innovation process. Today, nearly half of federal funding supports clean electricity technologies, neglecting the three-quarters of U.S. emissions from buildings, industry, agriculture, and transportation systems. The U.S. Department of Energy (DOE), which accounts for an estimated 80 percent of clean energy RD&D based on analysis of federal agencies' fiscal year 2020 enacted budgets,[188] mostly funds federal research laboratories, while universities, start-ups, and established firms have abundant capacity to translate increased federal funding into rapid technological progress. And federal funding for energy technology demonstration projects—which are critical to attracting private financing to scale up emerging technologies—has dropped over the last decade to nearly zero.

[187] Adapted from Varun Sivaram, et al., *supra* note 183, with underlying data from Third Way and the Breakthrough Institute.
[188] Varun Sivaram, et al., *supra* note 183, pp. 43-5; see Appendix 2 for a FY20 federal budget breakdown.

Fostering Innovation And Bringing Technologies To Market

Clean energy should be the focus of the next U.S. national innovation mission. Previous innovation missions have been wildly successful—both in their direct objectives, such as putting a man on the Moon, and in their spillover benefits to the economy, such as spawning the semiconductor industry and the Internet.

Proposed Recommendation:

x	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

The President-elect should launch a National Energy Innovation Mission. Tripling energy RD&D funding to $25 billion over the first term would raise the level of support to nearly 0.1% of GDP—on a par with competitors such as China, though still well short of the funding level for other priorities such as health innovation (Figure 1). An array of research shows that firms and research institutions can absorb a dramatic expansion of government investment in energy RD&D without decreasing the effectiveness of that funding to generate new research output.[189] Nevertheless, it would be prudent not to risk increasing funding beyond the federal government's capacity to wisely allocate new taxpayer dollars. Figure 2 presents a realistic proposal for federal government agencies to ramp up funding for clean energy RD&D to $25 billion by Fiscal Year 2026 (which starts Oct. 1, 2025).[190]

100-Day Plan:

- President-elect Biden should issue a Presidential Policy Directive (PPD) launching a National Energy Innovation Mission (draft PPD is included in the Appendix).
- The PPD should establish a White House Task Force on Energy Innovation to develop a National Energy Innovation Strategy and speed implementation. This Task Force should have representation from more than a dozen federal agencies that will be involved with the funding ramp-up; DOE should staff a secretariat to provide analytical support to the Task Force.

[189] David Popp, *Economic analysis of scientific publications and implications for energy research and development*, Nature Energy (2016), https://www.nature.com/articles/nenergy201620.

[190] Figure 2 was assembled by considering the capacity of each federal agency to rapidly increase funding for clean energy innovation. No single agency's overall budget should rise too quickly, taking into account lessons from history such as the doubling of the NIH budget from 1998 to 2003. The largest funder of clean energy innovation, DOE, is capable of doubling its clean energy R&D budget, in line with bipartisan proposals. Other agencies—from NASA to NSF to DOD—have the capacity to increase their funding at a faster pace because clean energy RD&D currently represents a fraction of their enormous investments in innovation. Finally, the federal government should develop new ways to rapidly increase funding for large-scale energy demonstration projects and take advantage of existing authorities (e.g., DOE Loan Programs Office; DOD demonstration and validation programs).

- The President-elect's first budget proposal to Congress (for fiscal year 2022) should increase funding for clean energy RD&D by 30 percent to $11.7 billion across ten technology pillars that each address a critical need for deep decarbonization. As Figure 3 indicates, President-Elect Biden's first budget proposal to Congress should reserve the largest funding increases to the Technology Pillars that are most underfunded today.[191]
- The Biden-Harris Administration should reassert U.S. international leadership in energy innovation by recommitting to Mission Innovation and strengthening bilateral collaboration with key partners.

Figure 2[192]:

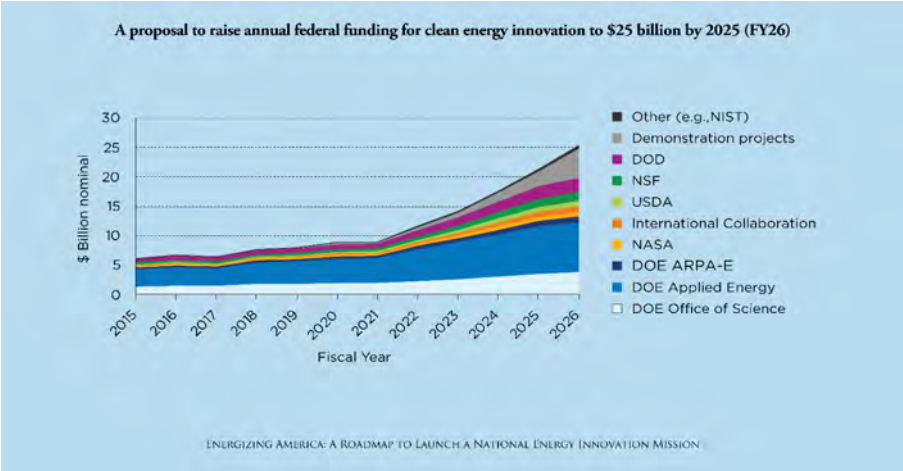
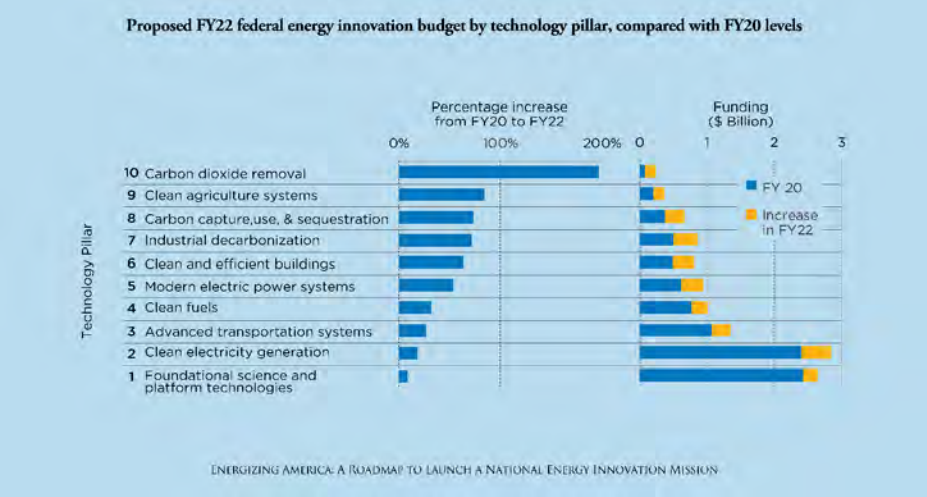


Figure 3[193]:

[191] The ten technology pillars group clean energy technologies together based on distinct functions. For example, renewable and nuclear power are grouped together within the clean electricity generation pillar. Energy storage and energy efficiency technologies are distributed across multiple pillars because they serve multiple functions. This organizational approach places the focus on achieving ends, which is what ultimately matters for deep decarbonization.
[192] Adapted from Varun Sivaram, et al., *supra* note 183.
[193] Adapted from Varun Sivaram, et al., *supra* note 183.



How Recommendation Creates Jobs, Improves Economy, & Addresses Climate Change:

The long-term nature of this downturn, combined with today's very low cost of government borrowing, strengthen the case for considering government investments like RD&D that pay economic dividends over a longer term.

U.S. economic competitors abroad are already following this playbook. For example, in the nascent but promising area of hydrogen energy technology, both China and Germany have announced multi-year investment packages in RD&D, hoping to capture lucrative new energy markets.[194] The U.S is poised to compete, not only in hydrogen, but also in advanced transportation, carbon capture, digital energy technologies, and more. But public investments are needed to boost competitiveness.

Investments in clean energy innovation have a proven track record of delivering long-term economic growth. Decades of federal funding for wind energy RD&D have produced economic benefits that outweigh costs by a factor of 18.[195] Public grants to innovative energy startups have increased their patenting activity, revenue, and survival rate.[196] And public investments in clean energy innovation are better for the economy than those in dirty technologies such as coal power; in fact, investments in some clean energy technologies, such as carbon capture, can deliver a bigger return to the U.S. economy than investments in biotechnology and artificial intelligence.[197]

[194] International Energy Agency, *World Energy Investment Report*, (2020), https://www.iea.org/reports/world-energy-investment-2020/rd-and-technology-innovation.
[195] Riser Wiser & Dev Millstein, *Evaluating the economic return to public wind energy research and development in the United States*, Applied Energy (March 2020), https://www.sciencedirect.com/science/article/pii/S0306261919321373.
[196] Sabrina T. Howell, Financing Innovation: Evidence from R&D Grants, American Economic Review (April 2017), https://pubs.aeaweb.org/doi/pdfplus/10.1257/aer.20150808.
[197] James Rydge, et al.,*Seizing opportunities from technological change and the transition to a low-carbon economy*, London School of Economics Grantham Institute (December 2018),

Tripling federal funding for clean energy RD&D can support at least a million jobs over the long run. Public investments in innovation, particularly when targeted at cultivating regional industrial clusters, boost long-term employment. A conservative estimate is that it takes $25,000 of annual government spending on RD&D to create and sustain each job—some analyses even estimate that the cost is ten times lower.[198] Using this conservative estimate, **an annual level of funding of $25 billion by 2025 for clean energy innovation will support one million jobs that will phase in over the following decade.**

To avoid the outsourcing of industry and production based on domestically developed technology, the federal government should pair funding for early-stage research with funding for later-stage development and demonstration, support for advanced manufacturing, and access for private firms to federal laboratories and other user facilities. In addition, government policies to rapidly deploy clean energy and create domestic markets for emerging technologies can also bolster domestic industries and support local jobs.[199]

How the Recommendation Supports Frontline or other Underserved Communities:

Over the first term of a Biden-Harris administration, the new jobs created by public RD&D investments will likely be concentrated among highly educated workers. But over the subsequent decade, more and better-paid jobs will become available for a much broader set of workers as innovative firms raise the economic productivity of industrial clusters. As the productivity of a workforce rises, wages for less-skilled workers rise twice as fast as those of high-skilled workers.[200] Overall, federal RD&D investments create 2.7 indirect jobs for every direct job funded, and the average income across all jobs induced by federal RD&D spending is $77,000 per person.[201] The benefits of investments in innovation, if made according to this plan, will be pronounced in socioeconomically underserved communities.

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https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/12/Sustainable-Growth-in-the-UK_Full-Report_78pp.pdf; Antoine Dechezlepretre et al., *Knowledge Spillovers from Clean and Dirty Technologies*, London School of Economics Grantham Institute, (October 2017), https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2013/10/Working-Paper-135-Dechezlepretre-et-al_updateOct2017.pdf.

[198] J. Gruber & S. Johnson, *Jump-starting America: How Breakthrough Science Can Revive Economic Growth and the American Dream*. PublicAffairs. 2019.

[199] Varun Sivaram et al., *Energy Innovation Policy: Priorities for the Trump Administration and Congress*, ITIF (December 2016), http://www2.itif.org/2016-energy-innovation-policy.pdf.

[200] *Id.*

[201] Breakthrough Energy, *Impacts of Federal R&D Investment On the US Economy*, (September 2020), https://www.breakthroughenergy.org/reports/RandD-Impact.

How the Recommendation Supports Biden's Climate Plan:
This recommendation is directly in line with the Biden Climate Plan's commitment to "make the largest-ever investment in clean energy research and innovation." The plan calls for a $400 billion investment in clean energy innovation over ten years. This plan is consistent with that pledge and would invest $90 billion over five years in clean energy RD&D.

Key Battleground State Activity:
Launching a National Energy Innovation Mission and tripling funding for clean energy innovation to $25 billion by 2025 will provide both immediate and lasting economic benefits to battleground states including MI, WI, PA, NC, AZ, and FL.[202] Each of these states already have thriving clean energy technology industries, projects, and research clusters, and federal funding could boost:

- Carbon capture, use, and sequestration projects that are under development or whose sponsor companies are from AZ, PA, FL, MI, and NC.
- Advanced manufacturing (manufacturing employs more than 10 percent of the workforce of MI, WI, and NC, and close to 10 percent of the workforce in PA).
- Universities and federal laboratories in battleground states, such as Carnegie Mellon in PA that benefits from the Manufacturing PA Innovation Program, and the M-WERC Energy Innovation Center in WI.

[202] Josh Freed & Jackie Toth, *Battleground States Climate and Energy Policies*, Third Way (April 24, 2020), https://www.thirdway.org/memo/battleground-state-climate-and-energy-policies.

Appendix 1: Draft PPD

Presidential Policy Directive: National Energy Innovation Mission

This Presidential Policy Directive launches a National Energy Innovation Mission to fight climate change and promote US competitiveness.

Introduction

Clean energy innovation is in the United States' national interest. It is central to meeting the challenge of climate change and creates huge opportunities for the United States in the growing global market for clean energy technologies.

The United States is home to the world's best and largest innovation system. Our universities, national laboratories, companies, and other institutions have unrivaled capabilities for innovation breakthroughs.

In prior decades, federal investment led to world-changing innovations, including life-saving drugs, the Internet, and solar photovoltaic cells. Federal investments in clean energy innovation can deliver significant returns.

Policy

This directive establishes clean energy innovation as a core national priority and launches a government-wide mission to promote clean energy innovation. It sets a goal of increasing federal funding for clean energy innovation to $25 billion per year by Fiscal Year 2026 (October 1, 2025–September 30, 2026). The directive defines the roles and responsibilities of federal agencies and offices in achieving that goal and promoting clean energy more broadly.

Roles and Responsibilities

1. A White House Task Force on Energy Innovation is hereby established. The Task Force will be co-chaired by the Director of the OMB and Assistant to the President with principal responsibility for climate change.

2. Members of the Task Force will include the Secretary of Energy, the Secretary of State, Secretary of Defense, Secretary of Agriculture, Secretary of Transportation, Secretary of Commerce, Secretary of the Treasury, Secretary of the Interior, Administrator of the Environmental Protection Agency, Administrator of NASA, Director of the National Science Foundation, Director of the Office of Science and

Technology Policy, US Trade Representative, Chair of the Council of Economic Advisors and Chair of the Council on Environmental Quality.

3. The Secretary of Energy will serve as Agency Lead of the Task Force, providing strategic guidance on energy innovation to Task Force members and maintaining a small secretariat at the US Department of Energy to support the work of the Task Force. The Secretary of Energy will draft a national energy innovation strategy for consideration by the Task Force by no later than May 31, 2021.

4. The Task Force will review the national energy innovation strategy drafted by the Secretary of Energy and submit a final strategy to the President no later than July 31, 2021.

5. Each federal agency or office on the Task Force will (i) prepare plans to invest in clean energy innovation in line with the agency's mission, and (ii) report to the President annually on its progress in promoting clean energy innovation on or before the anniversary of this directive.

6. The Task Force will meet at least quarterly to facilitate inter-agency collaboration on clean energy innovation, coordinate agency budgets, embed the National Energy Innovation Mission in official documents, and help remove obstacles to swift implementation.

7. This directive establishes a Federal Advisory Committee on Energy Innovation. Members will be appointed by the President based on recommendations from Task Force members. The Advisory Committee will meet with the Task Force at least twice each year.

Review

Together with their annual reports in 2024, each member of the Task Force will submit an assessment of the mechanisms established under this directive, together with recommendations for refinement or improvement in the years ahead.

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President of the United States

Appendix 2: Recommended Bide-Harris Administration Budget Proposal for FY22

Proposed FY 2022 Funding for Clean Energy RD&D by Federal Agency and Office/Organization ($ millions)				
Funding Agency	**Funding Office/Organization**	**FY 2020 Est.**	**FY 2022 Proposed**	**% Increase**
Department of Energy	**Energy Efficiency and Renewable Energy (EERE)**	**2,228**	**2,682**	**20%**
	Vehicle Technologies Office (EERE/VTO)	396	488	
	Bioenergy Technologies Office (EERE/BETO)	260	320	
	Hydrogen & Fuel Cell Technologies Office (EERE/FCTO)	150	185	
	Solar Energy (EERE/SETO)	280	303	
	Wind Energy (EERE/WETO)	104	113	
	Water Power (EERE/WPTO)	148	160	
	Geothermal Technologies Office (EERE/GTO)	110	170	
	Advanced Manufacturing Office (EERE/AMO)	350	432	
	Building Technologies Office (EERE/BTO)	230	301	
	Office of Carbon Management (CM)*	**472**	**812**	**72%**
	Carbon Capture (Power and Industrial)	115	300	
	Carbon Utilization	21	25	
	Carbon Storage	79	120	
	Advanced Energy Systems/Crosscutting	123	150	
	Negative Emissions Technologies (new office)	--	75	
	Methane Leak Detection and Mitigation	18	22	
	Office of Nuclear Energy (NE)	**1,493**	**2,028**	**36%**
	Versatile Test Reactor	65	450	
	Reactor Concepts RD&D	102	163	
	Fuel Cycle R&D	305	255	
	Advanced Reactor Research, Development, and Demonstration	330	520	
	Office of Electricity (OE)	**190**	**520**	**174%**
	Office of Science (SC)	**2,151**	**2,572**	**20%**
	Advanced Scientific Computing Research (SC/ASCR)	173	200	
	Biological and Environmental Research (SC/BER)	451	523	
	Basic Energy Sciences (SC/BES)	661	766	
	Fusion Energy Sciences (SC/FES)	671	740	
	Advanced Research Projects Agency-Energy (ARPA-E)	**425**	**516**	**21%**
	Subtotal, DOE	**6,959**	**9,130**	**31%**
Department of Agriculture	Agriculture Advanced Research and Development Authority (AGARDA)		50	
	Agricultural Research Service (ARS)	99	158	
	NIFA Agriculture and Food Research Initiative (NIFA/AFRI)	106	169	
	Subtotal, USDA	**205**	**377**	**83%**
Department of Defense	U.S. Army Research Laboratory (ARL)	155	202	
	U.S. Naval Research Laboratory (NRL)	97	127	
	U.S. Air Force	254	332	
	Other (Defense-Wide, DARPA, ESTCP)	298	391	
	Subtotal, DOD	**804**	**1,053**	**31%**
NASA		**339**	**394**	**16%**
National Science Foundation	Biological Sciences (BIO)	54	75	
	Computer and Information Science and Engineering (CISE)	24	34	
	Engineering (ENG)	156	219	
	Directorate for Mathematical and Physical Sciences (MPS)	162	227	
	Other NSF	21	29	
	Subtotal, NSF	**417**	**584**	**40%**
Other (NIST, NOAA, USGS, FHWA, EPA-ORD)		**169**	**221**	**31%**
Total	**N/A**	**8,894**	**11,758**	**32%**

*This is the proposed new name for the current Office of Fossil Energy

FY 2020 funding levels for non-DOE programs are estimates of the portion of funding that goes to clean energy / clean agriculture. Agency and Office totals include estimates of program direction and RD&D facilities (not shown in the table) and may be greater than the sum of RD&D programs.

Direct Air Capture, Carbon-to-Value & Negative Emissions

Opportunity/Problem:

Multiple independent studies have identified that Direct Air Capture (DAC) technology will be essential for the globe and the U.S. to decarbonize in time to limit warming to 1.5°C or 2°C. The U.S. can be the global leader in the development, manufacturing, and deployment of DAC technologies, which can create a whole new U.S. industry with the potential for more than 1.35 million high-quality, good-paying jobs, turning the biggest threat we'll face in our lifetime into one of the biggest opportunities as we transition to a sustainable circular economy.

Recommended Action(s):

- Provide direct financial support for and enable financing of first-of-a-kind DAC projects
- Establish a coordinated, cross-agency federal RD&D carbon removal strategy with private-sector engagement
- Leverage federal procurement and standards to create markets for DAC services and products made from CO2 captured from DAC

Program Type:

√ Program Modification

Authority:

√ Requires New Legislation

Job Benefits:

Full-scale deployment of DAC technologies, including the equipment and manufacturing for DAC plants, is estimated to create between 600,000 to 1.35 million jobs by 2050. As use of fossil fuels declines, ramping up DAC can help provide a bridge for fossil fuel workers and communities into the clean energy economy of the future.

Econ. Benefits:

The U.S. demand for industrial equipment for DAC could reach over $1 billion by 2030, and up to $259 billion by 2050, and the U.S. total available market for products that could feasibly be made from DAC-sourced carbon is estimated to be over $1 trillion dollars per year.

Direct Air Capture, Carbon-to-Value & Negative Emissions

Equity Benefits:

Because CO2 is distributed equally in the air and is not contaminated with the pollutants associated with fossil-based sources of carbon, the benefits of a robust DAC-enabled circular carbon economy can be more equitably distributed, while the negative impacts of the fossil economy on frontline communities can be significantly mitigated.

Climate Plan Tie:

Achieving the Biden Climate Plan goal of net-zero emissions by 2050 will not be possible without significantly scaling up DAC deployment and associated carbon storage and utilization.

Battleground State Benefits:

Many battleground states (e.g., TX, CO, MI, OH, PA, GA, NC, MN, and NV) would benefit from job creation, economic development, and job preservation related to DAC, including from CO2 storage infrastructure, low-emission concrete factories, and new carbon-to-value industries.

Direct Air Capture, Carbon-to-Value, and Negative Emissions

AUTHORS: Nicholas Moore Eisenberger, Abigail Regitsky, Mike Weiner, Preeti Kanther

DATE: August 15th, 2020

Statement of Issue and Summary of Recommendations

According to the most recent UN IPCC 1.5 Degree Report, scientists estimate that we must remove approximately 100–1,000 Gt of carbon dioxide (CO_2) from the atmosphere by 2100 to prevent dangerous changes to the earth's climate.[203] Multiple independent studies[204] have identified that Direct Air Capture (DAC) technology will be essential for the globe and the U.S. to achieve net-zero emissions in time to limit warming to 1.5°C or 2°C – even assuming highly ambitious rates of vehicle electrification, building and industry efficiency improvements, a net-zero emission power sector, and significant carbon removal from enhanced natural sequestration.

The world is already behind in developing the necessary DAC capacity to avoid exacerbated climate-related damages. Further delay will increase the amount of CO_2 that needs to be removed and shorten the time available to remove it; thus, the four years of a Biden-Harris administration are absolutely critical to begin mobilizing our nation and the world. Mobilizing to scale DAC will help the U.S. recover from the global pandemic by leveraging and preserving U.S. energy industry expertise, including infrastructure, innovation, and manufacturing leadership, and creating new sustainable circular industrial sectors. It also represents an excellent opportunity for the U.S. to enhance its international leadership, since global cooperation will likely be necessary for accelerating RD&D activities to increase DAC capacity in time to avert the dangers of increased climate change.

The U.S. can be *the* global leader in the development, manufacturing, and deployment of DAC technologies, which can create a whole new U.S. industry with the potential for more than 1.35 million high-quality, good-paying jobs, many of which build upon

[203] IPCC, *Special Report: Global Warming of 1.5C*, (2018), https://www.ipcc.ch/sr15/

[204] See John Larsen et al., *Capturing Leadership: Policies for the US to Advance Direct Air Capture Technology, Rhodium Group (May 9, 2019), https://rhg.com/research/capturing-leadership-policies-for-the-us-to-advance-direct-air-capture-technology/*. and James Mulligan et al., *Carbonshot: Federal Policy Options for Carbon Removal in the United States*, World Resources Institute (January 2020), . https://wriorg.s3.amazonaws.com/s3fs-public/carbonshot-federal-policy-options-for-carbon-removal-in-the-united-states_1.pdf.

skillsets of oil and gas workers and provide employment growth in the manufacture of steel, cement, and chemicals.[205]

To take advantage of this opportunity and build a domestic DAC industry at the scale and pace needed to reach net-zero emissions no later than 2050, we recommend the following policies:

- Provide direct financial support for and enable financing of first-of-a-kind DAC projects.
- Establish a coordinated, cross-agency federal RD&D carbon removal strategy with private-sector engagement.
- Leverage federal procurement and standards to create markets for DAC services and products made from CO_2 captured from DAC.

Opportunity / Problem Statement

In addition to enhancing biological and geological carbon removal processes, technological DAC – a key enabling technology for a broad spectrum of carbon removal and carbon mitigation solutions, from geologic sequestration to durable carbon-to-value products and materials – must rapidly be deployed at scale for the U.S. and the globe to limit warming to 1.5°C or 2°C. Fortunately, transitioning from a fossil-based carbon economy to an air-based circular carbon economy has the potential to leverage and preserve U.S. energy, technology, and manufacturing leadership, help the U.S. recover from the global pandemic, and create whole new sustainable industrial sectors in the U.S. for the long term.[206] This positive vision is fully achievable and already in motion, with growing entrepreneurial, corporate, capital market, academic, and state and federal interest and activities in DAC.[207] There are already several U.S.-based DAC companies

[205] John Larsen et al., *Capturing New Jobs*, Rhodium Group (June 23, 2020), https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Jobs-Employment-Opportunities-from-DAC-Scale-Up.pdf.

[206] See, e.g., Rory Jacobson & Matt Lucas, *A Review of Global and U.S. Total Available Markets For Carbontech*, Carbon180 (2020), https://static1.squarespace.com/static/5b9362d89d5abb8c51d474f8/t/5c0028d270a6ad15d0efb520/1543514323313/ccr04.executivesummary.FNL.pdf; John Larsen et al., *Capturing Leadership: Policies for the US to Advance Direct Air Capture Technology, Rhodium Group (May 9, 2019), https://rhg.com/research/capturing-leadership-policies-for-the-us-to-advance-direct-air-capture-technology*

[207] See, e.g. Department of Energy, *Department of Energy Awards $13.5 Million for Direct Air Capture Research, (Augusts 18, 2020), https://www.energy.gov/articles/department-energy-awards-135-million-direct-air-capture-research ;*,ExxonMobil, *ExxonMobil and Global Thermostat to advance breakthrough atmospheric carbon capture technology*, (June 27, 2019), https://corporate.exxonmobil.com/News/Newsroom/News-releases/2019/0627_ExxonMobil-and-Global-Thermostat-to-advance-breakthrough-atmospheric--carbon-capture-technology; Global Newswire, *Oxy Low Carbon Ventures, Rusheen Capital Management create development company 1PointFive to deploy Carbon Engineering's Direct Air Capture technology, (August 19, 2020) , https://www.globenewswire.com/news-release/2020/08/19/2080502/0/en/Oxy-Low-Carbon-Ventures-Rusheen-Capital-Management-create-development-company-1PointFive-to-deploy-Carbon-Engineering-s-Direct-Air-Capture-technology.html.*; Greentown Labs, *Urban Future Lab, Greentown Labs, and the Fraunhofer USA TechBridge Program Announce the Carbon to Value Initiative,* (July 16, 2020), https://greentownlabs.com/announcing-the-carbon-to-value-initiative/.

with initial deployments and scale-up partnerships with large U.S.-based energy, infrastructure, engineering companies, and leading universities and state and federal agencies. While the CO_2 capture costs of the initial deployments are relatively high, the projected cost of DAC at scale is ***not*** considered to be a significant issue,[208] with a cost curve pathway to commercial viability that is shorter and more rapid than solar, a jobs creation potential that could be significantly larger, and a carbon removal capability that can scale to hundreds of millions to billions of tons annually in the U.S. alone.

Proposed Recommendations

Check Boxes Below	
x	Is this a new or modification of an existing program?
	Does this roll back a Trump Administration regulation?

1. Provide direct financial support for and enable financing of foundational DAC projects.

Refine the Section 45Q Tax Credit: The 2018 revisions to the Section 45Q tax credit for carbon dioxide sequestration were designed to help spur the development and deployment of carbon capture, utilization, and storage (CCUS) projects in the U.S[209]. The revision also defined direct air capture projects as eligible for the first time. We recommend that the Biden-Harris administration support an elective direct pay mechanism for the Section 45Q tax credit, which would enhance monetization of the credit for taxpayers by allowing them to receive a direct payment from the U.S. treasury in lieu of the credit. This will allow project developers to finance projects without needing to turn to tax equity markets, which may be impacted in the short- and medium-term by the COVID-19 pandemic, making it more likely that the first generation of significant DAC projects can be deployed quickly enough to assist with economic recovery (there are several first-of-a-kind DAC demonstration projects in the U.S. and around the world, but total deployments are still in the thousands of tons per year).[210] There is precedent for providing such a benefit, as Congress provided a similar mechanism to direct pay for renewable energy projects through the 2009 American Recovery and Reinvestment Act with great success. The Biden-Harris administration could also consider encouraging Congress to enact revisions to the Section 45Q tax credit that would benefit DAC (as recommended by the Rhodium Group)[211] including extending the commence construction deadline for the credit from 2024 to 2030, increasing the value of the credit for geologic storage to $180/ton, and lowering the minimum capture and use thresholds to accommodate smaller DAC projects.

[208] National Academy, *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda, (2019), https://www.nap.edu/read/25259/chapter/7*
[209] Carbon Capture Coalition, *45Q Legislation*, (2018), https://carboncapturecoalition.org/45q-legislation/.
[210] IEA, Direct Air Capture – Analysis, (June 2020), https://www.iea.org/reports/direct-air-capture.
[211] *Supra* note 206.

Make DAC Projects Eligible for DOE Title XVII Loan Guarantees: In the near-term, and particularly during the post-pandemic recovery, capital-intensive, first-of-a-kind DAC projects may have difficulty accessing private financing from lending institutions. We recommend that the Biden-Harris Administration encourage Congress to make DAC projects eligible for the Title XVII Loan Program facilitated by the U.S. Department of Energy (DOE), which can provide a loan guarantee up to 80% of a project's cost that is the subject of the loan.[212] Because the federal government assumes the debt on the loan, a loan guarantee would help DAC project developers find tax equity partners to monetize the Section 45Q tax credit and/or otherwise secure private financing. The Biden-Harris administration should also request that Congress provide additional appropriations to the program to reduce application fees, third-party advisor fees, and credit subsidy costs, which are barriers that discourage use of the program.[213]

Make DAC Projects Eligible for Additional Financing Mechanisms: Outside of direct tax incentives, there are several financing mechanisms that could benefit DAC projects including master limited partnerships (MLPs) and private activity bonds (PABs). MLPs, which combine the tax advantages of a partnership structure with stock market access and liquidity typically available only to corporations, have been used to fund over $500 billion of energy-related infrastructure in the U.S.[214] Creating MLP eligibility for DAC would reduce the cost of equity and make cheaper capital more available for project financing. The Biden-Harris administration should encourage Congress to expand MLP eligibility to include DAC projects by passing the Financing our Energy Future Act (S. 1841 / H.R. 3249), which has bipartisan support in both chambers of Congress.

Tax-exempt PABs are another effective tool to help DAC projects attract financing by allowing projects to access lower interest rates and more favorable and flexible borrowing terms.[215] The Carbon Capture Improvement Act (S. 1763 / H.R. 3861) would make point-source carbon capture projects eligible for PABs. The Biden-Harris administration should encourage Congress to expand that language to include DAC projects and push for its enactment.

Pursue 30% ITC for DAC Projects: The Biden-Harris administration should encourage Congress to pursue a 30% investment tax credit (ITC) for DAC projects similar to that provided for solar photovoltaics and other renewable energy projects.

2. Establish a coordinated, cross-agency federal RD&D carbon removal strategy. The strategy should include private-sector engagement funded at $10.7 billion over 10 years across 10 federal agencies, in line with recommendations from the

[212] 42 U.S.C. § 16512(c) (2017).
[213] Bipartisan Policy Center, *New Opportunities to Spur Economic Recovery Bolstering Successful Financing Tools at DOE's Loan Programs*, (April 2020), https://bipartisanpolicy.org/wp-content/uploads/2020/04/LPO-Recommendations_April-2020-1.pdf
[214] Juilo Friedmann et al., *Capturing Investment: Policy Design to Finance CCUS Projects in the US Power Sector*, Columbia SIPA Center (April 28, 2020), https://www.energypolicy.columbia.edu/research/report/capturing-investment-policy-design-finance-ccus-projects-us-power-sector.
[215] *Id.*

Energy Futures Initiative[216] and should incorporate additional expert recommendations.[217] The Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) within the Executive Office of the President should coordinate the strategy to provide the high-level leadership needed for all agencies to cooperate to meet the urgency of the challenge. Among other carbon removal approaches, a DAC portfolio should be funded at $1.6 billion and focus on bringing down the costs of DAC through existing component and system optimization and scaling of manufacturing and commercial-scale projects, as well as fundamental research on new sorbent and solvent materials and applied technology development. Permanent geologic sequestration of captured carbon should be funded at $1.6 billion and include expanding the existing DOE CarbonSAFE program with additional storage sites and regional large-scale CO_2 injection demonstrations. Carbon utilization should be funded at $900 million and aim to accelerate the development and commercialization of new carbon-conversion processes and carbon-based materials to provide sources of revenue for DAC projects and create an air-based circular carbon economy. A cross-cutting program for large-scale demonstration projects across DAC, geological sequestration, carbon utilization, and other portfolios should be funded at $2 billion.

The Biden-Harris administration could accomplish some of this cross-agency coordination through executive order, but the administration will need to work with Congress to enact new authorization legislation, such as the bipartisan CREATE Act (S. 4341), and secure appropriations to provide the organization and funding necessary to fully carry out a federal carbon removal strategy.

The Biden administration should also create a public-private partnership for DAC. The recent increase in corporate engagement on Direct Air Capture and carbon removal is demonstrated by Exxon's joint development agreement with Global Thermostat to Occidental's investment in Carbon Engineering, to Microsoft and Amazon's significant carbon removal commitments, and many others.[218] Given the urgency and magnitude of the scale-up required, and given the existing relevant expertise and infrastructure capabilities that already exist in the industry and the federal government, there needs to be a coherent approach to harnessing American business in a broad-based

[216] The 10 agencies are DOE, USDA, NOAA, NSF, DOI, NASA, DOD, EPA, DOT, and NIST, from *Clearing the Air: A Federal RD&D Initiative and Management Plan for Carbon Dioxide Removal Technologies* (Energy Futures Initiative, 2019).

[217] The National Academies, *Developing a Research Agenda for Carbon Dioxide Removal and Reliable Sequestration*, (2019), https://www.nationalacademies.org/our-work/developing-a-research-agenda-for-carbon-dioxide-removal-and-reliable-sequestration; *Supra* note 206.

[218] ExxonMobil, *ExxonMobil and Global Thermostat to Advance Breakthrough Atmospheric Carbon Capture Technology*, (June 27, 2019), https://corporate.exxonmobil.com/News/Newsroom/News-releases/2019/0627_ExxonMobil-and-Global-Thermostat-to-advance-breakthrough-atmospheric--carbon-capture-technology; Reuters, *Occidental-backed company will build new U.S. CO2 removal plant*, (August 19 2020), https://www.reuters.com/article/us-usa-carboncapture-dac/occidental-backed-company-will-build-new-us-co2-removal-plant-idUSKCN25F1VN; Brad Smith, *Microsoft will be carbon negative by 2030*, Official Microsoft Blog (January 16, 2020), .https://blogs.microsoft.com/blog/2020/01/16/microsoft-will-be-carbon-negative-by-2030; Amazon, , *Climate Pledge*, (2019), https://sustainability.aboutamazon.com/about/the-climate-pledge

"mobilization" effort around DAC in partnership with the government. This partnership could be created through the CE4B Recommendation to create a DOE Foundation, among other convening tools available to a Biden administration. Any public-private partnership focused on DAC should incorporate robust, ongoing engagement with frontline communities and relevant labor unions as a part of its core design.

3. Leverage federal procurement and standards to create markets for DAC services and products made from CO_2 captured from DAC. Providing a revenue stream for DAC and carbon-based products is critical for developing a robust business model for DAC to attract sustained private sector investment. The Biden administration should implement some or all of the following policies to launch nascent carbon-to-value markets for various products and support project debt and equity financing for DAC projects:

- Direct the U.S. General Services Administration (GSA), with support from DOE and the cross-agency strategy above, to enter into contracts for DAC services to remove carbon from the atmosphere and permanently store it underground as part of a federal carbon management program.
- Direct the military to procure an increasing proportion of its fuel purchases--including for land vehicles, ships, and aircraft--from synthetic "drop-in" fuels made from DAC-based CO_2 and clean hydrogen. The U.S. Department of Defense (DOD), in coordination with the U.S. Department of Homeland Security (DHS) and DOE, and with support from the cross-agency strategy above, should establish standards for this synthetic fuel procurement.
- Establish a federal Buy Clean program for concrete, among other construction materials, which requires all federal agencies and large infrastructure projects using federal funding (e.g., interstate highways) to procure an increasing proportion of their concrete purchases from low-emission concrete, including concrete that sequesters carbon and/or is made from cement or aggregate that sequesters carbon. The U.S Environmental Protection Agency (EPA), with DOE and the National Institute of Standards and Technology (NIST) as technical partners, should establish the technical requirements of the Buy Clean program, and GSA and the U.S. Department of Transportation (DOT) should lead its implementation. The House Energy and Commerce Committee released a discussion draft of the CLEAN Future Act, which includes a federal Buy Clean provision.
- Build upon the Renewable Fuel Standard (RFS) to transition to a federal Low Carbon Fuel Standard (LCFS), similar to the California LCFS, which would allow fuels produced from captured carbon to qualify for credits. To provide enhanced revenue certainty for project financing, the LCFS should be designed with a credit price floor.

Past administrations have implemented green federal procurement policies through executive order, originally stemming from authorities provided in the Pollution

Prevention Act of 1990.[219] However, we recommend that the Biden administration work with Congress to enact authorizing legislation and appropriations for both federal procurement policies to maximize effectiveness. The Biden administration should work with Congress to pass legislation to transition the RFS to a federal LCFS before 2022, when current RFS requirements expire.

How the Recommendations Create Jobs, Improve the Economy, and Address Climate Change

To prevent the worst impacts of climate change and achieve net-zero emissions by 2050, decarbonization efforts including electrification, energy efficiency, synthetic fuels, and other types of carbon removal are all required. Even with rapid scale-up of each strategy, the U.S. will need to remove 563 million tons of CO_2 from the atmosphere annually using DAC (low DAC scenario) to meet a net-zero target. If other decarbonization options are slower to deploy, the U.S. may need to remove up to 1,847 million tons of CO_2 **per year** using DAC (high DAC scenario).[220] If implemented together, our recommendations would drastically accelerate domestic DAC scale-up and deployment to meet these carbon removal requirements.

Not only is scaling and deploying DAC necessary to meet our climate goals, but the economic opportunities of creating a U.S. DAC industry are huge: The U.S. demand for industrial equipment for DAC could reach more than $1 billion by 2030 and up to $259 billion by 2050,[221] and the U.S. total available market for products that could feasibly be made from DAC-sourced carbon is estimated to be over $1 trillion dollars per year.[222]

Full-scale deployment of DAC technologies, including the equipment and manufacturing for DAC plants, is estimated to create between 600,000 to 1.35 million jobs by 2050. On average, one megaton DAC plant can create upwards of 3,500 jobs across the supply chain, with 278 of those jobs being dedicated to plant operations after construction. As a result, the construction, engineering, and equipment manufacturing sectors combined could see at least 300,000 new jobs by 2050. Most of these new employment opportunities would be high-wage jobs. The largest employment surge is projected in the steel industry. A Rhodium Group analysis shows that DAC scale up may support up to a doubling of current steel manufacturing jobs.[223] These estimates do not include jobs from geological storage or carbon utilization enabled by DAC, so the job creation opportunity is likely even greater.

How the Recommendations Support Frontline or other Underserved Communities

[219] EPA, *Environmentally Preferable Purchasing Program History*, (2018), https://www.epa.gov/greenerproducts/environmentally-preferable-purchasing-program-history.
[220] *Supra* note 206.
[221] John Larsen et al., *Capturing New Business,* (June 23, 2020), https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Business-Market-Opportunities-from-DAC-Scale-Up.pdf
[222] *Supra* note 216.
[223] *Supra* note 206.

Because CO_2 is distributed equally in the air and is not contaminated with the pollutants associated with fossil-based sources of carbon, the benefits of a robust DAC-enabled circular carbon economy can be more equitably distributed, while the negative impacts of the fossil economy on frontline and disadvantaged communities can be significantly mitigated. At the same time, operation and maintenance jobs at DAC plants could be a major source of jobs for the communities that host them and provide opportunities for economic development without associated pollution. Scaling up of DAC deployment can also provide jobs and economic opportunities to workers in communities transitioning away from fossil fuels. Suitable geologic sequestration sites needed to permanently store DAC-captured CO_2 are often co-located with fossil deposits, and the type of work and skills used for resource extraction are similar to those needed to inject CO_2 back into the ground. Ramping up DAC as use of fossil fuels declines can help provide a bridge for fossil fuels workers and communities into the clean energy economy of the future.

How the Recommendations Support Biden's Climate Plan

The Biden Climate Plan would "[e]nsure the U.S. achieves a 100% clean energy economy and reaches net-zero emissions no later than 2050." Achieving this climate goal will not be possible without significantly scaling up DAC deployment and associated carbon storage and utilization, as supported by our recommendations. The Biden Climate Plan also aims to "[d]rive dramatic cost reductions in critical clean energy technologies, including…negative emissions technologies [and] the next generation of building materials… – and rapidly commercialize them, ensuring that those new technologies are made in America." DAC is a key negative emissions technology that can source carbon for low-emission concrete, advanced carbon fibers, and other manufacturing and building materials. By creating markets for DAC and related products and supporting the financing of DAC projects, our recommendations also ensure that these technologies will be developed and deployed domestically. Furthermore, as part of his vision of ARPA-C, the Biden Climate Plan specifically includes "capturing carbon dioxide through direct air capture systems and retrofits to existing industrial and power plant exhausts, followed by permanently sequestering it deep underground or using it to make alternative products like cement."

Our recommendations strive to create a full-scale domestic DAC industry, which would also support Vice President Biden's vision for economic recovery and long-term growth, particularly in domestic manufacturing sectors, such as industrial equipment, steel, cement, and chemicals.

Key Battleground State Activity

Regions with geological sequestration potential would benefit from the economic development and jobs opportunities from permanently storing DAC-sourced CO_2. Battleground states with natural saline basins that could be used for CO_2 storage

include: Texas, Colorado, Michigan, Ohio, and Pennsylvania.[224] DAC-related jobs could also provide new opportunities for fossil workers in these states to transfer their existing skills into good-paying jobs in the clean energy economy.

The creation of markets for low-emission concrete through a federal Buy Clean program would benefit ready-mix concrete facilities that are already taking advantage of new carbon utilization technologies. Battleground states with operational or under-construction carbon utilization concrete facilities include: Georgia, North Carolina, Ohio, Texas, Minnesota, and Nevada.[225] Because concrete must be made close to where used, this technology could be expanded to concrete ready-mix facilities in every state.

In addition, these battleground states have other DAC or carbon utilization projects that are planned, piloted, under construction, or operational, and would all benefit from policies to incentivize DAC deployment: Arizona, Colorado, Florida, Iowa, Minnesota, and Texas.[226] These and other rural states also have significant renewable energy technical potential,[227] which can be harnessed to power additional DAC and carbon-to-value industries.

[224] Stephen J. Lee, *U.S. Early-Stage CCUS Project Map*, https://stephenjlee.github.io/catf-ccus/#/geomapfc
[225] Matt Bright, *Mapping the Progress and Potential of Carbon Capture, Use, and Storage,* Third Way (June 1, 2020), https://www.thirdway.org/memo/mapping-the-progress-and-potential-of-carbon-capture-use-and-storage
[226] Ibid.
[227] Anthony Lopez et al., *U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis*, NREL (July 2012), https://www.nrel.gov/docs/fy12osti/51946.pdf

Advanced Reactors: Pathways to Demonstration and Commercialization

Opportunity/Problem:

As the largest source of U.S. clean energy today, nuclear power will play a role in meeting Biden-Harris administration's ambitious climate target of 100% clean electricity by 2035.[228] The U.S. needs a new generation of advanced nuclear technologies to address the challenges of existing nuclear power plants. The demonstration and commercialization of a new generation of advanced reactors will help the Biden-Harris administration reassert global leadership, provide new tools in the climate fight both at home and to allied nations, and provide an opportunity to integrate both the highest security as well as social and environmental justice considerations into our deployment approach.

Recommended Action(s):

- Adopt a whole-of-government approach to nuclear innovation
- Recognize nuclear energy as a source of clean energy and regaining the mantle of global leadership in nuclear energy exports
- Leverage the social sciences to secure environmental justice and equitable economic opportunity in the deployment of advanced reactors

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Investment in advanced nuclear technologies supports our science and technology workforce including students, academic experts, and national laboratory researchers, as well as new technology start-ups, manufacturing, construction, engineering, and power sector jobs. In addition to job-creating investments in advanced nuclear technologies, the Recommendations include a pilot Coal-to-Small Modular Reactor (SMR) substitution program. Advanced and Small Modular Reactors could be an ideal replacement for retiring coal plants and take advantage of existing infrastructure and local workforces. Nuclear power plants typically employ more people than a coal or gas plant and pay ~20% more on average than other power sector jobs, and are guaranteed to stay local.

Econ. Benefits:

The value of the global nuclear industry is estimated to be $1.5 trillion by 2035. However, the U.S. lags significantly behind other countries in the nuclear market. The Recommendations propose a historic investment in clean energy innovation through advanced reactors to ensure the continued participation of the U.S. as a market leader. There are more than 60 advanced reactor projects in the private sector across the U.S. The proposed regulatory reforms are designed to spur private investment in this sector similar to those for renewables and to position the U.S. to be a leader in the export of advanced nuclear technologies to other nations.

Advanced Reactors: Pathways to Demonstration and Commercialization

Equity Benefits:

The Recommendations propose a new, progressive approach to nuclear power by establishing a social science agenda for nuclear energy with the goal of achieving more equitable adoption of advanced reactors as well as a proposal to develop tools for restorative justice efforts, including providing new opportunities for those that have been negatively impacted by past nuclear fuel cycle activities.

Climate Plan Tie:

The Recommendations are tailored specifically to Biden's Climate Plan. Namely, the recommendations are intended to accelerate the transition to clean energy, ensuring equitable access to economic opportunities, and export of clean energy technologies.

Battleground State Benefits:

The Recommendations provide significant support opportunities for local, high-paying jobs for communities in Michigan, Ohio, Nevada, and North Carolina facing closure of their coal plants. Rather than a subsidy or bailout for these struggling communities, SMRs could provide a new economic opportunity that will provide local, high-paying jobs. Pennsylvania and North Carolina already have robust nuclear energy workforces which would further benefit from this plan.

[228]Nestor A. Sepulveda, Jesse D. Jenkins, Fernando J. de Sisternes, Richard K. Lester, The Role of Firm Low-Carbon Electricity Resources in Deep Decarbonization of Power Generation, Joule (Nov. 21, 2018), https://www.cell.com/joule/pdf/S2542-4351(18)30386-6.pdf; see also Intergovernmental Panel on Climate Change, Energy Systems (last visited Sept. 6, 2020) https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter7.pdf.

Advanced Reactors: Pathways to Demonstration and Commercialization

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DATE: August 15, 2020

Statement of Issue and Summary of Recommendations:
All low-carbon energy technologies, including nuclear power, are needed to meet the Paris Agreement goals and limit the rise of global temperatures to 1.5°C. Nuclear is the second-largest supplier of low-carbon electricity in the world, and the largest supplier of low-carbon electricity in the U.S.[229] Advanced nuclear technologies can be part of the global climate solution in addressing emissions and supplying low-carbon energy in industrializing economies, but the U.S. needs to demonstrate these technologies at home first. The U.S. is already behind many countries in the development and export of these technologies. Russia and China export nuclear energy to industrializing economies with an eye for geopolitical gain, and only provide the bare minimum with regard to international safeguards and security considerations.[230] The Biden Administration can clear a pathway for U.S. advanced nuclear power in ways that create jobs, promote environmental justice, and prioritize the needs of frontline communities through:

1. Vision and Leadership: Adopting a whole-of-government approach to nuclear innovation
2. Combatting the Climate Crisis: Recognizing nuclear energy as a source of clean energy and regaining the mantle of global leadership in nuclear energy exports
3. Pursuing Justice: Leveraging the social sciences to secure environmental justice and equitable economic opportunity in the deployment of advanced reactors

Opportunity / Problem Statement:

[229] International Energy Agency, *Nuclear Power*, (June 2020), https://www.iea.org/reports/nuclear-power (recognizing nuclear as the world's second largest source of low-carbon energy); U.S. Energy Information Administration, *What is U.S. Electricity Generation by Source?* (Feb. 27, 2020), https://www.eia.gov/tools/faqs/faq.php?id=427&t=3#:~:text=About%2063%25%20of%20this%20electricity,was%20from%20renewable%20energy%20sources (nuclear supplied 809 billion kWh in 2019, 53% of the total of low-carbon energy sources).
[230] The Economist, *The World Relies on Russia to Build Its Nuclear Power Plants* (Aug. 2, 2018), https://www.economist.com/europe/2018/08/02/the-world-relies-on-russia-to-build-its-nuclear-power-plants ("Russia's only real competitor is China, another country where government and business are tightly entwined.").

Fostering Innovation And Bringing Technologies To Market

As the largest source of U.S. clean energy today, nuclear power will play a role in meeting the Biden-Harris administration's ambitious climate target of 100% clean electricity by 2035.[231] The U.S. needs a new generation of advanced nuclear technologies to address the challenges of existing nuclear power plants. The demonstration and commercialization of a new generation of advanced reactors will help the Biden-Harris administration reassert global leadership, provide new tools in the climate fight both at home and to allied nations, and provide an opportunity to integrate the highest security as well as social and environmental justice considerations into our deployment approach.

Proposed Recommendation:

1) ***Vision and Leadership: Adopting a whole-of-government approach to nuclear innovation***

- **Establish nuclear-specific staff positions across the Administration to collectively shape and coordinate the U.S. nuclear energy strategy both domestically and internationally**
  - Include a nuclear-specific staff position for any White House climate office to ensure advanced nuclear is included as part of the climate response and set a clear mandate for an environmentally-just, community-centered approach to technology adoption.
  - Reinstate the Obama-era National Security Council position of Director for Nuclear Energy Policy to coordinate the various agencies (primarily the Department of Energy, Department of Commerce, and Department of State) that have jurisdiction over nuclear energy exports.
  - Include a nuclear-specific staff policy specialist on the White House National Economic Council to assist in coordination of President-elect Biden's domestic and international economic program.
  - Reinvigorate the Office of Science and Technology Policy to advise the Biden Administration with a view to integrated strategies including advanced reactors.
- **Re-establish the U.S. government as the first funder and customer of U.S. advanced nuclear energy to compete with Russian and Chinese state-owned nuclear enterprises**

[231] Nestor A. Sepulveda, et al., *The Role of Firm Low-Carbon Electricity Resources in Deep Decarbonization of Power Generation*, Joule (Nov. 21, 2018), https://www.cell.com/joule/pdf/S2542-4351(18)30386-6.pdf; *see also*Thomas Bruckner, et al., *Energy Systems*, Intergovernmental Panel on Climate Change (2014) https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter7.pdf.

- Reform the DOE loan guarantee program to make the $10.9 billion in loan guarantees specific to advanced nuclear technologies realistically available through funding credit subsidy fees or otherwise.[232]
- Utilize DOE authority under the Atomic Energy Act to issue site use permits at federal facilities to construct, own, and operate small modular reactors (SMRs) and microreactors.[233]
- Ask Congress to provide longer-term (e.g., 30 years or more) federal power purchase agreements for clean energy technologies, inclusive of nuclear power.
- Ask Congress to amend Section 203 of the Energy Policy Act to require the federal government to purchase higher percentages of clean energy, inclusive of nuclear energy.

- **Drive cost reductions in advanced nuclear by modernizing the nuclear regulatory licensing process**
  - Work with Congress to direct the Nuclear Regulatory Commission (NRC) to evaluate its licensing process together with existing license holders and license applicants. The current licensing process takes years and the NRC is required to recoup 90% of its costs from license holders and applicants, which dramatically stifles the potential for new market entrants.[234] Small procedural changes to the licensing process can have an outsized impact in terms of time and cost to applicants.[235]
  - Work with Congress to direct the NRC to submit a report to Congress within 90 days that addresses unique licensing challenges related to the flexible operation of nuclear reactors, such as use for nonelectric operations (i.e. industrial heat and hydrogen production), colocation of SMRs with industrial plants or other facilities, and siting SMRs at retired coal plants.

[232] Dep't of Energy, Advanced Nuclear Energy Project Loan Guarantees, https://www.energy.gov/lpo/title-xvii/products-services/advanced-nuclear-energy-projects-loan-guarantees

[233] DOE has the authority, pursuant to Section 161g of the Atomic Energy Act, to issue site use permits on federal lands to construct, own, and operate SMRs from which energy can then be sold commercially into the grid.

[234] Nuclear Reg. Comm'n, *License Fees*, https://www.nrc.gov/about-nrc/regulatory/licensing/fees.html (Sept. 30, 2020); *see also* @caorilne, Twitter (Aug. 12, 2020, 2:29 PM), https://twitter.com/caorilne/status/1293615723688779777 (Founder of an advanced nuclear company noting how, if her license went through today, annual NRC fees would total $4,669,000).

[235] Two examples of these types of changes are: (1) Modifying 10 C.F.R. § 51.104(a)(1) so that it only applies to the mandatory hearing on uncontested issues in construction permit, early site permit, and combined licensing proceedings. This would cut down the licensing process by several months, rather than requiring parties to wait for the Final EIS. (2) Establishing Generic Environmental Impact Statements ("GEIS") for advanced reactors. This would result in significant savings in the licensing process for portions of EIS that are similar for advanced reactors, but needs to be carefully tailored to items that are truly generic.

2) *Combatting the Climate Crisis*: Recognizing nuclear energy as a source of clean energy and regaining the mantle of global leadership in nuclear energy exports

- **Pursue a historic investment in clean energy innovation including advanced nuclear projects**
  - Double funding for the DOE's Advanced Reactor Demonstration Program in the first two years of the Biden-Harris administration, and quadruple funding in the second two years. Work with Congress to approve and provide specific authorizations through 2030 for the program through a multi-year appropriations mechanism to better encourage private investment.
  - Dramatically increase U.S. advanced reactor design certifications by fully funding licensing fees for new design certification, early site permits, and license applications before the NRC for a period of 10 years.
  - Expand funding for the DOE's hydrogen program, H2@Scale, specifically for the production of hydrogen with SMRs and scale up the ARPA-C[236] nuclear program to include focus on electricity and hydrogen.
- **Ensure the commercialization of advanced nuclear by accounting for the low-carbon value of nuclear in energy market pricing:**
  - Work with Congress to establish a 26% nuclear investment tax credit and extend the nuclear production tax credit to the first 10 years of a plant's operation, indexed to inflation.[237]
  - Ensure that the Biden-Harris administration's nominees for the Federal Energy Regulatory Commission ("FERC") commit to valuing clean energy in market pricing.
- **Treat advanced nuclear as critical infrastructure for development and decarbonization and include it as a part of a Green Marshall Plan for the Climate:[238]**
  - Promote exports through the establishment of potential partnerships. Nuclear energy exports are both beneficial for climate and serve as valuable national security assets. About 30 countries across the globe are considering or actively pursuing nuclear energy programs.[239] These types of partnerships can help establish century-long diplomatic relationships with purchasing countries, and ensure alignment with the U.S. commitment to nuclear security.

[236] American Action Forum, ARPA-C, Same as ARPA-E (July 1, 2020), https://www.americanactionforum.org/insight/arpa-c-same-as-arpa-e/.
[237] 26 U.S.C. § 45J.
[238] Sagatom Saha, et al., *Memo: A Green Marshall Plan - America's Global Climate Compact,* Data for Progress (Apr. 29, 2020), https://www.dataforprogress.org/memos/green-marshall-plan.
[239] World Nuclear Association, Emerging Nuclear Energy Countries (Aug. 2020). https://www.world-nuclear.org/information-library/country-profiles/others/emerging-nuclear-energy-countries.aspx

- Task the DOE with assessing which countries are best positioned to import U.S. advanced nuclear technologies and/or partner in building supply chain infrastructure based on key criteria, including regional stability and security, development needs and goals, and climate impact.
- Ramp up bi-lateral and multilateral international engagement efforts ahead of U.S. advanced nuclear technologies being commercially available.
- Authorize new funding mechanisms explicitly for the export of advanced nuclear technologies, including via the Export-Import Bank and other climate and development banks.
- Ask Congress and DOE to jointly conduct a review with the goal of modernizing the export process and making nuclear energy technologies more readily available.
- Preemptively pursue Atomic Energy Act Section 123 Agreements, which allow for the secure export of nuclear technologies, with democratic allies who are well-positioned to partner and/or import advanced nuclear technologies. This includes working to harmonize international licensing approaches.
- Fund the integration of safeguards- and security-by-design into U.S. advanced reactors to expedite technology readiness for export and reduce the burden on potential international partners.

3) *Pursuing Justice*: Leveraging the social sciences to secure environmental justice, equitable economic opportunity in the deployment of advanced reactors

- **Establish a social science agenda for nuclear energy with the goal of achieving more equitable adoption of advanced reactors:**
  The nuclear energy sector has long been dominated by some of the greatest technical minds in physics and engineering. However, over the decades there has been limited crossover with the social sciences, including Anthropology, Economics, Geography, History, Law, Politics, Communications, Design, Psychology, Sociology, and Science and Technology Studies. Below are steps that serve to better incorporate key insights from these fields of study:
  - Personnel is policy. In order to prepare for nuclear energy to play a significant role in the clean energy transition, we recommend the choosing of leaders with a proven commitment to working across disciplines and worldviews. Vetting for key nuclear energy positions within the administration should include questions on how they would leverage expertise in the social sciences in their leadership approach.
  - The next Assistant Secretary for the Office of Nuclear Energy, in coordination with the National Science Foundation's Directorate for Social, Behavioral and Economic Sciences, should put together a small interdisciplinary team tasked

with directly funding social science research to help guide the office's planning, decision-making, and funding strategies—and whenever possible the research should be published in order to provide a new shared knowledge base for the broader nuclear sector.
    - The administration should double the budget for the Nuclear Energy University Programs (NEUP) and expand its scope to support students in the social sciences, with an emphasis on the intersection with nuclear energy. This rapid expansion of the workforce pipeline could be achieved by funding interdisciplinary academic consortia which could be co-located with existing nuclear engineering departments.
    - Finally, special consideration should be paid to social and environmental justice as essential issues deserving both more research and rapid integration into the U.S.'s nuclear energy strategy. This will require many tools, including a research into the history of the sector, mapping of where inequalities still exist, and thoughtfully creating new frameworks that leverage distributive, procedural, and restorative justice efforts moving forward.
- **Invest in coal and power plant communities through a pilot Coal-to-SMR program:**
    - Over 600 coal plants have closed across the U.S. in the last decade, with another 25GW planned to close in the next five years, with many closures expected in Michigan, Ohio, Nevada, and North Carolina.[240] While this is great news for carbon emissions, it can be devastating to local economies. However, advanced reactors and SMRs can be an ideal replacement for these retiring coal plants. SMRs can take advantage of existing infrastructure and the local workforce.[241] Nuclear power plants typically employ more people than a coal or gas plant and pay ~20% more on average than other power sector jobs. And the jobs are guaranteed to stay local.[242] We propose developing a pilot program to identify, consult with, and fund amenable communities to study issues of workforce retraining and infrastructure repurposing. This will develop a template for other communities to follow. Such a program should focus on underserved communities and fund remediation efforts to clean up legacy pollution from coal mining and combustion in the decommissioning process. Ultimately this program could be expanded to include natural gas facilities.
- **Implement a review of the national fuel cycle strategy with a focus on equity:**

[240] Global Energy Monitor, Global Coal Plant Tracker, https://endcoal.org/tracker/.
[241] NuScale, *The Changing Role of Coal in Electrical Generation*, https://www.nuscalepower.com/environment/coal-plants.
[242] Nuclear Energy Institute, *Jobs*, https://www.nei.org/advantages/jobs.

- To overcome long-standing challenges related to the adoption of nuclear energy technologies, the Biden-Harris administration should update the 2012 Blue Ribbon Commission study on America's Nuclear Future with an eye towards equity and transitioning to advanced reactor fuel cycles.[243]
- The study should include input from frontline communities and develop tools for restorative justice efforts, including providing new opportunities for those that have been negatively impacted by past fuel cycle activities.
- As a part of the study, the Biden-Harris administration should direct the DOE to implement a comprehensive review of action required to secure key materials, including High Assay Low Enriched Uranium, that will be needed to keep advanced reactor fuel supply chains and manufacturing in the US.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

TheBiden Climate Plans call for a carbon pollution-free power sector by 2035, creating millions of jobs with a choice to join a union. More than one-third of nuclear energy industry workers are affiliated with labor unions.[244] The three largest unions represented in the nuclear industry have all endorsed Vice President Biden. The AFL-CIO advocates for "bringing advanced nuclear technologies to market with an American workforce and an American supply chain that will create good jobs across the occupational spectrum, from engineers and scientists to skilled construction crafts, to manufacturing and the specialty metals industry."[245]

Additionally, the recommended investments and regulatory reforms — on par with those for renewables— are designed to spur private investment in the more than 60 advanced reactor projects across the U.S.[246] and to position the U.S. to be a leader in the export of advanced nuclear technologies. Today, 37 countries have been identified as ready for advanced nuclear power now, with an additional 11 countries potentially ready

[243] Department of Energy, *Final Report: Blue Ribbon Commission on America's Nuclear Future* (Jan. 2012) https://www.energy.gov/sites/prod/files/2013/04/f0/brc_finalreport_jan2012.pdf.
[244] Kevin Randolph, *More Than One-Third of Nuclear Energy Industry Workers Affiliated with Labor Unions, Survey Finds*, Daily Energy Insider (Sept. 5, 2017), https://dailyenergyinsider.com/news/7614-one-third-nuclear-energy-industry-workers-affiliated-labor-unions-survey-finds/.
[245] Liz Shuler, *Shuler at Third Way: Nuclear Power is Good for the Labor Movement*, AFL-CIO (Feb. 21, 2017), https://aflcio.org/speeches/shuler-third-way-nuclear-power-good-labor-movement.
[246] John Milko, et al., *Getting to Zero Emissions by 2050*, Third Way (Oct. 17, 2019), https://www.thirdway.org/graphic/2019-advanced-nuclear-map.

by 2030.[247] The World Nuclear Association (WNA) has estimated the value of the global nuclear industry to be $1.5 trillion by 2035.[248]

How the Recommendation Supports Frontline or other Underserved Communities:

Frontline and underserved communities have lacked access to high-quality jobs, regional economic stability, and carbon and pollution reduction benefits associated with nuclear energy technologies. The development of advanced reactors opens the door for many different communities to gain access to nuclear energy for the first time. Traditionally the domain of large investor-owned utilities, advanced reactors, including microreactors, could allow new business models including direct community ownership, similar to the approach taken to finance many renewable energy projects.[249] Small modular reactors could replace coal and natural gas while preserving key jobs and infrastructure, allowing fossil communities to thrive through the energy transition. Restorative justice efforts should be launched for communities that have hosted nuclear mining, milling, and waste facilities by providing access, federal financing, and jobs programs, particularly for black and indigenous communities, that may have only previously had exposure to risks related to the production of U.S. nuclear weapons[250] without access to the benefits of civil nuclear energy technologies.

How the Recommendation Supports Biden's Climate Plan:

The proposed Recommendations are tailored specifically to the Biden Climate Plans to accelerate the transition to clean energy, ensure equitable access to economic opportunities, and export clean energy technologies:

- The move toward 100% low-carbon electricity by 2035 will require closing a large number of coal and gas powered plants. A coal-to-SMR pilot program that puts communities first could accelerate this transition by providing attractive economic opportunities. Once successful, the program could expand to other fossil-dependent communities.

[247] Jackie Kempfer, et al., *Mapping the Global Market for Advanced Nuclear*, Third Way (Sept. 22, 2020), https://www.thirdway.org/memo/mapping-the-global-market-for-advanced-nuclear.
[248] World Nuclear News, *Future Nuclear Supply Chain Worth Billions, Report Finds*, (Sept. 14, 2016), https://www.world-nuclear-news.org/NN-Future-nuclear-supply-chain-worth-billions-report-finds-1509167.html.
[249] Liwen Li et al, *Transitioning to Community-owned Renewable Energy: Lessons from Germany*, Procedia Environmental Sciences (2013), https://www.researchgate.net/publication/257168628_Transitioning_to_Community-owned_Renewable_Energy_Lessons_from_Germany.
[250] U.S. Department of Energy, *Closing the Circle on the Splitting of the Atom: The Environmental Legacy of Nuclear Weapons Production in the United States and What the Department of Energy is Doing About It*, (January 1996), https://www.energy.gov/sites/prod/files/2014/03/f8/Closing_the_Circle_Report.pdf.

- One of the targets of President-elect Biden's newly proposed ARPA-C[251] is a focus on "advanced nuclear reactors, that are smaller, safer, and more efficient at half the construction cost of today's reactors." With funding support in this Recommendation to achieve demonstrations for first-of-kind advanced reactors, costs for future reactors are significantly reduced.[252]
- Investing in advanced nuclear, first demonstrating domestically, and exporting abroad, the U.S. can lead in the export of clean energy technology while creating new supply chains and high-quality jobs at home.

Key Battleground State Activity:[253]
The recommendation provides significant support opportunities for jobs in communities in Michigan, Ohio, Nevada, and North Carolina facing closure of their coal plants. Rather than a subsidy or bailout for these struggling communities, SMRs could provide a new economic opportunity that will provide local, high-paying jobs. Pennsylvania and North Carolina already have robust nuclear energy workforces which would further benefit from this plan. Nuclear jobs are also an issue for Michigan--where the Palisades plant is scheduled to shut down in 2022, and Georgia, where the Vogtle 3 & 4 project is responsible for 9,000 construction-related jobs.[254] Finally, this recommendation takes care to ensure the voices of marginalized communities in states like Nevada are heard before any actions or decisions are taken with respect to waste.

[251] Ewelina Czapla, *ARPA-C, Same as ARPA-E,* American Action Forum(July 1, 2020), https://www.americanactionforum.org/insight/arpa-c-same-as-arpa-e/.
[252] Lauren M. Boldon & Piyush Sabharwall, S*mall Modular Reactor: First-of-a-Kind (FOAK) and Nth-of-a-Kind (NOAK) Economic Analysis*, U.S. Dep't of Energy Office of Scientific and Technical Information (Aug. 1, 2018), https://www.osti.gov/biblio/1167545-small-modular-reactor-first-kind-foak-nth-kind-noak-economic-analysis.
[253] Battleground states: Arizona, Colorado, Florida, Georgia, Iowa, Michigan, Minnesota, New Hampshire, Nevada, North Carolina, Ohio, Pennsylvania, Texas, Virginia.
[254] Damon Cline, *Vogtle Construction Site Employment Hits 9,000*, The Augusta Chronicle (Feb. 16, 2020), https://www.augustachronicle.com/news/20200216/vogtle-construction-site-employment-hits-9000.

Supporting Clean Energy Commercialization Through Technology Transfer

Opportunity/Problem:

Investing in research, development, demonstration, and deployment is insufficient to guarantee that our nation will have all the tools and technologies it needs to meet a goal of net-zero emissions by 2050, for all Americans. Targeted programs are needed that address the full suite of barriers to clean energy technology commercialization, including investments in technology transfer, regional innovation, manufacturing, market expansion, and deployment.

Recommended Action(s):

- DOE should increase its investment in the Office of Technology Transitions (OTT) to support clean energy technology transfer programs and prioritize funding startups and small businesses that are founded by entrepreneurs that come from underrepresented backgrounds, and Congress should authorize and fund these programs in a recovery bill.
- DOE should create a new program to invest in regional clean energy innovation ecosystems within the first 100 days of a new administration and Congress should authorize and fund this program.

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Supports job creation through investments in startups, entrepreneurs, and regional workforce expansion.

Econ. Benefits:

Supports economic development through investments in startups, entrepreneurs, and regional economic development activities. Preliminary studies in Colorado show employment in clean energy of 12 jobs per thousand people in 2017 as result of regional clean energy innovation investments.

Equity Benefits:

Supports entrepreneurs from underrepresented backgrounds by prioritizing their role in the development and deployment of clean energy technologies and would bring employment opportunities and economic development to frontline communities through targeted regional clean energy investments.

Supporting Clean Energy Commercialization Through Technology Transfer

Climate Plan Tie:

The climate plan calls for increased support of private sector entrepreneurs, strengthening support of minority-serving institutions, increasing investments in coal and power plant communities impacted by the climate transformation, and investing in the regional innovation ecosystems of the DOE national laboratories (national labs). The recommendations would directly support these priorities by strengthening DOE outreach to Minority Serving Institutions (MSIs) and underserved entrepreneurs and by supporting regional innovation activities in coal communities and at the national labs.

Battleground State Benefits:

Strengthens economic growth opportunities and job creation benefits driven by the DOE national labs in the states and regions in which they are located (key to Iowa, Tennessee, Colorado, Pennsylvania, and Virginia); delivers the economic benefits of clean energy innovation into America's heartland (key in Texas, Colorado, Arizona, and Iowa); helps revitalize communities that have been historically dependent on exployment in fossil fuel extraction and processing (e.g, coal, oil, and natural gas) and helps facilitate a just transition.

Supporting Clean Energy Commercialization through Technology Transfer

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Statement of Issue and Summary of Recommendations:
Investing in research, development, demonstration, and deployment is insufficient to guarantee that our nation will have all the tools and technologies it needs to meet a goal of net-zero emissions by 2050, for all Americans. A recent report from the International Energy Agency found that there are several technologies that are not on track to meet a global goal of net-zero emissions by 2050.[255] Targeted programs are needed that address the full suite of barriers to clean energy technology commercialization through investment in technology transfer and regional innovation programs.

The Department of Energy (DOE) has a history of supporting such programs, but such support has weakened under the Trump Administration and rapid investment is needed in order to meet a target of net-zero emissions by 2050 across all sectors of our economy. This will require a coordinated effort that rapidly scales up existing DOE programs and promotes the creation of new programs.

In order to give clean energy technologies the best chance at commercialization, the Biden-Harris administration should:

- Direct DOE to increase its investment in the Office of Technology Transitions (OTT) to support clean energy technology transfer programs and prioritize funding startups and small businesses that are founded by entrepreneurs that come from underrepresented backgrounds, including entrepreneurs of color, and work with Congress to authorize and fund OTT and related programs in a recovery bill; and
- Direct DOE to create a new program to invest in regional clean energy innovation ecosystems within the first 100 days of a new administration and work with Congress to authorize and fund this program through a recovery bill.

Opportunity / Problem Statement:

[255] *Tracking Clean Energy Progress*, Int'l Energy Agency (last visited Oct. 13, 2020), https://www.iea.org/topics/tracking-clean-energy-progress.

Fostering Innovation And Bringing Technologies To Market

Clean energy technologies face a number of barriers to commercialization, including high up-front capital costs, long development times, fragmented regulatory policy, and the need to displace incumbent technologies. For these reasons, the clean energy sector unlike other technology sectors requires targeted programs to ensure successful commercialization.

DOE has a history of supporting programs that diminish barriers to clean energy commercialization. Currently, the biggest investment in technology transfer at DOE is through the OTT.[256] Founded in 2015, OTT's focus is to expand the commercial impact of research investments by the DOE. Today, OTT is home to several programs that invest in improving the commercialization of lab discoveries including through the Technology Commercialization Fund (TCF),[257] which funds the commercialization of national lab research, and the Energy Innovation Corps (Energy I-Corps)[258] program, which provides intensive entrepreneurial training for national lab employees interested in commercializing their research.

While each of the 17 DOE national labs has a dedicated technology transfer staff who look for opportunities to commercialize inventions, they differ in the robustness of technology transfer programs that they offer to commercialize their discoveries.[259] Moreover, these programs, which are heavily focused on commercialization activities at the national labs, are not sufficient to address the broader national needs of clean energy technology commercialization.[260] Federal support needs to be broadened.

DOE's support of clean energy startups and entrepreneurs has faltered under the Trump Administration. The Trump Administration inappropriately zeroed out the Technology-to-Market Program[261] under the Office of Energy Efficiency and Renewable Energy (EERE), which supported a number of programs to enhance national clean energy technology commercialization. While some of these programs were moved to OTT, the associated funding was not transferred or purposefully never requested in the

[256] *The Office of Technology Transitions*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/technologytransitions/office-technology-transitions.
[257] *Technology Commercialization Fund*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/technologytransitions/services/technology-commercialization-fund.
[258] *Energy I-Corps*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/technologytransitions/energy-i-corps.
[259] U.S. Dep't of Energy, Report on Technology Transfer and Related Technology Partnering Activities at the National Laboratories and Other Facilities Fiscal Years 2009–2013 (2015), https://www.nist.gov/system/files/documents/2017/04/19/fy09-13annualreportontechnologytransfer.pdf.
[260] Tarak Shah with Arjun Krishnaswami, Nat. Resources Def. Council, Transforming the U.S Department of Energy in Response to the Climate Crisis: Legislative Authorization Principles for Clean Energy Innovation (2019), https://www.nrdc.org/sites/default/files/transforming-doe-response-climate-crisis-report.pdf.
[261] *Technology-to-Market*, U.S Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/eere/technology-to-market/home.

annual budget request. While some of these programs, including Lab-Embedded Entrepreneurship Programs,[262] Small Business Innovation Research (SBIR),[263] and Build4Scale[264] remain under the Trump Administration, other programs have been discontinued. In particular, the Trump Administration has ceased the following programs:

- Small Business Vouchers (SBV),[265] which helped small businesses gain access to national lab facilities and expertise;
- the Cleantech University Prize (Cleantech UP),[266] which gave university students the opportunity to pitch their clean energy business ideas in regional and national prize competitions; and
- the original National Incubator Initiative for Clean Energy (NIICE).[267]

The focus of OTT is to support commercialization activities of DOE research investments at the national labs, rather than supporting clean energy technology commercialization broadly. As such, a significant opportunity exists to expand the mission of OTT by revitalizing discontinued programs and expanding existing programs to support the national clean energy technology transfer ecosystem.

Proposed recommendations:

Recommendation #1.1: Revitalize the Department of Energy's investment in clean energy technology transfer.
To make significant progress on clean energy commercialization, the Biden-Harris administration should prioritize clean energy technology transfer activities at DOE.

First, the Biden-Harris administration should expand the mission of OTT to support clean energy technology commercialization broadly, not just at the national labs. Next, the Biden-Harris administration should work with Congress to significantly increase the level of funding for OTT and for specific technology transfer programs under OTT to at least $150 million annually. This level of funding will allow OTT to continue support for

[262] *Lab-Embedded Entrepreneurship Programs*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/eere/amo/lab-embedded-entrepreneurship-programs.
[263] *Small Business Innovation Research and Small Business Technology Transfer*, U.S. Dep't of Energy (last visited Oct. 13,2020), https://www.energy.gov/science/sbir/small-business-innovation-research-and-small-business-technology-transfer.
[264] *Build4Scale Training*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/eere/amo/build4scale-training.
[265] *Small Business Vouchers*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/eere/technology-to-market/small-business-vouchers.
[266] *Cleantech University Prize*, U.S. Dep't of Energy (last visited Oct. 13, 2020), http://www.cleantechup.org/.
[267] *National Incubator Initiative for Clean Energy (NIICE)*, U.S. Dep't of Energy (last visited Oct. 13, 2020), https://www.energy.gov/eere/technology-to-market/national-incubator-initiative-clean-energy-niice-0.

existing technology transfer programs like the revised NIICE and the Lab Partnering Service, and restart discontinued programs, including SBV and CleantechUP. Finally, Congress should grant the Chief Commercialization Officer who leads OTT special hiring authority, similar to the authority granted to the ARPA-E Director, to allow OTT to hire competitive talent with the private sector expertise needed to develop effective technology transfer programs for the clean energy sector.

These proposals have bipartisan support in Congress through existing and draft legislation in both the Senate and the House of Representatives,[268] as well as in the report from the Majority staff of the House Select Committee on the Climate Crisis[269] and the American Energy Innovation Council.[270]

Recommendation #1.2: Prioritize supporting entrepreneurs that come from underrepresented backgrounds and technologies that deliver clean energy to frontline communities.

While there exists a broad lack of support and funding for clean energy startups, these constraints are even worse for entrepreneurs who come from underrepresented backgrounds. For example, startups led by black women secured only 0.06% of the total technology venture funding awarded from 2009-2017.[271] This pattern of inequity means that entrepreneurs from underrepresented groups do not participate fully in the clean energy transition: their innovations remain underfunded, their potential positive impact on both their communities and the broader economy remains unfulfilled, and the nation has not taken advantage of the range of talent and skill in innovation needed to create a low-carbon economy.

[268] Small Businesses Partnering with National Labs Act, S. 2009, 116th Cong. (2019), https://www.congress.gov/bill/116th-congress/senate-bill/2009; Promoting Small Business Innovation through Partnerships with National Labs Act, H.R. 3574, 116th Cong. (2019), https://www.congress.gov/bill/116th-congress/house-bill/3574 ; Energy Innovation Corps, H.R. 7934, 116th Cong. (2020), https://www.congress.gov/bill/116th-congress/house-bill/7934; Technology Transitions Act, S. 2688, 116th Cong. (2019), https://www.congress.gov/bill/116th-congress/senate-bill/2688; Leveraging our National Labs to Develop Tomorrow's Technology Leaders Act, H.R. 5965, 116th Cong. (2020), https://www.congress.gov/bill/116th-congress/house-bill/5965; *From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future: Hearing Before Subcomm. on Energy of the House Science, Space, and Technology Committee*, 116th Cong. (2020), https://science.house.gov/hearings/from-lab-to-market-accelerating-our-progress-toward-economic-recovery-and-a-clean-energy-future.

[269] House Select Comm. on the Climate Crisis, Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America (2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.

[270] Am. Energy Innovation Council, Energy Innovation: Supporting the Full Innovation Cycle(2020), http://americanenergyinnovation.org/wp-content/uploads/2020/02/Energy-Innovation-Supporting-the-Full-Innovation-Lifecycle.pdf.

[271] *The State of Black Women Founders*, Digital Undivided (last visited Oct. 13, 2020), http://www.projectdiane.com/.

To address this pattern of inequity, the Biden-Harris administration should make certain that technology transfer programs reach existing communities at minority-serving institutions (MSIs) and other organizations that support underrepresented entrepreneurs. This would ensure that such entrepreneurs benefit from and engage in DOE technology transfer programs by having OTT staff directly partner with MSIs and other programs that support underrepresented entrepreneurs. For example, the University of Florida established the Empowering Women in Technology Startups program, which provides entrepreneurial training to women to help them pursue leadership roles in technology businesses.[272] OTT should fund existing programs like this one to provide targeted outreach and to recruit entrepreneurs into their programs by building off of existing programs and resources, rather than replicating such programs at DOE.[273]

Recommendation #2: Invest in regional clean energy innovation ecosystems.

From 2005 to 2017, five metro areas accounted for more than 90% of the nation's innovation sector growth, while the bottom 90% of metro areas lost jobs in innovation, leading to growing wealth inequality, deepening racial and socioeconomic inequity, and trapping parts of the nation in patterns of underdevelopment.[274] However, many regions of the U.S. have great potential for unlocking innovation.[275] By linking local economic development, energy resources, and workforce needs with clean energy technology development, these trends can be reversed so that key regions across the nation can become dynamic ecosystems of clean energy innovation.

Regional clean energy innovation ecosystems refer to groups of geographically-connected stakeholders that support advancing clean energy technologies through the lens of advancing economic development. Stakeholders may include state, local, and Tribal governments, universities, nonprofit organizations, clean

[272] HollyFechner and Matthew S. Shapanka, *Closing Diversity Gaps in Innovation: Gender, Race, and Income Disparities in Patenting and Commercialization of Inventions*, 19 Tech. and Innovation 727, 727–734 (2018),https://www.cov.com/-/media/files/corporate/publications/2018/06/closing_diversity_gaps_in_innovation_gender_race_and_income_disparities_in_patenting_and_commercialization_of_inventions.pdf.

[273] Additional examples include the Opportunity Hub in Atlanta, Georgia and proposals from the Center for an Urban Future for low-income entrepreneurs in New York City. Opportunity Hub, https://opportunityhub.co/ (last visited Oct. 14, 2020; Launching Low-Income Entrepreneurs, Ctr. for an Urban Future (2013), https://nycfuture.org/pdf/Launching-Low-Income-Entrepreneurs.pdf.

[274] Robert D. Atkinson, Mark Muro, and Jacob Whiton, Brookings Info. Tech. & Innovation Found., The Case for Growth Centers: How to spread tech innovation across America(2019), https://www.brookings.edu/wp-content/uploads/2019/12/Full-Report-Growth-Centers_PDF_BrookingsMetro-BassCenter-ITIF.pdf.

[275] *Id.*

energy incubators and accelerators, labor groups, and national labs. The Department of Commerce has proven the success of this model through its investment in the Regional Innovation Strategies Program.[276] When state-level clean energy policies and investments are aligned with clearly articulated economic development goals through regional clean energy ecosystems, supported by federal investment, regions can experience significant job growth, increased private sector investment, improved quality of life through cleaner air and water, and reduced impacts of climate change.[277]

In order to achieve these goals, the Biden-Harris administration should create a new program to invest in regional clean energy ecosystems across the nation, particularly in areas that are not home to DOE labs or states which receive significant DOE investments. This should include planning grants for interested state, local, and Tribal governments to undertake assessments of their existing clean energy resources, assets, and policy landscape, including existing research institutes and universities, training providers such as community colleges, and manufacturing facilities, as well as providing grants for communities to implement activities to build strong regional clean energy innovation ecosystems that build off of existing workforce and other assets in the region. Further, this program should be implemented in coordination with the Economic Development Administration under the Department of Commerce, which has a history of supporting region-based innovation through the Build-to-Scale program (B2S). This proposal has support in Congress through draft legislation[278] and from the Energy Futures Initiative.[279]

How the Recommendation Supports Biden's Climate Plan:
The Biden Climate Plans call for increased support of private sector entrepreneurs and strengthening support of minority-serving institutions. The recommendations in this report to strengthen OTT and to specifically target participation of entrepreneurs from underserved backgrounds would directly support these elements of the climate plan. Additionally, the Biden Climate Plans call for increasing investments in coal and power

[276] *Regional Innovation Strategies (RIS) Program*, U.S. Econ. Dev. Admin., (last visited Oct. 14, 2020), https://www.eda.gov/archives/2016/oie/ris/.
[277] Kavita Surana, et al., Univ. of Maryland Glob. Sustainability Initiative, Regional Clean Energy Innovation: Regional Factors for Accelerating the Development and Deployment of Climate Mitigation Technologies (2020), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5eb1e601895ed60da199e488/1588717067823/Final_Regional+Innovation+Report_2.20.20.pdf.
[278] *From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future: Hearing Before Subcomm. on Energy of the House Science, Space, and Technology Committee*, 116th Cong. (2020), https://science.house.gov/hearings/from-lab-to-market-accelerating-our-progress-toward-economic-recovery-and-a-clean-energy-future.
[279] IHS Markit and Energy Futures Initiative, Advancing the Landscape of Clean Energy Innovation(2019), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5e56b4e66212a045e9892505/1582740734147/Advancing+the+Landscape+of+Clean+Energy+Innovation.2+2019.pdf.

plant communities impacted by the climate transformation and investing in the regional innovation ecosystems of the national labs. The recommendation for DOE to support investments in regional clean energy ecosystems could bring direct economic benefits to coal communities and to the regional ecosystems in which the national labs are located, as well as other DOE investments.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

These recommendations would result in significant job creation, given the important role that startups and entrepreneurs play in employment and economic activity. For example, an earlier version of a clean energy incubator program at DOE leveraged over $1 billion in private sector investment and resulted in the creation of over 3,000 clean energy jobs.[280] Additionally, this recommendation would help address climate change by accelerating the time in which we have the tools and technologies needed to achieve a goal of net-zero emissions by 2050.

The clean energy innovation ecosystems recommendation has had proven successes in terms of employment, economic development, and climate impacts. For example, the state of Colorado prioritized regional clean energy innovation as part of the state's economic development plan in the late 2000s. As a result, the state experienced low failure rates of clean energy firms of 14%, a 21.7% reduction in energy-related per capita carbon dioxide emissions since 2005, and employment in clean energy of 12 jobs per thousand people in 2017.[281] The bottom-up, regional approach, combined with the assets and programs managed by OTT, could bring significant employment opportunities to frontline or underserved communities through targeted investments in regional clean energy ecosystems in such communities.

How the Recommendation Supports Frontline or other Underserved Communities:

The recommendations in this paper will help diversify the clean energy entrepreneurial ecosystem by strengthening outreach to entrepreneurs that come from underserved communities. Additionally, investments in regional clean energy innovation will benefit those most economically disadvantaged in our country and will help funnel resources to improve areas in most need of economic investment.

[280] Farah Benahmed and Doug Rand, Third Way, Rescue, Rebuild, and Reinvest: How to Save Clean Energy Startups(2020), http://thirdway.imgix.net/pdfs/rescue-rebuild-and-reinvest-how-to-save-clean-energy-startups.pdf.
[281] Kavita. Surana, et al., Univ. of Maryland Glob. Sustainability Initiative, Regional Clean Energy Innovation: Regional Factors for Accelerating the Development and Deployment of Climate Mitigation Technologies (2020), https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/5eb1e601895ed60da199e488/1588717067823/Final_Regional+Innovation+Report_2.20.20.pdf.

Key Battleground State Activity:
Investing in technology transfer programs at the national labs will strengthen connections between the labs and the areas in which they reside, which will be important for battleground states that are home to the labs including Iowa, Tennessee, Colorado, Pennsylvania, and Virginia. As an example of the success of this mechanism, an independent report has concluded that the Sandia Science & Technology Park contributed significantly to the local economy in 2018-2019 by adding 310 jobs and generating increases in economic activity and tax revenue to the city of Albuquerque and the state of New Mexico.[282]

The clean energy innovation ecosystems recommendation would be particularly beneficial for battleground states by bringing the economic benefits of clean energy innovation off of the coasts and into America's heartland. Existing Cleantech businesses in Nevada, North Carolina, Minnesota, together with their research universities and renewable energy resource availability, suggest a strong potential for clean energy innovation and technology transfer. Additionally, a recent report from the Environmental Defense Fund and Resources for the Future suggests the need for such investments to revitalize communities that have been historically dependent on coal, oil, and natural gas, and indicates that federal investments in regional economic development can result in significant workforce and economic growth in communities.[283]

[282] *Sandia Science & Tech Park Spurs Economic Growth*, Sandia Nat'l Labs. (Aug. 12, 2020), https://share-ng.sandia.gov/news/resources/news_releases/technology_park/.
[283] Daniel Raimi, Wesley Look, Molly Robertson, and Jake Higdon, Resources for the Future, Economic Development Policies to Enable Fairness for Workers and Communities in Transition (2020), https://www.edf.org/sites/default/files/content/worker-fairness-economic-development-report.pdf.

Establish a Department of Energy Foundation

Opportunity/Problem:

The United States' strong support for energy research and development should position it to lead the global energy transition. But the U.S. has difficulty moving new technologies from early discovery to scale. No one entity in the U.S. energy innovation system is responsible for bringing new technologies across the "valley of death" between proof of concept and early adoption in the market. This gap in the nation's energy innovation system could put the climate at risk by stalling the transition. A DOE Foundation would close this gap through the development of collaboration strategies aimed at catalyzing and incubating partnerships between the public, private, and philanthropic communities to tackle cross-cutting national challenges and strengthening regional energy innovation ecosystems.

Recommended Action(s):

- DOE should create a non-profit foundation similar to many of the other agency-related foundations that exist to support federal agencies.
- Congress should authorize and fund this foundation in a recovery bill.

Program Type:

√ New Program

Authority:

√ Requires New Legislation

Job Benefits:

In May, over 90% of small businesses were impacted by COVID-19. This unprecedented event now threatens to close many of these companies for good. This is particularly difficult for clean energy companies, and especially startups, which were already at a disadvantage with low-margins, high capital costs, and an unfriendly market dominated by incumbents. Between 2014 and 2019, solar employment increased 44%, a rate of job growth five times faster than that of the overall U.S. economy. By quickly saving clean energy startups,the U.S. could see growth rates, like that of solar, from a wide variety of other clean energy technologies.

Econ. Benefits:

The Foundation would support incubators and other organizations working with high-tech startups. These organizations have demonstrated their ability to help create jobs in all regions of the country, and technology-based startups have an outsized contribution on employment, innovation, exports, and productivity growth.

Establish a Department of Energy Foundation

Equity Benefits:

The Foundation would work to convene stakeholders in diverse communities across the country to better understand what those communities need. It would then leverage the network and capabilities of the federal government and private partners to bring resources to communities that would not customarily have access to these capabilities.

Climate Plan Tie:

The next administration's Innovate in America initiative will accelerate R&D through a $300 billion investment over four years. This kind of investment especially in diverse communities across every region of the country could be facilitated by the Foundation working with regional organizations to support clean energy innovation.

Battleground State Benefits:

The Foundation will expand access and support innovation in battleground states such as IA, MI, OH, PA, and TX which could benefit from public-private partnerships that bring new resources, funding, and expertise to the state.

Establish a Department of Energy Foundation

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DATE: October 1, 2020

Statement of Issue and Summary of Recommendations

Over the coming decades, the world economy must make a transition to low-carbon and no-carbon energy. This transition will require accelerated innovation to affordably reduce the carbon footprint of all major sources of emissions. The United States' strong support for energy research and development should position it well to lead the global energy transition. But the U.S. has difficulty moving new technologies from early discovery to scale. No one entity in the U.S. energy innovation system is responsible for bringing new technologies across the "valley of death" between proof of concept and early adoption in the market. Government and philanthropic funding typically come too early in the process to help would-be innovators get to market, while the private sector customarily prefers investments that pay off more quickly and with more certainty.

This gap in the nation's energy innovation system could put the climate at risk by stalling the transition. It could also open the way for China and other countries to capitalize on U.S. investments. If key technologies are made overseas, the U.S. will lose out on many of the commercial opportunities the transition will create, and its national security could be compromised.

A DOE Foundation would close this gap through the development of collaboration strategies aimed at catalyzing and incubating partnerships between public, private, and philanthropic communities to tackle cross-cutting national challenges and strengthening regional energy innovation ecosystems. Through these partnerships, the Foundation could stimulate pre-pilot and pilot-scale demonstrations, and facilitate testing of emerging clean energy technologies with customers and in regions ready to deploy the technology. The Foundation could convene all of the different entities needed to bridge the period between proof concept and first adoption. The Foundation would leverage its strong connection to DOE to connect startups, small businesses, and innovators with technical resources and expertise across the country to bring new technologies to the market.

To establish a DOE Foundation CE4B recommends the following actions:

1. The U.S. Department of Energy should create a non-profit foundation similar to many of the other agency-related foundations that exist to support federal agencies.
2. The Office of Science and Technology Policy, the Department of Energy, and the Office of Management and Budget should work with Congress to authorize and fund this foundation in a recovery bill within the first 100 days of the next administration.

Opportunity / Problem Statement

The United States' strong position at the front end of the innovation cycle gives it the inside track to capture a substantial share of the trillions of dollars that will flow into new clean energy products and services as they are commercialized and adopted globally. Yet, the United States is struggling to move innovative energy technologies from discovery to scale. In order to deploy clean energy technologies at the pace and scale needed to address climate change, we must improve collaboration and increase overall support for clean energy innovation by encouraging strategic coalitions of industry, venture capital, local and federal governments, philanthropic investors, and other partners.[284]

The Biden-Harris administration should establish a nonprofit agency-related foundation to coordinate public-private-partnerships focused on furthering the development of early-stage technologies and reducing perceived risk by the private sector. When it comes to clean energy, no one entity in the U.S. energy innovation system is responsible for or has the capabilities to bring new technologies from discovery to commercial application. This nonprofit foundation could bring together resources from across the federal government and the country to form the collaborative partnerships necessary to identify and incubate the breakthrough technologies required to transform our energy systems. A nonprofit foundation could:

- promote access to federal facilities and expertise,
- provide training and education to the energy workforce, researchers, and entrepreneurs,
- deploy funding for technology maturation,
- convene and engage stakeholders at national and regional levels, and
- serve as an innovation program with a higher tolerance for failure and lower volatility of funding by leveraging philanthropic and private sector investments.

[284] Jetta Wong and David M. Hart, *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*, Info. Tech. & Innovation Found., (May 11, 2020), https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation.

The Foundation would not be an agency but would have a strong connection to DOE. It could work with all of the federal agencies and provide a neutral platform to bring agencies and the private sector together around grand challenges and regional energy issues. Activities would include developmental support for early-stage scientists, startups, and entrepreneurs that need to better understand their markets, meet customers and further the maturation of their technologies from prototype to first pilot demonstration. The Foundation would have its own technical expertise and would draw on the expertise and capabilities of the DOE national laboratories. A not-for-profit organization capable of building and shepherding public-private partnerships between DOE, entrepreneurial energy technology companies, and private sector players like utilities and large industrials will improve the innovation pipeline and better position American entrepreneurial clean energy companies to bring their technology to commercial scale. By bringing together public and private resources on the path to commercialization, the Foundation would complement unique financing mechanisms for the deployment of clean energy technologies, such as a Clean Energy Deployment Administration.[285]

The Foundation would draw on precedents set by the diverse array of agency-related foundations that Congress has established over the past 50 years. These independent nonprofit foundations help create partnerships and leverage private sector follow-on funding to address broad societal challenges across different sectors. Agency-related foundations may deploy more flexible partnership mechanisms, receive and actively seek gifts on behalf of a federal agency, help agencies retain scientific talent, and provide public education and awareness opportunities regarding the role and value of federal R&D.[286] For example, the Foundation for the National Institutes of Health (FNIH) has raised more than $80 for every dollar of NIH funding.[287] Other agency foundations include the National Park Foundation (NPF), the Foundation for Food and Agriculture Research (FFAR), and the Centers for Disease Control Foundation (CDCF).[288]

These Foundations have demonstrated that they can raise tens of millions of private-sector dollars towards cutting-edge research and innovation which is a key driver of economic growth. According to a study from the Bureau of Labor Statistics,

[285] Jake Caldwell and Richard W. Caperton, *A New Clean Energy Deployment Administration*, Ctr. for Am. Progress (June 16, 2010), https://www.americanprogress.org/issues/green/news/2010/06/16/7964/a-new-clean-energy-deployment-administration/.
[286] Cong. Research Serv., Agency-Related Nonprofit Research Foundations and Corporations 2 (2019), https://fas.org/sgp/crs/misc/R46109.pdf.
[287] Found. for the Nat'l Insts. of Health (FNIH),Biomedical Science Needs to Achieve More in a Resources-limited World (last visited Oct. 14, 2020), https://fnih.org/sites/default/files/final/FNIH%20Capabilities%20Brochure.pdf.
[288] Cong. Research Serv., Agency-Related Nonprofit Research Foundations and Corporations 2 (2019), https://fas.org/sgp/crs/misc/R46109.pdf.

over half of the increase in economic output from 1948 to 2007 can be credited to R&D spending.[289] Furthermore, foundations can help agencies respond to crises and support whole-of-government recovery efforts. For example, the FNIH and CDCF have been assisting the federal government in their COVID-19 response by using their flexibility to quickly hire and deploy hundreds of staff to assist state and local government, provide medical supplies, personal protective equipment, laboratory equipment, and more.[290] The CDCF alone has raised over $133 million since the beginning of the pandemic.[291] Additionally, the FNIH is coordinating the inter-agency efforts to accelerate the most promising COVID-19 vaccines and treatments.[292]

Proposed Recommendations

Recommendation #1: DOE should create a non-profit foundation similar to many of the other agency-related foundations that exist to support federal agencies.

The Biden-Harris administration should direct the DOE to create a non-profit foundation similar to many of the other agency-related foundations that exist to support agency missions. The Office of Management and Budget should work with DOE to identify the appropriate funds for a Request for Proposal to be released within the first 100 days of a Biden-Harris administration. After selecting a non-profit organization, DOE and the organization should create an MOU that outlines the relationship between DOE, its employees, and its labs, and the Foundation. It should base the foundation on existing agency-related precedents.

The Obama-Biden administration's Interagency Workgroup on Lab-to-Market published through the Federal Laboratory Consortium the Technology Transfer Playbook in 2014, which included descriptions of several agency-related foundations.[293] Additionally, working with the Congress, the Obama-Biden administration established the USDA's FFAR. Finally, the Obama-Biden administration also included a Bureau of Land Management Foundation in the 2017 budget proposal, and H.R. 11 Revitalizing the Economy of Coal Communities included an authorization for the foundation. It was

[289] Earl Lane and Becky Ham, *The Payoff of Federal R&D: iPod, Google, and Human Genome Project*, Am. Ass'n for the Advancement of Sci. (Apr. 27, 2012), https://www.aaas.org/news/payoff-federal-rd-ipod-google-and-human-genome-project.
[290] Jetta Wong and David M. Hart, *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*, Info. Tech. and Innovation Found. (May 11, 2020) https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation.
[291] CDC Foundation, Making an Impact: The CDC Foundation Responds to Covid-19, (2020), https://www.cdcfoundation.org/sites/default/files/files/COVIDresponseupdate11final.pdf.
[292] Press Release, Found. For the Nat'l Insts. of Health, NIH to Launch Public-Private Partnership to Speed COVID-19 Vaccine and Treatment Options (Apr. 17, 2020), https://fnih.org/news/press-releases/nih-launches-partnership-to-speed-covid19-vaccines-treatments.
[293] Fed. Lab. Consortium for Tech. Transfer, Technology Transfer Playbook (last visited Oct. 14, 2020), available at https://federallabs.org/media/publication-library/technology-transfer-playbook.

eventually authorized in the Consolidated Appropriations Act of 2017 (P.L. 115-31).

The Biden-Harris administration should also look to the 2019 National Institute for Standards and Technology report, "Return on Investment Initiative: Green Paper," which highlighted several lab-to-market strategies, including the establishment of agency-related foundations. Additionally, in 2020 DOE commissioned a study by the National Academy of Public Administration "on the value of creating a nonprofit foundation that will better promote the transfer of technology to the marketplace." This is mandated in the Further Consolidated Appropriations Act of 2020 (P.L. 116-94).[294] The study should be finished in the fall of 2020.

Recommendation #2: The Biden-Harris Administration should work with Congress to authorize and fund this foundation in a recovery bill.
The Biden-Harris administration should work with Congress to authorize and fund the Foundation in the first recovery bill. Congress should provide the Foundation a one-time appropriation of $100,000,000 to jump-start its activities. This would establish the Foundation's credibility, help attract high-quality staff, and leverage substantially larger contributions from nongovernmental donors. This follows the approach that Congress took when it established the USDA's FFAR.

Additionally, Congress should provide an annual appropriation of $3,000,000 for the Foundation. This will help it avoid the need to continuously seek funding necessary to maintain core staff and fund critical operating expenses, which neither corporate nor philanthropic donors are usually willing to support.[295]

A DOE Foundation is envisioned in the bi-partisan and bi-cameral Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies for Energy Act or IMPACT bill introduced by Senators Chris Coons (D-DE) and Lindsey Graham (R-SC) (S.2005), along with Representatives Ben Ray Lujan (D-NM) and Joe Wilson (R-SC) (H.R.3575). The House Science, Space and Technology Committee examined this bill in its hearing on July 17, 2020, "Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future."[296] A revised bipartisan authorization of

[294] *An Assessment of the Value of a Non-Profit Foundation to Promote Department of Energy Technology Transfer to the Marketplace*, Nat'l Acad. of Pub. Admin.(Sept. 8, 2020), https://www.napawash.org/studies/academy-studies/an-assessment-of-the-value-of-a-non-profit-foundation-to-promote-department-of-energy-technology-transfer-to-the-marketplace.
[295] Maria Di Mento, *Five CEOs of Wealthy Foundations Pledge to Do More to Help Charities Pay Overhead*, Chronicle of Philanthropy (Sept. 4, 2019), https://www.philanthropy.com/article/5-CEOs-of-Big-Foundations/247063.
[296] *From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future: Hearing Before Subcomm. on Energy of the House Science, Space, and Technology Committee*, 116th Cong. (2020), https://science.house.gov/hearings/from-lab-to-market-accelerating-our-progress-toward-economic-recovery-and-a-clean-energy-future.

the IMPACT bill passed the House on September 24, 2020 in H.R.4447, the Clean Economy Jobs and Innovation Act.[297]

Additionally, the Republican Ranking Member, Rep. Frank Lucas (R-OK-3) introduced the Securing American Leadership in Science and Technology Act of 2020, or SALSTA bill, (H.R.5685) in January 2020. This bill includes an authorization for a National Institute of Standards and Technology Foundation (Sec. 313) and an authorization for any government-owned federal laboratory to enter into an agreement with a nonprofit foundation to support its mission (Sec. 809). The IMPACT Bill and the Sec. 313 of SALSTA are authorizations of agencies, while Sec. 809 of SALSTA covers federal laboratories.

Jobs, the Economy, and Climate Change

In May 2020, over 90% of small businesses were impacted by COVID-19.[298] This unprecedented event now threatens to close many of these companies for good. This is particularly difficult for clean energy companies, and especially startups, which were already at a disadvantage with low-margins, high capital costs, and an unfriendly market dominated by incumbents. Between 2014 and 2019, solar employment increased 44%, which was five times faster than job growth in the overall U.S. economy.[299] By stimulating more innovative technology companies the U.S. could see growth rates like that of solar from a wide variety of additional technology areas.

The Foundation would support incubators and other organizations working with high-tech startups. These organizations have demonstrated their ability to help create jobs in all regions of the country and support technology-based startups which have an outsized contribution to employment, innovation, exports, and productivity growth.[300] Supporting these organizations would begin to rebuild the infrastructure the country needs to save early-stage companies and cement their path towards the growth envisioned in the Build Back Better plans.

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[297] Clean Economy Jobs and Innovation Act, H.R. 4447, 116th Cong. (2019), https://www.congress.gov/116/bills/hr4447/BILLS-116hr4447rh.pdf;Mr. Luján of New Mexico, 116th Cong., Amendment to Rules Committee Print 116-63 (2019), https://amendments-rules.house.gov/amendments/LUJAN_109_xml918200949184918.pdf;Committee on Rules, 116th Cong., H.R. __ (2020),erules.house.gov/sites/democrats.rules.house.gov/files/Rule_HR4447HR6270HR8319.pdf.

[298] *COVID-19 Impact on Small Business: Part 3*,Nat'l Fed'n of Indep. Bus. (Apr. 2, 2020), https://www.nfib.com/content/press-release/economy/covid-19-impact-on-small-business-part-3/.

[299] *National Solar Jobs Census*, The Solar Found. (last visited Oct. 14, 2020), https://www.thesolarfoundation.org/national/#:~:text=The%20solar%20workforce%20added%20more,in%20the%20overall%20U.S.%20economy.

[300] John Wu and Robert D. Atkinson, *How Technology-Based Start-Ups Support U.S. Economic Growth*, Info. Tech. & Innovation Found. (Nov. 28, 2017), https://itif.org/publications/2017/11/28/how-technology-based-start-ups-support-us-economic-growth.

Supporting Frontline or other Underserved Communities

The Foundation is particularly important for establishing and developing regional networks of science and technology clusters. It would work to convene stakeholders in diverse communities across the country to better understand the needs of the communities. It would then leverage DOE's expertise and network of researchers to help fill the gaps in expertise around strategically and regionally important technologies. It will focus on disadvantaged communities, non-coastal regions, and communities that do not have access to strong research institutions. Not only will this help the Foundation engage the public in a way that federal agencies, national laboratories, and research institutions can not, but it has the potential to empower those communities with access to unique facilities and world-class expertise.

Supporting Biden's Climate Plan

The Biden-Harris administration's Innovate in America initiative will accelerate R&D through a $300 billion investment over four years. A DOE Foundation that works with regional organizations to develop innovation and technology hubs could particularly benefit diverse communities. The Foundation would be able to help communities learn about the opportunities to access new funds for high-quality training, technical education, manufacturing, and R&D.Through the Sustainable Infrastructure and Clean Energy Plan, the Biden-Harris administration will make a historic investment in the development of new clean energy technologies working through new partnerships and regional ecosystems of innovation.

Key Battleground State Activity

The DOE Foundation could expand access and support innovation in battleground states such as Iowa, Michigan, Ohio, Pennsylvania, and Texas which could benefit from public-private partnerships that bring new resources, funding, and expertise to the state.

US Offshore Wind Industry: A New Job-Rich Climate-Positive American Industry Can Be Launched During the Biden Administration's First Year

Opportunity/Problem:

Offshore wind power (OSW) is the largest untapped renewable energy opportunity in the United States. Using first-100-day policy actions, the Biden Administration can launch a large new American industry capable of generating 5,000 megawatts (MW) of offshore wind power by 2025 followed by 30,000 by 2030—enough to power 11 million homes—and 200,000 MW before 2050. Once unleashed, offshore wind can deliver immediate job creation during Biden's first term while playing a pivotal role in meeting the 100% clean energy by 2035 Biden policy goal and standing up an enduring American industry for our younger generations.

Recommended Action(s):

- Issue an EO regarding offshore wind, either as a stand-alone EO or as an essential component of a broader climate and clean energy EO that overrides Trump's EO 13783 (Mar. 2017) and EO 13795 (Apr. 2017).
- The Secretary of the Interior should issue a Secretarial Order directing DOI's and BOEM's to return to regular permitting, advance pending leases and address other key barriers.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

More than 80,000 good-paying jobs by 2025, continuing at least through 2035.

Econ. Benefits:

$17 billion injected into the U.S. economy by 2025, $108 billion by 2030 and $166 billion by 2035 for construction, transportation and port-related development.
Nearly $2 billion in offshore lease payments will flow to the U.S. Treasury during 2021 and 2022 alone

Equity Benefits:

Low-income communities will receive direct health benefits from the downscaling of fossil fuel electricity generation. Displacement of pollution by building just the current queue of OSW projects will avoid 7000 premature deaths in the Northeast, including a disproportionately large 1,800 minority deaths,

Climate Plan Tie:

Clean, reliable renewables are essential to achieving clean energy targets.

Battleground State Benefits:

Significant job opportunities for Virginia, North Carolina, Pennsylvania, North Carolina, Michigan, Georgia, and New Hampshire

U.S. Offshore Wind Industry: A New Job-Rich, Climate-Positive American Industry Can be Launched During the Biden Administration's First Year

Authors: Willett Kempton, Michael Northrop, Tommy Beaudreau, Erich Stephens, Ann G. Berwick, Stephanie McClellan, Ph.D., Dan Reicher

DATE: 30 September 2020

Statement of Issue and Summary of Recommendations

Offshore wind power is the largest untapped renewable energy opportunity in the United States. Using *first-100-day* policy actions, the Biden Administration can launch a large new American industry capable of generating 5,000 megawatts (MW) of offshore wind power by 2025 followed by 30,000 MW by 2030—enough to power 11 million homes—and 200,000 MW before 2050. Once unleashed, offshore wind can deliver immediate job creation during the first term of the Biden-Harris administration while playing a pivotal role in meeting the 100% clean energy by 2035 and standing up an enduring American industry for our younger generations.

Early administrative actions on the part of the Biden-Harris administration can get construction started on currently-designed projects on the East Coast, while also stimulating new project work on the West Coast, Gulf of Mexico, and Great Lakes, as well as manufacturing in inland and coastal states. States from Massachusetts to Virginia have already put the policies and contracts into place needed to get projects built; they only await federal actions held up by the Trump Administration's Department of the Interior (DOI). Because offshore wind projects are located in federal waters, they rest on DOI's ability to issue the necessary leases and permits. Once early Biden Administration actions set these in motion, offshore wind will create numerous immediate and tangible benefits:

- More than 80,000 good-paying jobs by 2025, continuing at least through 2035.
- $17 billion injected into the U.S. economy by 2025, $108 billion by 2030 and $166 billion by 2035 for construction, transportation and port-related development.
- Nearly $2 billion in offshore lease payments will flow to the U.S. Treasury during 2021 and 2022 alone.

- Over the long term, a sustainable source of clean energy that powers over 20 million households and provides the foundation of a new industry for decades to come. (Projections from Wood McKenzie's August 2020 Economic Impact Study)

Offshore wind is already a mature technology. In Europe, projects are routinely built on-time, on-budget, and operate reliably for decades. Technological improvements are now focused on continuous cost reductions, making the industry cost-competitive with fossil fuel-based electric generation in many regions.[301] Recent experience in Europe also demonstrates that offshore wind projects can be built and operated safely even during the global pandemic.

The Executive branch actions itemized below will quickly unleash and elevate the U.S. offshore wind industry to large scale, creating an entirely new industrial sector for the nation. These recommendations will immediately initiate ten offshore wind projects totaling 8,000 MW of capacity, with contracts, currently stalled under the Trump administration and awaiting federal approvals to start construction. Approval of the first utility-scale offshore wind project to be built in the U.S.—Vineyard Wind, located 14 miles off the coast of Massachusetts—has been delayed by more than a year by the Trump Administration, creating a chilling effect across the industry that can quickly be remedied. The economic impact of a Biden-Harris administration policy change would be nationwide: while projects are located along coastal states, the scale of the supply chain needed to serve this new industry is such that many states, including several battleground and mid-western states, will benefit from this new American industry.

Opportunity / Problem Statement:
The Trump Administration's DOI has failed to sign approvals to construct projects or hold lease sales for additional requested offshore wind areas. On Day 1 of the Biden-Harris administration, this failure can be remedied through signing of a presidential Executive Order and a DOI Secretarial Order, followed by DOI approval of queued up paperwork. (None of these items require legislative action). Because these projects are otherwise ready to begin construction, these Executive actions will have a large, immediate and visible effect on employment and construction activity starting in 2021. These and other Executive actions by nine additional agencies, as described below under "Proposed Recommendations" can jumpstart these offshore wind projects and play a key role in an economic recovery led by President-elect Biden.

Proposed Recommendations:

[301] *See* Simon Evans, *Analysis: Record-low Price for UK Offshore Wind Cheaper than Existing Gas Plants by 2023*, Carbon Brief (Sept. 20, 2019), https://www.carbonbrief.org/analysis-record-low-uk-offshore-wind-cheaper-than-existing-gas-plants-by-2023.

Fostering Innovation And Bringing Technologies To Market

Below are policies and executive actions that the Biden-Harris administration can implement – on Day 1, in the first 100 days, and in the first term – to capture the American offshore wind opportunity that awaits the new administration.

- **White House Executive Order** – *Day 1*. The White House should issue an Executive Order regarding offshore wind, either as a stand-alone action or as an essential component of a broader climate and clean energy Executive Order that overrides Trump's Executive Order 13783 (Mar. 2017) and Executive Order 13795 (Apr. 2017). President-elect Biden's Executive Order should be accompanied by a major Presidential address that grounds offshore wind in policy themes regarding climate change, the clean energy economy, the importance of science, and environmental justice. Elements of the Executive Order include: **Establish** targets for permitting and constructing 5,000 MW of offshore wind by 2025, 30,000 MW by 2030, and at least 200,000 MW by 2050 (for context, every 5,000 MW of offshore turbines can power about 2 million homes); **Establish** the policy framework for offshore windas central to the strategy for combating climate change, building the clean energy economy, and pursuing environmental justice; **Establish** a White House-coordinated interagency task force to expedite federal permitting of renewable energy, effectively implement the FAST Act, uphold environmental protections, and engage stakeholders; **Establish** a White House-coordinated task force on offshore wind transmission and grid interconnection; **Direct** the DOE / NREL to support transmission infrastructure investments to enable the integration of offshore wind into regional grids; **Support and direct** DOE and DOT manufacturing and investment incentives and financing programs for offshore wind infrastructure, including ports and support facilities, turbine and vessel manufacturing and supply chain, and planning and development of generation and transmission infrastructure; **Establish** a Department of Labor job training initiative to build workforce and technical capacity for clean energy jobs, including offshore wind.

✓	Is this a modification of an existing program?
✓	Does this roll back a Trump Administration regulation?

- **The Department of the Interior and Bureau of Ocean Energy Management (BOEM)**. DOI and BOEM are the lead agencies for advancing the permitting of utility-scale OSW power generation and transmission. *Day 1*: The Secretary of the Interior should issue a Secretarial Order directing the following actions: **Plan** a major Secretarial address regarding DOI's role in achieving the Biden-Harris administration's policy goals related to climate, clean energy, and environmental justice; **Direct** BOEM to return to regular permitting

order for offshore wind projects, including timely publication of notices of intent to prepare environmental (NEPA) reviews, review and approval of site assessment plans (SAPs), and construction and operations plans (COPs); and review and approval of rights of way (ROWs); **Direct** BOEM to advance pending offshore wind lease sales for the New York Bight and offshore California; **Direct** BOEM to develop a schedule for the identification and potential leasing of additional wind energy areas in the Atlantic and Pacific; **Direct** the Deputy Secretary of the Interior to convene representatives of the commercial fishing industry, offshore wind industry, and relevant federal agencies to address offshore wind impacts on and potential synergies with fishing interests; **Direct** the Deputy Secretary of the Interior to convene representatives of the offshore wind industry, environmental NGOs, and relevant federal and state agencies to address offshore wind impacts on wildlife including avian species and marine mammals.

	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

- **Other Federal Agencies**. Realizing the potential of offshore wind—to address the climate challenge, build clean energy infrastructure, support environmental justice, and support economic revitalization—will require an Administration-wide effort.

  a. **Commerce / NOAA.** The National Marine Fisheries Service (NMFS) should participate in DOI-led stakeholder engagement regarding commercial fishing and development of best practices and policy guidance, and ensure that NMFS staff is properly resourced to conduct timely consultations and appropriate impact analyses in connection with the offshore wind leasing and permitting process. *First 100 Days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

b. Department of Defense. Through the interagency coordination process, the U.S. Army Corps of Engineers (ACOE) should align its environmental review and permitting process with the BOEM COP approval process to ensure that the permitting of generation and nearshore / onshore transmission components of offshore wind projects are harmonized. *First 100 Days*. Issue high-level policy direction across the branches, including the Department of the Navy, establishing that combating

climate change and developing renewable energy is vital to national security. This policy direction should be included in a major address by the Secretary of Defense. *First 100 Days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

c. DHS / Coast Guard (USCG). Establish clear guidance regarding coastwise trade in connection with offshore wind facility construction and Jones Act compliance. *First 100 Days*. Establish clear guidance for USCG Port Access and Reliability Studies and vessel routing measures to ensure appropriate and consistent accommodation of offshore wind energy lease areas and project development. *First 100 Days*

✓	Is this a modification of an existing program?
✓	Does this roll back a Trump Administration regulation?

d. EPA. In coordination with the Council on Environmental Quality (CEQ) and relevant states, evaluate and quantify the environmental benefits of offshore wind in terms of air quality, estimated reduced mortality and morbidity, health and employment benefits for low-income and minority communities, and CO2 reductions. These analyses will assist in quantifying the Environmental Justice value and net environmental benefits of clean energy, including offshore wind development. *First 100 Days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

e. FERC and Regional Transmission Organizations/Independent System Operators (RTOs/ISOs). Transmission and Grid Interconnection. Establish a federal and state task force to coordinate among federal and state agencies, FERC, and the RTOs/ISOs for optimizing grid readiness for offshore wind interconnection. *First 100 Days***.** FERC direction to RTOs/ISOs on planning for renewable energy integration, including offshore wind. *First Term***.** Consistent with the Executive Order, establish federal and state regional working groups, chaired by a senior appointee from DOI, for the Northeast and the Mid-Atlantic to develop integrated planning and strategies for

offshore wind transmission and the potential for open-access offshore grid transmission systems. *First 100 Days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

f. **DOT, ACOE, USCG, DOL.** Financing, Infrastructure, and Job Training. Support new port development to facilitate offshore wind project development, manufacturing and supply chain: **Establish** an interagency technical advisory group (including DOT, ACOE, USCG, and DOE) to evaluate possible assistance (agency or financial) for development and construction of "advanced offshore wind marshalling ports" that can deploy current generation turbines and allow expansion to new sizing and deployment technologies (*e.g.,* waterside, 35 ft channel, rail access, greater than 200 acres, no overhead obstructions from port to sea). *First 100 Days*. **Support** increased funding for the DOT Better Utilizing Investments to Leverage Development (BUILD) program to support port modernization, turbine and vessel manufacturing facilities, and supply chain facilities. *First Term*. At DOL, in coordination with the offshore wind industry, organized labor, community colleges and universities; **Establish** job training programs focused on building technical competency and capacity to support the construction and operation of renewable energy projects. *First 100 days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

g. DOE. Research and Development to Support New U.S. Industries. Support increased funding and finance for DOE programs that fund research, development, and early deployment of turbine blades designed for U.S. conditions, a LIDAR wind measurement campaign, and ARPA-E technologies including floating wind. Goals should target both U.S.-specific technology needs and developing research and IP that can lead to U.S. manufacturing of turbine components. *First Term*.

	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

h. Treasury, Congress. Tax Policy. Establishing a stable tax policy that aligns with the development cycle of offshore wind will support the financing and rapid construction of utility-scale offshore wind projects: **Support** legislation extending at

30% the investment tax credit (ITC) through 2026. *First 100 Days*. Department of Treasury to **Amend** Section 45 tax credit guidance to align with the offshore wind development cycle, including (1) allowing use of the "continuous efforts" test rather than "continuous construction" test regardless of how a project qualified; and (2) allow offshore wind projects to have up to 7 years of safe harbor (rather than the current 4) in which to complete construction. *First 100 Days*. **Support** legislation reinstating the 48C Advanced Energy Manufacturing credit with direction to DOE to use the authority to support accelerated domestic offshore wind manufacturing. *First 100 Days*

✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

How the Recommendation Supports Frontline or other Underserved Communities:

Labor and environmental justice groups have been at the forefront of advocacy for offshore wind. For example, New York state and New York City environmental justice coalitions have vociferously supported rapid development of offshore wind ever since Hurricane Sandy, as these groups understand that rapid development of offshore wind can help to alleviate the existential threat to their neighborhoods from climate change-related impacts like storm surge and flooding. Labor and environmental justice groups are also eager to take advantage of job training opportunities and participate in this nascent industry. These communities will also experience direct health benefits from the downscaling of fossil fuel electricity generation. Displacement of pollution by simply building the current queue of projects will avoid 7,000 premature deaths in the Northeast, including a disproportionately large 1,800 deaths in minority communities, according to recent testimony by the University of Delaware to BOEM. It will be important to engage minority and low income communities to minimize pollution from ships as marine operations increase.

How the Recommendation Supports the Biden Climate Plan:

Offshore wind is the largest clean power production resource in U.S. coastal areas, where 53% of U.S. residents live. Without a major build out of offshore wind, the U.S. will not successfully address the climate change crisis or meet key elements of the Biden Climate Plan, including building 60,000 wind turbines and eliminating CO_2 emissions from power generation. Several state governments (New York, Massachusetts, New Jersey, and Maryland) have inventoried their renewable resources and determined that their state clean energy commitments cannot be met without offshore wind. A 30,000 MW build by 2030 would power 20% of the electricity of the East Coast, powering homes from North Carolina to Massachusetts. As demonstrated in our table below, our suggested Biden-Harris administration goal of deploying 5,000 MW of offshore wind

power by 2025, and 30,000 MW by 2030, aligns with and further drives the renewable energy mandates and offshore wind procurement targets already established by East Coast states. These actions would launch a national industry that could deliver 200,000 MW before 2050. Additionally, the expanding resource can help meet electric needs as states move to electrify their transportation and building sectors in order to meet climate mandates. Adding Gulf of Mexico and West Coast offshore wind project development would bring additional clean energy generation and job creation.

The table below shows how these results support the Biden Climate Plan.

	Year	Capacity of offshore wind (MW)	Turbine count (equiv. 5 MW)[302]	CO_2 Reduction short tons/year[303]	Reduction of US power CO2	Fraction of NE + Mid-Atlantic power met by offshore wind[304]
Current "shovel-ready" projects	2025	5,000	1,000	1.250	0.5%	3%
Current state requirements and plans	2030	30,000	6,000	7,500	3%	23%
Projected industrial development	Before 2050	200,000	40,000	50,000	20%	150%

As shown in this table, by acting on already teed-up 5,000 and 30,000 MW levels of offshore wind potential, the Biden-Harris administration has the opportunity to launch a new industry that makes significant contributions to the Biden Climate Plan's goals, displacing 20% of the CO2 emissions of the entire U.S. power sector. Longer-term, the "before 2050", as shown last row in the above table, shows that offshore wind would produce more than all current electricity load of the entire region. The rows for "2030" and "before 2050" show our projections based on current market conditions--the rate of growth through 2050 could be faster if policies were adopted in addition to market forces alone.

Key Battleground State Activity:

[302] The Biden plan to build 60,000 turbines is presumably measured in new generation land-based turbines, approaching 5 MW, so we here count turbines in 5 MW increments, even though OSW turbines are substantially larger.

[303] US avg. power production is 0.99 pounds of CO_2 emissions per kWh or about 0.5 short ton/MWh, and US power sector totals 2.06B tons/year (EIA, FAQ), we assume OSW 55% CF.

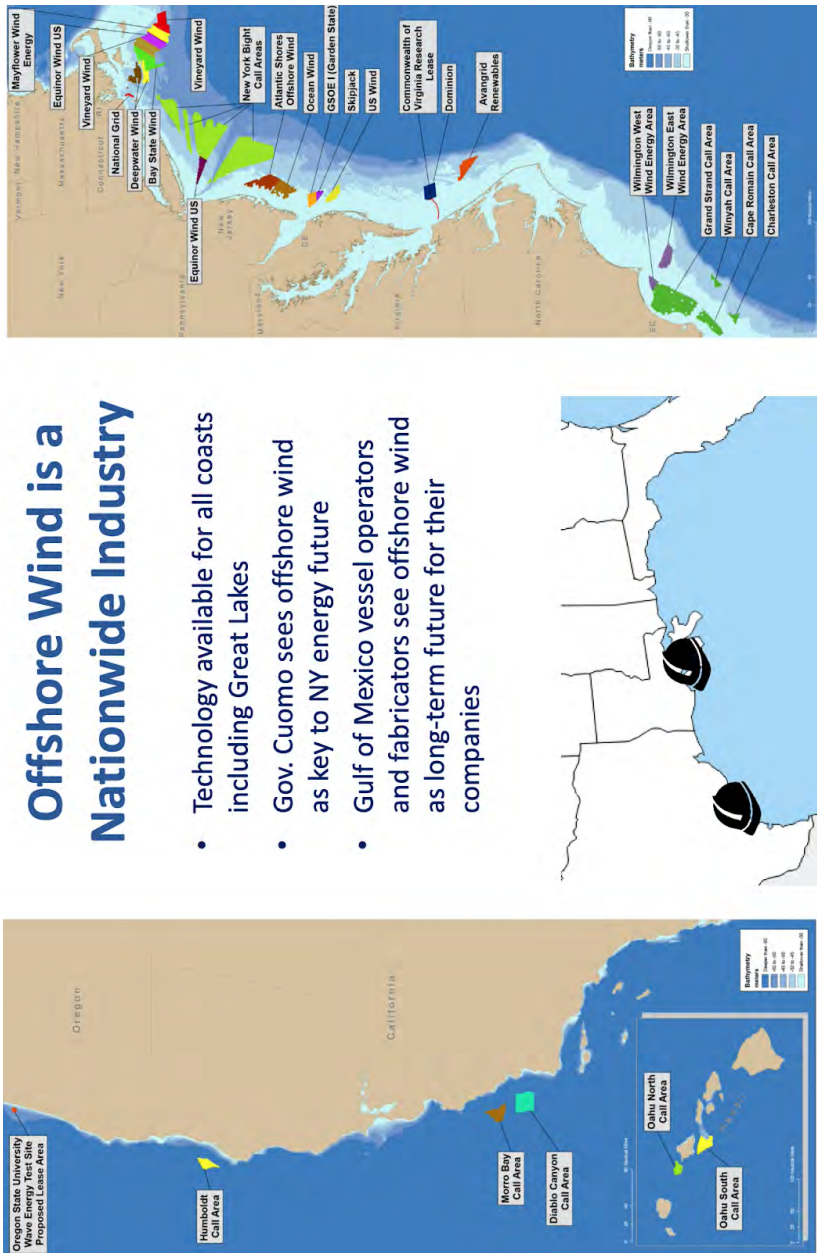
[304] *Northeast + Mid-Atlantic are 10 coastal states from MA through NC, plus DC, whose average load is 73 GWa (Kempton et al 2007, doi:10.1029/2006GL028016). This column represents how much of that electrical load is produced by each row's capacity of OSW.*

Fostering Innovation And Bringing Technologies To Market

The Biden Administration's support for a 30,000 MW by 2030 goal is likely to support important economic opportunities in several critical battleground states, including **Virginia, Pennsylvania, North Carolina, Michigan, Georgia,** and **New Hampshire**. Of those, Virginia is the most concrete, with a state law requiring 5,200 MW of offshore wind by 2035. Virginia's Norfolk and Hampton Road's shipbuilding facilities could build a Jones Act installation vessel, and Virginia is already discussing with Siemens-Gamesa the establishment of an offshore wind blade manufacturing factory in the state. Additional opportunities abound in North Carolina, which already has one lease off its coast, could see additional leasing in the next two years, and could use the Port of Wilmington, NC for construction.

Appendix Attached

Appendix - BOEM Lease Areas



Map of projects from Bureau of Ocean Energy Management, 2020

Access to Grid and Consumer Energy Data Held by Utilities

Opportunity/Problem:

The effective use and integration of "grid-edge" and "behind-the-meter" consumer technologies (such as distributed energy resources (DERs) and intelligent sensors, devices, and appliances) depends on electronic access to data regarding the electric grid, including power quality, hosting capacity, energy usage, and cost. Today, barriers exist to the access to such data by consumers and, more importantly, by their selected service or technology providers.

Recommended Action(s):

- Direct the collaboration of states and utilities to adopt a unified data-sharing solutio
- Make such a solution directly comparable to data portability initiatives in areas of the digital economy such as "Open Banking," already developed in Britain and Australia.
- Make data portability simple, consumer-friendly, and secure

Program Type:

√ Program Modification

Authority:

√ Existing Authority

√ Requires New Legislation

Job Benefits:

The full potential of distributed resource solutions - from smart home appliances and controls to on-site power generation, storage, electric vehicle (EV) charging - and the coordination of technologies with utility price or market signals can create jobs. Realizing this employment potential, however, requires access to this important data.

Econ. Benefits:

Job creation opportunities, innovation opportunities.

Equity Benefits:

The current balkanized approach to data sharing, where it even exists, prevents the emergence of many cost effective, digital, data-driven efficiency services that permit low-income consumers to manage their energy spending, to measure and monitor their energy use, to respond to pre-paid or time of use rates, or to participate in money-saving demand response programs.

Climate Plan Tie:

Renewable generation and energy efficient practices and technologies, including DERs, as well as intelligent sensors, control systems, devices, and appliances, help meet CO_2 reduction goals by offering controllable flexibility of demand. The effective use and integration of such technologies and practices reduce building-related energy consumption, and reduce the need for fossil fuel-powered generation. Innovation in this technical space can not only aid the US in meeting its energy and climate goals but also allow it to take a leadership role internationally in the development and application of these solutions.

Battleground State Benefits:

This would impact all states. States with active consideration of data sharing or that have adopted Green Button standards include Arkansas, California, Maryland, Ohio, North Carolina, New York, and Virginia.

Access to Grid and Consumer Energy Data Held by Utilities

AUTHORS: Bob King, Caitlin A. Smith, Michael Murray

DATE: 9.16.20

Statement of Issue and Summary of Recommendations:

The opportunity and problem to be addressed
Energy efficiency practices and technologies, including distributed energy resources (DERs) and intelligent sensors, control systems, devices and appliances, have meaningful and important roles to play in improving the efficiency of energy use, improving the productivity of American workers, and meeting the Biden Climate Plan carbon dioxide reduction goals critical to averting the worst impacts of climate change. The effective use and integration of such "grid edge[305]" and "behind-the-meter" consumer technologies and practices depend on electronic access to data from homes and buildings regarding the electric grid, including power quality, hosting capacity, energy usage, and cost. Today, many barriers exist to the access to such data by consumers and, more importantly, by their selected service or technology providers.

Policy solution
Federal leadership and legislation are needed to direct the collaboration of states and utilities in the adoption of a truly unified data-sharing solution. The solution required is somewhat analogous to the standardized automatic teller machine (ATM) system developed for retail banking transactions, and directly comparable to data portability initiatives in areas of the digital economy such as "Open Banking," already developed in Britain and Australia. Data portability must be simple, consumer-friendly, and secure. Additionally, in order to effectively support the development and adoption of efficient technologies, it must allow innovators to integrate with a single online platform to access consumer and grid data, with the proper permissions, regardless of that consumer's location, their electric utility, or their retail electric provider.

Background:
While the movement toward Automated Metering Infrastructure, or AMI, was underway prior to the Obama Administration, that administration's forward-looking response included a significant acceleration of utility AMI adoption with the investment of approximately $5 billion in federal funds. Under its leadership a vision emerged of a "smart grid" that could be "self-aware," automatically responsive, and even

[305] Olivia Chen, *What is Grid Edge?*, Green Tech Media (Jan. 1, 2017), https://www.greentechmedia.com/articles/read/what-is-the-grid-edge.

"self-healing."[306] These actions were driven, in part, by the vision that this new infrastructure would make available much more granular data related to consumer energy use and consumption patterns. The expectation was that AMI would lead to a renaissance of smart energy innovation, engendering an array of competitive efficiencies and distributed technology services for consumers – all to improve efficiency, safety, and comfort, while offering choices to fit different lifestyles and objectives.[307]

Anticipating the flood of data to be created by AMI, the Obama White House, in 2011, challenged the utility industry to adopt a standard protocol to enable the simplified sharing of data.[308] The open standard that developed with the involvement and support of industry stakeholders, DOE, and the National Institute of Standards and Technology, is today a North American Energy Standards Board-approved standard formally known as REQ.21[309] Energy Service Provider Interface. It is commonly referred to as the "Green Button[310]" standard. The 'Green Button Download My Data' component describes an online process for consumers to simply and securely obtain a snapshot of their own energy usage. With respect to market innovation, 'Green Button Connect My Data' enables true data portability -- a secure process to allow a customer-authorized, third-party service provider to access specified customer energy information, in an ongoing way, for a specified period of time. This standard has been acknowledged and adopted by utility regulatory commissions in California, Colorado, Illinois, Maryland, New York, Texas, and Ontario, Canada.

Federal support for completing and supporting the Green Button standard evaporated under the Trump Administration, and in many ways the deployment and use of energy

[306] U.S. Dep't of Energy, Recovery Act: Smart Grid Investment Grant (SGIG) Program, https://www.energy.gov/oe/information-center/recovery-act-smart-grid-investment-grant-sgig-program .

[307] *See, e.g.*, Nat'l Ass'n of Reg. Util. Commissioners, Resolution on Smart Grid Principles 1 (2011), https://pubs.naruc.org/pub.cfm?id=53985C3E-2354-D714-51A8-281C62A21700 ("WHEREAS, NARUC supports the adoption and implementation of smart grid technology because smart upgrades to, and modernization of, the transmission and distribution system can make the electric grid more efficient and offer benefits to consumers and society, especially when combined with advanced metering, efficient pricing, and consumer-focused technologies.").

[308] *See The History of Green Button*, Green Button Alliance, https://www.greenbuttonalliance.org/about#history (explaining that the Green Button Alliance is a non-profit organization of utilities and data users created to guide adoption and development of the data sharing standard).

[309] *The NAESB Energy Services Provider Interface Model Business Practices Information Page*, N. Am. Energy Standards Bd., https://www.naesb.org/ESPI_Standards.asp ("The North American Energy Standards Board (NAESB) Energy Services Provider Interface (ESPI) Model Business Practices were developed in 2011 through a request from the industry and with the support of the Department of Energy, the National Institute of Standards and Technology and the White House Office of Science and Technology Policy. The Model Business Practices define a data exchange protocol for the transfer of energy usage information between a utility and a third party with customer authorization. The industry-consensus standard serves as the basis for "Green Button" implementations throughout North America and is the standard endorsed and supported by the Green Button Alliance (GBA).").

[310] Green Button Data, http://www.greenbuttondata.org/ ("The Green Button initiative is a voluntary industry-led effort that responds to a 2012 White House call-to-action to provide utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format for electricity, natural gas, and water usage.").

data portability stagnated. In the absence of a federal role, implementation of Green Button Connect My Data has depended upon state initiatives, with diminished usefulness as each state approaches this challenge differently. The detailed design, structure, and operation of each utility portal, while generally based on the Green Button standard, tends to be modified by local stakeholder negotiations, state commission decisions, or both, making the process of adoption cumbersome and inflexible, and resulting in local variations from the hoped-for and more useful standardized approach.[311] Business requirements for a Texas online data portal, for example, were recently adopted in a contested case.The requirements, however, did not contemplate future iterations of the standard or seek to harmonize with the efforts of other states. For all its improvements over other similar efforts, Texas's implementation is technically different from all others, which inhibits interstate commerce and limits the proliferation of energy technologies that save customers money and help integrate renewable energy sources onto the grid.[312] This story has, unfortunately, been replicated in many other states. State implementations undertaken in the absence of a workable national vision have made clear the need for standardized data and interoperability in order to maximize the benefit of these new technologies to American consumers.

The current, balkanized approach to energy data portability poses additional challenges. For example, even if every utility tried to adopt an identical online portal, state and utility regulations vary dramatically. Third-party service providers must integrate marketing, enrollment, data access, and operations software with each utility system separately and keep each version of their own software updated every time state regulators or individual utilities make changes. Furthermore, each of America's more than 3,500 utilities would have to support a growing array of data-driven device and application developers if each maintains its own portal. These difficulties and unnecessary barriers have hobbled innovation, and the technology and service proliferation promised by AMI has not been delivered, denying consumers potential savings and other benefits. Many companies that entered the arena initially have either fled to other markets or gone out of business.

Equally troubling, the failure of the utility industry to resolve this challenge and create a tenable consumer pathway to facilitate data sharing and meet consumer demand for data-driven technologies has spawned less secure, less transparent intermediary providers. These "gray-market" data exchanges use a customer's login and password to access their utility's website in order to gather data, in essence impersonating customers online to extract and exchange the information service providers and aggregators need. Similar activities in the financial services sector provide a cautionary tale: The lack of federal government leadership has resulted in millions of Americans sharing their banking logins and passwords with new market entrants, creating substantial security and liability concerns. The electric power sector can avoid a similar fate by establishing

[311] Michael Murray et al., Advanced Energy Mgmt. All., Energy Data: Unlocking Innovation with Smart Policy (2017), https://static1.squarespace.com/static/52d5c817e4b062861277ea97/t/5a3a8c66c8302509260492b2/1513786475950/Energy-data-unlocking-innovation-with-smart-policy.pdf.
[312] Pub. Util. Commission of Tex., Project 48525, https://interchange.puc.texas.gov/Search/Filings?ControlNumber=48525 (addressing the redesign of Smart Meter Texas).

national guidelines on energy data portability and taking steps to improve interstate and utility industry collaboration.

Opportunity / Problem Statement:
The current approach to sharing data held by utilities, which is needed to support innovation in energy efficiency and DER solutions, as well as to effectively integrate those solutions into the operation of the grid, is not working. Current data-sharing policies and techniques will not work effectively so long as they are approached one utility at a time, under 50 different state policies. Federal leadership supporting a single online resource portal through which consumers could simply authorize technology and service providers to access their utility-held data would allow the delivery of the energy innovation and consumer benefits promised by the massive investments in AMI. The growth of grid-edge or behind-the-meter devices, and the sharing of their associated data, will allow more renewables to be added onto the power grid, make the system more flexible and less vulnerable to power outages, thereby, strengthening national security.

Proposed Recommendation:

Check Boxes Below	
✓	Is this a modification of an existing program?
	Does this roll back a Trump Administration regulation?

At a very minimum this policy requires the support for H.R. 5796, introduced by Representatives Welch and Cartwright in February of 2020 in the US House of Representatives.[313] However, that legislation only envisions reinvigoration of the industry dialogue. And, while federal (DoE) leadership will be important, dialogue alone may only lead to longer delays in making this important and needed data exchange solution available in the US. Given the importance of meeting near term energy efficiency, renewable energy, and climate goals, the bill should be strengthened to drive the industry toward a truly unified industry solution with concrete deadlines, or at least aspirational timelines for implementation. Furthermore, HR 5796 continues to accept the current paradigm, under which every utility would ultimately adopt its own local data portal, still leading to an unsatisfactory and balkanized solution, itself a barrier to innovation. The legislation should be modified to clearly state the goal of a single national system, while allowing for future pairing with an international solution. Reflecting the value of an ATM-like solution, the legislation should not prohibit industry from charging a modest fee for facilitating data access and data sharing. The ultimate solution will be so simple for consumers, and so cost-effective for

[313] Perhaps: Representatives Welch and Cartwright consider this bill a minimum goal. *See* E-Access Act, H.R. 5796, 116th Cong. (2d Sess. 2020).

innovative energy service providers, that they will gladly pay a modest fee for use of the solution.[314] HR 5796 currently prohibits such a solution.)

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:
As noted above, the full potential of distributed resource solutions and their coordination with utility price or market signals--and all the jobs this implies-- requires access to this data. This policy would result in a system analogous to the ATM standardization that revolutionized retail banking and would increase efficiency and renewable energy deployment; thereby, reducing the need for fossil fuel powered generation and contributing toward the achievement of the Biden-Harris administration's ambitious climate goals. Innovation in this technical space can not only aid the US in meeting its energy and climate goals but also allow it to take a leadership role internationally in the development of these solutions.

Some utilities are reluctant to facilitate data sharing based on an outdated perspective that their monopoly is threatened by third-party energy solutions that reduce electric sales or simply lead consumers to rely on third-parties for other energy services. However, this is wrongheaded for three reasons.[315] First, consumers are already finding ways to work with third parties to invest in on-site technologies and services. The decentralized energy revolution is already underway. Second, utilities are simply unaware of the extent of the activity because they are not themselves providing the platform for consumers to access their data or share it with providers. By facilitating the exchange of data, utilities can be privy to consumer activities and preferences while improving security and reducing costs, so that the benefits can be shared by a greater number of consumers. Third, while some utilities are generally trying to respond to consumer interest in home or business services and solutions, utilities can only offer so many options, and this artificially stifles innovation and limits consumer choice. Meeting important national goals, and remaining competitive internationally requires a more open framework. Achieving that will benefit utilities as well as their customers.

How the Recommendation Supports Frontline or other Underserved Communities:
AMI will allow low-income communities to have more choice and access to cost-savings opportunities.The current balkanized approach to data sharing, where it even exists, prevents the emergence of many cost effective, digital, data-driven efficiency services that permit low-income consumers to manage their energy spending, to measure and

[314] Based on personal interviews conducted by the authors with the largest manufacturers and integrators of Home Energy Management Systems, especially smart thermostats. Also note that currently third parties are paying intermediaries, such as Urjanet, to create virtual data platforms through the use of less secure screen-scraping. *See* Ma-Keba Frye, *Urjanet Raises $14.65M in Series D Funding*, Urjanet (Jun. 23, 2020), https://urjanet.com/newsroom/series-d-funding/.
[315] Personal interviews with utility executives across the country, conducted by the authors over the past four years. *See also* Mark Templeton et al., Abrams Envtl. Law Clinic, Regulatory Guide: Freeing Energy Data (2016), https://www.law.uchicago.edu/files/file/freeing_energy_data_report_abrams_environmental_clinic_june_2016.pdf.

monitor their energy use, to respond to either pre-paid or time of use rates, or to participate in money-saving demand response programs.

How the Recommendation Supports the Biden Climate Plan:
Energy efficiency practices and technologies, including distributed energy resources and intelligent sensors, control systems, devices and appliances, have an important role to play in improving the efficiency of energy use, improving the productivity of American workers, and in helping meet the Biden-Harris administration's carbon dioxide reduction goals so critical to averting the worst impacts of climate change. The effective use and integration of such "grid edge," and "behind-the-meter" consumer technologies and practices depends on the access to key data about the electric grid, including power quality, hosting capacity, and, in particular, as data related to consumer or building energy consumption.

Key Battleground State Activity: As a national recommendation, this would impact all states. States with active consideration of data sharing or that have adopted Green Button standards include Arkansas, California, Maryland, Ohio, North Carolina, New York, and Virginia. New York in particular is considering a broadened Integrated Energy Data Resource that would include grid as well as consumer information, and include aggregate or anonymized data access in addition to permissioned data of individual consumers.

Accelerating an American Industry for Clean Hydrogen Production

Opportunity/Problem:

Hydrogen can decarbonize industrial processes and electricity generation, will be instrumental in integrating energy sectors, and can be used to export abundant renewable energy from key states to the rest of the country and around the world. The US should rapidly scale up a national hydrogen industry, including demonstrating and manufacturing electrolyzers at industrial scale, to drive down costs and establish US leadership.

Recommended Action(s):

- Create a Production Tax Credit for clean hydrogen and hydrogen carriers (such as ammonia) starting at $0.40-$2.00/kg, depending on the emissions intensity, phasing to zero over 10 years, for hydrogen produced in the US.
- Create a manufacturers' Production Tax Credit of $500 per kW of capacity for American-manufactured electrolyzers.
- Provide Federal leadership for infrastructure planning and construction, by immediately convening a commission to develop a blueprint for hydrogen infrastructure, and by promoting demonstration of technologies and creating additional demand-pull policies.

Program Type:

√ New Program

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

The hydrogen industry could create 700,000 jobs by 2030 and over 3 million by 2050. It would also spur additional clean electricity deployment and its corresponding jobs.

Econ. Benefits:

Rapid scale-up in hydrogen production capacity would lower costs of clean hydrogen and create a new manufacturing industry in the US.

Equity Benefits:

Using hydrogen to decarbonize industrial processes and electricity generation can reduce air pollution from factories currently sited disproportionally in low-income areas and communities of color. A hydrogen industry can also employ former fossil fuel workers.

Climate Plan Tie:

A scale-up in electrolyzer manufacturing and hydrogen production is the best way to achieve the Biden plan's goal of clean hydrogen at fossil hydrogen costs, and to achieve the plan's goal of decarbonizing industry.

Battleground State Benefits:

Hydrogen could help many battleground states take advantage of their huge renewable electricity potential (ex: AZ, CO, IO, NV, TX). Manufacturing states (ex: MI, NC, OH) could also benefit from production, and fossil fuel states (ex: CO, PA, TX,) would benefit from hydrogen jobs that could directly make up for fossil fuel job loss.

Accelerating an American Industry for Clean Hydrogen Production

AUTHORS: Solomon Goldstein-Rose, Stephen H. Crolius, Abigail Regitsky, Trevor Brown

DATE: 8/11/20

Statement of Issue and Summary of Recommendations:
Hydrogen will play a crucial role in integrating energy systems as the world transitions to renewable electricity, electric vehicles, clean industrial processes and clean heating and power for buildings. To fulfill its potential, hydrogen must be produced at the lowest cost and with the least greenhouse gas emissions possible. The key way to achieve this in the long run, which we must start rapidly scaling up, is by the electrolysis of water using clean electricity.

The United States is especially well endowed with renewable energy resources.[316] These resources have been swiftly developed as a result of policies such as tax credits. Many states in the central and western parts of the country could profitably install even more renewable generation if there was a way to get the captured energy to market. New high-voltage lines are hard to permit. Hydrogen, on the other hand, can provide a way to get the captured energy to market by integrating electricity with other sectors, including transportation and industry, and by opening new export markets.

The US now needs a portfolio of policies spurring investment in a rapid scale-up of hydrogen production and a strategic equitable build-out of hydrogen infrastructure. These policies should go beyond tax credits, because hydrogen's role in integrating various energy systems is complex and will best succeed with Federal coordination. The policies should also be ambitious because the economic and political prize is even more substantial than renewable electricity alone: hydrogen could form an industry that eventually employs more workers than the current fossil fuel sector, and that exports both energy and chemical materials worldwide, strengthening US competitiveness in the global market.

Immediate policy steps (recession recovery package and first 100 days executive action):

[316] Nat'l Renewable Energy Lab., Renewable Energy Technology Resource Maps and Technical Potential for the United States (2012),https://www.nrel.gov/gis/assets/docs/resource-maps.pptx (maps of potential energy).

- Create a Production Tax Credit for clean hydrogen and hydrogen carriers (such as ammonia) starting at $0.40-$2.00/kg, for hydrogen produced in the US regardless of where the electrolyzers were manufactured. Methane-derived hydrogen with CO2 capture and storage ("CCS") and electrolysis-derived hydrogen would both be eligible, and the rate would depend on the emissions accounting for fugitive methane along supply chains and emissions intensity of electricity purchased for hydrogen production. The credit would phase to zero over 10 years.
- Create a manufacturers' Production Tax Credit of $500 per kW of capacity for American-manufactured electrolyzers.
- Provide Federal leadership for equitable infrastructure planning and construction, by immediately convening a commission to develop a blueprint for hydrogen infrastructure, and by promoting demonstration of technologies and creating additional demand-pull policies.

Opportunity / Problem Statement:
Hydrogen can decarbonize industrial processes and electricity generation, will be instrumental in integrating energy sectors, and can be used to export abundant renewable energy from key states to the rest of the country and around the world.[317]

The US should rapidly **scale up a national hydrogen industry**, including demonstrating and manufacturing electrolyzers at industrial scale, to drive down costs and establish US leadership.[318] This will speed our decarbonization process, create jobs, and help us export clean energy and chemicals worldwide.

Current Federal policies support renewable electricity production and hydrogen electric vehicle sales, but none exist to spur scale-up in domestic hydrogen production capacity. Europe, Saudi Arabia, Australia, and other countries have recently announced ambitious plans centered around scaling up hydrogen production.[319] The US needs to be

[317] *See Steven J. Davis, et al., Net-Zero Emissions Energy Systems*, Science 360, June 2018, https://science.sciencemag.org/content/sci/360/6396/eaas9793.full.pdf.
[318] Solar, wind, and battery costs dropped as they began to be mass-manufactured. For hydrogen examples *see* Trevor Brown, *Gigwatt-Scale Electrolyzer Manufacturing and Deployment*, Ammonia Energy Ass'n (Nov. 14, 2019), https://www.ammoniaenergy.org/articles/gigawatt-scale-electrolyzer-manufacturing-and-deployment/.
[319] *See European Comm'n, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Hydrogen Strategy for a Climate-Neutral Europe (2020),* https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf; Trevor Brown, *Saudi Arabia to Export Renewable Energy Using Green Ammonia*, Ammonia Energy Ass'n (July 16, 2020), https://www.ammoniaenergy.org/articles/saudi-arabia-to-export-renewable-energy-using-green-ammonia/; Stephen H. Crolius, *Australia Issues National Hydrogen Strategy*, Ammonia Energy Ass'n (Dec. 5, 2019), https://www.ammoniaenergy.org/articles/australia-issues-national-hydrogen-strategy/.

a major early player in this developing market if it is to retain domestic manufacturing, be a net energy exporter, and replace declining fossil fuel jobs.

Proposed Recommendations:

1. Create a Production Tax Credit for clean hydrogen and hydrogen carriers (such as ammonia) starting at $0.40-$2.00/kg, for hydrogen produced in the US regardless of where the electrolyzers were manufactured. Both methane-derived hydrogen with CCS and electrolysis-derived hydrogen would be eligible for the credit, and the rate would depend on the emissions accounting for fugitive methane along supply chains and emissions intensity of electricity purchased for hydrogen production. The credit would phase to zero over 10 years.
    - New statute in 2021 COVID recession recovery package or a First 100 Days infrastructure bill.
    - Administered like Section 45 credits,[320] with a role for DOE to define qualified clean hydrogen production processes and carriers, and to set credit rates between $0.20/kg for production using grid electricity and $1.00/kg for production using purchased or owned 100% clean electricity.
    - No direct cost. The credit will cost forgone revenue but clean hydrogen production barely exists in the US at the moment so the initial total amounts will be small. The credit may also stimulate the growth of clean hydrogen producers and pay for itself in general business tax collection.
    - By passing this as a tax credit and as part of the economic recovery package, companies positioned to build or add clean hydrogen production capacity can be spurred to immediately hire more construction and hydrogen production workers.
    - Supporting clean hydrogen production can provide an alternate business path for employers and workers currently relying on fossil fuels for their livelihoods.

2. Create a manufacturers' PTC of $500 per kW of capacity for American-manufactured electrolyzers.
    - New statute in 2021 COVID recession recovery package or a First 100 Days infrastructure bill (structured along the lines of former 45M manufacturing credits[321]). A manufacturing credit in addition to a hydrogen production credit will help build an American electrolyzer manufacturing base: the major electrolyzer companies, today based in Europe and Asia, are currently building advanced, large-scale manufacturing plants. This credit will incentivize them to immediately build manufacturing capacity in the US. It will also address the key challenge of lowering capital costs of electrolyzers (which the hydrogen

[320] *See* 26 U.S.C. § 45–45T, available at https://www.law.cornell.edu/uscode/text/26/subtitle-A/chapter-1/subchapter-A/part-IV/subpart-D.
[321] *See* I.R.C. § 45M, available at https://irc.bloombergtax.com/public/uscode/doc/irc/section_45m.

production credit does not do directly) so they can be economically run intermittently to pair with clean electricity generation.
- Administration, cost, immediate stimulus to hydrogen production, and benefit to fossil fuel and manufacturing workers are all similar to the first tax credit. This credit would give an additional and immediate stimulus to electrolyzer manufacturing and the companies and workers who do it.
- Rapidly increasing the scale of manufacturing of electrolyzers, which have not been produced at massive scale, will lower their capital costs and therefore lower hydrogen costs - as solar, wind, and battery costs have dropped in recent decades. This will enable all hydrogen-dependent clean industries - including fertilizer, steel production, other industrial processes, some transportation (especially maritime and rail[322]), and potentially some grid electricity storage - to grow more rapidly, be centered in the US, and decarbonize the world sooner and more affordably.

3. Provide Federal leadership for equitable infrastructure planning and construction, by immediately convening a commission charged with developing a blueprint for hydrogen infrastructure, and by promoting the demonstration of new technology and creating additional demand-pull policies.
   - Under existing executive authority. Relevant agencies include, but are not limited to, DOE, DOD, USDA, FERC, USACE, DOT (including PHMSA), DOC, and NIST.
   - The complexity and importance of hydrogen-related infrastructure development are unsuited to bottom-up free market mechanisms. The Administration should take leadership on a national hydrogen strategy with at least the level of ambition of those enacted over the last two years in other countries, including the EU, Germany, France, Austria, the Netherlands, Norway, Portugal, and Australia.
   - A first step should be to convene a cross-sectoral, cross-agency commission with representation from hydrogen technology developers; electric and gas utilities; hydrogen infrastructure companies; steel manufacturers; petroleum producers and refiners; renewable and nuclear electricity producers; environmental justice experts; academics; experts who have led state-level hydrogen infrastructure programs; frontline community representation; and relevant Federal agencies.
   - Within six months, it should propose initial steps for economic recovery via hydrogen infrastructure demonstration and build-out. Within a year, it should provide a full blueprint for the first wave of hydrogen infrastructure in the US, and should map out workable investment mechanisms. Further initial ideas within and beyond the commission are:

[322] *See* Mattie Hensley and Jonathan Zimmerman, Sandia Nat'l Labs., H2@Rail[SM] Workshop (2019), https://energy.sandia.gov/wp-content/uploads/dlm_uploads/2019/09/H2@RailWorkshop_Report_SAND2019-10191R.pdf.

- Creating hydrogen infrastructure or innovation hubs, perhaps tied to national labs.
- Encouraging the use of "blue" hydrogen (produced from methane with CCS) in the short term, to begin rolling out hydrogen in distribution infrastructure and chemical/fuel synthesis.
- Demonstrations of clean steelmaking employing hydrogen.
- Navy/Coast Guard procurement of clean hydrogen/ammonia as maritime fuels (the President could commit to exceed International Maritime Organization decarbonization schedules[323]).
- Incentives for farmers to purchase low-emissions fertilizer made from clean hydrogen.
- RD&D to validate and support regulations for large-scale hydrogen injection in natural gas pipes.
- Subsidies and demonstrations for chemical synthesis using hydrogen instead of petroleum:
  - Formic acid, ethylene, and carbon-neutral fuels can be produced with hydrogen as an input instead of petroleum.[324] The petrochemical industries have a global market of ~$450 Billion/year.[325] As oil production drops globally through the clean energy transition, the US could make itself a lead exporter of clean chemicals produced from hydrogen feedstock. Low capital cost electrolyzers will be key to helping renewable chemicals compete economically with petroleum, given the intermittency of renewable electricity.[326] Demonstrations of hydrogen-based chemical synthesis can provide proof of concept and other information to crucial early market entrants in U.S. hydrogen production. And DOE can speed overall technology development by including chemical synthesis RD&D alongside energy-specific chemical processes.

- Federal leadership in strategically planning a US hydrogen infrastructure build-out will support states, because hydrogen infrastructure will necessarily cross state borders (part of its usefulness is moving energy without new transmission wires); the hydrogen industry, by boosting proactive investment

[323] *Reducing Greenhouse Gas Emissions from Ships*, Int'l Mar. Org. (last visited Oct. 14, 2020), http://www.imo.org/en/MediaCentre/HotTopics/Pages/Reducing-greenhouse-gas-emissions-from-ships.aspx.
[324] *See* Robert F. Service, *Can the World Make the Chemicals it Needs Without Oil?*, Am. Ass'n for the Advancement of Sci. (Sept. 19, 2019), https://www.sciencemag.org/news/2019/09/can-world-make-chemicals-it-needs-without-oil.
[325] *See* Grand View Research, Petrochemicals Market Size, Share & Trends Analysis Report by Product (Ethylene, Propylene, Butadiene, Benzene, Xylene, Toluene, Methanol), by Region, and Segment Forecasts, 2020–2027 (2020), available at https://www.grandviewresearch.com/industry-analysis/petrochemical-market.
[326] *See* Robert F. Service, *Can the World Make the Chemicals it Needs Without Oil?*, Am. Ass'n for the Advancement of Sci. (Sept. 19, 2019), https://www.sciencemag.org/news/2019/09/can-world-make-chemicals-it-needs-without-oil.

and planning; and consumers, who will benefit from lower prices, cleaner air, and as little unneeded infrastructure as possible, all made more likely by a coordinated national strategy.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

The dynamics of business reinvestment suggest that reducing fossil fuels use will not reduce jobs. Healthy companies constantly reinvest to maintain and extend their business platforms. Fossil fuel companies are no exception, with their continuous movement into previously unexploited reserves, development of new plants and logistics infrastructure, and pursuit of R&D aimed at new products and energy conversion technologies. However, society need not direct these investments into fossil energy. The investments could be devoted to similar pursuits in the clean hydrogen arena - in fact, a couple oil companies are already shifting in that direction.[327] Energy-sector jobs, compensation rates, and GDP need not decrease during the transition, and could show net increases as demand for clean US energy grows worldwide. Additionally, hydrogen can enable new industries in clean chemical synthesis and production of new materials and carbon-neutral fuels, which will see massive global markets in the coming decades.

The US fossil fuel sector currently employs about 1.2 million people.[328] A rapid scale-up in hydrogen production and electrolyzer manufacturing would create jobs in several sectors: electrolyzer manufacturing plants, hydrogen and ammonia synthesis facilities, construction of hydrogen infrastructure, and installation of clean electricity generation systems. One estimate suggests that a hydrogen industry could create 700,000 jobs in the US by 2030, on the way to 3.4 million by 2050.[329] With federal coordination and input from frontline communities, this new infrastructure and new jobs can be equitably targeted where they are most needed and desired.

[327] *E.g.* Press Release, British Petroleum, bp Australia Announces Feasibility Study into Hydrogen Energy Production Facility (May 8, 2020), https://www.bp.com/en/global/corporate/news-and-insights/press-releases/bp-australia-announces-feasibility-study-into-hydrogen-energy-production-facility.html.
[328] *Clean Jobs America 2019*, E2 (Mar. 13, 2019), https://e2.org/reports/clean-jobs-america-2019/ (fossil employment).
[329] *See* Fuel Cell & Hydrogen Energy Ass'n, Road Map to a US Hydrogen Economy: Reducing Emissions and Driving Growth Across the Nation (2020), https://static1.squarespace.com/static/53ab1feee4b0bef0179a1563/t/5e7ca9d6c8fb3629d399fe0c/1585228263363/Road+Map+to+a+US+Hydrogen+Economy+Full+Report.pdf. Estimates of total hydrogen market volume from the DOE H2@Scale initiative range from similar levels as this report to more than twice as much, so job creation could potentially be even greater. The Road Map report doesn't limit hydrogen production to electrolysis, so job numbers could be somewhat different, but likely in the same order of magnitude.

By making clean hydrogen available and affordable, a US scale-up of hydrogen production capacity would enable decarbonization of feedstocks and fuel for steel, chemical synthesis, and other industrial processes worldwide (industry as a whole emits nearly 20% of total global GHG emissions). It would also enable more clean electricity generation and would power some forms of clean transportation and building fuel use (those three sectors cause just under half of current GHG emissions). Finally, replacing fossil fuels, as hydrogen can do directly, would eliminate a further ~9% of current emissions that come from fossil fuel processing and escaped methane. Thus, scaling up hydrogen can play a key enabling role in deploying equipment necessary to eliminate three quarters of global emissions.[330]

How the Recommendation Supports Frontline or other Underserved Communities:

Most notably, as hydrogen replaces fossil fuels in industrial processes the particulate matter and other air pollution that has for so long been discriminatorily sited in communities of color and low-income areas will be eliminated, even while desired factories are able to keep operating and employing a local workforce.

Second, hydrogen production can naturally replace oil production in the same locations that currently produce and distribute large amounts of oil, preserving jobs in those regions. Workforce development policies and job-creation in this emerging sector could replace fossil jobs. Community engagement, outreach, and training should be developed/targeted for frontline communities.

Third, a scale-up in electrolyzer manufacturing that brings down the cost of clean hydrogen will expand access to clean vehicles to lower-income families. Once hydrogen distribution and fueling infrastructure is built out, or when it becomes practical to distribute hydrogen through existing gas lines, hydrogen electric vehicles could be preferred over battery electric vehicles for Americans who rent their homes and don't necessarily have a place to charge a battery vehicle at home.

How the Recommendation Supports Biden's Climate Plan:
VP Biden's plan aims to "ensure that the market can access green hydrogen at the same cost as conventional hydrogen" which would be best achieved by rapidly scaling up electrolyzer manufacturing (RD&D can play a role for further cost reductions but we do not need to wait to start scale-up). The plan also notes the need to decarbonize "industrial heat needed to make steel, concrete, and chemicals" which will require clean hydrogen in many cases. Most importantly, VP Biden has created a strong campaign

[330] Solomon Goldstein-Rose, The 100% Solution: A Plan for Solving Climate Change (2020).

focus on manufacturing in the US, so immediate stimulus policies that spur a rapid scale-up in electrolyzer manufacturing and installation aligns closely with the VP's vision and political message.

Key Battleground State Activity:
Arizona, Colorado, Iowa, Nevada, Texas, and many other rural states have massive under-tapped renewable potential.[331] Texas is a particularly interesting case, because it has large solar and wind potential and also could serve as a logical hub for hydrogen distribution infrastructure - the Gulf Coast has the majority of existing US hydrogen pipeline and ammonia-capable ports, and could be a center for electrolyzer manufacturing, clean electricity production, hydrogen production (including "blue" hydrogen produced from existing gas wells with CCS as a transition step), and hydrogen distribution.

Other battleground states, such as Michigan, North Carolina, and Ohio, are known for manufacturing and could benefit from the growth of an electrolyzer manufacturing industry. Still others, such as Pennsylvania, Texas, and Colorado, have relatively large numbers of jobs in fossil energy industries and could benefit from a hydrogen industry which could employ many of the same workers.

[331] For example,Texas could theoretically deploy around 100 times as much wind and around 10,000 times as much solar as it has now. Anthony Lopez, et al., Nat'l Renewable Energy Lab., U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis (2012), https://www.nrel.gov/docs/fy12osti/51946.pdf; *Electricity: Detailed State Data*, U.S. Energy Info. Admin (Sept. 22, 2020), https://www.eia.gov/electricity/data/state/.

Ending Reliance on Fossil Fuels and Building a Just Transition

Enforcing the 2050 Climate Goal: Carbon Pricing in Support of Community Investment

Opportunity/Problem:

The Biden campaign has proposed a goal of achieving net-zero emissions no later than 2050.[332] Complementary policies make vital contributions to emissions reductions but do not cover all sectors and greenhouse gases nor guarantee the U.S. will stay on track towards net-zero emissions. Carbon pricing can act as a complementary strategy to the range of other policies and provide an additional source of revenues for climate-focused investment.

Recommended Action(s):

- Apply a carbon fee to GHG emissions, increasing faster than inflation.
- Automatically increase the fee if emissions in a given period exceed the trajectory required to achieve net-zero emissions by 2050.
- Divide the fee proceeds between a progressive individual dividend and investment in clean energy, resilient infrastructure, and just transition. Increase investment portion if emissions fall behind net-zero trajectory.

Program Type:

√ New Program

Authority:

√ Requires New Legislation

√ Requires New Regulations

Job Benefits:

The revenue generated would be re-invested in communities and pollution-abating industries, stimulating near-term recovery and longer-term economic growth.

Econ. Benefits:

The investment of revenues in clean energy, resilient infrastructure, and just transition would produce both economic and climate benefits. Leveling the playing field for clean energy technologies through the carbon price and investment of revenues in clean technologies could further improve cost-competitiveness of U.S. industry, spur innovation, expand deployment and accessibility, and enable companies in new, clean technologies to succeed and grow.

Equity Benefits:

Dividends under the policy could provide direct economic assistance to low- and middle-income households, in many cases more than offsetting the impact of the carbon fee and helping to supplement incomes during these difficult economic times. Rising carbon prices and investments in decarbonizing energy and industry will help accelerate the closure or conversion of the highly polluting facilities that have long burdened the health of frontline communities.

Climate Plan Tie:

The fee, investment, and escalator work in lockstep to be the "enforcement mechanism" keeping the U.S. on track to achieve VP Biden's net-zero goal for 2050. The policy contributes to making "a historic investment in clean energy" and innovation.

Battleground State Benefits:

The Climate Enforcement Plan would not supersede state policy, providing key states the opportunity to continue or develop their own policies and their own plans for using revenues.

Enforcing the 2050 Climate Goal: Carbon Pricing in Support of Community Investment

AUTHORS: Véronique Bugnion, Donald M. Goldberg, Michael Green, Dave Grossman, Jennifer Macedonia, David Miller, Caroline Normile, Nicole Pavia, James Tong

DATE: August 2020

Statement of Issue and Summary of Recommendations:

The Biden campaign has proposed a goal of achieving net-zero emissions no later than 2050.[333] Policies are needed to drive action, invest in an equitable clean energy revolution, and keep the United States on target to meet that goal. Carbon pricing -- based on the concept that emitters, not the public, should bear the costs of their greenhouse gas (GHG) emissions -- can help do all of those. Carbon pricing can act as a backstop should a range of other policies fall short. It can send an important price signal throughout the economy. It can provide much-needed financial support to low- and middle-income families. It can help boost the clean energy economy and create jobs. It can be a source of revenues for climate-focused investment, including measures to reduce emissions, build resilience to climate impacts, and ensure a just transition. To accomplish these things, the *Climate Enforcement Plan* would:

- Apply a carbon fee to GHG emissions, increasing at a rate greater than inflation;
- Increase the carbon price by an automatic additional increment if emissions in a given period exceed the trajectory necessary to achieve net-zero emissions by 2050;
- Divide the proceeds from the carbon price between a progressive individual dividend and investment in clean energy, resilient infrastructure, and just transition;
- Increase the percentage of proceeds going towards investments in emission reductions if the U.S. fails to stay on its emissions trajectory;
- Apply a border adjustment to reflect the GHG content of goods from countries lacking equivalent climate goals to ensure the U.S. maintains a globally competitive position; and,
- Complement programs in states and localities that have led the nation in climate action.

[333] *The Biden Plan for a Clean Energy Revolution and Environmental Justice*, Biden For President (last visited Oct. 14, 2020), https://joebiden.com/climate-plan/#.

Ending Reliance on Fossil Fuels and Building a Just Transition

Opportunity/Problem Statement:
An ambitious plan is needed to put our planet on a trajectory towards a healthy, sustainable climate. The Biden campaign is crafting policies to put the country on a path to achieve net-zero emissions no later than 2050.[334] While policies such as a federal clean energy standard, transportation electrification, and building retrofit programs make vital contributions to emissions reductions, they do not cover all sectors or greenhouse gases nor guarantee the U.S. will stay on track towards net-zero emissions. This proposed "*Climate Enforcement Plan,*" based largely on congressional bill language, uses a self-calibrating carbon fee to achieve critical objectives:

- Spur emission-reducing actions, in concert with other policies;
- Provide financial support to low- and middle-income families;
- Invest revenues in clean energy, clean transportation, carbon sequestration, and other mitigation strategies, with a particular focus on communities of color and low-income communities overburdened by exposure to toxic pollution from GHG-emitting sources;
- Invest in making infrastructure and communities more resilient to climate impacts;
- Ensure that workers and communities that have been dependent on the fossil fuel industry are not harmed by the transition to a clean economy;[335] and,
- Provide additional strategies that keep the country on a trajectory to hit net-zero by 2050.

Proposed Recommendation:

Check Boxes Below	
New	Is this a new or modification of an existing program?
No	Does this roll back a Trump Administration regulation?

The policy requires congressional action and leverages language from bills introduced during the 116th Congress.[336] Codifying the proposal would make it less susceptible to tampering by future administrations, helping keep the U.S. on track for its 2050 objective. The following section summarizes key policy elements.

[334] *The Biden Plan for a Clean Energy Revolution and Environmental Justice*, Biden For President (last visited Oct. 14, 2020), https://joebiden.com/climate-plan/#.
[335] *See e.g.Climate Change is a Reality. New York is Fighting It.*, New York State (last visited Oct. 14, 2020), https://climate.ny.gov/.
[336] Sen. Durbin introduced the America's Clean Future Fund Act, S. 4484 as this paper was being finalized, so specific sections of it are not cited below. *See* America's Clean Future Fund Act S. 4484, 116th Cong. (2020), available at https://www.congress.gov/bill/116th-congress/senate-bill/4484.

Covered Sectors and Greenhouse Gases
Sample language: H.R. 763 § 9901; S.2284 § 4691; S.940 § 9901; H.R.4058 § 9902
The policy covers the majority of emitting sectors of the economy. Covered fuels are crude oil, natural gas, coal, and any derived products, as well as fluorinated greenhouse gases. Entities are covered at the point of entry of the fossil fuels into commerce, namely petroleum refineries and petroleum product importers, coal mining operations and coal importers, entities entering natural gas into the pipeline network, importers of natural gas, and industrial facilities with greenhouse gas process emissions. Qualified carbon capture and storage projects are eligible to apply for carbon fee refunds provided they account for fugitive emissions.

Fee Structure
Sample language: S.2284 §§ 4692 & 4693
A carbon charge has three design elements: the initial charge, the annual increase above inflation, and the escalator if emissions reductions are not met. A key component of this proposal is the automatic escalator, which serves as a critical enforcement mechanism (or, some might say, an insurance policy). The escalator must be high enough to drive emissions reductions if they lag behind the target trajectory.

Revenue Distribution
Sample language: H.R. 4058 § 302; S.2284 § 9512(d); S.4484
Revenue from the carbon price funds a progressive carbon dividend for eligible households, as well as emission reduction, resilience, and just transition investments. The carbon dividend is allocated to households whose adjusted gross income is less than a set threshold[337] to offset higher energy costs; each adult receives a pro-rata share of the revenue, and each child receives a half-share.[338] The climate investment portion of the carbon fee would be managed by an independent federal agency for climate finance overseen by a commission appointed by the president and confirmed by the senate. An innovative element of the *Climate Enforcement Plan* increases the share allocated to investment by a prescribed percentage whenever the country fails to stay on its emissions trajectory. This additional backstop mechanism provides added investment funding to bring emissions reductions back in line.

Border Adjustments
Sample language: S940 § 9921; H.R. 4142 § 4693

[337] The threshold should be set to ensure most lower- and middle-income households do not bear undue burden from the plan.
[338] Donald Marron and Elaine Maag, Tax Policy Ctr., How to Design Carbon Dividends (2018), https://www.taxpolicycenter.org/sites/default/files/publication/156300/how_to_design_carbon_dividends.pdf.

Carbon-intensive primary products (such as iron, steel, aluminum, cement, glass, pulp, paper, or chemicals) and manufactured products imported from countries without equivalent abatement measures should be subject to a carbon charge equivalent to the fee levied on U.S. products.[339] To protect the competitiveness of U.S. industry, exporters of primary and manufactured products to countries with non-equivalent climate measures would receive a refund of the carbon charge.

State Interaction

Sample language: HR.763 § 11; S2284 § 8

The policy must take into account the progress being made on carbon pricing at the regional, state, and local levels. Early adopters should not be penalized for taking action, and their reliance on expected carbon price revenues should not be undermined. The policy should clearly declare that it does not preempt or supersede state law or regulation to the extent the local jurisdiction enacted higher or more stringent standards and could credit emitters for fees already paid to states or municipalities.

Regulatory Action

Regulatory action is required to operationalize the *Climate Enforcement Plan*, but the plan does not include a moratorium on other greenhouse gas regulation.[340]

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change:

The carbon price and escalator mechanisms set a clear, market-based incentive for addressing polluters' negative externalities by pricing carbon emissions. The revenue generated would be re-invested in communities and pollution-abating industries, stimulating near-term recovery and longer-term economic growth.

The dividends provided by the *Climate Enforcement Plan* would mean most low- and middle-income households receive more in dividends than they might pay in higher energy costs — helping to supplement the incomes of those who contribute the least to climate change and who have been the most negatively impacted by COVID-19 health and economic crises. The resulting increase in discretionary spending would benefit local small businesses.

[339] Adele Morris, *Making Border Carbon Adjustments Work in Law and Practice*, Brookings (July 26, 2018), https://www.brookings.edu/research/making-border-carbon-adjustments-work-in-law-and-practice/.

[340] In the absence of new regulatory authority, the administration could leverage its existing authority under the Clean Air Act to regulate certain source categories with carbon pricing approaches, such as emissions trading for the power sector under Clean Air Act section 111(d). *See* Clean Air Act Amendments of 1990, S. 1630, 101st Cong. (1989), available at https://www.congress.gov/bill/101st-congress/senate-bill/1630/text.

Leveling the playing field for clean energy technologies through the carbon price, coupled with investment of revenues in clean technologies, could further improve their cost-competitiveness, spur innovation, and enable companies commercializing those technologies to succeed. Investments in adaptation measures and resilient infrastructure could help protect people and communities from a range of harmful climate impacts; every $1 spent on resilience efforts saves society at least $4 in damages, not including lives saved and livelihoods protected.[341] Investments in just transition could help ensure that workers and communities transitioning away from fossil fuels are empowered to contribute to the clean energy economy. All of these investments, in conjunction with other investments to move to a clean energy economy, will promote a shift in employment to cleaner technologies,[342] create hundreds of thousands of new jobs, and increase GDP.[343]

How the Recommendation Supports Frontline or other Underserved Communities:

Communities of color, low-income communities, and indigenous communities are at especially high risk from climate change and pollution. These communities have historically received few benefits from public clean energy investment, have high energy burdens, and are more likely to live in polluted areas.[344] The *Climate Enforcement Plan* helps to address these historical inequities.

Dividends under the policy provide direct economic assistance to low- and middle-income households, more than offsetting the impact of the carbon fee for most.[345] Investments in decarbonizing energy, industry, buildings, and transport will help accelerate the closure or conversion of highly polluting facilities that have long burdened the health of frontline communities. By supporting retrofit programs that make buildings healthier, less costly, and more energy efficient, investments of carbon

[341] *Multi-Hazard Mitigation Council (MMC): Projects*, Nat'l Inst. of Bldg. Scis. (last visited Oct. 14, 2020), https://www.nibs.org/page/mmc_projects.
[342] Marc Hafstead and Lauren Dunlap, *Carbon Pricing 106: Effects on Employment*, Resources for the Future (May 18, 2020), https://www.rff.org/publications/explainers/carbon-pricing-106-effects-employment/.
[343] Risky Business, From Risk to Return: Investing in a Clean Energy Economy (2016), https://riskybusiness.org/site/assets/uploads/sites/5/2016/10/RBP-FromRiskToReturn-WEB.pdf; DM Anderson, et al., U.S. Dep't of Energy, Assessing National Employment Impacts of Investment in Residential and Commercial Sector Energy Efficiency: Review and Example Analysis (2014), https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-23402.pdf.
[344] *Disparities in the Impact of Air Pollution*, Am. Lung Ass'n (last updated Apr. 20, 2020), https://www.lung.org/clean-air/outdoors/who-is-at-risk/disparities; Cheryl Katz, *People in Poor Neighborhoods Breathe More Hazardous Particles*, Sci. Am. (Nov. 1, 2012), https://www.scientificamerican.com/article/people-poor-neighborhoods-breate-more-hazardous-particles/.
[345] Dallas Burtraw, Maya Domeshek, and Amelia Keyes, *Carbon Pricing 104: Economic Effects Across Income Groups*, Resources for the Future (May 4, 2020), https://www.rff.org/publications/explainers/carbon-pricing-104-economic-effects-across-income-groups/.

pricing revenue ameliorate additional risks facing underserved communities. Investments in adaptation and resilient infrastructure would help protect these communities from climate impacts. Investments in clean energy job training programs and technology deployment in underserved communities help spread the benefits of a clean energy economy to those communities. Just transition investments provide economic security for workers and communities transitioning away from fossil fuels, such as training, education, and affordable financing for new businesses.

How the Recommendation Supports Biden's Climate Plan:

The plan satisfies fundamental principles of the Biden Climate Plan.

- The fee, investment, and escalator work in lockstep to be the "enforcement mechanism" keeping the U.S. on track to achieve VP Biden's net-zero goal for 2050, "based on the principles that polluters must bear the full cost of the carbon pollution they are emitting;"
- The policy contributes to making "a historic investment in clean energy" and innovation, "incentiviz[ing] the rapid deployment of clean energy innovations across the economy, especially in communities most impacted by climate change", and building "a stronger, more resilient nation;" and,
- The boost to the clean energy economy will support VP Biden's plan to create jobs, and the investments in just transition ensure we "fulfill our obligation to workers and communities who powered our industrial revolution and subsequent decades of economic growth."

Key Battleground State Activity:

The momentum behind carbon pricing at the state level is rapidly growing. Virginia just joined the Regional Greenhouse Gas Initiative in the Northeast/Mid-Atlantic, and Pennsylvania is moving in that direction as well. The West Coast states have been leaders on carbon pricing for years, and numerous states in other regions are exploring it. The *Climate Enforcement Plan* would not supersede state policy, providing key states the opportunity to continue or develop their own policies and their own plans for using revenues.

Key Announcements for Biden Climate World Summit

Opportunity/Problem:

President Trump has reversed US global leadership on climate change. Biden has committed to rallying the world around climate change and rebuilding US leadership by rejoining the Paris Climate Agreement on Day 1 and hosting a "Climate World Summit" within his first 100 days in office. The Summit is an exceptional opportunity to show unhesitating commitment from the US to global climate leadership, and to rebuild key bilateral relationships, international forums, and financial institutions.

Recommended Action(s):

At the Climate World Summit, we recommend the following four key announcements:

- Align all US foreign assistance with the Paris Agreement
- Elevate climate change as a national and global security priority
- Build a coalition to press major coal-financing countries to put a moratorium on coal investments around the world, and redirect funds to clean alternatives
- Advance gender equity, recognizing that the benefits include improved climate change mitigation and adaptation

Program Type:

√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

Shifting funds towards clean energy technologies will facilitate job growth in these sectors. Veterans will be enlisted to build our crumbling energy infrastructure and to implement the DOD's EE and RE programs.

Econ. Benefits:

The shift away from coal reduces our dependence on finite resources and will help slow down the effects of climate change, which has cost the U.S. $240 billion per year for the last 10 years. The DOD is expected to face reduced costs as a result of the increase in operational viability and resiliency of defense programs.

Equity Benefits:

Rec #3: Empowerment of women and girls will improve gender equity
Rec #2: Moratoriums on coal will positively impact communities in close proximity to power plants, who experience negative health effects as a result of harmful pollutants.

[332] The Biden Plan for a Clean Energy Revolution and Environmental Justice, Biden For President (last visited Oct. 14, 2020), https://joebiden.com/climate-plan/#.

Key Announcements for Biden Climate World Summit

Climate Plan Tie:

Rec #2 is in line with Biden's plan to rally the rest of the world to meet the threat of climate change and achieve a 100% clean energy economy by 2050

Rec #4 is in line with Biden's plan to make climate change a core national security priority by tasking our military to regularly analyze risks and threats created by climate refugees, resource scarcity, and military readiness.

Battleground State Benefits:

Battleground states will benefit from job creation as a result of assigning climate change as a core national security priority. Battleground states such as Pennsylvania, Florida, and Wisconsin can all benefit from job creation to 1) recover from the coronavirus pandemic, and 2) tackle the climate crisis.

Key Announcements for Biden Climate World Summit

COLLABORATORS: Tina Latif, Amanda Spinner, Kaylene Hung, Jordan Hibbs, Sarah Booth

Statement of Issue and Summary of Recommendations:

President Trump has reversed the US's historic leadership on global climate action, and withdrawn from the Paris Climate Agreement. Joe Biden's Climate Plan commits to rallying the world around climate action. In addition to rejoining the Paris Climate Agreement on Day 1, Biden has also committed to holding a "Climate World Summit" in his first 100 days. The Summit will "directly engage the leaders of the major greenhouse gas-emitting nations of the world to persuade them to join the United States in making ambitious national pledges, above and beyond the commitments they have already made." Biden's Climate Plan also emphasizes equity and environmental justice.

In one debate, Biden indicated that invitations to the Summit would be sent on Day 1. This is a major diplomatic moment in the fight against climate change, especially in the lead up to the UN Climate Change Conference Conference of Parties 26 (COP26) in November 2021.

This paper provides recommendations for key announcements that the Biden Administration could make at the "Climate World Summit." The Summit will demonstrate the American commitment to global climate leadership, and help rebuild key bilateral relationships, international forums, and financial institutions.

In this paper, we recommend the following four key announcements:

- **Recommendation #1: Align all US foreign assistance with the Paris Agreement**
- **Recommendation #2: Build a coalition to press major coal-financing countries to put a moratorium on coal investments around the world, and redirect funds to clean alternatives**
- **Recommendation #3: Advance gender equity, which improves climate change mitigation and adaptation**
- **Recommendation #4: Elevate climate change as a national and global security priority**

PROPOSED RECOMMENDATIONS

Check Boxes Below	
Yes	Is this a new or modification of an existing program?
Yes	Does this roll back a Trump Administration regulation?

Ending Reliance on Fossil Fuels and Building a Just Transition

Recommendation #1: Align all US foreign assistance with the Paris Agreement

Background

The Biden Administration should announce the alignment of all US foreign assistance and development aid with the goals of the Paris Climate Agreement at the Climate World Summit. Building on the momentum of the Summit, the Administration should build a coalition of countries to develop standards and guidelines to systematically align all global development cooperation with the Paris Agreement.

The fundamental aim of development cooperation is to facilitate the economic, social, and environmental transformation of developing countries in the face of complex challenges. Climate change threatens this aim. Development institutions cannot deliver on their mandates without anticipating and accounting for climate change.

The Biden administration should take advantage of the current window of opportunity - 2021 will be especially decisive. The postponement of COP26 means countries have one more year to update their Nationally Determined Commitments (NDC) under the Paris Agreement. Moreover, there is an unprecedented opportunity to harness economic recovery resources to fundamentally overhaul the global economy to be greener and more sustainable.

Key Summit Announcement

- Commit to aligning all US foreign and development aid with the Paris Agreement, and financial commitments be delivered equitably with community engagement in development.
- Announce a coalition of countries to develop standard guidelines to systematically align all global development cooperation with the objectives of the Paris Agreement. This coalition should be announced at the Summit, and the standards should be released for adoption by COP26. At COP26, the US may call on partners and new countries and institutions to sign on to the agreement.
- The US, coordinated through the Development Finance Corporation and US ExIm Bank, should bring on board key allies to create a coalition of financial institutions and regional development banks to encourage lending practices in line with net-zero energy goals and immediately direct substantial investment towards green infrastructure and development.
- **Partners: Organisation for Economic Co-operation and Development (OECD), World Bank, International Monetary Fund (IMF), Department for International Investment (DFID/CDC), European Investment Bank (EIB), Regional Development Banks, other national Development Finance Institutions**

Recommendation #2: Build a coalition to press major coal-financing countries to put a moratorium on coal investments around the world, and

instead redirect funds to retire existing coal/gas investments and build new clean alternatives

The transition to phase out coal is not progressing fast enough.[347] While many countries have made significant progress towards eliminating coal, coal consumption has increased steadily since the early 2000s, particularly in non-OECD countries.[348] The University of Maryland estimates that globally, 598 GW of new coal capacity could come online in the next 15 years, including 223 GW that have already started construction.[349] **There is urgency in the establishment of this coalition, as it is in the best interest of all countries to prevent the many planned coal power plants from being built.**

To facilitate the transition to clean energy and in order to meet energy demand with alternative resources, the OECD estimates that $6.9 trillion in investments is needed annually to meet the goals set forth by the Paris Agreement.[350] This level of investment represents a five-fold increase by 2050. As a result, **a critical component of this coalition is a funding mechanism between countries to support clean energy development.**

Lastly, communities that have borne the brunt of the global carbon economy, and specifically coal, must be considered. Communities in close proximity to power plants have been exposed to harmful pollutants throughout their lifetime and must be included in the clean energy transition and communities whose livelihoods depend on the fossil fuel industry need a clear path forward with respect to job opportunities and training. In China alone, approximately 4.3 million people are employed in China's coal mines.[351] U.S. coal mines employ approximately 50,000.[352] **It's crucial the coalition considers how a just transition away from coal can occur on a global scale.**

<u>Key Summit Announcement</u>

- The US should build a coalition with top coal-financing and coal-producing countries to put a moratorium on coal investment and redirect funds to investments in clean energy technologies.
- The coalition should develop just transition plans for coal communities that bring economic justice to communities that have borne the brunt of the global carbon economy.
- The commitment to stop investing in coal should apply to domestic and international investments.

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[347] *See* Annex note [1].
[348] *See* Annex note [2].
[349] University of Maryland School of Public Policy, *The State of Global Coal Power* (last visited Oct. 22, 2020), https://cngs.wpengine.com/#global_assessment.
[350] OECD, UN Environment & World Bank Group, Financing Climate Futures: Rethinking Infrastructure (2018), http://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf.
[351] Somini Sengupta, *The World Needs to Quit Coal. Why Is It So Hard?*, N.Y. Times (Nov. 24, 2018), https://www.nytimes.com/2018/11/24/climate/coal-global-warming.html.
[352] Taylor Kuykendall & Gaurang Dholakia, *U.S. Coal Mining Employment Hits New Low at the End of 2019, May Go Lower in 2020*, S&P Global Market Intelligence (Feb. 19, 2020).

- The commitment should build on established coalitions and initiatives,[353] such as the Powering Past Coal Alliance,[354] Climate Action 100+,[355] and The Investor Agenda[356] but also include precise timelines for the cessation of coal investment and production, steps for replacing planned coal plants with alternative energy sources, and financial mechanisms to ensure funds are available to facilitate the transition.
- The alliance should be initiated at the Climate World Summit, hosted by the Biden Administration within the first 100 days of office.
- **Key Partners:** The countries responsible for the most coal production or those with a significant amount of planned coal construction,[357] which include **China, the US, Indonesia, India, Australia, Russia, Vietnam, Japan, South Africa, South Korea, Poland, Pakistan, and the Philippines.**

Recommendation #3: Advance gender equity, recognizing that the benefits include improved climate change mitigation and adaptation

A changing climate affects everyone but women and youth disproportionately bear the brunt of the related environmental, economic, and social shocks. Often, women and girls are the last to eat or be rescued, they face greater health and safety risks as water and sanitation systems become compromised, and they take on increased domestic and care work as resources dwindle.Through their experiences as early adopters of many new agricultural techniques, first responders in crises, entrepreneurs of green energy, and decision-makers at home, women offer valuable insights and solutions into better managing the climate and its risks. Yet, their contribution is often overlooked in humanitarian and climate action and their practical needs are often forgotten.

Improving women's access to education, reproductive health, and productive farming resources will significantly reduce GHG emissions and strengthen the resiliency of communities to adapt to climate change.[358] While it is certainly not the sole burden of women to advance the solution on climate change, the status of women and girls will be crucial to meeting the objectives of the Paris Agreement. **If we can gain ground on gender equity, we gain ground on climate change.**

<u>Key Summit Announcement</u>

- US to lead gender equity announcement: (a) US to reinstate funding to UNFPA; (b) new fund focusing on empowering female smallhold farmers

Recommendation #4: Elevate climate change as a national and global security priority

[353] *See* Annex note [3].
[354] Powering Past Coal Alliance, https://poweringpastcoal.org/ (last visited Oct. 22, 2020).
[355] Climate Action 100+, http://www.climateaction100.org/ (last visited Oct. 22, 2020).
[356] The Investor Agenda, https://theinvestoragenda.org/ (last visited Oct. 22, 2020).
[357] BP, *Statistical Review of World Energy* (2019), https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf.
[358] *See* Annex note [4].

The idea of exploring climate change as a security issue should be well recognized in United States domestic and foreign policy. Experts recognize that the longer action on climate is delayed, the higher likelihood and intensity of violent conflict, trauma, and coercion related to the process of climate adaptation.[359] As the impacts of climate change accelerate, there is less time for mitigation, adaption, and management of these urgent issues and a greater likelihood that they will result in conflict. Two recent examples of conflicts made worse by climate change include the Syrian Civil War and the ISIS Invasion of Iraq which were both impacted by droughts and other extreme weather which caused economic turmoil and instability.[360]

On a national level, the impacts of climate change on the US military infrastructure and operations must be addressed. A 2019 Department of Defense (DoD) report identified that the effects of climate change have posed threats to mission planning and execution of defense strategies.[361] For example, weather events like recurrent flooding, permafrost thawing, hurricanes, and rising sea waters have resulted in infrastructure damage and interruptions in testing programs, training operations, and mission execution. Operational readiness is critical to the DoD and the security of the US, but this readiness is threatened by climate change. Elevating climate change as a core national security priority will increase the operational viability and resiliency of defense programs. As the nation's largest energy user, the DoD should increase initiatives related to energy efficiency and clean energy. There are also additional security benefits to efficient management of energy, such as needing to refuel less and bring in fewer fuel convoys - which can save lives and reduce harm to soldiers in combat zones.[362]

On a global level, the convergence of climate change and security is expected to be a compounding problem.[363] The consequences of climate change manifest in different ways for different countries. For indigenous peoples inhabiting the Arctic regions, thinning ice sheets and unpredictable amounts of snowfall limit their ability to hunt for food. For families living along the coast of Bangladesh, sea-level rise and extreme weather events are responsible for mass migration into the countryside and

[359] *See generally* Richard A. Falk, This Endangered Planet 353 (Random House 1971).
[360] *See generally* Peter Schwartzstein, *Climate Change and Water Woes Drove ISIS Recruiting in Iraq*, Nat'l Geographic (Nov. 14, 2017), https://www.nationalgeographic.com/news/2017/11/climate-change-drought-drove-isis-terrorist-recruiting-iraq/; Elaisha Stokes, *The Drought That Preceded Syria's Civil War Was Likely Worst in 900 Years*, Vice (Mar. 3, 2016), https://www.vice.com/en/article/3kw77v/the-drought-that-preceded-syrias-civil-war-was-likely-the-worst-in-900-years.
[361] *See generally* Dep't of Defense, Report on Effects of Changing Climate to the Department of Defense (Jan. 2019), https://www.reed.senate.gov/imo/media/doc/Sec%20335%20RTC%20on%20Effects%20of%20a%20Changing%20Climate%20to%20DOD2.pdf.
[362] *See generally* Nat'l Renewable Energy Lab'y, Renewable Energy at Work in War Zones (Aug. 5, 2010), https://www.nrel.gov/news/features/2010/1521.html.
[363] *See generally* Bruce Lieberman, A Brief Introduction to Climate Change and National Security, Yale Climate Connections (July 23, 2019), https://yaleclimateconnections.org/2019/07/a-brief-introduction-to-climate-change-and-national-security/.

displacement of people.[364] In southern Africa, unusual amounts of rainfall, increasing temperature and higher humidity have played a large role in the spread of malaria-carrying mosquitoes to new areas, leading to an upsurge in malaria cases. Demonstrably, while not a direct cause of conflict, global environmental degradation and climate change are considered as "threat multipliers" that worsen underlying conditions - public health, ethnic tensions, food scarcity, forced migration, poverty, and other sources of instability.

Key Summit Announcement

- The commitment to establish a National Intelligence Estimate on national and economic security impacts from climate change
- The commitment to mitigate impacts of climate change on defense posture, readiness, infrastructure, and threat picture, as well as to prioritize the Defense Department's strategy to manage those impacts
- The commitment to increase the Department of Defense's energy efficiency and renewable energy initiatives and programs
- The commitment to enlist the nation's veterans to rebuild our crumbling energy infrastructure and to implement the Department of Defense's energy efficiency and renewable energy initiatives and programs
- The commitment to use the purchasing power of the DOD to bring down the cost of deploying new RE tech

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: While this paper is international-facing, its recommendations will have domestic benefits to the US. First and foremost, climate change is a global problem that can only be solved through competent and coherent global cooperation: if the US shows a commitment to help developing countries, it will encourage their commitment to transitioning to net zero economies by 2050 (as is required by the Paris agreement). In this way, addressing climate change abroad will reduce the direct impacts on the US and for all. Second, by mobilizing foreign aid towards creating new, climate-friendly infrastructure and policies in emerging economies, the US will be creating opportunities to connect American businesses directly with new customers and suppliers. For instance, America's chief aid agency, United States Agency for International Development (USAID), uses its expertise to encourage private companies to collaborate on projects. For example, they have worked with Cargill and Land O'Lakes to help dairy farmers in East Africa raise their productivity, increasing the value of the companies' exports to places like Kenya and Uganda.[365] These investments have a real connection to America's security and domestic economy.

[364] *See generally* Press Release, Climate Change Threatens Lives and Futures of Over 19 Million Children in Bangladesh, UNICEF (Apr, 5, 2019), https://www.unicef.org/press-releases/climate-change-threatens-lives-and-futures-over-19-million-children-bangladesh.
[365] *See generally* Bill Gates, Giving Foreign Aid Helps America's Economy, GatesNotes (June 27, 2017), https://www.gatesnotes.com/Development/Foreign-Aid-Helps-Americas-Economy.

How the Recommendation Supports Frontline or other Underserved Communities: This paper is international-facing, but its focus is by definition on frontline and underserved communities in developing countries. Historical responsibility and equity is also at the core of the UN Climate Change Convention.[366]

How the Recommendation Supports Biden's Climate Plan: This paper supports Biden's Climate Plan by: (a) providing detailed recommendations for his proposed World Climate Conference in the first 100 days of government (b) making climate change a core national security priority; (c) fulfilling America's pledge and enhancing our security by helping developing countries better manage the adverse effects of climate change, as well as Biden's Foreign Policy Leadership Plan.[367]

Key Battleground State Activity: N/A, but see reasoning above regarding domestic impacts of these international-facing policies.

[366] *See generally* United Nations Framework Convention on Climate Change, Preamble (1992), https://unfccc.int/resource/docs/convkp/conveng.pdf.
[367] Biden-Harris Campaign, The Power of America's Example: The Biden Plan for Leading the Democratic World to Meet the Challenges of the 21st Century (last visited Oct. 22, 2020), https://joebiden.com/americanleadership/#.

Annex

[1] The UN reports that "countries are currently planning to produce 150% more coal in 2030, than would be consistent with limiting warming to 2°C, and almost three times more than would be consistent with limiting warming to 1.5°C."[368] According to the Carbon Brief, 199,572MW of coal plants are under construction today, and 297,829MW are planned worldwide.[369] We have seen progress towards coal phaseouts, for reasons related to environmental concerns as well as economic, and this progress stems from financial institutions (such as Barclays, Deutsche Bank, Morgan Stanley, and others), states and utilities within the US, as well as other countries. OECD countries have made the most progress, and have decreased their consumption of coal by around 2.8% annually for the last decade.[370]

[2] While many countries have made significant progress towards eliminating coal, the same trend is not present for non-OECD countries in particular, whose coal consumption has increased steadily since the early 2000s. According to a report produced by Statista, the China Construction Bank, Bank of China, and ICBC (Industrial and Commercial Bank of China) alone contributed $13.2, $11.5, and $7.3 billion respectively to coal mining companies from 2016 to 2019.[371] Statista also released data that breaks down megawatts of coal under construction in the year 2018.[372] China, India, Indonesia, Vietnam, and Japan were the top 5 offenders, with 128,650MW, 36,158MW, 11,466MW, 9,705MW, and 8,724MW of planned construction respectively. South Africa, South Korea, Poland, Pakistan, and the Philippines also had notable amounts of planned construction. President Xi Jinping of China has recently said that he is "committed to open, clean and green development." China's large financial commitments and planned construction of coal both domestically and abroad don't support that statement, but they have dramatically increased renewable energy use and production. According to the Center for Strategic and International Studies, China is now the world's largest producer of wind and solar energy and four of the world's five

[368] UN News, *Is the World Read to End the Coal Era and Embrace Clean Energy?* (Nov. 29, 2019), https://news.un.org/en/story/2019/11/1052271.
[369] Carbon Brief, Global Coal Power (Mar. 26, 2020), https://www.carbonbrief.org/mapped-worlds-coal-power-plants.
[370] Robert Rapier, *Global Coal Consumption Is Being Driven By Developing Countries*, Forbes (July 19, 2020), https://www.forbes.com/sites/rrapier/2020/07/19/global-coal-consumption-is-being-driven-by-developing-countries/#3ad8f9ec1c4f.
[371] Jennifer Rudden, *Cumulative Financing of Coal Mining Companies by Selected Banks Worldwide from 2016 to 2019*, Statista (Mar. 21, 2020), https://www.statista.com/statistics/1093876/global-funding-coal-mining-bank/.
[372] Niall McCarthy, *Where the Most Coal Power Plants are Under Construction*, Statista (Mar. 29, 2019), https://www.statista.com/chart/17517/megawatts-of-coal-power-capacity-under-construction/.

largest renewable energy deals were made by Chinese companies back in 2016.[373] However, the installment of additional solar farms will only go so far in helping the environment so long as continued investment in fossil fuels still exists.

[3] There are international alliances focused on this issue, including the Powering Past Coal Alliance, Climate Action 100+, and the Investor Alliance. The Powering Past Coal Alliance in particular has been signed by national and subnational governments, businesses, and organizations. However, none of the National Governments who are the biggest contributors to coal financing and coal production have signed on. Additionally, although the alliance's key premise is to facilitate the transition of coal to clean energy, the alliance does not mention a specific timeline for this transition. It is time for the United States to take a more active global leadership role in the fight against climate change and that starts with an urgent commitment to place a moratorium on coal.

[4] According to Project Drawdown, improving access to quality education and reproductive health care, particularly for women and girls, can prevent more than 85 gigatons of CO2 between 2020 and 2050.[374] This is the equivalent of taking nearly 22,000 coal-fired plants offline. However, according to data from the reproductive health advocacy and research group Guttmacher Institute, there are 214 million women globally who wish to avoid pregnancy but do not have access to modern contraception.[375] Women who have been historically marginalised often also face bigger barriers to getting an education and birth control.

President Trump's numerous environmental rollbacks have included actions that limit women's access to reproductive health care. President Trump has pulled US funding from the United Nations Population Fund (UNFPA) - the UN sexual and reproductive health agency - for three years in a row.[376] Within the US, the Trump administration has also attempted to give employers greater ability to deny insurance coverage for birth control.[377]

This is undoubtedly a controversial topic - but as Project Drawdown notes: "Honoring the dignity of women and children through family planning is not about governments

[373] Dominic Chiu, *The East Is Green: China's Global Leadership in Renewable Energy*, Ctr. for Strategic & Int'l Studies (2017), https://www.csis.org/east-green-chinas-global-leadership-renewable-energy.
[374] Project Drawdown, Health and Education (last visited Oct. 22, 2020), https://www.drawdown.org/solutions/health-and-education.
[375] Guttmacher Inst., Investing in Sexual and Reproductive Health in Low- and Middle-Income Countries (July 2020) https://www.guttmacher.org/fact-sheet/adding-it-up-investing-in-sexual-reproductive-health#.
[376] *See* Statement on the United States Decision to Again Withhold Funding from UNFPA, United Nations Population Fund (July 15, 2019), https://www.unfpa.org/press/statement-united-states-decision-again-withhold-funding-unfpa-0.
[377] Sarah McCammon, *Supreme Court Takes Up Birth-Control Conscience Case*, NPR (Jan. 17, 2020), https://www.npr.org/2020/01/17/795342900/supreme-court-takes-up-birth-control-conscience-case.

forcing the birth rate down (or up, through natalist policies). Nor is it about those in rich countries, where emissions are highest, telling people elsewhere to stop having children. When family planning focuses on healthcare provision and meeting women's expressed needs, empowerment, equality, and well-being are the result; the benefits to the planet are side effects."[378]

Additionally, in low-income countries, women are the primary farmers and produce 60 to 80% of the food, often on five acres of land or less.[379] Despite being the primary food producers of our world, women smallholders have less access to resources, including land rights, credit and capital, training, tools and technology. While they farm as capably and efficiently as men, this well-documented disparity in resources and rights means women produce less food on the same amount of land. According to the Food and Agriculture Organization of the United Nations, if all women smallholders receive equal access to productive resources their farm yields will rise by 20 to 30 percent, resulting in one hundred million to 150 million people will no longer be hungry.[380] Project Drawdown finds that supporting women as smallhold-farmers could reduce 2.1 gigatons of carbon dioxide by 2050. This is similar to the impact household recycling is estimated to have globally.[381]

[378] Project Drawdown, *supra* note 374.
[379] *Id.*
[380] Food and Agriculture Organization of the United Nations, Women in Agriculture: Closing the Gender Gap for Development (Nov. 2010), http://www.fao.org/3/a-i2050e.pdf.
[381] While out of the scope of this recommendation document, it is also important to consider that if all farmers - women and men - followed better agricultural and land-use practices, it would help reduce carbon emissions through soil retention and avoided deforestation.

Rejecting Line 3 to Support a Clean Energy Future

Opportunity/Problem:

Enbridge Inc., a Canadian pipeline company, has proposed to construct a new tar sands oil pipeline that would carry crude oil from the Alberta Athabasca tar sands oil fields across northern Minnesota to Superior, Wisconsin. The project is a climate change disaster that will infringe on Native American treaty rights and expose sensitive and pristine ecosystems to irreparable oil spills. Opposed by a large coalition of Indigenous and environmental groups, the Line 3 project serves only oil and pipeline industry's interests in their attempt to expand their overseas markets, with no long term benefit to Minnesota or other states.

Recommended Action(s):

- A new Biden Administration could delay or stop Line 3 by requiring a full environmental impact report ("EIS") for the project; if the Army Corps has already approved the 404 permit, they would need to pause, revise, or rescind that permit in order to review it. The legal basis for this review might be a compelling change or new information (ie. climate change impact on waterways, environmental justice analysis, additional information on the impact of oil spills on waterways, etc). This could be done immediately after taking office and would build on the precedent set in 2018 requiring an EIS on the Keystone XL Pipeline ("KXL") and in the 2017 reversal of a required EIS, including an environmental justice analysis, for the Dakota Access Pipeline ("DAPL").
- The Biden-Harris Administration could order an immediate pause on oil pipeline construction and a moratorium on any new projects or expansion projects while they review Trump-era approvals for conflict or undue influence of industry. This sort of moratorium could extend to cover existing projects that were permitted and constructed under the Trump Administration (ie. DAPL) along with projects underway (Line 3, KXL, and others depending on where proposals are at then).

Program Type:

√ Program Modification
√ Rollback of Trump Program

Authority:

√ Existing Authority
√ Requires New Regulations

Job Benefits:

Advocate for infrastructure job creation instead of Line 3 construction.

Econ. Benefits:

Avoid $287 billion dollars over 30 years in GHG social costs; avoid the enormous costs of oil pipeline spill clean-up; and, preserve sensitive ecosystems and resulting ecosystem services and Native Americans livelihoods.

Rejecting Line 3 to Support a Clean Energy Future

Equity Benefits:

- Prioritize the protection of Native American culture and livelihoods
- Avoid the disastrous consequences of an oil spill in ecologically sensitive Native land

Climate Plan Tie:

Avoid 193 million tons of annual GHG emissions, equivalent to building 50 coal-fired power plants.

Battleground State Benefits:

Line 3 has enormous opposition from the public and major environmental groups;
line 3 has enormous opposition from many Native American groups; and,
denial of the project is consistent with Minnesota climate goals.

Rejecting Line 3 to Support a Clean Energy Future

AUTHORS: Jim Doyle, Andy Pearson, Kevin Whelan, Julia Evelyn

Date: September 28, 2020

Statement of Issue and Summary of Recommendations. Enbridge Inc., a Canadian pipeline company, has proposed to construct a new tar sands oil pipeline that would carry a processed form of tar sands oil mined from the Athabasca Oil Sands fields of Alberta, Canada across northern Minnesota. Tar sands oil is the dirtiest oil on earth. The mining of tar sands has ravaged the Alberta boreal forest landscape, destroying over 2 million acres as of 2014 according to the World Resources Institute.[383] Because of the complex processing required, tar sands oil creates up to 30% more life-cycle atmospheric CO_2 than conventional oil production.[384] As a proposed 36-inch pipeline to carry tar sands oil from Canada to the United States, Line 3 is very similar to the Keystone XL proposal, in that it is the same diameter pipe and carries the same product.

The Line 3 project has been called a replacement for the existing Line 3, which is now over 50 years old and has over 900 structural anomalies.[385] While we are supportive of immediately shutting down and decommissioning the current Line 3, the replacement Line 3 is a new pipeline that will double the capacity of the existing pipeline from 390,000 barrels per day to 760,000 barrels per day.[386] The regulatory record shows that the oil carried by the new pipeline will be primarily new heavy crude oil, with the current Line 3 oil re-routed to other pipelines.[387] Thus, the proposal seeks to increase net oil production and consumption by 760,000 barrels per day.

The primary purpose of this pipeline is to expand Canadian tar sands oil to overseas markets, a fact admitted by Enbridge itself.[388] However, as demonstrated by

[383] Rachael Petersen and Nigel Sizer, *Tar Sands Threaten World's Largest Boreal Forest*, World Resources Inst. (July 15, 2014), https://www.wri.org/blog/2014/07/tar-sands-threaten-world-s-largest-boreal-forest.
[384] Total Estimated GHG Emissions and Production Volumes for 75 OCI Test Oils, Carnegie Endowment for Int'l Peace (last visited Oct. 14, 2020), http://oci.carnegieendowment.org/#total-emissions.
[385] Line 3 Abandonment Fact Sheet, Honor the Earth (last visited Oct, 14, 2020), available at http://www.honorearth.org/line_3_abandonment_fact_sheet.
[386] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, at 13 (finding 6), https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.
[387] Id. at 196 (finding 677).
[388] Id. at 177, 194 (findings 594 and 667).

the Minnesota Department of Commerce,[389] Enbridge has yet to provide a credible demand or sales forecast for this new oil. The construction of Line 3, which would actually increase world oil use, will only slow the transition to a carbon free energy economy. The Line 3 project puts some of the most pristine land in our country at a serious risk of an oil spill. The pipeline's route crosses ceded treaty territory in northern Minnesota where Native communities have usufructuary rights to hunt, fish, and gather wild rice. According to the Minnesota Department of Commerce, Line 3 will have "disproportionate and adverse impacts on environmental justice communities, particularly Native American communities in the project area."[390]

Policy recommendations:

- A Biden-Harris Administration could stop Line 3 by requiring a full EIS for the project.
- The new Administration could also order an immediate pause on oil pipeline construction and a moratorium on any new projects or expansion projects while they review Trump-era approvals for conflict or undue influence of industry.

Opportunity / Problem Statement: **Problem:** Enbridge Inc., a Canadian pipeline company, has proposed to construct a new tar sands oil pipeline that would carry crude oil from the Alberta Athabasca tar sands oil fields across northern Minnesota to Superior, Wisconsin. The project is a climate change disaster that will infringe on Native American treaty rights and expose sensitive and pristine ecosystems to irreparable oil spills. Opposed by a large coalition of Indigenous peoples and environmental groups, the Line 3 project serves only oil and pipeline interests in their attempt to expand their overseas markets, with no long term benefit to Minnesota or other states.

Activities to Date: The Line 3 project, now in its later stages of regulatory approval by the State of Minnesota, was first proposed in 2014, but due to enormous public pressure as well as Minnesota regulatory mistakes, construction is now delayed to this coming winter at the earliest. The Minnesota Public Utilities Commission ("MN PUC") has

[389] In re Applications of Enbridge Energy, Limited Partnership, for a Certificate of Need and a Routing Permit for the Proposed Line 3 Replacement Project in Minnesota from the North Dakota Border to the Wisconsin Border (Minn. Ct. App. 2019), https://cases.justia.com/minnesota/court-of-appeals/2019-a18-1283.pdf?ts=1559581404.

[390] Direct Testimony of Kate O'Connell on Behalf of Minnesota Department of Commerce Division of Energy Resources, PUC Docket No. PL9/CN-14-916, PUC Docket No. PL9/CN-14-916, September 11, 2017.

issued a Route Permit and a Certificate of Need for the project.[391] The Minnesota Department of Commerce ("MN DOC") and environmental groups have challenged the MN PUC decisions in pending lawsuits.[392] The water crossing permits drafted by the Minnesota Pollution Control Agency are the subject of an on-going contested case hearing. There has been fierce opposition to this project by the public; 94% of the 72,249 written comments solicited in the regulatory hearings opposed the pipeline [11].[393] Many major environmental groups in Minnesota including MN350, Sierra Club, Honor the Earth, Indigenous Environmental Network, Minnesota Environmental Partnership, Climate Generation, Environment Minnesota, Minnesota Interfaith Power & Light, TakeAction MN, Land Stewardship Project, Friends of the Headwaters, and Rainforest Action Network, as well as national organizations such as Greenpeace, Natural Resources Defense Council, Center for Biological Diversity, Oil Change International, 350.org, Sunrise Movement, and Power Shift Network, in addition to multiple Tribal governments including the Red Lake Band of Chippewa and the White Earth and Mille Lacs Bands of Ojibwe strongly oppose this pipeline. Due to the strong public opposition the project has had extensive media coverage in Minnesota [12].[394]

Proposed Recommendation:

Check Boxes Below	
x	*Is this a modification of an existing program?*

[391] Order Finding Environmental Impact Statement Adequate, Granting Certificate of Need as Modified, and Granting Routing Permit as Modified, Docket No. PL-9/CN-14-916, Docket No.. PL-9/PPL-15-137, May 1, 2020.
[392] In re Applications of Enbridge Energy, Limited Partnership, for a Certificate of Need and a Routing Permit for the Proposed Line 3 Replacement Project in Minnesota from the North Dakota Border to the Wisconsin Border (Minn. Ct. App. 2019), https://cases.justia.com/minnesota/court-of-appeals/2019-a18-1283.pdf?ts=1559581404; Line 3 Pipeline Replacement, Commerce Dep't (last visited Oct. 14, 2020), https://mn.gov/commerce/energyfacilities/line3/.
[393] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, Attachment C, https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.
[394] See, e.g., Dan Kraker, Another Line 3 Appeal: Four Things to Know, MPRNews (Aug. 20, 2020), https://www.mprnews.org/story/2020/08/20/another-line-3-appeal-4-things-to-know; WCCO-TV, Walz Administration Keeps Up Fight Against Line 3 Crude Oil Pipeline, CBS Minn. (Aug. 18, 2020), https://minnesota.cbslocal.com/2020/08/18/walz-administration-keeps-up-fight-against-line-3-crude-oil-pipeline/; Dan Kraker, State Utility Regulators Reaffirm Support for Line 3, MPRNews (June 25, 2020), https://www.mprnews.org/story/2020/06/25/state-utility-regulators-reaffirm-support-for-line-3.

x	*Does this roll back a Trump Administration regulation?*

- A new Administration could stop Line 3 by requiring a full EIS for the project; if the Army Corps has already approved the 404 permit, they would need to pause or rescind that permit in order to review. The legal basis for this review might be a compelling change or new information (i.e., climate change impact on waterways, environmental justice analysis, additional information on the impact of oil spills on waterways, etc). This could be done immediately after taking office and would build on the precedent set in 2018 requiring an EIS on KXL and in the 2017 reversal of a required EIS for DAPL.
- A new Administration could order an immediate pause on oil pipeline construction and a moratorium on any new projects or expansion projects while they review Trump-era approvals for conflict or undue influence of industry. This type of moratorium should extend to cover existing projects that were permitted and constructed under the Trump Administration (i.e., DAPL) along with projects underway (Line 3, KXL, and others).

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: The project has serious implications for climate change. The regulatory record shows that 193 millions tons of CO2eq per year will result from the mining, pipeline operation, and the burning of the oil.[395] This is equivalent to building 50 coal fired power plants, putting an additional 38 million gasoline passenger vehicles on the road, and is equal to five times the 2016 Minnesota emissions from the transportation sector and five times the 2016 emissions from the electricity sector.[396] The MN DOC has estimated that the climate effects due to this pipeline will result in $287 billion in social costs over 30 years.[397] It is important to

[395] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, at 196 (finding 676), https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.
[396] Line 3 Report: A Giant Step Backward, MN350 (last visited Oct. 14, 2020), https://mn350.org/giant-step-backward/ (containing references).
[397] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, at 196 (finding 676), https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.

emphasize the oil carried by this pipeline is primarily new oil and no societal need for this oil has been demonstrated.

The MN DOC estimates the project will provide approximately 4,200 construction jobs for the approximately one year of construction time with half of those jobs local,[398] in a region of the state where jobs are desperately needed. However, we believe that we can have both good jobs and protect the environment. Instead of building new and unneeded fossil fuel infrastructure which has serious and negative climate, environmental, and social justice implications, we agree with the position of the Biden campaign on job creation through rebuilding our state and country's infrastructure: *Support new jobs through an unprecedented investment in public infrastructure, including roads, bridges, transit, rail, ports, airports, waterways, freight, energy, and broadband, and increasing the number of sustainable homes.*[399] These goals also align with Minnesota Governor Tim Walz's plans for putting people to work by fixing our crumbling infrastructure.[400] Another potential source of jobs could be the removal of the existing Line 3 after its decommissioning. Because of the grave threat of oil release that the existing Line 3 pipeline presents, it must be shut down immediately in any case. We feel strongly that job creation and protecting the environment are entirely compatible goals. However we also note that job creation or other economic benefits cannot by themselves justify an environmentally irresponsible project with serious negative environmental and social justice impacts.

How the Recommendation Supports Frontline or other Underserved Communities: Line 3 is an environmental justice issue due to the profound and disastrous consequences a pipeline spill would have in northern Minnesota on Native treaty land and natural resources. The pipeline's route crosses ceded treaty territory in northern Minnesota where Native communities have usufructuary rights to hunt, fish, and gather wild rice.[401] According to the Minnesota Department of Commerce, Line 3 will have "disproportionate and adverse impacts on environmental justice communities,

[398] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, at 251, 252 (findings 900 and 908), https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.
[399] Press Release, Biden For President, Biden-Sanders Unity Task Force Recommendations, 67 (July 8, 2020), https://joebiden.com/wp-content/uploads/2020/08/UNITY-TASK-FORCE-RECOMMENDATIONS.pdf.
[400] Building One Minnesota: Local Jobs and Projects Plan, State of Minn. (last visited Oct. 14, 2020), https://mn.gov/governor/buildonemn/.
[401] Winona Laduke, Why the White Earth Band of Ojibwe Legally Recognized Wild Rice's Rights, Civil Eats (Feb. 8, 2019), https://civileats.com/2019/02/08/why-the-white-earth-band-of-ojibwe-legally-recognized-wild-rices-rights/.

particularly Native American communities in the project area."[402] The permitting process has not required an environmental justice analysis and thus far has not been responsive to the concerns of Native peoples. Indeed, Indigenous groups have been at the forefront of the opposition to Line 3. The pipeline is vigorously opposed by the Native rights advocacy group Honor the Earth which, along with the tribal governments of Red Lake Band of Chippewa and the White Earth Band of Ojibwe, is mounting legal challenges to the pipeline permits granted so far by the State of Minnesota.[403]

How the Recommendation Supports the Biden Climate Plan: The recommendation to stop Line 3 Replacement Pipeline Project supports The Biden Climate Plan by reducing additional carbon into the atmosphere. The primary purpose of this pipeline is to expand Canadian tar sands oil to overseas markets, a fact admitted by Enbridge itself.[404] However, as noted by the Minnesota Department of Commerce[405], Enbridge has yet to provide a credible sales demand forecast for this new oil. Considering the current instability in oil markets and the considerable uncertainty around how well they can recover,[406] it is clear that the age of oil is coming to an end faster than anyone could have predicted. Electrification of transportation will be a major contributor to the decline of oil.[407] The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future will be an important part of this transition, with its commitment to *"reinvent the American transportation system from the factory line to the electric vehicle charging station'* and the goal of *"Transforming the U.S. electricity sector – and electrifying an increasing share of the economy – represents the biggest job creation and economic opportunity engine of the 21st*

[402] Direct Testimony of Kate O'Connell on Behalf of Minnesota Department of Commerce Division of Energy Resources, PUC Docket No. PL9/CN-14-916, PUC Docket No. PL9/CN-14-916, September 11, 2017.
[403] Honor the Earth to Challenge Newly Issued Certificate of Need and Route Permit for Proposed Line 3, Honor the Earth (last visited Oct. 14, 2020), http://www.honorearth.org/hte-puclegalaction.
[404] Application of Enbridge Energy, Ltd. P'ship, for a Certificate of Need for the Line 3 Project in Minnesota from the North Dakota Border to the Wisconsin Border, OAH 65-2500-32764, OAH 65-2500-33377, at 177, 194 (findings 594 and 667), https://mn.gov/oah/assets/2500-32764-2500-33377-enbridge-line-3-report_tcm19-336838.pdf?sourcePage=/oah/lawyers-and-litigants/administrative-law/opinion-archive.jsp%3Fid=19-336837.
[405] In re Applications of Enbridge Energy, Limited Partnership, for a Certificate of Need and a Routing Permit for the Proposed Line 3 Replacement Project in Minnesota from the North Dakota Border to the Wisconsin Border (Minn. Ct. App. 2019), https://cases.justia.com/minnesota/court-of-appeals/2019-a18-1283.pdf?ts=1559581404.
[406] Wal van Lierop, After COVID-19, the Oil Industry Will Not Return to "Normal", Forbes (Apr. 5, 2020), https://www.forbes.com/sites/walvanlierop/2020/04/05/after-covid-19-the-oil-industry-will-not-return-to-normal/#18b82c05281e.
[407] Matthew Green and Simon Jessop, Past its Peak? Battered Oil Demand Faces Threat from Electric Vehicles, Reuters (May 19, 2020), https://www.reuters.com/article/us-data-esg-autos/past-its-peak-battered-oil-demand-faces-threat-from-electric-vehicles-idUSKBN22V1HY.

century.""[408] The construction of Line 3, which would actually increase world oil use, will only slow this transition. Minnesota cannot be complicit in enabling this increase in fossil fuel consumption.

As noted above the record shows that 193 millions tons of CO2eq per year will result from the project equivalent to building 50 coal fired power plants or putting an additional 38 million gasoline passenger vehicles on the road, with an estimated $287 billion in social costs over 30 years. Although the majority of these emissions will result from the end use (burning) of the oil, the Biden-Sanders Unity Task Force Recommendations is very clear about the need to consider full life cycle climate assessment of new fossil fuel infrastructure:

> ***Climate Test****: Ensure that all major domestic and international infrastructure projects that require federal approval or receive significant federal funds or financing consider climate change (i.e., apply a climate test) and cumulative impacts, including a full life cycle assessment, and identify and invest in all opportunities to avoid, minimize and mitigate climate impacts, including impacts from fossil fuel infrastructure projects and export terminals.* [23][409]

Given the demonstrated lack of need and the potential serious/disproportionate impacts to Native communities, Line 3 clearly fails the Biden-Sanders Climate Test.

Key Battleground State Activity: Minnesota is, of course, a key battleground state, with the outcome in the 2016 election decided by only 45,000 votes, or 1.5%. The Line 3 project is the most impactful environmental controversy currently in Minnesota, rivaled in media coverage only by the Polymet case. Most major environmental groups in the state including MN350, Sierra Club, Honor the Earth, Indigenous Environmental Network, Minnesota Environmental Partnership, Climate Generation, Environment Minnesota, Minnesota Interfaith Power & Light, TakeAction MN, Land Stewardship Project, Friends of the Headwaters, and Rainforest Action Network, as well as multiple Tribal governments including the Red Lake Band of Chippewa and the White Earth and Mille Lacs Bands of Ojibwe strongly oppose this project. The largest public comment period on Line 3 drew 68,000 comments in opposition to the line, representing 94% of the total comments submitted.

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[408] The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future, Biden For President (last visited Oct. 14, 2020), https://joebiden.com/clean-energy/.
[409] Press Release, Biden For President, Biden-Sanders Unity Task Force Recommendations, 51 (July 8, 2020), https://joebiden.com/wp-content/uploads/2020/08/UNITY-TASK-FORCE-RECOMMENDATIONS.pdf.

Federal Divestment

Opportunity/Problem:

To most quickly and effectively achieve the goal of decoupling the U.S. government from fossil fuels, we must focus not only on new investments in clean energy but divestment of fossil fuel support, including "default" support tied to legacy frameworks. This paper focuses on one specific case in which the federal government props up investment in fossil fuels: the Thrift Savings Plan (TSP), the retirement savings vehicle for federal employees, which serves approximately 5.5 million participants with >$700 billion in assets, equivalent to over 40% of the $1.7 trillion President-elect Biden has pledged to climate change action over 10 years.

Recommended Action(s):

- Direct the Federal Retirement Thrift Investment Board to create a TSP Climate Choice option (default or not) that does not include exposure to fossil fuel-related investments. Automatically increase the fee if emissions in a given period exceed the trajectory required to achieve net-zero emissions by 2050.

Program Type:

√ Program Modification

Authority:

√ Existing Authority

Job Benefits:

- Divestment will spur innovation and jobs in the growing clean tech sector.
- Clean energy already employs 2.4 million, twice as many as fossil fuels.
- Clean energy cannot immediately replace all fossil fuel jobs; we must plan for a fair transition.

Econ. Benefits:

- Clean energy innovation will drive U.S. competitiveness abroad and well-paid jobs at home.
- Wind and solar are already the cheapest forms of energy in many areas.
- Clean energy supports and increases U.S. economic resilience.

Equity Benefits:

- Divestment will improve the health and well-being of low-income areas and communities of color, which are disproportionately affected by the placement of fossil fuel facilities.
- At the same time, innovation will improve disadvantaged communities' access to clean energy technologies such as solar and energy efficiency.

Climate Plan Tie:

By providing a Climate Choice investment option for the $700 billion in the TSP, this action will prevent involuntary government support for the fossil fuel industry. With no infusion of additional funds, this action could also support the clean energy economy (e.g., companies in the RE100).

Battleground State Benefits:

85% of all federal employees work outside of Washington, D.C. Many of the states with the largest number of federal employees are also key battleground states: Virginia (2nd, 155,682); Texas (4th, 148,453); Florida (5th, 99,212); Georgia (6th, 80,042); and Pennsylvania (8th, 68,300).

Federal Divestment

Authors: Noel Bakhtian, Conor Bronsdon, Allison Johnson, K Kaufmann, Sydney Menees, RL Miller, Amanda Spinner

Statement of Issue and Summary of Recommendations
The Biden Climate Plan states that the new administration will "lead the world to address the climate emergency and lead through the power of example, by ensuring the U.S. achieves a 100% clean energy economy and net-zero emissions no later than 2050." To leverage the full power of the U.S. government to achieve this goal, we must focus not only on new investments and partnerships in clean energy, but divesting federal support for fossil fuels, including "default" support tied to legacy frameworks. This paper focuses on the Thrift Savings Plan (TSP), the retirement savings vehicle for federal employees, which serves approximately 5.5 million participants with over $700 billion in assets.[410]

The recommendation is to direct the Federal Retirement Thrift Investment Board (FRTIB) to create a Climate Choice option that excludes fossil fuel exposure.

Opportunity / Problem Statement
At present, the federal government's support for fossil fuels is woven throughout the executive branch. However, much of this support could be reversed through executive order, budget authority, and regulation. This paper focuses on the TSP, the primary retirement savings vehicle for federal employees.[411]

The TSP is the equivalent of a 401(k) for federal employees and members of the uniformed services. It has approximately 5.5 million participants, with approximately $700 billion in assets and is the largest defined-contribution plan in the world.[412] While the TSP currently offers investors options for the amount and risk allocation of their accounts, federal employees do not have any control over the types of industries in which their money is invested.

[410] Thrift Savings Fund, Independent Auditor's Report (2019), https://www.frtib.gov/ReadingRoom/FinStmts/TSP-FS-Dec2018.pdf.
[411] Although outside the scope of this white paper, we recommend that the Treasury Department use the Dodd-Frank Act to regulate financial institutions so that they internalize the lending and investment risks associated with climate change; and the Export-Import Bank to stop financing fossil fuel projects. Additionally, there is opportunity for FRTIB to establish guidelines on fossil or clean energy investment across the entire TSP. *See* Graham Steele, The Great Democracy Initiative, A Regulatory Green Light: How Dodd-Frank Can Address Wall Street's Role in the Climate Crisis (2020), https://greatdemocracyinitiative.org/wp-content/uploads/2020/01/Final_Greenlight_Steele.pdf.
[412] TSP Fund Trading, Thrift Savings Plan, http://tspfundtrading.com/tsp.html.

Ending Reliance on Fossil Fuels and Building a Just Transition

In recent years, the fossil fuel divestment movement has rapidly expanded around the world.

- Globally, over 1,000 institutions have divested $14 trillion from fossil fuels, and approximately 58,000 individuals have divested over $5 billion.[413]
- Of the organizations divesting, 13% are governments and 13% are pension funds. Another 32% are faith-based organizations, 15% are philanthropic organizations, and 15% are educational institutions.
- In January 2018, New York City officials set a goal of divesting their $189 billion in pension funds from fossil fuel companies within five years.[414] In July 2018, Ireland became the world's first country to divest from fossil fuels.[415]
- To date, over 350 of approximately 1,400 divestment commitments worldwide have come from faith-based institutions, including the largest-ever joint fossil divestment announcement by faith institutions, in May 2020.[416]
- Oslo became the first capital city to divest its $9 billion pension fund; and Norway as a whole divested its $850 billion pension fund from 114 companies, basing its decisions on climate and environmental criteria.[417]

Creating a fossil fuel-free option would not only give TSP participants the ability to align their retirement investments with their values, it could also help participants mitigate their own financial risks. At the discretion of the administration, the "default" could also be set as the fossil fuel-free option.

As the climate threat grows and more of the world transitions to clean and renewable energy, holding shares in fossil fuel companies may pose the prospect of bigger and bigger losses for investors. Specifically, unmitigated climate change poses significant

[413] *Divestment Commitments*, Fossil Free, https://gofossilfree.org/divestment/commitments/.
[414] Oliver Milman, *New York City Plans to Divest $5bn from Fossil Fuels and Sue Oil Companies*, The Guardian (Jan. 10, 2018, 1:35 PM), https://www.theguardian.com/us-news/2018/jan/10/new-york-city-plans-to-divest-5bn-from-fossil-fuels-and-sue-oil-companies.
[415] Damian Carrington, *Ireland Becomes World's First Country to Divest from Fossil Fuels*, The Guardian (Jul. 12, 2018, 11:12 AM), https://www.theguardian.com/environment/2018/jul/12/ireland-becomes-worlds-first-country-to-divest-from-fossil-fuels.
[416] Jenny Tuazon, *Breaking: Biggest-Ever Joint Faith Divestment from Fossil Fuels*, 350 (May 18, 2020), https://350.org/breaking-biggest-ever-joint-divestment-from-fossil-fuels/.
[417] Guest Contributor, *Oslo Becomes First Capital City in the World to Divest from Fossil Fuels*, Eco Watch (Oct. 19, 2015, 3:39 PM), https://www.ecowatch.com/oslo-becomes-first-capital-city-in-the-world-to-divest-from-fossil-fue-1882108400.html.

risks not only to our environment but to our financial system.[418] Companies that do not adapt and transition to clean energy quickly enough may face significant and unhedgeable risks. Divestment from fossil fuels — specifically within the next 10 years — could be a linchpin of environmental and financial sustainability.

It will also increase pressure on the coal, gas and oil industries as major sources of carbon emissions, while potentially spurring innovation across all sectors of the energy industry, including but by no means limited to renewables and other clean technologies. President-elect Biden's vision of a U.S. clean energy economy includes nuclear, carbon capture and other technologies that will ensure a broad portfolio of energy resources.

Legislative background

The TSP is overseen by the FRTIB, established as an independent agency by the Federal Employees' Retirement System Act of 1986 (5 U.S.C. 8351 and 8401-79). The Act vests responsibility for the agency in six named fiduciaries: five board members and an executive director. The five members of the FRTIB, one of whom is designated as chairman, are appointed by the President with the advice and consent of the Senate and serve on the board on a part-time basis. The members appoint the executive director, who is responsible for the management of the agency and the TSP.

This recommendation is based in large part on Sen. Jeff Merkley's RISE Act, S.1460,[419] but the authors believe that the FRTIB may have sufficient authority to create a Climate Choice option without additional enabling legislation. During the Trump administration, the FRTIB created a blended retirement system for active-duty military members, providing a precedent for change.

Proposed Recommendation

- Direct the FRTIB to create a Climate Choice option for federal employees. The Climate Choice fund should be managed so that its performance is equivalent to non-Climate Choice funds. In constructing this portfolio, the Climate Choice fund

[418] Researchers at Stanford University have suggested that if climate change is left unchecked through 2100, per capita losses in U.S. gross domestic product could range between 6.7 percent and 14.3 percent annually—figures that could translate into trillions of dollars. *See* Stanford Institute for Economic Policy Research, Ten Facts About the Economic of Climate Change and Climate Policy at 7 (Oct. 2019), https://siepr.stanford.edu/sites/default/files/publications/Ten-Facts-about-Economics-of-Climate-Change-and-Policy.pdf. Another study from the Cambridge Centre for Risk Studies has predicted "unhedgeable" portfolio losses of 40 percent to 45 percent. University of Cambridge Institute for Sustainability Leadership, Unhedgeable Risk: How Climate Change Sentiment Impacts Investment (2015), https://www.cisl.cam.ac.uk/resources/publication-pdfs/unhedgeable-risk.pdf.

[419] 116th Cong. § 3 (2019) ("The Board shall select an index which is a commonly recognized index comprised of common stock[,] . . . [t]he historical performance of [which] shall be comparable to that of the other investment funds and options available," and the Board will "ensure that no investment in the portfolio is an investment with respect to a fossil fuel entity."), https://www.merkley.senate.gov/imo/media/doc/RISE%20Act%20116th%20Congress.pdf.

could also include securities in the RE100 (companies committed to 100-percent clean power) and similar entities considered leaders on corporate social responsibility metrics, although the fund manager would have discretion to formulate the portfolio.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change

The divestment policies recommended here align strongly with President-elect Biden's vision for rapid action on climate change and environmental justice, framing a 100-percent clean energy economy not only as an obligation but also as an opportunity. Federal divestment from fossil fuels will send a signal through the capital markets about the future direction of investment.

Coal and natural gas plants are closing — or not being built — because they are no longer competitive. Solar and wind energy are now the cheapest forms of power in many regions across the country, with enormous job opportunities across a range of disciplines and skill sets.

A growing clean energy sector, backed up with a strong divestment option, can create jobs at twice the rate of fossil fuels. According to the "2019 U.S. Energy & Employment Report" from the Energy Futures Initiative and the National Association of State Energy Officials, the clean energy and energy efficiency sectors accounted for 2.4 million jobs, compared to half that many in fossil energy, with salaries at competitive levels.

While a Climate Choice option — and divestment — within the TSP will not in and of themselves drive innovation and growth in renewables unless the RE100 are highlighted, the resulting demand for clean technologies will, creating high-quality, middle-class jobs for U.S. workers. The Bureau of Labor Statistics has identified solar installer and wind technician as the fastest-growing job categories in the country, with increases expected 11-13 times faster than the national average. Skill sets are transferable across the fossil fuel and clean energy industries; and retraining programs in states with strong fossil fuel economies, such as Wyoming and West Virginia, have found increasing interest in retraining.

At the same time, climate policy must include comprehensive planning for a fair transition, based on the reality that jobs in clean energy cannot and will not replace all fossil fuel jobs. The Biden energy platform specifically mentions the need to leave no workers or communities behind.

Fair transitions are not one-size-fits-all; funding and programs will need to be flexible so individual communities can set their own priorities based on local needs.

How the Recommendation Supports Frontline or other Underserved Communities

Today, low-income individuals are often unable to take advantage of clean energy technologies like solar or energy efficiency. The National Conference of State Legislatures found that a lack of access to upfront capital, low credit scores and a lack of homeownership were often the main barriers to access.[420] The recommendation supports frontline[421] or other underserved communities in two key ways.

First, oil and gas companies are responsible for emitting harmful pollutants that are responsible for health outcomes such as cancer, anemia, brain damage, birth defects, respiratory and eye irritation, asthma, and lung function impairment (among others). Thus, by divesting from fossil fuels, we are decreasing the resources these industries' need to continue normal operations, which will, in turn, help to improve the health and well-being of low-income areas and communities of color, as well as of frontline workers at fossil fuel facilities. The negative health impacts associated with the fossil fuel industry are well documented, as is the likelihood that harmful pollutants from fossil fuel industries disproportionately impact low-income areas and communities of color.[422]

Second, funds divested from fossil fuels can be redirected into renewable energy or low-carbon technologies that facilitate an energy future that is just and inclusive.

As more funds are directed toward clean energy technologies, we will be able to make them more affordable and accessible to all Americans,[423] thus creating equitable access to clean energy and more affordable energy bills.[424]

How the Recommendation Supports Biden's Climate Plan

The Biden Plan leverages innovation and the power of the government to lead the U.S. toward a 100% clean energy economy and net-zero emissions no later than 2050. By providing a Climate Choice option for the $700-billion TSP, this recommendation will

[420] Jocelyn Durkay, *Energy Efficiency and Renewables in Lower-Income Homes*, 25 Nat'l Conf. St. Legislatures 6 (2017), https://www.ncsl.org/research/energy/energy-efficiency-and-renewables-in-lower-income-homes.aspx.

[421] Either economically dependent on fossil fuels or those most impacted by the environmental impacts of climate change.

[422] A recent study from the EPA looked at the burden of emissions on groups according to their economic level, race, and ethnicity. They found that "those in poverty had 1.35 times higher burden than did the overall population, and non-Whites had 1.28 times higher burden. Blacks, specifically, had 1.54 times higher burden than did the overall population." Ihab Mikati et al., *Disparities in Distribution of Particulate Matter Emission Sources by Race and Poverty Status*, 108 Am. J. Pub. Health 4, 1 (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5844406/pdf/AJPH.2017.304297.pdf.

[423] There is also an opportunity for TSP options that demonstrate track record in underserved communities or funds that deploy venture capital in disadvantaged areas.

[424] Solar and energy-efficient technologies can drive down energy costs in the home, which will also help decrease the associated energy burden for low-income households.

leverage an existing government mechanism to prevent involuntary support for the fossil fuel industry.

Additionally, the creation of a Climate Choice option could encourage companies aligned with a clean energy economy (RE100s) and provide support to some clean energy companies through existing TSP funds shifted from fossil fuels, without necessitating new federal funding. Compared to the Biden pledge of $1.7T over 10 years, changes to the TSP ($700B) would represent a significant shift in federal-related capital towards clean energy. This is an addition to and will supplement the redirection of federal procurement towards clean energy.

Key Battleground State Activity

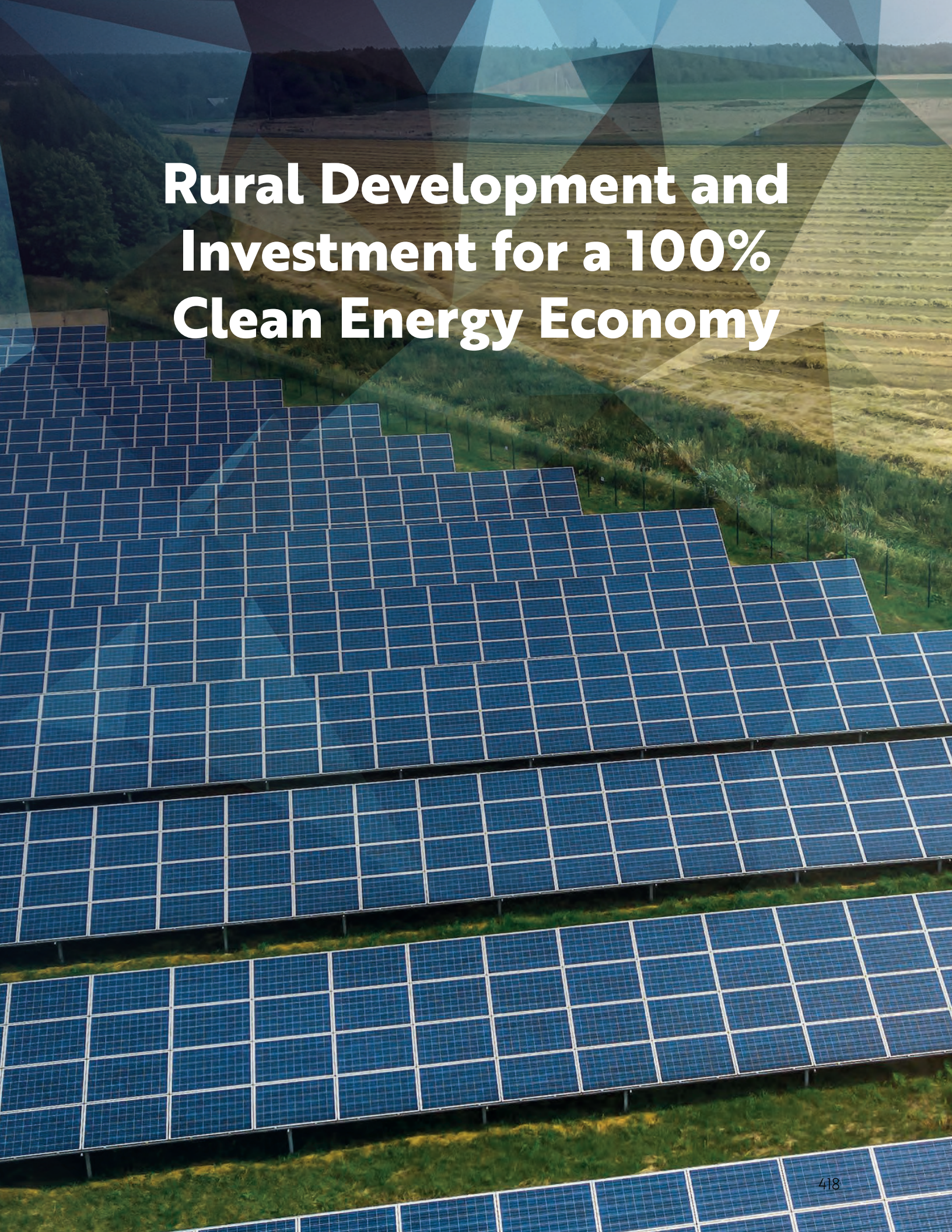
The vast majority of all federal employees -- about 85 percent -- work outside of Washington, D.C. (as of February 2019).[425] Many of the states with the largest number of federal employees are also key battleground states. Virginia ranks second on federal employees with 155,682; Texas is fourth with 148,453; Florida, fifth with 99,212; Georgia, sixth with 80,042; and Pennsylvania, eighth with 68,300.

Some battleground states are already experiencing adverse impacts of climate change and stand to benefit from large-scale divestment in fossil fuels and growth in more sustainable sectors. Climate scientists and analysts at Climate Central and ICF International developed the *States at Risk: America's Preparedness Report Card* and determined the states which face the greatest climate threats but are ill-prepared. These include key battleground states such as Florida, Nevada, Ohio, and Texas.[426]

Divestment will support continuing job growth in the clean energy sector, with both red and blue states developing strong local markets. For example, according to the Solar Foundation's 2019 Solar Job Census, two key swing states, Florida and Texas, both have more than 10,000 solar jobs.[427]

[425] Ron Kness, *Where Most Federal Government Employees Work*, ClearanceJobs (Mar 20, 2020), https://news.clearancejobs.com/2020/03/20/where-most-federal-government-employees-work/.
[426] Climate Cent. & ICF Int'l, States at Risk: America's Preparedness Report Card, http://assets.statesatrisk.org/media/NationalSummary.pdf.
[427] The Solar Foundation, National Solar Jobs Census 2019 (2020), https://www.thesolarfoundation.org/national/.

Rural Development and Investment for a 100% Clean Energy Economy



Regenerative Agriculture: A Solution to Multiple Climate, Environmental & Economic Problems

Opportunity/Problem:

Nitrogen fertilizer production consumes 1-2% of global energy. In addition, much of the fertilizer is lost to both air and water, endangering human health by contaminating water supplies, causing eutrophication in waterways that promotes dead zones in our oceans and bays. The cumulative impact of these farming practices also hurt the long-term economic viability of farming. In 2014, Iowa State University soil scientists estimated that Iowa farmers lose more than $1 billion annually due to soil erosion. Changing these practices will create more of a resilient economic farming system.

Recommended Action(s):

- Reform Federal Crop Insurance to encourage the building of soil health
- Offer preferential loans for producers demonstrating risk-mitigation through improved soil health outcomes
- Increase funding for USDA's Natural Resources Conservation Service (NRCS) Soil Health Division
- Establish an Outcomes-Verified Soil Health (OVSH) Program
- Help increase the market for cover crop products
- Increase funding for Conservation Title Working Lands Programs and other programs listed in the House Select Committee on Climate Crisis Report
- Recognize Indigenous Conservation Practices

Program Type:

√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

Farm bankruptcies are on the rise amid COVID-19 pandemic. The transition to regenerative agriculture could provide substantial cost savings for farmers preserving their farm and jobs.

Econ. Benefits:

The transition to regenerative agriculture as a cost cutting measure could have significant economic benefits. The preponderance of data from farms adopting these techniques shows consistently positive economic benefits from regenerative farming practices. Notable case studies conducted across the U.S. by the National Association of Conservation Districts and American Farmland Trust.

Equity Benefits:

Underserved communities and people of color are the most likely to be harmed by agricultural waste from industrial farming including dangerous concentrations of groundwater nitrates, a leading cause of blue baby syndrome. By reducing or eliminating synthetic nitrogen fertilizer we stop this harm.

Climate Plan Tie:

Regenerative agriculture is key to Biden's plan of "decarbonizing the food and agriculture sector, and leveraging agriculture to remove carbon dioxide from the air and store it in the ground."

Battleground State Benefits:

This greatly benefits farmers and farming in almost every battleground state but it is especially strong in Iowa, Texas, Minnesota, Illinois, Kansas, Wisconsin and N. Carolina.

Regenerative Agriculture: A Solution to Multiple Climate, Environmental & Economic Problems

AUTHORS: Genevieve Nowicki, Clint Wilder, Tim LaSalle, Ph.D, Katie Rock

DATE: September 30, 2020

Statement of Issue and Summary of Recommendations: Nitrogen fertilizer used in agriculture is primarily made using natural gas, a process that consumes 1-2% of global energy.[428] Nitrogen fertilizer leads to losses in the environment that negatively affect climate, biodiversity, environmental and human health. Additionally, underserved communities are the people most likely to be harmed by agricultural waste from industrial farming.[429] By transitioning to regenerative agriculture, growers can reduce[430] or eliminate the use of synthetic nitrogen fertilizer without negatively impacting yields and in some cases increasing yields.[431] Regenerative agriculture practices include using cover crops, reducing tilling, rotating crops, spreading compost (as well as microbial super-compost "inoculants") or using intensive grazing, and moving away from synthetic fertilizers, pesticides, herbicides, frequent & excessive disturbance and factory farming.[432] Regenerative farmers save money owing to not having to purchase synthetic fertilizer, spending less on inputs, allowing for increased overall profits.
While regenerative agriculture is extremely beneficial, farmers are hesitant to transition due to a lack of technical assistance, training, and capital for purchasing new equipment

[428] Fred Pearce, *Can the World Find Solutions to the Nitrogen Pollution Crisis?*, Yale Environment 360 (Feb. 6, 2018), https://e360.yale.edu/features/can-the-world-find-solutions-to-the-nitrogen-pollution-crisis.
[429] Claudine Benmar, *Tracking Down the Public-Health Implications of Nitrogen Pollution*, Grist (Mar. 2, 2010) https://grist.org/article/public-health-implications-of-nitrogen-pollution/.
[430] N2O emissions from fertilizer use could be reduced 50%, simply by reducing the rate of application. Neville Millar et al., *Nitrogen Fertilizer Management for Nitrous Oxide (N_2O) Mitigation in Intensive Corn (Maize) Production: An Emissions Reduction Protocol for US Midwest Agriculture*, 15 Mitigation & Adaptation Strategies for Global Change 185 (2010).
[431] Andrew McGuire, *How Does Regenerative Agriculture Reduce Nutrient Inputs?*, Wash. St. Univ. (Feb. 4, 2020), http://csanr.wsu.edu/how-does-regenerative-agriculture-reduce-nutrient-inputs/; Aaron Ristow et al., Am. Farmland Tr., Quantifying Outcomes with Partial Budget Analysis, NTT, & Comet (2020), https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2020/01/Rstow-Economics-PBA-012020.pdf; *Findings*, Am. Farmland Tr., https://farmland.org/soil-health-case-studies-findings/; *Welcome to the Future of Agriculture*, Cal. St. Univ. Chico, https://www.csuchico.edu/regenerativeagriculture/.
[432] Tracy Fernandez Rysavy, *Regenerative Agriculture 101*, Green America, https://www.greenamerica.org/healthy-soil-cool-climate/regenerative-agriculture-101.

and supplies. The following policy recommendations could help solve these problems, support farmers economically, and spur economic development in rural areas:

- Reform Federal Crop Insurance to encourage the building of soil health
- Offer preferential loans for producers demonstrating risk-mitigation through improved soil health outcomes
- Increase funding for USDA's Natural Resources Conservation Service (NRCS) Soil Health Division
- Establish an Outcomes-Verified Soil Health (OVSH) Program
- Help increase the market for cover crop products
- Increase funding for Conservation Title Working Lands Programs and other programs listed in the House Select Committee on Climate Crisis Report[433]
- Recognize Indigenous Conservation Practices[434]

Opportunity / Problem Statement: Nitrogen fertilizer presents our environment with significant challenges that negatively affects climate, biodiversity, and environmental health.[435] Nitrogen fertilizer production consumes 1-2% of global energy.[436] In addition, much of the fertilizer is lost to both air and water, endangering human health by contaminating water supplies, causing eutrophication in waterways that promotes dead zones in our oceans and bays[437]. Nitrogen fertilizer also increases the loss of healthy biodiverse soils, and releases more CO_2 and NOx[438] emissions that

[433] House Select Comm. on the Climate Crisis, Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America 341 (2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.
[434] Annie Sneed, *What Conservation Efforts Can Learn from Indigenous Communities*, Scientific American (May 29, 2019), https://www.scientificamerican.com/article/what-conservation-efforts-can-learn-from-indigenous-communities/.
[435] Pearce, *supra* note 428.
[436] University of Tokyo, *Researchers Dramatically Clean Up Ammonia Production and Cut Costs*, Phys.org (Apr. 24, 2019), https://phys.org/news/2019-04-ammonia-production.html.
[437] Roddy Scheer & Doug Moss, *What Causes Ocean "Dead Zones"?*, Scientific American (Sept. 25, 2012), https://www.scientificamerican.com/article/ocean-dead-zones/.
[438] Nationwide, Nitrogen fertilizer use has <50% use-efficiency. This not only presents an economic loss for the grower, but the lost Nitrogen either leaches down to our aquifers where it contaminates our drinking water, runs off into our waterways causing dead zones downstream, or volatilizes into the atmosphere as a GHG 300x as potent as CO_2. Agricultural use of Nitrogen fertilizer contributes to 60% of N_2O emissions; 6% of GHG emissions as a whole. Stephen J. Del Grosso et al., *Estimating Agricultural Nitrous Oxide Emissions*, 89 Eos 529 (2008), https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2008EO510001; Dave S. Reay et al., *Global Agriculture and Nitrous Oxide Emissions*, 2 Nature Climate Change 410 (2012), https://www.nature.com/articles/nclimate1458.

contribute to higher GHG levels[439]. Reliance on and access to cheap Nitrogen fertilizer has also led to the near elimination of an important soil conservation practice: cover cropping, which not only allows farmers to fix Nitrogen out of atmosphere and into their soils, but has been shown to build soil carbon[440], and importantly, increase infiltration of water, maintaining soil in place, and reducing runoff and erosion. The cumulative impact of these farming practices also hurt the long-term economic viability of farming. In 2014, Iowa State University soil scientists estimated that Iowa farmers lose more than $1 billion annually due to soil erosion.[441] Changing these practices will create more of a resilient economic farming system.

Proposed Recommendation[442]: The historical assumption has been that food yields and profit are negatively affected by the elimination of fertilizers. However, recent research has shown this is not necessarily the case. Current research, knowledge, and practices show reducing or eliminating synthetic nitrogen fertilizer can *increase* farmers' profit over the status quo, while also increasing soil health, crop yields, and food nutrient density. Healthier soils improve carbon capture, water absorption (reducing flooding), drought resistance (retaining more moisture in times of water shortages) – and increase biodiversity that make crops more resilient to disease and insect infestation.[443]

Several universities, including the Center for Regenerative Agriculture at California State University-Chico, are researching and practicing regenerative agriculture with little to no fertilizers being applied. Crop yields have either not suffered or in many cases increased over crops where fertilizers were applied.[444] These regenerative agriculture practices include using cover crops, reducing tilling, rotating crops, spreading compost

[439] Robert Sanders, *Fertilizer Use Responsible for Increase in Nitrous Oxide in Atmosphere*, Univ. Cal. Berkeley (Apr. 2, 2012), https://news.berkeley.edu/2012/04/02/fertilizer-use-responsible-for-increase-in-nitrous-oxide-in-atmosphere/.
[440] Mark Sperow, *Updated Potential Soil Carbon Sequestration Rates on U.S. Agricultural Land Based on the 2019 IPCC Guidelines*, 204 Soil & Tillage Res. (2020), https://www.sciencedirect.com/science/article/pii/S0167198720305018.
[441] Donnelle Eller, *Erosion Estimated to Cost Iowa $1 Billion in Yield*, Des Moines Reg. (May 3, 2014, 10:58 PM), https://www.desmoinesregister.com/story/money/agriculture/2014/05/03/erosion-estimated-cost-iowa-billion-yield/8682651/.
[442] Special thanks to Land Core for providing recommendations. *See* Land Core, Policy Recommendations: Agriculture (2019), https://drive.google.com/file/d/1Zu69jD_Y_c4pzEKsblwApmdyhnh4Jrkz/view.
[443] Jeff Moyer et al., Rodale Inst., Regenerative Agriculture and the Carbon Soil Solution (2020), https://rodaleinstitute.org/wp-content/uploads/Rodale-Soil-Carbon-White-Paper_v9.pdf.
[444] *Welcome to the Future of Agriculture*, Cal. St. Univ. Chico, https://www.csuchico.edu/regenerativeagriculture/.

(as well as super-compost "inoculants") or using intensive grazing, and moving away from synthetic fertilizers, pesticides, herbicides, and factory farming.[445]

The preponderance of data from farms adopting these techniques shows consistently positive economic benefits from regenerative farming practices. Notable case studies conducted across the U.S. by the National Association of Conservation Districts (2017)[446] and American Farmland Trust (2019)[447] have yielded very positive financial results. In the NACD study, four corn and soybean farmers in the Upper Mississippi River Basin saw these average gains: (1) increased crop yield revenue by up to $76 per acre, (2) reduced fertilizer costs by up to $50 per acre, and (3) reduced costs of erosion repair by up to $16 per acre. Additional case studies and benefits are available.[448] [449] Major companies have already started to adopt or encourage these practices such as General Mills, Cargill, Wrangler, Walmart and McDonalds.[450]

While there is a significant movement in the right direction, farmers need more training and financial support to drive discovery and implementation of regenerative agricultural systems. The transition time is the biggest hurdle for farmers, as many farmers are economically stressed and therefore risk averse. The policies below help address these hurdles including changes to the crop insurance program, additions to the USDA's Natural Resources Conservation Service (NRCS), and education/outreach needs.

- **Reform Federal Crop Insurance**: The Federal Crop Insurance Program covers some 90% of U.S. cropland and costs $7-$10 billion annually. But Federal Crop

[445] Fernandez Rysavy, *supra* note 432.
[446] *Soil Health Research*, Nat'l Ass'n Conservation Dists., https://www.nacdnet.org/soil-health-research/.
[447] *Findings*, Am. Farmland Tr., https://farmland.org/soil-health-case-studies-findings/.
[448] Ristow et al., *supra* note 431.
[449] In the AFT study, six field crop farmers and two almond growers in four states averaged $41 per acre in increased profits. Average savings included $36 per acre for fertilizer and $35 per acre for machinery use, fuel, and labor from reduced tillage. *Findings*, Am. Farmland Tr., https://farmland.org/soil-health-case-studies-findings/.
[450] *Regenerative Agriculture*, General Mills, https://www.generalmills.com/Responsibility/Sustainability/Regenerative-agriculture; Bridget Christenson, *Cargill to Advance Regenerative Agriculture Practices Across 10 Million Acres of North American Farmland by 2030*, Cargill (Sept. 16, 2020), https://www.cargill.com/2020/cargill-to-advance-regenerative-agriculture-practices-across-10; *Soil Health: Wrangler and the Future Farmers of America (FFA) Team Up*, Wrangler (Jul. 9, 2017), https://www.wrangler.com/sustainability/land/soil-health.html; Doug McMillon, *Walmart's Regenerative Approach: Going Beyond Sustainability*, Walmart (Sept. 21, 2020), https://corporate.walmart.com/newsroom/2020/09/21/walmarts-regenerative-approach-going-beyond-sustainability; *McDonald's Supports Sustainable Grazing Practices That Can Help Reduce Emissions*, McDonald's (Sept. 22, 2020), https://news.mcdonalds.com/index.php/news-releases/news-release-details/mcdonalds-supports-sustainable-grazing-practices-can-help-reduce.

Insurance is not currently structured to encourage farmers to adopt regenerative practices. The program should be amended to address these issues. One example in Iowa and Illinois, is a provision where farmers can receive a $5 per acre break on Federal crop insurance premiums if they plant cover crops[451], thanks to a partnership between the Federal Risk Management Agency (which administers Federal crop insurance) and the States' Departments of Agriculture. Through Congress, or possibly an Executive Order, the Risk Management Agency (RMA) should be directed to adopt this or other similar incentive programs to encourage regenerative agricultural practices, such as offering preferential crop insurance rates for producers that demonstrate risk-mitigation through improved soil health outcomes. RMA should incorporate the role of soil health in reducing risk associated with not only droughts, floods, and extreme temperatures; but also pest and disease. USDA's NRCS conservation practices that build soil health should be part of USDA's RMA "Good Farming Practices".

- **Loan programs**: The existing Commodity Credit Corporation provides a potential framework for Federal investment. Investments could include low or no-interest Federal loans to farmers and ranchers to support a transition to regenerative agriculture, and financing high impact projects such as field edge plantings (i.e. hedgerows/windbreaks/filter strips) and compost infrastructure. Additionally, USDA's Farm Service Agency (FSA) should offer preferential loans for producers demonstrating risk-mitigation through improved soil health outcomes (eg. increased soil carbon and water infiltration rates) or through the submission of a management plan to implement soil health practices.
- **Increase funding for NRCS including to expand the Soil Health Demonstration Trial (SHDT) in the 2018 Farm Bill and to restore the National Soil Health Monitoring Network.** The SHDT incentivizes farmers through grants to adopt regenerative practices and track their results, creating a valuable knowledge base.[452] With a significant increase in funding, the program can cover new geographic areas and a wider range of farm and ranch sizes. USDA's NRCS should restore the National Soil Health Monitoring Network, a national-scale network of sites sampled and analyzed periodically to track changes in soil properties, essential for building accurate models for agricultural and climate risk, and to serve as a baseline for regionally-appropriate soil health benchmarks. Additionally, the funds should expand the capacity of USDA's NRCS to restore their historical role in providing on-farm technical assistance.

[451] Rod Swoboda, *Plant Cover Crops, Get Crop Insurance Discount*, Farm Progress (Oct. 8, 2019), https://www.farmprogress.com/cover-crops/plant-cover-crops-get-crop-insurance-discount.
[452] *CIG On-Farm Conservation Innovation Trials*, USDA, https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/cig/?cid=nrcseprd1459039.

- **Outcomes-Verified Soil Health (OVSH) Program:** Establish a voluntary program that encourages farmers and ranchers to measure and verify improvements in soil health outcomes, using a consistent baseline standard set by the USDA's NRCS, and creating the necessary infrastructure for monitoring and rewarding soil health and its associated resilience. The program should help standardize and validate market-based incentives, such as corporate supply chain integration, carbon/ecosystem services markets, potential tax credits and preferential lending, based on risk-mitigation.
- **U.S. Training programs & support independent research**: Fund supporting grants for local/regional third-party, non-Federal organizations and universities, to partner with NRCS, to develop soil health trainings/demonstrations for growers and "train the trainer" curricula for technical assistance providers, prioritizing the importance of soil health and ecosystem services in a regenerative context. University agricultural extensions and cooperative extensions are well placed to provide this training, however there needs to be increased funding for cooperative extension to develop regenerative agricultural specialists.

- **Market for cover crop products**: Help create a market for U.S.-grown cover crops and crop rotations by encouraging school lunch to incorporate edible mixed grains and legumes into the menu. Provide these crops to food banks and other federal distribution programs. Also, use the U.S. Agency for International Development (USAID) as a buyer for edible mixed grains and legumes. Consider a buy legumes campaign similar to the "Got Milk" campaign.
- **Expand Conservation Title Working Lands Programs**: Increase funding and expand eligible acreage of key conservation programs within USDA's Working Lands Programs, "which provide financial and technical assistance to farmers for improved land stewardship and conservation practices". In addition, increase funding for the Conservation Stewardship Program (CSP) and Environmental Quality Improvement Program (EQIP). These programs are laid out in the House Select Committee on Climate Crisis Report, page 341.[453]
- **Indigenous Conservation Practices**: When traditional indigenous conservation practices on tribal land are substantially equivalent to NRCS Conservation Practice Standards, they should be eligible for funding from Federal programs. In addition, Indigenous communities should have access to new agricultural policies, programs and economic incentives and, at a minimum, ensure legislative language specifies tribes, as well as states or other entities.

[453] House Select Comm. on the Climate Crisis, Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America 341 (2020), https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Farm bankruptcies are on the rise amid COVID-19 pandemic.[454] As cited above, the transition to regenerative agriculture could provide substantial cost savings for farmers. In 2014, Iowa State University soil scientists estimated that Iowa farmers already lose more than $1 billion due to soil erosion annually.[455] The transition to regenerative agriculture as a cost cutting measure could have significant economic benefits to the farm economy and individual farmers in some cases providing a lifeline to struggling farmers.

How the Recommendation Supports Frontline or other Underserved Communities: Underserved communities and people of color are the most likely to be harmed by agricultural waste from industrial farming. "Low-income Latino farmworkers are often the hardest hit by problems with contaminated drinking water…estimates that 20 percent of small public water systems in the county have unsafe levels of nitrates and other contaminants."[456] Another example, "[i]n North Carolina … the number of pigs on factory farms exceeds the total population of people in the state. The contamination from North Carolina pig farms has yielded dangerous concentrations of groundwater nitrates, a leading cause of blue baby syndrome."[457] By returning more livestock to graze the land, exposures to surface water contaminants will decrease leading to better public health outcomes for low income people, people of color, and frontline communities.

How the Recommendation Supports Biden's Climate Plan: Regenerative agriculture is key to Biden's plan of "decarbonizing the food and agriculture sector, and leveraging agriculture to remove carbon dioxide from the air and store it in the ground." Increasing soil carbon through improved management practices is the only way we know how to do this. Additionally, part of Biden's plan of "[p]artnering with farmers and ranchers … making it accessible to all families, it's also about having water they can rely on for growing that food." Increasing soil carbon increases water retention and supports farmers and ranchers by making their land more resilient.

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[454] *Farm Bankruptcies on the Rise Amid COVID-19 Pandemic*, FB (May 7, 2020), https://www.fb.org/newsroom/farm-bankruptcies-on-the-rise-amid-covid-19-pandemic.
[455] Eller, *supra* note 441.
[456] Claudine Benmar, *Tracking Down the Public-Health Implications of Nitrogen Pollution*, Grist (Mar. 2, 2010), https://grist.org/article/public-health-implications-of-nitrogen-pollution/.
[457] *Environmental Racism*, Food Empowerment Project, https://foodispower.org/environmental-and-global/environmental-racism/.

Key Battleground State Activity: This greatly benefits farmers and farming in almost every battleground state but it is especially strong in Iowa, Texas, Minnesota, Illinois, Kansas, Wisconsin and North Carolina.[458]

[458] *FAQs*, USDA: Econ. Res. Serv. (Sept. 2, 2020), https://www.ers.usda.gov/faqs/.

Filling the Hole in the Clean Energy Economy for Aviation, Heavy Machinery and Plastic Materials Through Algae Biofuel and Biomaterials

Opportunity/Problem:

A continued reliance on fossil fuels means that the US will continue to see rising Greenhouse Gas Emission (GHG) emissions, fuel price volatility, energy security risks and stranded communities and assets. Although breakthroughs in electric battery technology will continue to transform the passenger vehicle fleet, long-haul trucks, heavy machinery, marine transportation and aviation still rely primarily on fossil fuels and replacement turnover can take decades.

Recommended Action(s):

- Create an Algae Incentive Program (AIP) similar to the California Solar Initiative (CSI), to use the economies of scale to bring algae fuels to the current market cost.
- Increase 45Q Carbon Capture and Storage (CCS) tax credit and eliminate the qualifying threshold.
- Incentivize federal procurement of biobased products rather than petroleum products.
- Increase investment in R&D to help accelerate commercial scale algae production and improve carbon capture efficiency
- Allow algae fuels access to USDA Business & Industry (B&I) Loan Guarantee Program.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation
√ Requires New Regulations

Job Benefits:

Growing the algae industry will help create rural and agricultural jobs - everything from operators, engineers and scientists to accounting, marketing development and logistics.

Econ. Benefits:

The programs could provide significant economic development in hard hit areas. These programs would help drastically reduce GHG emissions from medium and heavy duty trucks, aircraft and ships (which makes up 23%, 9% & 2% of the transportation GHG respectively).

Equity Benefits:

Algae is a chemically safer alternative compared with its fossil-derived counterpart which helps protect communities around refineries which tend to be disproportionately people of color and economically underserved.

Climate Plan Tie:

Biden's climate plan states that the US must "reduce emissions in global shipping and aviation" and "double down on the liquid fuels of the future, which make agriculture a key part of the solution to climate change. Advanced biofuels... reduce emissions in planes, ocean-going vessels, and more."

Battleground State Benefits:

The algae industry, including R&D, algae production, and final product conversion, operates in several key states including Florida, Arizona, Texas, and Michigan.

Filling the Hole in the Clean Energy Economy for Aviation, Heavy Machinery and Plastic Materials Through Algae Biofuel and Biomaterials

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Statement of Issue and Summary of Recommendations: Despite breakthroughs in electric battery technology for passenger vehicles; long-haul trucks, heavy machinery, marine transportation and aviation[459] still rely primarily on fossil fuels, replacement turnover can take decades. However, state of the art catalytic upgrading of algae-derived products creates fuels and other goods that are tunable to a wide variety of applications, including drop-in fuels such as biodiesel, marine-grade diesel and jet fuel.[460] Instead of fossil fuels, algae can also provide the basis for plastics, foam products, and fertilizers while substantially improving the Greenhouse Gas Emission (GHG) footprint, and is generally a chemically-safer alternative than fossil-derived counterparts.[461] Algae farms are projected to produce up to five-fold more biomass per acre compared to traditional crops, and thus have a significant carbon capture advantage over even the most productive traditional agricultural crops.[462] Additionally, most algae production does not compete with the food production (land-based or aquaculture). The following recommendations will help bring algae biomaterials and fuels for long-haul trucks, heavy machinery, marine transportation and aviation to market competitively:

[459] U.S. Dep't of Energy Office, Sustainable Aviation Fuel: Review of Technical Pathways (2020), https://www.energy.gov/sites/prod/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf.
[460] U.S. Dep't of Energy, Integrated Strategies to Enable Lower-Cost Biofuels (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-integrated-strategies-to-enable-low-cost-biofuels-july-2020.pdf.
[461] *The Global Bio-Based Polymer Market in 2019 – A Revised View*, BioPlastics Magazine (Jan. 27, 2020), https://www.bioplasticsmagazine.com/en/news/meldungen/20200127-The-global-bio-based-polymer-market-in-2019-A-revised-view.php.
[462] Peter J. le B. Williams & Lieve M.L. Laurens, *Microalgae as Biodiesel & Biomass Feedstocks: Review & Analysis of the Biochemistry, Energy & Economics*, 3 Energy & Envtl. Sci. 554 (2010), https://pubs.rsc.org/en/content/articlelanding/2010/ee/b924978h#!divAbstract.

- Create an Algae Incentive Program (AIP) similar to the California Solar Initiative (CSI), to use the economies of scale to bring algae fuels to the current market cost.
- Increase 45Q Carbon Capture and Storage (CCS) tax credit and eliminate the qualifying threshold.
- Incentivize federal procurement of biobased products rather than petroleum products.
- Increase investment in R&D to help accelerate commercial scale algae production and improve carbon capture efficiency
- Allow algae fuels access to USDA Business & Industry (B&I) Loan Guarantee Program.

Opportunity / Problem Statement: To boost a recovering economy and ensure a clean energy future, an immediate critical need and unique opportunity exists for a just transition from fossil-based energy and products towards a sustainable bioeconomy in a safe and equitable manner. Greenhouse Gas Emission (GHG) reductions are foundational to such sustainable development while enhancing US energy security and independence. Otherwise, a continued reliance on fossil fuels means that the US will continue to see rising GHG emissions, fuel price volatility, energy security risks and stranded communities and assets. Although breakthroughs in electric battery technology will continue to transform the passenger vehicle fleet, long-haul trucks, heavy machinery, marine transportation and aviation[463] still rely primarily on fossil fuels and replacement turnover can take decades.

Proposed Recommendation: The Federal government has spurred investment and R&D decarbonizing the economy over the past several decades[464] with some success in building its biofuel and performance-advantaged chemical sectors. However, second and third generation technologies can expand these sectors with lower GHG emissions, less environmental impact, and greater drop-in functionality.[465] Another important advantage of algae-derived biofuel over earlier generation biofuels that are based on corn, animal fat and vegetable oils is transitioning from food and feed competition to the inclusion of complementary technologies.

[463] U.S. Dep't of Energy, Sustainable Aviation Fuel: Review of Technical Pathways (2020), https://www.energy.gov/sites/prod/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf.
[464] U.S. Dep't of Energy, Federal Activities Report on the Bioeconomy: Algae (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-farb-algae-report-july-2020.pdf.
[465] Amanda Barry et al., U.S. Dep't of Energy, National Algal Biofuels Technology Review (2016), https://www.energy.gov/sites/prod/files/2016/06/f33/national_algal_biofuels_technology_review.pdf.

Algae, encompassing photosynthetic and non-photosynthetic aquatic organisms including microalgae and seaweeds (macroalgae), create a highly versatile and tunable platform for the development of fuels and products. In most cases, large scale algae production can be done on marginal land, including the underdeveloped coastal area around the US[466] that is unsuitable for food crops. Algae farms are projected to produce up to five-fold more biomass per acre compared to traditional crops, and thus have significant carbon capture advantages over even the most productive traditional agricultural crops.[467]

State of the art catalytic upgrading of algae-derived oils and products creates fuels and products that are completely tunable to material applications and drop-in fuels including biodiesel, marine-grade diesel and jet fuel.[468] Algae biofuels are compatible with existing infrastructure and can be used with factory-standard engines without modifications.[469] Similarly, an emerging sector for algae-based biomaterials is on the horizon -- algae can form the basis for plastics, foam products, and fertilizers/compost, with substantially lower GHG emissions and improved chemical safety compared to fossil-derived counterparts.[470] Startup companies are growing rapidly using algae to make shoes, skis, textiles, foam interiors, soil amendments and other products.

Federal agencies such as the DOE, USDA, NOAA, and NSF are funding strategic R&D in complementary areas to increase algal biomass productivity and product yield in economically and environmentally sustainable systems.[471] Algae was classified as a crop

[466] Halley E. Froehlich et al., *Blue Growth Potential to Mitigate Climate Change Through Seaweed Offsetting*, 29 Current Biology 3087 (2019), https://www.sciencedirect.com/science/article/pii/S0960982219308863.
[467] Williams & Laurens, *supra* note 462.
[468] U.S. Dep't of Energy, Integrated Strategies to Enable Lower-Cost Biofuels (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-integrated-strategies-to-enable-low-cost-biofuels-july-2020.pdf.
[469] *Announces Three New Renewable Fuels Agreements*, UPS (Jul. 29, 2015), https://www.pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1438111777421-236; Kirsten Korosec, *Algae Jet Fuel Helps Power United Airlines Flight*, ZDNet (Nov. 7, 2011, 10:18 AM), https://www.zdnet.com/article/algae-jet-fuel-helps-power-united-airlines-flight/; *Virgin Atlantic and LanzaTech Celebrate as Revolutionary Sustainable Fuel Project Takes Flight*, LanzaTech (Oct. 4, 2018), https://www.lanzatech.com/2018/10/04/virgin-atlantic-lanzatech-celebrate-revolutionary-sustainable-fuel-project-takes-flight/.
[470] *The Global Bio-Based Polymer Market in 2019 – A Revised View*, Bio Plastics Magazine (Jan. 27, 2020), https://www.bioplasticsmagazine.com/en/news/meldungen/20200127-The-global-bio-based-polymer-market-in-2019-A-revised-view.php.
[471] U.S. Dep't of Energy, Federal Activities Report on the Bioeconomy: Algae (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-farb-algae-report-july-2020.pdf.

in the 2018 Farm Bill, a significant legislative victory that enabled algae producers to access the same USDA resources available to traditional crop growers.[472]

Barriers to cost-competitive and commodity-scale biofuels and biomaterials include cultivation, harvesting and production costs.[473] Further challenges include competing with and integrating into a fossil fuel and plastics economy supply chain and infrastructure. Additional economic value is possible through valorizing high value co-products from the production of biofuel that include biomaterials, chemicals, nutraceuticals, animal feed, and biofertilizers.[474] A recent calculation and projection of algae-based fuels showed that with the inclusion of co-products, a fuel price of $2.50 per gallon can be achieved, providing a future sustained investment to 2030 to overcome the critical cost and technology barriers.[475]

The carbon capture opportunity of algae production follows the high farm productivity, highly effective CO_2 assimilation potential and high carbon content of the biomass. Building on and expanding existing carbon capture and utilization tax and other incentive policies can further drive investment and innovations.

The US made significant investments in algae biofuels a decade ago, and the industry has advanced considerably since then due to the ability to valorize co-products and scientific and engineering advances in algae production. Now is the time to double-down on these investments to accelerate progress in the US algae industry and not risk the setbacks the US experienced in the solar industry. The US had seen progress in the solar industry in the 1970s, however, government investment stopped and the solar industry became a niche technology. Fortunately, in 2006 the US increased the solar investment tax credit (ITC) and California created the California Solar Initiative (CSI). These two policies, along with the incentive program in Germany, restarted the

[472] *Algae Agriculture Triumphs in Farm Bill Compromise*, Algae Biomass Organization (Dec. 12, 2018), https://algaebiomass.org/blog/10424/algae-agriculture-triumphs-farm-bill-compromise/.
[473] U.S. Dep't of Energy, Bioenergy Technologies Office 2019 R&D State of Technology (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-2019-state-of-technology-july-2020-r1.pdf; Argonne Nat'l Lab. et al., 2017 Algae Harmonization Study: Evaluating the Potential for Future Algal Biofuel Costs, Sustainability, and Resource Assessment from Harmonized Modeling (2018), https://www.nrel.gov/docs/fy18osti/70715.pdf.
[474] Lieve M.L. Laurens et al., *Development of Algae Biorefinery Concepts for Biofuels and Bioproducts; A Perspective on Process-Compatible Products and Their Impact on Cost-Reduction*, 10 Energy & Envtl. Science 1716 (2017); Preeta Mehta et al., *High-Value Coproducts from Algae—An Innovational Way to Deal with Advance Algal Industry*, *in* Waste to Wealth: Energy, Environment, and Sustainability 343 (Reeta Rani Singhania et al. eds., 2018), https://link.springer.com/chapter/10.1007/978-981-10-7431-8_15.
[475] U.S. Dep't of Energy, Bioenergy Technologies Office 2019 R&D State of Technology (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-2019-state-of-technology-july-2020-r1.pdf.

solar photovoltaic industry. The prices for solar were almost $10 per watt in 2006 and are now barely over $1 per watt[476] -- about a 9 fold price decrease.[477] With a similar program for algae fuels, economies of scale could bring the price to $2.50per gallon --as cited above. Below are the recommended programs to bring about the economies of scale:

- **Accelerate scale-up efforts through Algae Incentive Program (AIP):** Through the inception of a multi-year deployment program, such as those developed and guided by the DOE's Advanced Manufacturing Office and the USDA, a long term agronomic and feasibility demonstration can be implemented. A mechanism is the investment of approximately $100M/year for large-scale collaborative deployment of algae production systems for 5-10 years. Similar to the California Solar Initiative (CSI) program,[478] a guaranteed target price for algae-based fuels and products -- initially very high at approximately $30 per gallon, then declining -- would create certainty for a determined volumetric amount, spur investment and job creation, and allow for the nascent industry to mature. A gradual price reduction would be possible afterwards until commodity fuel price points are achieved. The DOE EERE Advanced Manufacturing Office (AMO), in coordination with Bioenergy Technologies Office (BETO), would design and implement the incentive program, modeled after the CSI program, to bring algae marine-grade diesel and algae biodiesel for long-haul trucks and heavy machinery to market rate. Again, a recent calculation and projection of algae-based fuels showed that with the inclusion of co-products, a fuel price of $2.50 per gallon can be achieved, providing a future sustained investment to 2030 to overcome the critical cost and technology barriers.[479] This program would provide the market mechanism for that investment.
- **Increase and expand 45Q tax credit:** Increase 45Q Carbon Capture and Storage (CCS) tax credit for carbon utilization to $50/ton escalating to $80/ton over ten years and eliminate the annual tonnage qualifying threshold for qualified carbon capture facilities. A robust algae industry can deliver massive reductions in

[476] *Solar Industry Research Data*, Solar Energies Industries Ass'n, https://www.seia.org/solar-industry-research-data.
[477] Zachary Shahan, *Solar Panel Prices Have Dropped off Cliff & Sunk into Ocean—Solar Panels 9× Cheaper than in 2006*, CleanTechnica (Aug. 30, 2020), https://cleantechnica.com/2020/08/30/solar-panel-prices-have-dropped-off-cliff-sunk-into-ocean-solar-panels-9x-cheaper-than-in-2006/.
[478] This part of the CSI had a $2.1 billion budget for 10 years. Asal Esfani et al., Cal. Pub. Util. Comm'n, California Solar Initiative Annual Program Assessment 14 (2019), https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/2019-CSI-APA.pdf.

[479] U.S. Dep't of Energy, Bioenergy Technologies Office 2019 R&D State of Technology (2020), https://www.energy.gov/sites/prod/files/2020/07/f76/beto-2019-state-of-technology-july-2020-r1.pdf.

greenhouse gas emissions, but only if the infrastructure to deliver CO_2 to algae cultivation facilities (including Direct Air Capture) is put into place. The 45Q incentive currently provides $35/ton for 12 years.[480] An increase in the tax credit, and eliminating the qualifying threshold, would help accelerate further investment in this infrastructure.

- **Incentivize Federal procurement of biobased products:** Provide Federal procurement allowance to spend up to 20% more for biobased products versus petroleum based products. Federal law and the Federal Acquisition Regulation direct that all federal agencies purchase biobased products in categories identified by the U.S. Department of Agriculture (USDA). To date, USDA has identified 139 categories (e.g. cleaners, carpet, lubricants, paints) of biobased products for which agencies and their contractors have mandatory purchasing requirements. As USDA identifies product categories for mandatory federal purchasing, minimum biobased content is established for the category.[481]
- **More investment in R&D – NREL, USDA:** Long-term (5-10 year) R&D investment at both the fundamental and applied science level is critical to overcome the fundamental barriers in achieving the maximum solar energy conversion and carbon capture targets for algae fuels. Increased investment should also provide for collaborative research between the funding agencies and interface with the nascent commercial industry.
- **Access to USDA loan guarantee program:** Access to capital is extremely important in scaling a business. Allowing algae production facilities and operations access to the USDA Business & Industry (B&I) Loan Guarantee Program and increasing the cap of $25 million would help provide the necessary capital. Congress has already increased the budget of this program.[482]

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: Growing the algae industry will help create rural and agricultural jobs - everything from operators, engineers and scientists to accounting, marketing development and logistics. These programs would help drastically reduce GHG emissions from medium and heavy duty trucks, aircraft and ships (which makes up 23%, 9% & 2% of the transportation GHG respectively).[483]

[480] *45Q Tax Credit*, Carbon Capture Coalition, https://carboncapturecoalition.org/45q-legislation/.
[481] *See BioPreferred*, USDA, https://www.biopreferred.gov/BioPreferred/faces/Welcome.xhtml.
[482] *USDA to Provide $1 Billion in Loan Guarantees for Rural Businesses and Ag Producers*, USDA (May 22, 2020), https://www.usda.gov/media/press-releases/2020/05/22/usda-provide-1-billion-loan-guarantees-rural-businesses-and-ag.
[483] *Fast Facts on Transportation Greenhouse Gas Emissions*, EPA, https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions.

How the Recommendation Supports Frontline or other Underserved Communities: The algae industry is particularly important to rural communities, as many algae production facilities and operations are in rural areas.[484] Additionally, algae is a chemically safer alternative compared with its fossil-derived counterpart[485] which helps protect communities around refineries which tend to be disproportionately people of color and economically underserved.

How the Recommendation Supports Biden's Climate Plan: Biden's climate plan states that the US must "reduce emissions in global shipping and aviation" and "double down on the liquid fuels of the future, which make agriculture a key part of the solution to climate change. Advanced biofuels… reduce emissions in planes, ocean-going vessels, and more." These programs would do exactly as called for in the Biden plan without affecting our food supply or need to convert more land to agricultural land; protect our natural ecosystems and produce energy at home.

Key Battleground State Activity: The algae industry, including R&D, algae production, and final product conversion, operates in several key states including Florida, Arizona, Texas, and Michigan.

[484] This is true across the nation, in small communities in the Southwest (Texas, New Mexico, and Arizona), the Northeast (Maine, Connecticut, New Jersey, Vermont), the West Coast (California, Oregon , Washington), middle America (Idaho, Michigan, Illinois, Minnesota, Kansas, Nebraska, and others), in the Southeast (Georgia, Mississippi, Florida), Alaska, and Hawaii. *See generally* Algae Companies and Organizations, BioTech Careers (last visited Oct. 21, 2020), https://www.biotech-careers.org/company-core-activity/algae; *see also Algae Biomass Summit*, Algae Biomass Org. (2020), https://www.algaebiomasssummit.org/.

[485] *The Global Bio-Based Polymer Market in 2019 – A Revised View*, BioPlastics Magazine (Jan. 27, 2020), https://www.bioplasticsmagazine.com/en/news/meldungen/20200127-The-global-bio-based-polymer-market-in-2019-A-revised-view.php.

Bioenergy & Innovative Forest Products Enable Forest Restoration for Wildfire Risk Reduction

Opportunity/Problem:

Forest restoration results in 'slash piles' that can pose a fire hazard, emitting carbon and criteria pollutants in frontline communities. Federal action can create and expand markets for the low-value 'slash' biomass, which will accelerate forest restoration, create rural jobs, reduce pollutants, and create low-carbon energy.

Recommended Action(s):

- Enhance USFS budgeting and collaborative authorities;
- Increase R&D/deployment grants for innovative wood products facilities.
- Increase the allowable size of biopower facilities that can receive tariffs in order to capture economies of scale and leverage forest residues.

Program Type:

√ New Program
√ Program Modification

Authority:

√ Existing Authority
√ Requires New Legislation

Job Benefits:

Forest restoration jobs are inherently located in rural frontline communities. The reforms to USFS's process will provide the certainty required for local forest restoration contractors to grow in these local communities.

Econ. Benefits:

The economic benefits, especially for rural communities, are substantial. According to a 2017 report by the Center for American Progress, "investing in an additional 2 million acres of restoration annually would create up to 42,000 jobs. The indirect economic effects would also be strong, as much of the restoration costs are paid to labor and the economic benefits stay within communities."

Equity Benefits:

Forest restoration paired with innovative wood products & bioenergy is a means to reduce criteria pollutant emissions--the emissions that are most locally destructive to human health--and, over time, reduce the incidence of severe wildfires which can devastate frontline communities at the wildland-urban interface.

Climate Plan Tie:

These activities have significant benefits for frontline communities, as noted above. The Biden climate plan specifically calls for leveraging natural solutions for the climate and resilience benefits. Reforestation - combined with the bioenergy solutions - reduce wildfire risk while protecting water quality, wildlife habitat, increasing water quantity and reducing carbon emissions.

Battleground State Benefits:

Primarily impacts western states, including competitive states like Colorado and New Mexico, among others.

Bioenergy & Innovative Forest Products Enable Forest Restoration for Wildfire Risk Reduction

AUTHORS: Matt Lucas, Daniel Sanchez, Zach Knight

DATE: September 27 2020

Statement of Issue and Summary of Recommendations:
Forests in the western U.S. are at a tipping point — overgrowth, tree mortality, and water scarcity all threaten the health of forests and the public benefits they provide. Wildfire seasons are getting longer and more severe with no end in sight. With insufficient funding, it is clear that the status quo is unsustainable.

Forest restoration (aka forest management, ecological restoration, or fuels reductions treatments) is the strategic removal of brush and shrubs and the selective thinning of trees to return forests to a healthier and more natural state. These practices reduce wildfire risk while protecting water quality, wildlife habitat, increasing water quantity and reducing carbon emissions.

Since 2018, the U.S. has lost 13.1 million acres of forests to 98,786 recorded wildfires, and the USFS estimates that 80 million acres of public and private lands are at risk of wildfire across the United States. Nearly half of the U.S. Forest Service's (USFS) 193 million acres require restoration, at an estimated cost of over $100 billion. At current levels of government spending, it could take over 200 years to complete this critical work. While additional public dollars and philanthropy would accelerate forest restoration work, additional federal measures to create and expand new markets for low-value forest biomass are required to meet the pace and scale necessary to address this compounding problem. Innovative forest products and bioenergy, can create new revenues for forest restoration while also creating multiple benefits: reduced carbon and criteria emissions and rural job creation.

Innovative wood products, biopower, and biofuels all increase potential revenues and enhance carbon storage from the low-value biomass that results from forest restoration. Expanding these opportunities will accelerate forest restoration and the co-benefits of decarbonization, reduce air pollution, and create rural jobs. In particular this set of policies can help drive economic growth in at least two sectors:

- **Innovative Wood Products.** Products such as mass timber, include numerous products with sufficient commercial and technical readiness, and potential market size, to justify increased public and private investments in their development. The U.S. stands to benefit significantly from support for innovation in the sector through increased local capacity, strengthened regional collaborations, and increased carbon storage in long-lived wood products. According to recent analysis for California, the most promising classes of innovative forest products include mass timber , transportation fuels, and treated wood.

- **Bioenergy, biopower and biofuels** Biopower is the production of electric power using biomass fuel. Notably, biopower is a baseload resource that (unlike wind and solar) can be called on demand. With the right set of federal incentives, biopower can bring significant benefits to forest restoration and associated air quality.

  Biofuels made from forest biomass are at a commercial inflection point and have favorable economics, particularly when coupled to existing clean fuel incentive programs like the federal Renewable Fuel Standard, California's Low Carbon Fuel Standard, and the federal 45Q tax credit for carbon sequestration.

Policies to leverage the benefits of this sector include

1. Enhance USFS authorities and programs to meet the scale of this challenge;
2. Increase coordination among federal/state agencies and with private landowners;
3. Increase both R&D and deployment grants for innovative wood products facilities;
4. Buy down the cost curve to reduce the cost of new biopower and biofuel facilities;
5. Focus federal procurement of biopower and mass timber;
6. Encourage state-level regulators to increase biopower project scale;
7. Establish an interagency working group to promote bioenergy and associated forest products;
8. Develop certification programs to promote sustainable biomass procurement from U.S. forests;
9. Promote the carbon benefits of working forests; Nx
10. Reform federal renewable fuels policy to allow forest biomass from federal lands to qualify.

Rural Development and Investment for a 100% Clean Energy Economy

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Opportunity / Problem Statement: Forest restoration, a necessity for wildfire risk reduction in a warming world, results in 'slash piles' that themselves pose a fire hazard, emitting carbon and criteria pollutants in frontline communities. Federal action can expand and scale solutions--innovative forest products and bioenergy--that create and expand markets for the low-value 'slash' biomass thereby increasing pace and scale of forest restoration while creating multiple benefits: creating rural jobs, reducing local and global pollutants, and creating low-carbon energy.

Proposed Recommendation:

11. **Enhance USFS:** Continue to enhance budgeting and collaborative authorities of the USFS. Several important authorities were granted to the USFS in 2018, including a budgetary "fix" to wildfire suppression funding, collaborative stewardship authority, and small changes to management practices. Further expansion of these authorities, and the opportunity to create new authorities that support conservation finance, is likely necessary to achieve meaningful action that matches the scale of the challenge.
12. **Increase Coordination:** Federal coordination with state and private landowners also conducting forest restoration can realize operation efficiencies in forest restoration project planning and execution.
13. **Increase both R&D and deployment grants:** for innovative wood products facilities. The Timber Innovation Act, included in the 2018 Farm Bill, for instance, authorized USDA to conduct performance-driven research and development, education, and technical assistance to promote innovative wood products.
14. **Buy down the cost curve:** Reduce the cost of the first cohort of new biopower and biofuel facilities. While DOE and USDA Loan Guarantee programs might seem like obvious vehicles, process and overhead costs are ill-suited for the smaller scale of bioenergy so we suggest grant funding as was used during ARRA for a cohort of carbon capture facilities.
15. **Federal procurement of biopower and mass timber:** Require federal power authorities (e.g., Bonneville Power Authority) to serve as buyers for biopower using preferential tariff structures that recognize the value of biopower across electricity generation, emissions mitigation, and forest restoration. GSA could advance the adoption of innovative wood products as a major building owner. Federal procurement of biofuels through both GSA and DLA can also accelerate adoption of biofuels.
16. **Encourage state-level regulators to increase biopower project scale:** California has a tariff structure, BioMAT, that could serve as a foundation to be

improved upon, notably with larger limits on facility size to capture economies of scale.

17. **Establish an interagency working group:** to (1) renew intra-agency commitment to innovative wood products across agencies, including both research and demonstration, and (2) coordinate research prioritization and outcomes across agencies, led by the Office of Science and Technology Policy and loosely based on the National Nanotechnology Initiative. This group should include representation from the Department of Labor and HUD to fully ensure that positive economic and jobs impacts are shared among rural communities' economies and communities of color.
18. **Certification programs**: USDA's Bio-Preferred program, for instance, includes mandatory purchasing requirements for federal agencies, and voluntary labeling. Enhancements could promote sustainable biomass procurement from U.S. forests.
19. **Promote the carbon benefits of working forests**: Forests are the largest carbon sink in the U.S. Policy should drive restoration, reforestation, and sustainable timber harvest across ownership types (corporate, small private, and public).
20. **Reform federal renewable fuels policy**: See other memo about a National Low Carbon Fuel Standard, which would incentive carbon-conscious use of forest biomass. In the absence of broad renewables fuels policy reform, the Renewable Fuels Standard should be amended to allow forest biomass from federal lands to qualify under the D3 category.

Check Boxes Below	
Y	Is this a modification of an existing program?
N	Does this roll back a Trump Administration regulation?

How the Recommendation Creates Jobs, Improves the Economy, and Addresses Climate Change: The economic benefits, especially for rural communities, are substantial. According to a 2017 report by the Center for American Progress, "investing in an additional 2 million acres of restoration annually would create up to 42,000 jobs. The indirect economic effects would also be strong, as much of the restoration costs are paid to labor and the economic benefits stay within communities."

Rural Development and Investment for a 100% Clean Energy Economy

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How the Recommendation Supports Frontline or other Underserved Communities: Forest restoration can both create jobs in rural communities and also reduce wildfire risk. By doing so, these activities result in less carbon emissions and fewer criteria pollutants in frontline and rural communities.

The jobs associated with forest management practices naturally occur in rural communities, driving economic opportunity and investment in many underserved areas. Forest restoration paired with innovative wood products & bioenergy is a means to reduce carbon and pollutant emissions that are most locally destructive to human health--and, over time, reduce the incidence of severe wildfires which can devastate frontline communities at the wildland-urban interface.

How the Recommendation Supports Biden's Climate Plan: As noted earlier, this set of activities has benefits for frontline communities. Also, the Biden climate plan calls for leveraging natural solutions for the climate and resilience benefits. Reforestation - combined with the bioenergy solutions - reduce wildfire risk while protecting water quality, wildlife habitat, increasing water quantity and reducing carbon emissions.

Wildfires are an uncontrolled release of CO2 and other criteria pollutants (notably PM2.5) into the atmosphere where they harm human health, as does burning of 'slash piles' composed of forest thinnings from forest restoration. By contrast, consuming slash for innovative wood products & bioenergy vastly reduces emissions of criteria pollutants. Bioenergy facilities, being dispatchable, are also expected to back out fossil-fueled dispatchable electricity generation on the grid.

Key Battleground State Activity: Primarily impacts western states, including competitive states like Colorado and New Mexico, among others.

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