

ISSUE BRIEF MARCH 2021

# **Raising US Climate Ambition in Advance of COP26: An Economic and National Security Imperative**

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### INTRODUCTION

Rejoining the Paris Agreement was one of President Joe Biden's top priorities on his first day in office after former President Donald Trump formally withdrew the United States from the accord in 2020. The Biden-Harris administration is already looking ahead to the twenty-sixth Conference of the Parties (COP26) in November and, as of publication, is working diligently to revise the United States' Nationally Determined Contribution (NDC), which must include a higher emissions reduction target. The focus on climate within the administration reflects the views of the majority of Americans who believe that climate change is causing harm to their local communities and that the government should be doing more to act, according to a Pew Research Center survey in 2020.<sup>1</sup> The Biden-Harris administration set ambitious targets for carbon-free electricity by 2035 and net-zero emissions by 2050. However, executive action alone is not enough, and congressional support will be necessary to achieve these goals over the coming decades. Congress laid a strong policy foundation for clean energy development by passing the Energy Act of 2020, which could serve as a launch pad for further legislative action. The US government, through a whole-of-government approach, must define the near-term pathway toward net-zero emissions and articulate them to the international community in a credible and transparent way. More ambitious climate action is critical to reestablishing US global leadership, and one of the most effective ways to mitigate climate change is to accelerate the energy transition by rapidly deploying clean energy resources and investing in advanced energy technologies. This issue brief addresses why climate action is vital to US economic and national security interests, and how the energy transition will open new opportunities for employment and economic growth as the country recovers from the global COVID-19 pandemic.

The Global Energy Center promotes energy security by working alongside government, industry, civil society, and public stakeholders to devise pragmatic solutions to the geopolitical, sustainability, and economic challenges of the changing global energy landscape.

Alec Tyson and Brian Kennedy, "Two-Thirds of Americans Think Government Should Do More on Climate," Pew Research Center, June 23, 2020, https://www.pewresearch.org/science/ 2020/06/23/two-thirds-of-americans-think-government-should-do-more-on-climate/.

Green economic recovery will be a main theme at COP26 in November. The conference was originally scheduled for November 2020 and was postponed due to the pandemic. The United Kingdom, in partnership with Italy, will be hosting the climate summit, and, in the extra year between conferences, is championing a green economic recovery and increased climate ambition for all parties to the Paris Agreement, as well as nongovernmental actors and civil society. The drastic cross-sectoral impacts of the pandemic caused global energy-related carbon emissions to fall by 6 percent in 2020, the greatest drop since World War II. Notably, while demand for fossil fuels fell precipitously, renewable energy reached its highest ever share of the global energy mix.<sup>2</sup> The world had an opportunity to check emissions growth and use economic stimulus packages to drive the energy transition. However, by December, emissions were rising again, and surpassed December 2019 levels, according to the International Energy Agency.<sup>3</sup> Therefore, global efforts to reduce emissions must continue to improve. In the last year, the European Union, China, the United Kingdom, and Japan set carbon neutrality targets for mid-century and are releasing plans for emissions reductions in the next decade. The United States, which produces 13 percent of global carbon emissions, is a welcome member back into the Paris Agreement, and can help make meaningful progress during the next round of climate negotiations in Glasgow.<sup>4</sup>

This issue brief argues that the United States can lead global action on climate change, starting with domestic progress on economic recovery, technology competitiveness, and resiliency measures, all of which will shore up national security interests. The first section discusses how government support for expansion of the clean energy sector-especially in areas like carbon capture, offshore wind, and energy efficiency—can create well-paying jobs for communities affected by the pandemic and those whom the energy transition could leave behind. The second section outlines how the United States can improve its international competitiveness in crucial technologies like electric vehicles and advanced nuclear to improve energy security and bolster trade relationships with allies and partners. The third section analyzes the economic impact of climate change and the high costs of rebuilding after climate-induced natural disasters and extreme weather. The fourth section examines the national security impacts of climate on military training and operations, and how the Department of Defense (DOD) is working across the government to respond. Finally, the last section makes the case for why engagement in international climate negotiations and close cooperation with allies and partners is critical to US interests, arguing that climate change is a borderless threat that every nation must work to address.

### **BACKGROUND ON THE PARIS AGREEMENT**

Former US President Barack Obama and 195 other national leaders adopted the landmark agreement of the United Nations Framework Convention on Climate Change at COP25 in Paris in 2015. The Paris Agreement is a bottom-up approach to preventing a rise in average global temperature above 2 degrees Celsius (°C), with best efforts to keep temperature rise below 1.5°C from pre-industrial levels.

In 2018, the Intergovernmental Panel on Climate Change (IPCC) authored a scientific report that supports the Paris Agreement emissions reduction target. The IPCC's Special Report: Global Warming of 1.5°C was a wake-up call. It asserted that the world had just over a decade to halve global carbon emissions and reach net-zero carbon emissions by 2050 to avoid the disastrous effects that would result from a rise in average global temperature, including extreme weather events, sea level rise, ocean acidification, deglaciation, and biodiversity loss. The IPCC is made up of 195 countries that are members of the United Nations or the World Meteorological Organization. Scientists from around the world contribute to the assessment reports, which provide a comprehensive summary of the latest scientific findings about climate change.\*

- \* United Nations Framework Convention on Climate Change, "The Paris Agreement," accessed March 25, 2021, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement; United Nations Intergovernmental Panel on Climate Change, *Special Report: Global Warming of 1.5*°C, 2018, https://www.ipcc.ch/sr15/.
- 2 "Global Energy Review: CO<sub>2</sub> Emissions in 2020," International Energy Agency, March 2, 2021, https://www.iea.org/articles/global-energy-review-co2-emissions-in-2020.
- 3 "After Steep Drop in Early 2020, Global Carbon Dioxide Emissions Have Rebounded Strongly," International Energy Agency, March 2, 2021, https://www.iea.org/news/after-steep-drop-in-early-2020-global-carbon-dioxide-emissions-have-rebounded-strongly.
- 4 Mengpin Ge and Johannes Friedrich, "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors," World Resources Institute, February 6, 2020, https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector.

# PROMOTE A GREEN ECONOMIC RECOVERY

Since February 2020, the COVID-19 pandemic has taken a strong toll on the US economy and overall labor force, on top of the mounting loss of life, which now exceeds five hundred thousand lives.<sup>5</sup> Over the past year, the United States has shed nearly ten million jobs and, as of February 2021, unemployment hovered over 6 percent, a substantial increase in comparison to the pre-pandemic low of 3.5 percent.<sup>6</sup> As a result, many American families now struggle to pay for health insurance and feed themselves and their families, with many burdened with despair or loss of purpose.<sup>7</sup>

A targeted post-pandemic green recovery can push the US clean energy industry beyond previous employment and performance projections and help the economy quickly rebound. This effort would also uplift and support marginalized communities disproportionately impacted by COVID-19 as well as fossil fuel workers likely to lose out to the clean energy transition. With targeted executive action in line with President Biden's "Build Back Better" plan; congressional investment in infrastructure, tax, and clean energy legislation; and willful intention to integrate justice into the recovery strategy, the US clean energy industry could emerge from 2020 stronger than before. Already, despite the economic fallout from the coronavirus pandemic, the US renewable energy sector had a record year in 2020, with wind and solar installations soaring 61 percent and 33.6 gigawatts (GW) added to the grid, a 50 percent increase

over the previous benchmark high witnessed in 2016.<sup>8</sup> On the other hand, a demand shock driven by the pandemic combined with an oil price war between Russia and Saudi Arabia struck the oil and gas sector in 2020.<sup>9</sup> In looking beyond COVID and into the post-pandemic era, the United States has the opportunity to rebuild in a way that facilitates the decarbonization of the oil and gas sector, and the economy as a whole.

Clean energy jobs, from weatherization technician to solar installer, are relatively high-paying opportunities that exceed national averages by 8 to 19 percent, are often locally sourced, and are readily accessible without a four-year degree.<sup>10</sup> In fact, around 50 percent of clean energy workers do not have a bachelor's degree yet earn more than their peers with the same educational attainment in other fields.<sup>11</sup> As such, investing in clean energy development and climate action would not only serve to cut emissions and reduce pollution, but also create hundreds of thousands of well-paying jobs.<sup>12</sup>

According to recent research conducted at the University of California, Berkeley, wind, solar, and storage costs have fallen so fast that the United States could decarbonize 90 percent of its electricity grid by 2035, all the while decreasing wholesale energy costs by 10 percent. According to the researchers, moving to 90 percent clean electricity would create 530,000 more jobs per year, primarily in wind, solar, and storage, compared with business as usual; inject \$1.7 trillion into the US economy over the next fifteen years; avoid \$1.2 trillion in cumulative environmental and health damages;

<sup>5 &</sup>quot;COVID Data Tracker," Centers for Disease Control and Prevention, accessed March 25, 2021, https://covid.cdc.gov/covid-data-tracker/#datatracker-home.

<sup>6 &</sup>quot;The Employment Situation – February 2021," US Bureau of Labor Statistics, March 5, 2021, https://www.bls.gov/news.release/pdf/empsit.pdf.

<sup>7</sup> Nina Lakhini, "A Perfect Storm': US Facing Hunger Crisis as Demand for Food Banks Soars," *The Guardian*, April 2, 2020, https://www.theguardian.com/environment/2020/apr/02/us-food-banks-coronavirus-demand-unemployment; Megan Leonhardt, "66% of Americans Fear They Won't Be Able to Afford Health Care," CNBC News, January 5, 2021, https://www.cnbc.com/2021/01/05/americans-fear-they-wont-be-able-to-pay-for-health-care-this-year.html.

<sup>8</sup> Irina Ivanova, "Ignoring Pandemic, Americans Installed Record Amounts of Solar and Wind Energy," CBS News, February 18, 2021, https://www.cbsnews.com/news/solar-wind-energy-united-states-2020/.

<sup>9</sup> Colin Eaton and Sarah McFarlane, "2020 Was One of the Worst-Ever Years for Oil Write-Downs," *Wall Street Journal*, December 27, 2020, https://www.wsj.com/articles/2020-was-one-of-the-worst-ever-years-for-oil-write-downs-11609077600.

<sup>10</sup> Mark Muro, Adie Tomer, Ranjitha Shivaram, and Joseph W. Kane, *Advancing Inclusion through Clean Energy Jobs*, Brookings Institution, April 15, 2019, https://www.brookings.edu/research/advancing-inclusion-through-clean-energy-jobs/.

<sup>11</sup> Ibid.

<sup>12</sup> Joel Jaeger and Devashree Saha, "10 Charts Show Economic Benefits of Climate Action," World Resources Institute, July 28, 2020, https://www.wri.org/blog/2020/07/economic-benefits-climate-action-us.

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Solar panel installers work on panels that the Energy Department is using to leverage a Power Purchase Agreement with Sun Edison and Xcel Energy. Unsplash/Science in HD (@sciencceinhd)

and revitalize domestic manufacturing, particularly in places that need it most.<sup>13</sup> To do this, the report authors argue that the United States would have to add 70 GW of new solar and wind, on top of 50 GW of new four-hour battery storage, while also retaining existing nuclear, existing hydropower, and much of operating natural gas capacity.<sup>14</sup> While previous research predicted power sector decarbonization would be possible only by 2050, with wind and solar now cheaper than fossil fossil-generated electricity, new price curves for variable renewables and storage have altered that initial projection.<sup>15</sup>

#### Employment Opportunities in Key Energy Technologies

Beyond solar, wind, grid, and storage buildouts, vast employment and economic opportunities exist across the whole clean energy sector, from new technology development to infrastructure improvement. From carbon capture, utilization, and storage (CCUS) to advanced nuclear technology to the offshore wind sector, scaling new energy and climate technologies in the United States could have substantial knock-on effects for economic growth and job creation, on top of anticipated emissions reduction benefits.

<sup>13</sup> Goldman School of Public Policy, *The 2035 Report: Plummeting Solar, Wind, and Battery Costs Can Accelerate Our Clean Electricity Future*, University of California, Berkeley, June 2020, http://www.2035report.com/wp-content/uploads/2020/06/2035-Report. pdf?hsCtaTracking=8a85e9ea-4ed3-4ec0-b4c6-906934306ddb%7Cc68c2ac2-1db0-4d1c-82a1-65ef4daaf6c1.

<sup>14</sup> Ibid.

<sup>15 &</sup>quot;Renewable Electricity Futures Study," National Renewable Energy Laboratory, accessed March 25, 2021, https://www.nrel.gov/analysis/re-futures.html.

The electric vehicle (EV) manufacturing industry could generate thousands of new, well-paying union jobs in the United States, particularly in the underemployed Rust Belt where both existing and new automakers are moving into the space. For example, General Motors (GM) announced in January 2020 that it would phase out gas and diesel vehicles by 2035, with a goal of releasing thirty new EVs globally by 2025.<sup>16</sup> In November 2020, the auto giant affirmed that it would hire three thousand new employees to build twenty new EV models by 2023, on top of the 1,100 new workers it intends to onboard at its now-constructed Ultium Cells electric battery plant in Lordstown, Ohio.<sup>17</sup> Additionally, startup Lordstown Motors purchased the now-shuttered GM vehicle manufacturing plant in the same Ohio town, where it now intends to manufacture its all-electric pickup truck, the Endurance.<sup>18</sup> In June 2020, Lordstown Motors CEO Steve Burns stated that he would hire six hundred workers in 2021 with the intention of employing between four and five thousand people at the plant in the near future.<sup>19</sup> This employment development is particularly important to the local community, which saw job prospects decline when GM closed its manufacturing facility. The Biden-Harris administration and US Congress should build on this momentum to write policies that incentivize and facilitate EV uptake, enhance EV development and market expansion, and support the development of charging infrastructure at home and on the road.

As a focus of legislative support and executive interest, CCUS technology expansion could generate well-paying jobs and develop a new manufacturing sector in the United States, as well as associated export opportunities. The Carbon Capture Coalition estimates that the CCUS industry in the United States could support between 100,000 and 140,000 jobs in construction and operations, as well as create additional employment opportunities in pipelaying and transport.<sup>20</sup> It is highly unlikely that the United States will be able to meet its 2050 netzero emissions targets without greater investment in carbon capture technologies.<sup>21</sup> CCUS technologies support deep decarbonization in hard-to-abate industries like steel and cement, enable scalable blue hydrogen production, lower the carbon intensity of gas-fired power plants, and help deliver negative emissions.<sup>22</sup> While the 45Q CCUS tax credit has helped jumpstart projects and expand market access, CCUS deployment remains in a nascent phase in the United States if the country is to meet net-zero targets.<sup>23</sup> Yet, momentum is now building in Congress with the newly introduced Storing CO2 and Lowering Emissions (SCALE) Act, a bipartisan legislative effort to build out the CCUS transport infrastructure system in the United States.<sup>24</sup> Preliminary analysis of the bill demonstrates that, if successful, provisions in the act could generate thirteen thousand direct and indirect jobs over five years.<sup>25</sup> To meet climate goals and support both economic and job growth, more funding

- 16 Paul A. Einstein, "GM to Go All-Electric by 2035, Phase Out Gas and Diesel Engines," NBC News, January 28, 2021, https://www.nbcnews.com/business/autos/gm-go-all-electric-2035-phase-out-gas-diesel-engines-n1256055.
- 17 Jack Kelly, "GM Plans to Hire 3,000 Workers to Build Environmentally Friendly Electric Vehicles Including a Brand New \$10,000 Hummer," Forbes, November 10, 2020, https://www.forbes.com/sites/jackkelly/2020/11/10/gm-plans-to-hire-3000-workers-to-buildenvironmentally-friendly-electric-vehicles-including-a-brand-new-100000-hummer/?sh=7a02295a546a; Jamie L. LaReau, "GM Fast-Tracks Electric Vehicle Plans, Starts Hiring Near Former Lordstown Plant," Detroit Free Press, November 5, 2020, https://www.freep.com/story/money/cars/general-motors/2020/11/05/gm-electric-vehicle-hiring-ohio-lordstown-jobs/6173465002/.
- 18 "Lordstown: About Us," Lordstown Motors, accessed March 25, 2021, https://lordstownmotors.com/pages/about.
- 19 Jamie L. LaReau, "GM's Former Plant in Lordstown Will Return to Mass Vehicle Production, Thousands of Jobs," *Detroit Free Press*, May 22, 2020, https://www.freep.com/story/money/cars/general-motors/2020/05/22/gm-lordstown-motors-plant-jobs-electric-pickupsvehicles/5229669002/.
- 20 Carbon Capture Coalition, Carbon Capture Jobs and Project Development Status, June 2020, https://carboncapturecoalition.org/wp-content/uploads/2020/06/Carbon-Capture-Jobs-and-Projects.pdf.
- 21 "Global Climate Goals 'Virtually Impossible' without Carbon Capture: IEA," Reuters, September 24, 2020, https://www.reuters.com/ article/us-iea-carboncapture/global-climate-goals-virtually-impossible-without-carbon-capture-iea-idUSKCN26F0IB.
- 22 Brad Page et al., *Global Status of CCS 2020*, Global Carbon Capture and Storage Institute, March 2021, https://www.globalccsinstitute.com/wp-content/uploads/2021/03/Global-Status-of-CCS-Report-English.pdf.
- 23 US Department of Energy, "Internal Revenue Code Fact Sheet: Fossil Energy," last updated October 2019, https://www.energy.gov/sites/prod/files/2019/10/f67/Internal%20Revenue%20Code%20Tax%20Fact%20Sheet.pdf.
- 24 "Bipartisan Group Introduces Nation's First Comprehensive CO<sub>2</sub> Infrastructure Bill," Office of Senator Chris Coons, United States Government, March 17, 2021, https://www.coons.senate.gov/news/press-releases/bipartisan-group-introduces-nations-first-comprehensive-co2-infrastructure-bill.
- 25 Industrial Economics, Incorporated, *Employment Effects of Investment in CO<sub>2</sub>Transport Infrastructure and Geologic Storage—the 2020* SCALE Act, February 2021, https://www.catf.us/wp-content/uploads/2021/03/2021-SCALE-Act-Jobs-Report.pdf.

and political support for CCUS in the United States must be appropriated and exercised.

Additionally, as the Biden-Harris administration and Congress shift their attention to infrastructure, a generally bipartisan focus area, great opportunity exists to support clean energy jobs and economic development in related legislation.<sup>26</sup> As part of his COVID recovery plan, President Biden specifically highlights sustainable infrastructure development and investment as a core tenet of his strategy to rebuild the US economy.<sup>27</sup> One area that could benefit from federal investment while also making the energy system more sustainable and resilient is the energy grid, which is in dire need of improvement. In its most recent quadrennial review, the American Society of Civil Engineers (ASCE) rated the US energy system a C-, asserting that all three components of the electricity grid (generation, transmission, and distribution) suffer from underinvestment.<sup>28</sup> In a 2020 report, the ASCE asserted that the United States continues to underinvest in national electricity infrastructure, and if the gaps are not mitigated, American households will lose on average \$5,800 in disposable income between 2020 and 2039, US businesses could lose \$637 billion, and the economy could shed 540,000 jobs.<sup>29</sup> Alternatively, according to an analysis conducted by the American Federation of Labor and Congress of Industrial Organizations (AFL-CIO) and the Energy Futures Initiative (EFI), a 25-30 percent increase in utility sector capital expenditure annually could generate 20,000 direct utility jobs, 90,000 indirect jobs, and 118,000 induced jobs.<sup>30</sup>

While investment in grid infrastructure has the potential to create new jobs and stimulate the US economy,

support for the energy efficiency sector, the largest cohort of the clean energy workforce, would grow industry employment in a field hurting from last year's substantial job losses. According to the AFL-CIO/EFI report, only a small percentage of industrial, commercial, government, and residential buildings eligible for energy efficiency retrofits are renovated every year.<sup>31</sup> There are over four million government buildings in the United States, and every \$1 million the government invests in building retrofits would create roughly ten jobs.<sup>32</sup> Given that the energy efficiency sector supports a large proportion of all clean energy jobs, many of which were lost as result of the pandemic, strong legislative and executive support for weatherization and other efficiency measures would help rebuild a damaged industry, boost the entire green economy, lower both energy demand and building electricity costs, and cut emissions.

To achieve President Biden's national 2035 zero-carbon power generation goal, the United States will need to increase clean energy deployment, notably nuclear power production, and it cannot afford to lose the nuclear reactors that are currently generating clean electricity. Since nuclear energy currently generates 20 percent of US power and over half of the nation's clean electricity, maintaining the existing US nuclear reactor fleet is crucial to meeting decarbonization goals. However, many US facilities are being decommissioned or have already been shut down. The nuclear energy industry also employs thousands of people, particularly Navy veterans, around the country, in addition to generating economic activity and providing tax revenue in surrounding local communities. The US nuclear energy industry supports one hundred thousand direct jobs, on

<sup>26</sup> Jim Tankersley, "Biden Team Prepares \$3 Trillion in New Spending for the Economy," *New York Times*, updated March 25, 2021, https://www.nytimes.com/2021/03/22/business/biden-infrastructure-spending.html.

<sup>27 &</sup>quot;Build Back Better: Joe Biden's Jobs and Economic Recovery Plan for Working Families," Biden-Harris Campaign, accessed March 25, 2021, https://joebiden.com/build-back-better/.

<sup>28</sup> American Society of Civil Engineers, 2021 Report Card for America's Infrastructure: Energy, 2021, https://infrastructurereportcard.org/cat-item/energy/.

<sup>29</sup> American Society of Civil Engineers, Failure to Act: Electric Infrastructure Investment Gaps in a Rapidly Changing Environment, 2020, https://www.asce.org/electricity\_report/.

<sup>30</sup> American Federation of Labor and Congress of Industrial Organizations, and Energy Futures Initiative, *Energy Transitions*, 2020, https://static1.squarespace.com/static/58ec123cb3db2bd94e057628/t/6011a8b83d1c6a79cf0b27fe/1611770049298/Energy+Transitions.pdf.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid.; Andrew C. Burr, Cliff Majersik, Sarah Stellberg, and Heidi Garrett-Peltier, *Analysis of Job Creation and Energy Cost Savings from Building Energy Rating and Disclosure Policy*, Institute for Market Transformation and Political Economy Research Institute, University of Massachusetts, March 2012, https://www.peri.umass.edu/fileadmin/pdf/other\_publication\_types/PERI-IMT-2012-Analysis\_Job\_Creation.pdf.

top of almost four hundred thousand secondary jobs.<sup>33</sup> The planned shuttering of the Pacific Gas and Electric Company (PG&E) Diablo Canyon nuclear energy facility in 2025 is expected to result in \$1 billion in local annual economic losses for San Luis Obispo County, California, and cut 3,200 jobs on-site and across the local community.<sup>34</sup> The most recent nuclear facility closure at Indian Point in New York will also have negative economic and social impacts on the adjacent towns, as they lose one thousand jobs and millions in annual property tax revenue, and may now be forced to cut public resource budgets for services like education.<sup>35</sup>

The next generation of nuclear reactors, which includes small modular reactors (SMRs), has the potential to expand the US zero-carbon electricity portfolio and provide rural and remote areas around the nation with safe, reliable, and clean energy. NuScale Power, the company closest to commercializing and deploying its SMR design, projects that 110,000 construction, operations, and maintenance jobs will be created in the installation of seventy units around the country, with an additional 13,500 jobs to be generated in module fabrication and assembly.<sup>36</sup> And while these employment numbers appear promising, the company remains nearly ten years away from deploying its first operational unit, though many of those jobs could be generated well in the meantime as the industry grows and the launch date nears. Without a concerted effort to support the US nuclear energy industry, achieving 100 percent clean power production in twenty years will be near impossible, and thousands of jobs and millions in local economic development will be lost.

Finally, as a burgeoning industry along US shorelines, especially in the Northeast, the offshore wind sector has the potential to create thousands of well-paying union jobs and stimulate strong economic activity in the United States across a robust supply chain. Beyond direct employment, US offshore wind development would support turbine manufacturing, shipbuilding, transmission, and other associated industry jobs. A 2017 study projected that 8 GW of offshore wind buildout by 2030 in the United States could create sixteen thousand annual jobs, with that number more than doubling when related manufacturing employment is included.<sup>37</sup> In November 2020, the American Wind Energy Association estimated that, if the United States built out wind farms on all fifteen of its commercial offshore leases, the resulting projects could produce 30 GW of clean electricity, create 83,000 jobs, and generate \$25 billion in annual economic output over the next ten years.<sup>38</sup> Yet, as it stands, the United States is home to only one operating utility-scale offshore development-Ørsted's Block Island windfarm off the coast of Rhode Islandand, while US players like Vineyard Wind and Dominion Energy have charged ahead with their own projects off the coasts of Massachusetts and Virginia, respectively, vast untapped opportunity remains.<sup>39</sup> US offshore wind potential extends from the Northeast to the Mid-Atlantic to the Great Lakes to the West Coast and even to the Gulf of Mexico; strong government support at the federal, state, and local levels will be necessary to create a mature US offshore wind market and capitalize on the sector's economic and employment benefits.

33 "Jobs," Nuclear Energy Institute, accessed March 25, 2021, https://www.nei.org/advantages/jobs.

34 Stephanie Finucane, Kaytlyn Leslie, and David Sneed, "What Diablo Canyon's closure will mean for SLO County's economy," The Tribune, June 21, 2016, https://www.sanluisobispo.com/news/local/article85204657.html.

35 Thomas C. Zambito, "Cortlandt to get \$3.2M in federal funding to boost economy after Indian Point closes," Lohud.com, September 30, 2020, https://www.lohud.com/story/news/local/westchester/cortlandt/2020/09/30/cortlandt-gets-indian-point-closure-help/3586650001/; "Countdown to Shutdown: The effect of lost jobs, revenue in Cortlandt," News12, August 1, 2019, https://westchester.news12.com/countdown-to-shutdown-the-effect-of-lost-jobs-revenue-in-cortlandt-40867277.

36 Energy Futures Initiative and AFL-CIO, *Energy Transitions*; "Cost-Competitive in a New Era of Nuclear," NuScale, accessed March 25, 2021, https://www.nuscalepower.com/newsletter/nucleus-summer-2019/powering-the-next-generation-of-nuclear.

37 BVG Associates Limited, US Job Creation in Offshore Wind: A Report for the Roadmap Project for Multi-State Cooperation on Offshore Wind, Clean Energy States Alliance, November 2, 2017, https://www.cesa.org/ resource-libraryresource/u-s-job-creation-in-offshore-wind/.

38 US Offshore Wind Power Economic Impact Assessment, American Wind Energy Association, March 2020, https://supportoffshorewind.org/wp-content/uploads/sites/6/2020/03/AWEA\_Offshore-Wind-Economic-ImpactsV3.pdf.

39 Brian Dowd, "Offshore wind projects secure facility lease," *MV Times*, August 20, 2020, https://www.mvtimes.com/2020/08/20/ offshore-wind-projects-secure-facility-lease/; "Dominion Energy Completes Construction of First Offshore Wind Project in US Federal Waters," Dominion Energy, June 29, 2020, https://news.dominionenergy.com/2020-06-29-Dominion-Energy-Completes-Constructionof-First-Offshore-Wind-Project-in-U-S-Federal-Waters.

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Wind turbines rotate off the shores of Block Island, Rhode Island. This windfarm installation is the only operating offshore wind project in the United States. Shutterstock/Diane Diederich

#### **Just Transition and Energy Justice Implications**

As the energy transition accelerates, it is inevitable that fossil fuel workers may be negatively impacted, and while new energy industries are poised to gain jobs, certain areas and sectors of the legacy system are likely to see concentrated employment losses as market forces and policies push consumers and lenders toward green energy. Fortunately, many of the jobs of tomorrow, whether in the US geothermal, hydrogen, or CCUS industries, allow for varying degrees of skill transferability. For example, much of the knowledge employed in oil and gas exploration and extraction is also applicable to geothermal drilling and resource exploitation; given the strong overlap in industry expertise, opportunities exist for fossil fuel workers to transition into the US geothermal industry, especially if the sector grows beyond the West and into states like Texas, and oil and gas companies move into the space as they decarbonize their portfolios.<sup>40</sup> Additionally, pipe layers and manufacturers from the natural gas and petroleum industries may also have an opportunity to transition into the carbon capture and hydrogen sectors, both of which require a similar skillset to create and build transport infrastructure for carbon dioxide and hydrogen, respectively. As such, government and congressional support for these growing clean energy industries would not only create new jobs, but also help ensure that new opportunities exist for workers who may lose their legacy energy sector jobs.

Historically coal- and gas-dependent regional economies are particularly vulnerable to changing energy and economic trends. For instance, it is estimated that

<sup>40</sup> Jigar Shah and Tim Latimer, "Geothermal energy is surging – battered oil and gas companies should take advantage," *Utility Dive*, July 28, 2020, https://www.utilitydive.com/news/geothermal-energy-is-surging-battered-oil-and-gas-companies-should-take-a/582377/.

the Ohio River Valley will see a 50 percent contraction in fossil fuel-related economic activity between 2021 and 2030, as well as associated job losses.<sup>41</sup> However, in a plan put forth by a regional consortium led by the University of Pittsburgh, known as the Marshall Plan for Middle America, authors posit that investing \$60 billion annually in energy efficiency and renewable energy over the next twenty years could create 410,000 new jobs across Kentucky, Ohio, Pennsylvania, and West Virginia.<sup>42</sup> The impact of this energy investment on the region would be a tenfold increase in renewable power and a 1.5-2 percent reduction in the total regional unemployment rate. In addition, in delivering on efficiency retrofits and building out clean energy generation, citizens across the four-state region could save up to 40 percent on their energy bills, savings they could then be reinjected back into the economy.43 In areas expected to be hit hardest by the clean energy transition, ambitious policy strategies and targeted investment plans could have a lasting, positive impact on regional communities.

Providing low-income communities and communities of color with greater access to energy-efficient retrofits would serve to reduce heavy energy costs and, in turn, leave individuals with more cash to invest in their communities. Even before the pandemic, one in four US households struggled with high energy costs, spending more than 6 percent of their total incomes on electricity and heating bills, with 13 percent of severely burdened households spending up to one-tenth of their earnings on utilities.<sup>44</sup> Many low-income families in the United States live in poorly insulated housing with older appliances that are not energy efficient, and these same individuals often face obstacles in receiving capital for improvements like weatherization that could cut household energy use by 25 percent and, in turn, reduce both average electricity and heating costs, and greenhouse

gas emissions.<sup>45</sup> Energy efficiency advancement can also support the local workforces in communities with high energy burdens; the Energy Conservation Corps provides free weatherization certification training for at-risk and economically disadvantaged youth in North Charleston, South Carolina, offering them a pathway to stable employment.<sup>46</sup> Energy efficiency is the cornerstone of the clean energy economy; equal access to retrofit improvements would help ensure that the clean energy transition is both inclusive and just, with no community excluded from the benefits of change.

# RAISE US GEO-ECONOMIC COMPETITIVENESS IN THE ENERGY TRANSITION

If it were to lead on clean energy technology development, the United States would have a strong opportunity to concurrently mitigate climate risk, generate economic growth, and create millions of jobs. At the same time, the United States would also be able to raise its geo-economic competitiveness in the global clean energy economy, particularly in comparison to China and Russia. Gaining market ground on a range of technologies—from electric vehicles to advanced nuclear reactors to hydrogen—would provide the United States with greater economic leverage on the international stage as the accelerating energy transition and climate change reshape the world.

#### Expand electric vehicle manufacturing

The United States is home to several electric vehicle manufacturers, most notably Tesla and General Motors, and US automakers are quickly ramping up their production of EVs at the same time as the US government moves to install over five hundred thousand charging

42 Ibid.

<sup>41</sup> Leslie Marshall et al., *The Marshall Plan for Middle America, Center for Sustainable Business*, University of Pittsburgh, December 18, 2020, https://www.sustainablebusiness.pitt.edu/sites/default/files/marshall\_plan\_for\_middle\_america\_roadmap\_0.pdf.

<sup>43</sup> Ibid.

<sup>44</sup> Ariel Drehobl, Lauren Ross, and Roxana Ayala, *How High Are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burdens across the US*, American Council for an Energy-Efficient Economy, September 10, 2020, https://www.aceee.org/energy-burden.

<sup>45</sup> Ariel Drehobl, "Low-Income Households Pay More for Energy, but Efficiency Can Help," US News, September 30, 2020, https://www. usnews.com/news/healthiest-communities/articles/2020-09-30/poor-households-pay-more-for-energy-but-efficiency-can-help.

<sup>46 &</sup>quot;The Environmental Conservation Corps ('ECC') Program," The Sustainability Institute, accessed March 25, 2021, http://sustainabilityinstitutesc.org/ecc/.

stations over the next ten years.<sup>47</sup> However, the US EV market is a fraction of global sales. China and Europe represented 41 and 42 percent of global 2020 EV sales, respectively, with the US market accounting for a paltry 2.4 percent of worldwide sales last year.48 Across the industry, automakers are expected to invest \$300 billion in electric vehicle production and development over the next five to ten years, with half of that cash flow to be spent in China.49 And beyond the manufacture and sale of the vehicle itself, China also dominates large components of the EV supply chain, from mining to mineral processing to battery production and vehicle assembly. For example, of the 142 lithium-ion battery cell mega factories currently under development around the world, 107 are to be established in China, with just nine set to break ground in the United States.<sup>50</sup> As the battery is the single most expensive component in the vehicle, accounting for nearly 30 percent of consumer costs, producing the packs domestically and adjacent to car assembly plants helps keep prices low.<sup>51</sup> China's vertically integrated EV supply chain and co-location of mineral processing, battery manufacture, and vehicle production, coupled with a massive domestic consumer market, provide the country with a cost-competitive and economic advantage over US automakers.

China, due to its competitive advantage, has seized the opportunity to export its electric vehicles, both passenger cars and buses, to other countries around the world, building new trade and diplomatic relationships in the process. China monopolizes the electric bus (e-bus) market, and Chinese companies produce nearly all of the e-buses on the road today.<sup>52</sup> In moving into the European market, Chinese firm BYD sold 259 e-buses in the Netherlands, the largest single order of electric buses in Europe as of December 2019.53 The second-largest fleet of e-buses in the world after China circulates in Chile, where now over seven hundred Chinese buses navigate the streets of Santiago.<sup>54</sup> In an effort to decarbonize its taxi fleet, the Chilean government has also recently implemented a plan to subsidize the purchase of fifty electric taxis, all of which are to be purchased from BYD.55 And to build trust and ensure vehicle longevity for the new taxis, the Chinese company has even agreed to manage vehicle maintenance. These examples demonstrate a growing push by Chinese EV makers to sell and deploy vehicles across Europe and Latin America, with over one thousand units sold across the latter in 2019 alone. Chinese EV makers are also targeting the high-potential Indian auto market, expected to be the world's third largest by 2026, where Chinese producer Great Wall Motors has

- 47 "Readout of the White House's Meeting with Electric Vehicle Charging Infrastructure Leaders," Office of the White House, March 2, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/02/readout-of-the-white-houses-meeting-with-electric-vehicle-charging-infrastructure-leaders/.
- 48 "Canalys: China's electric vehicle sales to grow by more than 50% in 2021 after modest 2020," Business Wire, February 22, 2021, https://www.businesswire.com/news/home/20210222005461/en/Canalys-China%E2%80%99s-electric-vehicle-sales-to-grow-by-morethan-50-in-2021-after-modest-2020.
- 49 Paul Lienert, Norihiko Shirouzu, and Edward Taylor, "Exclusive: VW, China spearhead \$300 billion global drive to electrify cars," Reuters, January 10, 2019, https://www.reuters.com/article/us-autoshow-detroit-electric-exclusive/exclusive-vw-china-spearhead-300-billionglobal-drive-to-electrify-cars-idUSKCN1P40G6.
- 50 Evelyn Cheng, "China's electric car strategy is starting to go global and the US is lagging behind," CNBC News, October 22, 2020, https://www.cnbc.com/2020/10/23/chinas-electric-car-strategys-implications-for-us-energy-security.html.
- 51 Ira Boudway, "Batteries for Electric Cars Speed Toward a Tipping Point," *Bloomberg*, December 16, 2020, https://www.bloomberg.com/ news/articles/2020-12-16/electric-cars-are-about-to-be-as-cheap-as-gas-powered-models; Justin Harper, "Chinese £3,200 budget electric car takes on Tesla," BBC, February 25, 20201, https://www.bbc.com/news/business-56178802.
- 52 Linda Poon, "How China Took Charge of the Electric Bus Revolution," *Bloomberg CityLab*, May 8, 2018, https://www.bloomberg.com/news/articles/2018-05-08/in-china-shenzhen-electrified-its-entire-bus-fleet.
- 53 Kyle Field, "Keolis Nederland BV Selects BYD To Supply Largest Electric Bus Order In Europe," Cleantechnica, December 7, 2019, https://cleantechnica.com/2019/12/07/keolis-nederland-bv-selects-byd-to-supply-largest-electric-bus-order-in-europe/.
- 54 La transición hacia buses eléctricos en América Latina es irreversible," Diálogo Chino, December 10, 2020, https://dialogochino.net/es/clima-y-energia-es/38837-la-transicion-hacia-buses-electricos-en-america-latina-es-irreversible/.
- 55 Mauricio Monroy, "Ministerio de Energía financiará hasta \$8 millones para cambiarse de un taxi básico a uno eléctrico," *La Tercera*, January 22, 2021, https://www.latercera.com/mtonline/noticia/ministerio-de-energia-financiara-hasta-8-millones-para-cambiarse-deun-taxi-basico-a-uno-electrico/30BZ2ZHPCRH2BEJHFK3X5VS4JQ/.

begun sales of the cheapest EVs available for purchase.<sup>56</sup>

In ceding market share in battery manufacturing to East Asia and EV export opportunities across growing markets to China, the United States has undeniably lost out on economic potential as the transport sector electrifies. While the United States is unlikely to pursue a vertically integrated supply chain from mine to battery, US companies could ramp up battery assembly and manufacturing stateside, and automakers could increasingly co-locate those facilities with vehicle production plants, like Tesla's combined battery, storage, and vehicle Gigafactory in Nevada. In building scaled production for battery packs and siting facilities near vehicle assembly and consumer markets, the price point for US EVs could drop, which may both stimulate demand and increase product competitiveness at home and abroad. In claiming a stronger foothold in the vehicle supply chain of tomorrow and positioning themselves in a strategic export market by growing their share of global EV sales, US automakers have an opportunity to reap the economic and trade benefits of penetration in growing EV markets as demand continues to accelerate.

#### Compete in advanced nuclear technology

Though the United States originally developed the civil nuclear energy industry in the second half of the twentieth century, in recent decades the US nuclear sector has stalled, with only two new reactors coming online since 1996, and many having been decommissioned.<sup>57</sup> There is a direct link between the struggles of the domestic nuclear power industry and the challenges that the US civil nuclear export program has faced in recent decades. Furthermore, the US private nuclear energy sector has had to compete against Russian and Chinese state-owned enterprises, which are able to provide vendor countries with generous state-backed financing, public guarantees, and on-site labor forces.

With the support of the state behind their international projects, Russia as well as China have been able to expand the number of their nuclear reactor builds under contract around the world, which is part of a strategy to grow their geopolitical influence, since nuclear projects establish a decades-long diplomatic relationship between the vendor and purchasing country.<sup>58</sup> Russia has thirty-three new plants on order, worth around \$130 billion, and twelve currently under construction around the world in places like India and Turkey.<sup>59</sup> In contrast, the United States is set to complete just two traditional light-water reactors by 2030, both part of the Vogtle project in Georgia.<sup>60</sup> According to the US Department of Commerce, the United States has withdrawn from a market valued at between \$500 and \$740 billion over the next decade.<sup>61</sup> Beyond the missed economic potential, US leadership—in partnership with civil nuclear allies in the international nuclear energy market-ensures that new nuclear reactors adhere to the highest safety and nonproliferation standards.

However, the United States has an opportunity to lead in the development, deployment, commercialization, and scale of the new generation of nuclear reactors as the greater international market moves away from large light-water reactors. Given the high capital expenditure associated with large-scale nuclear reactors, SMRs can offer a more affordable, scalable, and accessible nuclear

- 58 David W. Yellen, "The trade war we want China to win: China's nuclear exports can challenge Russian dominance," *EnergySource*, February 26, 2020, https://www.atlanticcouncil.org/blogs/energysource/the-trade-war-we-want-china-to-win-chinas-nuclear-exports-can-challenge-russian-dominance/.
- 59 "Russia leads the world at nuclear-reactor exports," *The Economist*, August 7, 2018, https://www.economist.com/graphic-detail/2018/08/07/russia-leads-the-world-at-nuclear-reactor-exports.
- 60 "Vogtle," US Department of Energy Loan Programs Office, accessed March 25, 2021, https://www.energy.gov/lpo/vogtle.
- 61 Jonathan Chesebro, 2016 Top Markets Report: Civil Nuclear, US Department of Commerce, International Trade Administration, May 2016, http://large.stanford.edu/courses/2017/ph241/morris-s1/docs/ita-may16.pdf.

<sup>56</sup> Fermín Koop, Manuela Andreoni, Andrés Bermúdez Liévano, and Alejandra Cuéllar, "Chinese electric buses roll out across Latin America," Diálogo Chino, July 6, 2020, https://dialogochino.net/en/climate-energy/36128-chinese-electric-buses-rollout-across-latin-america/; Aditi Shah, "China's Great Wall agrees to buy General Motors' India plant," Reuters, January 17, 2020, https://www.reuters.com/article/ us-india-great-wall-motor-gm/chinas-great-wall-agrees-to-buy-general-motors-india-plant-idUSKBN1ZG0QB; "Canalys: China's electric vehicle sales to grow by more than 50% in 2021 after modest 2020," Business Wire, February 22, 2021, https://www.businesswire.com/ news/home/20210222005461/en/Canalys-China%E2%80%99s-electric-vehicle-sales-to-grow-by-more-than-50-in-2021-aftermodest-2020.

<sup>57 &</sup>quot;What is the status of the US nuclear industry," Energy Information Administration, last updated April 15, 2020, https://www.eia.gov/energyexplained/nuclear/us-nuclear-industry.php.

energy opportunity with strong export potential across the world. As countries like Poland move to decarbonize their energy mixes, next generation reactors are a potentially viable option to provide reliable, zero-carbon power, and they may be well-suited to accessing remote and rural areas. The United States serves as a current entrepreneurial leader in developing the next generation of reactor technologies, which may provide an opportunity to elevate US global leadership in civil nuclear technologies, especially if international demand for nuclear energy triples by 2050.<sup>62</sup>

#### Develop a hydrogen economy

Given the challenge of achieving net-zero emissions by 2050, hydrogen will inevitably be part of the clean energy equation. As a high-energy-density, zero-carbon fuel source, hydrogen can be used to decarbonize hardto-abate sectors like cement or steel, lower emissions and cut pollution in diesel ground transport, and provide long-duration or grid-scale energy storage. The United States maintains one of the largest hydrogen pipeline infrastructure systems and is among the biggest producers of hydrogen, mostly from steam reforming of natural gas.<sup>63</sup> The US oil and gas industry possess the technological expertise and human capital necessary to scale the domestic hydrogen market and develop a robust export regime for ammonia and steam methane reforming technology.64 And with abundant renewable energy generated in California and the Midwestern wind

belt, the United States could scale "green" hydrogen production at home or potentially sell the fuel abroad, particularly to growing markets in Europe and East Asia.<sup>65</sup> However, unlike the European Union, the United States currently lacks a national hydrogen strategy or incentive programs to facilitate hydrogen market growth.<sup>66</sup> Lest it miss a key opportunity as the field evolves, the US government should take advantage of existing national expertise and infrastructure, as well as rising global demand, to lead in this pivotal space.

To do so, the United States could employ lessons learned from the European Union and concentrate hydrogen production and deployment in key regional clusters, like ports, transport hubs, and industrial centers.<sup>67</sup> For example, the Los Angeles Port Authority, in taking advantage of California's rich renewable energy resources, could produce green hydrogen at scale and integrate it into port operations in lieu of dirtier fuels, and replace heavy diesel trucks with hydrogen fuel-cell vehicles.68 On the Gulf Coast, the greater Houston area, home to the largest port in the nation by tonnage and the US energy epicenter, offers another bright opportunity for US hydrogen. Endowed with nearly one thousand miles of existing pipeline, low-cost methane and hydrogen production, and geological storage, the Texas Gulf Coast is well positioned to become a global clean hydrogen leader.<sup>69</sup> And beyond the coasts, opportunity exists for hydrogen development and deployment in Midwestern industrial hubs. Hydrogen can also be

- 65 James Temple, "How falling solar costs have renewed clean hydrogen hopes, *MIT Technology Review*, August 7, 2020, https://www.technologyreview.com/2020/08/07/1006126/green-hydrogen-affordable-solar-wind-renewables/.
- 66 *Hydrogen Roadmap Europe*, Fuel Cells and Hydrogen Joint Undertaking, European Union, January 2019, https://www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe\_Report.pdf.
- 67 David W. Yellen and Randolph Bell, *The Atlantic Council Hydrogen Policy Sprint Brief 1: Has Hydrogen's Time Come in the United States?* Atlantic Council Global Energy Center, March 2, 2021, https://www.atlanticcouncil.org/wp content/uploads/2021/03/AC\_ HydrogenPolicySprint\_1.pdf.
- 68 "Port of Los Angeles Preliminarily Awarded \$41 million from California Air Resources Board to Launch Zero Emissions Hydrogen-Fuel-Cell-Electric Freight Project," Port of Los Angeles, September 14, 2018, https://www.portoflosangeles.org/references/news\_091418\_ carb\_toyota.
- 69 Brett A. Perlman, "Houston as the Capital of a Low Carbon Energy World," University of Houston and Center for Houston's Future, accessed March 25, 2021, https://uh.edu/uh-energy/educational-programs/tieep/content/houston-as-the-capital-of-a-low-carbon-energy-world-brett-perlman.pdf.

<sup>62</sup> Jackie Kempfer, Todd Moss, Jake Kincer, Josh Freed, and Jessica Lovering, "Mapping the Global Market for Advanced Nuclear," Third Way, September 22, 2020, https://www.thirdway.org/memo/mapping-the-global-market-for-advanced-nuclear.

<sup>63 &</sup>quot;H<sub>2</sub>Economy Today, *Bloomberg*, last updated October 2019, https://sponsored.bloomberg.com/news/sponsors/features/hyundai/explore-the-global-hydrogen-economy-today/?adv=16713&prx\_t=aXwFABAY\_At\_sQA.

<sup>64</sup> Jennifer A. Dlouhy and Will Wade, "John Kerry touts opportunities for oil and gas companies in a hydrogen-powered future," WorldOil.com, March 2, 2021, https://www.worldoil.com/news/2021/3/2/john-kerry-touts-opportunities-for-oil-and-gas-companies-ina-hydrogen-powered-future.

blended into existing natural gas pipelines to reduce emissions and build commodity demand.<sup>70</sup> Opportunities abound across the country to scale the hydrogen market, and with strong state and federal policies in addition to investment from applicable stakeholders, the United States could garner geo-economic leverage as this sector continues to grow.

#### Scale carbon capture, utilization, and storage

To reach net-zero emissions by 2050, global leaders must embrace the need to capture, store, and reuse carbon from fossil fuel, heavy industry, and waste facilities, among other emitting sites.<sup>71</sup> Emissions generated from a steel mill, land fill, or gas-fired power plant can be stored in the ground or upcycled into productive commodities like ethanol, acetate, and sustainable fuels.72 While in a nascent stage globally, the industry in the United States represents half of the operating CCUS plants in the world, with the potential to commercially scale the technologies domestically and abroad.73 In capitalizing on existing pipeline infrastructure and expertise, US players could grow the industry at home and subsequently enter other regional markets. It is likely that countries across Asia, from Japan to Indonesia, will continue to depend on carbon-intensive fuels in the short and medium terms; by employing CCUS at international facilities in these markets, the United States could solidify its role as the sector leader, reduce global emissions, and likely generate new, sustainable products for local or broad use.<sup>74</sup> Even if the United States works to cut emissions domestically, only if other emitters are able to do the same can the world effectively battle climate change. CCUS, with the United States at the helm, could be deployed globally to achieve collective decarbonization goals.

# CALCULATE THE ECONOMIC COST OF CLIMATE INACTION

Rising global temperatures, sea level rise, and increasingly severe extreme weather events will destabilize and damage critical infrastructure, workforce productivity, property, and community well-being. US regional economies that depend on favorable climatic conditions for activities like fishing, agriculture, and tourism will need to adapt, or face serious disruption. And hotter average temperatures will result in increased energy demand and put a strain on the electric grid, rendering power output less efficient and forcing rates up.75 In the Fourth National Climate Assessment, released in 2017, the US Global Change Research Program clearly articulates that continued warming and unmitigated emissions "will cause substantial net damage to the US economy throughout the century, especially in the absence of increased adaption efforts ... annual losses in some economic sectors are projected to reach hundreds of billions of dollars by the end of the century."<sup>76</sup> The United States needs to act in this critical moment to mitigate climate risks and prevent serious economic repercussions across the country, especially for low-income communities and communities of color, which often bear the brunt of the impact.

As average global temperature continues to rise, natural disasters are expected to grow more severe and more frequent. According to a recent report published by the Environmental Defense Fund, the United States has witnessed a fourfold increase in climate-related extreme weather events since 1980.<sup>77</sup> Models predict that, with no mitigation efforts, the Southwest could experience seventy more extreme heat days every year, the Western states could see six times more acres burned as a

- 70 "Hyblend Project To Accelerate Potential for Blending Hydrogen into Natural Gas Pipelines," National Renewable Energy Laboratory, November 18, 2020, https://www.nrel.gov/news/program/2020/hyblend-project-to-accelerate-potential-for-blending-hydrogen-innatural-gas-pipelines.html.
- 71 Amena Saiyid, "Carbon capture and storage projects need a 100-fold increase to reach net-zero: think tank," IHS Markit, December 8, 2020, https://ihsmarkit.com/research-analysis/carbon-capture-and-storage-projects-need-a-100fold-increase-to.html.
- 72 Catherine Clifford, "This start-up turns pollution from factories into fuel that powers cars and one day planes," CNBC News, July 27, 2018, https://www.cnbc.com/2018/07/27/lanzatech-turns-carbon-waste-into-ethanol-to-one-day-power-planes-cars.html.
- 73 Brad Page et al., Global Status of CCS 2020, Global Carbon Capture and Storage Institute, December 1, 2020, https://www.globalccsinstitute.com/wp-content/uploads/2021/03/Global-Status-of-CCS-Report-English.pdf.
- 74 "Asia is set to support global coal demand for the next five years," International Energy Agency, December 17, 2019, https://www.iea.org/news/asia-is-set-to-support-global-coal-demand-for-the-next-five-years.
- 75 Fourth National Climate Assessment: Summary Findings, US Global Change Research Program, 2018, Revised February 2020, https://nca2018.globalchange.gov/#sf-1.

<sup>76</sup> Ibid.

<sup>77</sup> Marcy Lowe & Rebecca Marx, *Climate Change-Fueled Weather Disasters: Costs to State and Local Economies, Environmental Defense Fund*, Summer 2020, https://www.edf.org/sites/default/files/content/report-ClimateChange-FueledWeatherDisasters.pdf.

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Houston-area residents canoe down flooded city streets after Hurricane Harvey inundated the metropolitan area with trillions of gallons of water in August 2017. Shutterstock/Irina K

result of fires, and the Gulf could suffer nearly twice the number of Category 4 and 5 hurricanes.<sup>78</sup> Per agency data, the Government Accountability Office has calculated that, since 2005, the federal government has spent \$450 billion on disaster-related assistance, and the National Oceanic and Atmospheric Administration found that the United States experienced fourteen billion-dollar weather and climate disasters in 2018 alone, with a total price tag of \$91 billion.<sup>79</sup> In evaluating total loss to economic output, researchers writing in *Science* 

estimated that for every 1°C in increased global temperature, US global domestic product is expected to fall by 1.2 percent, costing the economy \$257 billion.<sup>80</sup> To provide just some recent examples, Hurricane Harvey, which walloped the Houston metropolitan area for more than three days in 2017, cost \$125 billion, while Hurricane Maria, which devastated the island of Puerto Rico, resulted in up to \$140 billion in damage.<sup>81</sup> None of this accounts for the incalculable price ascribed to entire livelihoods destroyed and dozens of lives lost.

<sup>78 &</sup>quot;The Rising Cost of Climate Change-Fueled Extreme Weather," Environmental Defense Fund, August 12, 2020, https://www.edf.org/climate/rising-cost-climate-change-fueled-extreme-weather.

<sup>79</sup> J. Alfredo Gómez et al., Climate Resilience: A Strategic Investment Approach for High-Priority Projects Could Help Target Federal Resources, US Government Accountability Office, October 2019, https://www.gao.gov/assets/gao-20-127.pdf; "Billion-Dollar Weather and Climate Disasters: Events (2018)," US National Oceanic and Atmospheric Administration, accessed March 25, 2021, https://www.ncdc.noaa.gov/billions/events/US/2018.

<sup>80</sup> Solomon Hsiang et al., "Estimating Economic Damage from Climate Change in the United States," *Science* 356 (June 2017): 1362-1369, accessed March 25, 2021, https://science.sciencemag.org/content/356/6345/1362.

<sup>81</sup> Chris Mooney, "Hurricane Harvey year's costliest US disaster at \$125 billion in damages," *The Texas Tribune*, January 8, 2018, https://www.texastribune.org/2018/01/08/hurricane-harvey-was-years-costliest-us-disaster-125-billion-damages/; Adrian Florido, "Puerto Rico Estimates It Will Cost \$139 Billion To Fully Recover From Hurricane Maria," National Public Radio, August 9, 2018, https:// www.npr.org/2018/08/09/637230089/puerto-rico-estimates-it-will-cost-139-billion-to-fully-recover-from-hurricane-m.

The February 2021 Texas cold snap and subsequent energy crisis provides a vivid example of what happens when climate-related risk is not taken into consideration. In 2011, the Federal Energy Regulatory Commission and the North American Electric Reliability Corporation produced a report detailing the risks to the Texas energy system after a similar winter storm took gas, coal, and wind generation offline, forcing regulators to shed load across the state.<sup>82</sup> Texas state regulators, government officials, energy companies, and legislators all failed to heed report guidelines and recommendations, choosing to maximize profit instead of investing in important resilience and winterization measures. And while those investments would have cost billions of dollars and likely resulted in higher rates or taxes, those costs now pale in comparison to the \$50 billion in damages the state of Texas has incurred as a result of the weeklong disaster that brought the system within minutes of a full-scale months' long blackout.83 That price tag includes the tens of thousands of people whose homes flooded as their pipes burst, but it does not account for the dozens of people who lost their lives throughout the event, many of whom froze to death.<sup>84</sup> If government leaders fail to act preemptively to address climate risk, the economic damage will be severe, the catastrophe long, and the death toll high.

# ADDRESS CLIMATE CHANGE AS A NATIONAL SECURITY THREAT

The threats of climate change go far beyond economic concerns. The Biden-Harris administration's Interim National Security Strategic Guidance mentions "climate" twenty-seven times, and often in tandem with the words "crisis" and "emergency."<sup>85</sup> The focus on climate as a national security priority within the DOD establishment dates back to the George W. Bush administration, and by 2008, Congress was calling for DOD to account for the impacts of climate change in defense strategy.<sup>86</sup> Climate change poses a national security threat because it influences human migration patterns, can exacerbate social and political instability, hinders military training and readiness, and expands the scope of military missions. The United States should accelerate emissions reduction efforts to mitigate the impacts of climate change and help DOD readily adapt to a changing training and operating environment.

#### Impact on military readiness

The changing climate is already having direct impacts on military readiness, and costing billions of dollars to rebuild after natural disasters strike due to the high costs of replacing older buildings and investing in new, expensive equipment. In 2019, a DOD study found that seventy-nine priority installations across the country were highly exposed to climate threats such as sea level rise, drought, and wildfires.<sup>87</sup> Extreme weather events also lead to personnel displacement and health risks, both of which disrupt training regimens, deployment preparation, and even current global operations. Eventually, DOD will have to consider alternative locations for military installations as climate threats grow, and if natural disasters occur more frequently and resiliency measures do not improve.

Military installations along the US coasts are particularly

<sup>82</sup> Federal Energy Regulatory Commission and North American Electric Reliability Corporation, *Report on Outages and Curtailments During the Southwest Cold Weather Event on February 1-4, 2011*, August 2011, https://www.ferc.gov/sites/default/files/2020-04/08-16-11-report.pdf.

<sup>83</sup> Mark Chediak, Naureen S. Maik, and Josh Saul, "Texans Will Pay for Decades as Crisis Tacks Billions Onto Bills," *Bloomberg Green*, February 22, 2021, https://www.bloomberg.com/news/articles/2021-02-22/texans-will-pay-for-the-state-s-power-crisis-for-decadesto-come; Erin Douglas, "Texas 'second and minutes' away from catastrophic monthslong blackouts, officials say," *The Texas Tribune*, February 18, 2021, https://www.texastribune.org/2021/02/18/texas-power-outages-ercot/.

<sup>84</sup> Ryan W. Miller, "Millions of gallons have leaked from burst water pipes in just one Texas city: 'That's an incredible amount of water," USA Today, February 18, 2021, https://www.usatoday.com/story/news/nation/2021/02/18/texas-winter-weather-frozenpipes-burst-food-damage-expected/4489631001/; Sami Sparber, "At least 57 people died in the Texas winter storm, mostly from hypothermia, *The Texas Tribune*, March 15, 2021, https://www.texastribune.org/2021/03/15/texas-winter-storm-deaths/.

<sup>85</sup> The White House, Interim National Security Strategic Guidance, United States Government, March 3, 2021, https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf.

<sup>86</sup> Statement of Sherri Goodman, Senior Fellow at the Wilson Center, "Climate Change, National Security and the Arctic," US House of Representatives Committee on Appropriations, United States Government, 117th Congress, 2021.

<sup>87</sup> Office of the Under Secretary of Defense for Acquisition and Sustainment, *Report on Effects of a Changing Climate to the Department of Defense*, January 10, 2019, https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGE-REPORT-2019.PDF.

#### **ISSUE BRIEF**

Raising US Climate Ambition in Advance of COP26: An Economic and National Security Imperative



US Navy aircraft deliver critical aid to Filipino citizens in the wake of Typhoon Haiyan—one of the most powerful tropical cyclones ever recorded—in 2013. REUTERS/Wolfgang Rattay

vulnerable to changes in the ocean's temperature, which impact sea level and the intensity of hurricanes and floods. Hampton Roads, Virginia, is a clear-cut example of the vulnerabilities of US military installations to sea level rise. Naval Station Norfolk has one of the highest rates of sea level change of any station along the East Coast, at an average increase of 4.73 millimeters per year.<sup>88</sup> The region already must cope with tidal flooding, which impacts daily operations and damages critical infrastructure.<sup>89</sup> Over the last few years, other coastal bases have faced devastating impacts from hurricanes, such as Hurricane Florence in 2018, which struck Camp Lejeune, and Hurricane Michael, also in 2018, which hit Tyndall Air Force Base, causing \$3.6 billion and \$1.4 billion in damages, respectively.<sup>90</sup> Rebuilding efforts were still ongoing in 2020 as Tyndall Air Force Base prepared for twin hurricanes that pummeled the Gulf Coast.<sup>91</sup>

Extreme heat waves result in prolonged drought and increase the likelihood of wildfires, in addition to creating hazards to human health. During the wildfires that stretched across the West Coast in 2020, Camp Pendleton and the surrounding region had to evacuate seven thousand people when one fire burned 4,200 acres

<sup>88</sup> National Oceanic and Atmospheric Administration, "Relative Sea Level Trend: 8638610 Seawells Point, Virginia," accessed on March 25, 2021, https://tidesandcurrents.noaa.gov/sltrends/sltrends\_station.shtml?id=8638610.

<sup>89</sup> Statement of Ann C. Phillips, Rear Admiral, US Navy (Retired), Special Assistant to the Governor of Virginia for Coastal Adaptation and Protection, "Promoting Resiliency of Our Nation's Water Resources Infrastructure," US House of Representatives Subcommittee on Water Resources and Environment, United States Government, 116th Congress, 2019.

<sup>90</sup> Shawn Snow, "3.6 Billion Price Tag to Rebuild Lejeune Buildings Damaged by Hurricane Florence," Marine Corps Times, December 12, 2018, https://www.marinecorpstimes.com/news/your-marine-corps/2018/12/12/36-billion-price-tag-to-rebuild-lejeune-buildings-damaged-by-hurricane-florence/; Rachel S. Cohen, "A Tyndall Plan Is Ready, but Will Funding Follow?" Air Force Magazine, April 30, 2019, https://www.airforcemag.com/a-tyndall-plan-is-ready-but-will-funding-follow/.

<sup>91</sup> Rachel S. Cohen, "Gulf Coast Air Bases Prepare for Possible Twin Hurricanes," *Air Force Magazine*, August 21, 2020, https://www.airforcemag.com/gulf-coast-air-bases-prepare-for-possible-twin-hurricanes/.

of land overnight.<sup>92</sup> Other bases, especially those that conduct basic training, struggle with increasing temperatures and meeting training requirements. When temperatures and humidity reach a certain threshold, base commanders have to call a "black flag" day and decrease levels of training activities for personnel safety. Military leaders are under strong pressure to take responsibility for cases of heat stroke and exhaustion, which increased by 60 percent between 2008 and 2018, some even resulting in the death of service members.<sup>93</sup>

#### Impact on military missions

When disasters strike, the US military must mobilize to prepare installations, evacuate personnel, and organize the first response for the surrounding community. As natural disasters increase in frequency and severity, as described above, new mission requirements arise, both domestically and around the world. For example, during the hurricane season in 2020, Gulf States Louisiana, Mississippi, Alabama, and Florida organized the National Guard to lead disaster response and called on the Coast Guard to assist with search and rescue operations.<sup>94</sup> On a global scale, the US military is also a leader in humanitarian assistance and disaster relief (HADR), notably responding to Typhoon Haiyan in the Philippines in 2013 and the Great East Japan Earthquake in 2011. Climate change could cause demands for US HADR missions to increase over time.95

Aside from HADR missions, increased involvement of the US military in conflict resolution or peacekeeping operations could also result from climate-driven extreme weather events. Longer-term security impacts of climate change-such as droughts, crop failure, and spread of disease-can indirectly lead to political instability and human migration, especially in the most climate-vulnerable and fragile states as defined by the Organisation for Economic Co-operation and Development.<sup>96</sup> The Pacific Islands Forum's Boe Declaration on Regional Security calls climate change the "single greatest threat to the livelihood, security, and wellbeing of the peoples of the Pacific."97 Pacific countries are dealing with increasing food and water insecurity and potential forced migration as sea level rise makes living areas uninhabitable. In other parts of Asia, such as the Mekong Delta, countries like Vietnam are also susceptible to sea level rise, which causes salinization of fresh water supplies and threatens agriculture and aquaculture productivity.98 Finally, sub-Saharan Africa is warming 1.5 times faster than the global average, causing displacement of people across the Sahel, which exacerbates societal tensions in countries like Mali and Nigeria and causes increased competition for food and water resources.<sup>99</sup> Data from the Pew Research Center show that countries from this region of Africa collectively had the highest growth of emigrant populations to places like Europe and the United States, second only to Syria, between 2010 and 2017.100 While climate change is not the sole cause of food insecurity, political instability, or human migration, it is a "threat

- 92 Alex Riggins, David Hernandez, and Gary Warth, "Evacuations Lifted in Fallbrook, Camp Pendleton as Crews Halt 4,200-Acre Brush Fire," Los Angeles Times, December 24, 2020, https://www.latimes.com/california/story/2020-12-24/300-acre-fire-san-fallbrook-camppendleton.
- 93 David Hasemyer, "Military Fights a Deadly Enemy: Heat," NBC News and Inside Climate News, July 23, 2019, https://www.nbcnews.com/news/us-news/military-s-climate-change-problem-blistering-heat-killing-soldiers-during-n1032546.
- 94 Jared Morgan, "Gulf Coast Military Bases Brace for Hurricane Sally," *Military Times*, September 15, 2020, https://www.militarytimes.com/ news/your-military/2020/09/15/gulf-coast-military-bases-brace-for-hurricane-sally/.
- 95 Ed McGrady, Maria Kingsley, and Jessica Stewart, *Climate Change: Potential Effects on Demands for US Military Humanitarian Assistance and Disaster Response*, CNA Analysis & Solutions, November 2010, https://apps.dtic.mil/sti/pdfs/ADA564975.pdf.
- 96 "States of Fragility," Organisation for Economic Co-operation and Development, last updated September 17, 2020, http://www3.compareyourcountry.org/states-of-fragility/overview/0/.
- 97 François Gemenne, Bastien Alex, and Alice Baillat, Implications of Climate Change on Defence and Security in the South Pacific by 2030, Observatory on Defence and Climate, May 2019, https://climateandsecurity.files.wordpress.com/2019/07/ obs\_climat-et-dc3a9fense\_201905-re-implications-of-climate-change-in-the-south-pacific-by-2030-spdmm-report.pdf.
- 98 Shiloh Fetzek, Rachel Fleishman, and Andrea Rezzonico, Climate Security and the Strategic Energy Pathway in Southeast Asia, International Military Council on Climate and Security, February 2021, https://imccs.org/wp-content/uploads/2021/01/Climate-Security-and-the-Strategic-Energy-Pathway-in-SOUTHEAST-Asia\_February-2021.pdf.
- 99 Igarapé Institute, West Africa at the Precipice: Visualizing Climate Stress and Insecurity, February 2021, https://igarape.org.br/ wp-content/uploads/2021/02/2021-02-18-4P-West-Africa-at-the-Precipice-Visualizing-Climate-Stress-and-Insecurity.pdf.
- 100 Phillip Connor, "International Migration from sub-Saharan Africa Has Grown Dramatically since 2010," Pew Research Center, February 28, 2018, https://www.pewresearch.org/fact-tank/2018/02/28/ international-migration-from-sub-saharan-africa-has-grown-dramatically-since-2010/.

multiplier" that exacerbates these issues, and can potentially lead to conflict that threatens US national security interests and warrants a US military response.<sup>101</sup>

#### **Shaping DOD's Response to Climate Risk**

If global emissions reductions do not start to decline dramatically, climate change will increase strains on the US military, challenge operational readiness, and intensify social and political unrest around the world, which could lead to future warfare. The Department of Defense, under the leadership of Secretary Lloyd Austin, will be addressing these threats by integrating climate risk across the department's planning and strategy efforts. Secretary Austin recently stood up a Climate Change Working Group that will oversee the implementation of these efforts and track progress toward whole-of-government climate security objectives, in close coordination and consultation with Congress and other agencies.<sup>102</sup> Engagement with members of Congress, especially as it pertains to local constituencies, will also help support DOD's efforts in climate mitigation. Reducing fossil fuel consumption in military operations will ultimately save the lives of US troops who have been historically at risk during fuel transport and make the military more agile.<sup>103</sup> In terms of installation energy, legislation can drive procurement in renewable energy and improve energy efficiency measures to reduce emissions because most of DOD's three hundred thousand buildings are covered by federal energy management.<sup>104</sup> Due to its sheer size and purchasing power, DOD can reshape energy markets. US military bases around the country are already taking active steps to expand renewable energy and modernize outdated grid infrastructure, which improves resiliency in the electricity system and brings workforce benefits to neighboring communities.

# BUILD MOMENTUM FOR GLOBAL CLIMATE ACTION

The United States' executive branch has an ambitious agenda to accelerate the domestic energy transition and, in the process, bring economic benefits to local communities across the country and protect national security interests. Support for this agenda will have to come from Congress and every agency across the government to achieve success. The Energy Act of 2020, passed in December, provides support for technologies such as carbon capture, energy storage, and advanced nuclear as well as technological innovation, and is a historic support package for energy and national security. The United States now has an opportunity to build on this foundation of bipartisan action to address the impending threats of climate change to domestic economic and social systems. Until recently, the United States was the top greenhouse gas (GHG) emitter, and remains one of the highest emitters per capita in the world.<sup>105</sup> Therefore, the United States has an obligation to act to reduce emissions and contribute to global efforts for climate change mitigation.

The United Nations Framework Convention on Climate Change process is the most effective mechanism to bring countries together to address climate change. Many analysts criticize the system for being imperfect, arguing that the Paris Agreement falls short of efforts needed to achieve a 1.5°C scenario. However, the Paris Agreement can improve only through the bottom-up commitments of its signatories. COP26 in Glasgow this November offers the chance for the global community to come together and not only reaffirm commitments to the mutual goal of reducing GHG emissions, but to work out the important processes to enhance global efforts, develop evaluation mechanisms to track meaningful progress, and increase support for developing countries to reach climate ambitions. The UK COP26 Presidency has made every effort to maximize the gap

105 Mengpin Ge and Johannes Friedrich, "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors," World Resources Institute, February 6, 2020, https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector.

<sup>101</sup> CNA Corporation, National Security and the Threat of Climate Change, April 2007, https://www.cna.org/cna\_files/pdf/national%20security%20and%20the%20threat%20of%20climate%20change.pdf.

<sup>102</sup> US Secretary of Defense, "Establishment of the Climate Working Group," March 9, 2021, https://media.defense.gov/2021/Mar/10/2002597518/-1/-1/0/ESTABLISHMENT-OF-THE-CLIMATE-WORKING-GROUP.PDF.

<sup>103</sup> Jon Powers and Michael Wu, "A Clean Energy Agenda for the US Department of Defense," *Energy Source*, January 14, 2021, https://www.atlanticcouncil.org/blogs/energysource/a-clean-energy-agenda-for-the-us-department-of-defense/.

<sup>104</sup> Heather L. Greenley, *Department of Defense Energy Management: Background and Issues for Congress,* Congressional Research Service, July 25, 2019, https://fas.org/sgp/crs/natsec/R45832.pdf.

in convenings due to the pandemic to encourage public and private sector actors around the world to set more ambitious climate targets, and ultimately aim to achieve global net-zero GHG emissions by 2050. The United States will play a pivotal role in supporting the agenda of the COP26 Presidency and work together with allies and partners to build lasting climate action beyond November to ensure a prosperous and secure future.

This brief makes the following policy recommendations for the United States' enhanced climate action for economic and national security interests:

- Promote a green economic recovery: As the United States prepares for the post-pandemic era, stimulus packages and other forms of government support can rebuild the economy in a way that facilitates the decarbonization of the oil and gas sector and the expansion of clean energy. Further, targeted policies can create employment opportunities and ensure a just energy transition.
- Raise US geo-economic competitiveness in the energy transition: Government support for the development and deployment of technologies—such as electric vehicles, advanced nuclear, hydrogen, and CCUS—will be crucial for the decarbonized energy system. Global leadership in these technologies can provide the United States with important geo-economic advantages over adversaries and, at the same time, help partners and allies reach emissions reduction targets.
- Calculate the economic cost of climate inaction: Enhanced climate mitigation and adaptation efforts can save the US government billions of dollars from disaster-related assistance and prevent losses to future economic output. Further, developing regulations that require robust climate risk assessments and protections can save costs and, ultimately, American lives.

- Address climate change as a national security threat: Reduced carbon emissions can lessen the strain on the US military by mitigating the threat of climate-related disruptions to living and training environments that impede warfighting readiness and cost billions to repair. Additionally, both climate mitigation and adaptation efforts can protect the stability and livelihoods of climate-vulnerable populations to prevent forced migration and potential conflict.
- Build momentum for global climate action: The United States should set an example for climate action, starting with the release of a more ambitious NDC, and shape domestic policies to develop pathways for carbon-free electricity and, eventually, netzero emissions. At the same time, the United States should support the COP26 Presidency by encouraging other countries to enhance emissions reduction targets to align with the 1.5°C scenario outlined in the Paris Agreement.

The United States is in the process of reviewing its NDC targets and can set an example for the world by leveraging the full weight of the US government to support climate ambition, as well as the impressive efforts of states and cities around the country. However, the United States will not succeed in fighting climate change alone. Even if it achieves net-zero emissions by 2050, all action will be insufficient to tip the balance and prevent severe disruptions to the current way of life, like the country is already seeing with wildfires across the West Coast and extreme temperature fluctuations across Texas. A united global effort to transform the conventional energy system is required to mitigate climate impacts, protect biodiversity, and ensure a bright future for generations to come. Raising US Climate Ambition in Advance of COP26: An Economic and National Security Imperative



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