



Atlantic Council

VETERANS ADVANCED
ENERGY PROJECT

Veterans Advanced Energy Fellowship Policy Proposals



Atlantic Council

VETERANS ADVANCED ENERGY PROJECT

The Veterans Advanced Energy Project is designed to drive US leadership in advanced energy by recruiting, equipping, and empowering military veterans who understand the importance of the evolving energy landscape to our future security and prosperity.

Advanced energy is defined by leading edge energy technologies including solar, wind, batteries, microgrids, advanced nuclear, electric vehicles, and end-user energy efficiency.

The Veterans Advanced Energy Project mission applies to veterans of the US armed services and national guard, reservists, active-duty service members, and their spouses.

The Veterans Advanced Energy Project is housed within the Atlantic Council Global Energy Center, which 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.

For more information, please visit www.AtlanticCouncil.org

Cover image: Jerimie Williams, Wind Technician and Air Force Veteran, stands atop a wind turbine at Invenergy's Goldthwaite Wind Energy Center. Invenergy is the Founding Sponsor of the Veterans Advanced Energy Project.

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Veterans Advanced Energy Fellowship 2021 Policy Proposals

As part of the 2020-2021 Veterans Advanced Energy Fellowship, each fellow prepared a policy memo and a persuasive five-minute flash talk on a topic related to national security, advanced energy, and/or military veterans. Both the written and oral presentations of the policy proposal were developed with the assistance of an advisor from the Atlantic Council network.

Each policy proposal diagnoses a problem and proposes a solution to a specific actor or actors. The papers include an executive summary, background on the topic, an analysis of the problem, and a proposed course of action. Fellows also consider the counterarguments of the policy prescription to strengthen the proposed pathway. Fellows were strongly encouraged to select a topic that they have a professional or personal connection.

The five-minute persuasive flash talks were presented to the Atlantic Council Global Energy Center and Veterans Advanced Energy Project network on June 15, 2021 and on August 2, 2021 during the 2021 Veterans Advanced Energy Week.



ABOUT VAEF

The Veterans Advanced Energy Fellowship seeks to create a cadre of future leaders within the advanced energy industry. A successful fellow will become a peer mentor, advocate, and spokesperson for other veterans, reservists, and military spouses, helping to solidify the advanced energy connection to national security and the mission-driven advancement of veterans' employment in advanced energy. As fellows rise within advanced energy organizations, they can more closely tie national security to energy security, as well as move the advanced energy economy forward. Learn more at www.vetsenergyproject.org/fellowship

2020-2021 VETERAN ADVANCED ENERGY FELLOWS



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A Combined Tax Credit Strategy to Stimulate Domestic Lithium-Ion Demand and Support Increased US Presence in the Lithium-Ion Value Chain

By: Jonathon Gillis

Significant bipartisan attention has been paid to China's dominance of the lithium-ion value chain. Chinese concentration threatens national security and US competitiveness in electronics, grid storage, and transportation. Many prior discussions have focused on the first stage of the lithium-ion value chain, sourcing, of which the United States owns less than 1% of the global share. However, recent work by the US International Trade Commission has found that "the unrefined product value chain (mining/extraction) is geographically diverse amongst the four key materials, while the refining value chain that precedes the final product manufacturing (LIBs) is clustered across Asia, especially in China." Countering growing Chinese influence in lithium-ion production will require the United States to scale domestic capability across the entire value chain, including refining, anode and cathode production, cell manufacturing, and recycling.

Stimulating and supporting a domestic lithium-ion value chain will require robust and predictable demand. Early output by US refiners and manufacturers is likely to be more expensive than Chinese products and may suffer from quality challenges. These issues will be resolved as US producers "learn by doing," but early buyers are critical to support this transitional stage. Past supply-side lithium-ion incentives in the United States assumed substantial growth in the electric vehicle (EV) market. When this growth failed to materialize, manufacturers supported by federal grants filed for bankruptcy and were subsequently acquired by Chinese firms. While the US EV market now appears poised for greater near-term growth, the failures of 2009 supply-side incentives are still instructive. Barring mandates and more substantial subsidies for EVs, reliance on EVs to support a concerted scaling effort in US refining and manufacturing is hazardous, especially because vehicle buyers outside of the luxury market are highly price sensitive.

A supplementary and more predictable source of early demand is grid storage. A number of studies have found that storage will become increasingly important for electric reliability and price stability as the share of variable generation increases. Storage is not a perfect substitute for transmission, but it can alleviate transmission congestion and reduce the need for time- and resource-intensive transmission expansion projects in certain areas. When configured appropriately, storage can also provide valuable resilience services at critical facilities. Notably, grid storage projects are less constrained by size than EVs, making them a more likely market for early domestic manufacturing output.

Currently, there are no federal subsidies for standalone storage. Storage facilities looking to take advantage of investment tax credits must pair with solar or other subsidized forms of generation.

This requirement prevents standalone storage from being financeable in most circumstances. Bipartisan bills introduced in the House and Senate this year seek to expand investment tax credits to include standalone storage, which is an appropriate measure. However, as noted

above, early US manufacturing output may not be cost competitive with Chinese products, so an expansion of US investment tax credits may still fail to stimulate demand for domestically produced storage. Additionally, batteries manufactured abroad and integrated into the US electric system may be exploited later by state actors familiar with their vulnerabilities. Consequently, grid storage incentives should seek to create demand specifically for domestically-produced storage technologies. Investment tax credits should be supplemented by an additional “Made in America” tax credit for storage products meeting some defined requirements. Such a tax credit was proposed by the Biden campaign in September 2020.

Subsidies for domestically-manufactured storage technologies are an important supplement to supply-side investment. Grid storage is a critical component of grid modernization planning, which itself is a subset of necessary infrastructure improvements. The current infrastructure bill presents an opportunity to implement this practical approach. Policymakers of both parties should support targeted subsidies designed to enhance the US presence in the lithium-ion value chain and to support research and development in next-generation storage technologies. An investment tax credit for standalone storage paired with an additional “Made in America” incentive will stimulate demand and allow domestic manufacturers time to bring costs to parity with China. This approach has the additional benefit of reducing supply chain vulnerabilities and enhancing national security.

Colorado's Opportunity to Lead with a Just Climate Transition

By: Mike Hennen

Summary

Colorado's legislature and Governor Jared Polis should solidify the state's commitment to climate leadership and a just workforce transition by developing a comprehensive labor plan for the energy transition, expanding the role of the Just Transition Advisory Council to broaden collaboration on energy policy, and fund new programs to support transitioning workers.

Context

Colorado has established itself as a leader with commitments to cut emissions 50% by 2030, 90% by 2050, and with ambitious plans from the state's electric utilities to cut their emissions at an even faster pace. Equally important, the state has recently established a first-of-its-kind [Office of Just Transition](#), charged with supporting coal workers, employers, and communities as the state's economy shifts away from coal. In late 2020, the office published its [Just Transition Action Plan](#), outlining a suite of recommendations to support economic growth in coal communities and help coal workers transition to new jobs with family-sustaining incomes. In the 2021 legislative session, lawmakers built on this plan with [new funding](#) for coal transition, and tying contractor apprenticeship standards to some [new clean energy programs](#).

The work of the just transition office is critically needed, and the experience of coal workers and communities in neighboring Wyoming offers a cautionary tale. Over the past few years, several of the nation's largest coal mines have ceased operations in Wyoming as their owners went bankrupt amid a declining national coal economy. The 2019 [bankruptcy of Blackjewel](#) unfolded abruptly, with 500 workers sent home mid-shift, workers left with unpaid wages and unfunded retirement accounts, and terminated health care benefits. The impacts of coal's decline in Colorado have been more modest to date, and the proactive work of the Just Transition Office will be critical to avoiding such abrupt and damaging economic collapses as seen in Wyoming.

But this plan for the coal sector is not sufficient to manage Colorado's climate transition. A comprehensive labor plan for the energy transition must also ensure new jobs in clean energy are at least as attractive as those displaced in fossil fuel sectors. And it must address more than just coal, as Colorado's oil and gas industries also face disruption in years to come. While [the state identifies](#) between 2,000 and 3,000 potential coal transition workers, [more than 33,000](#) Coloradans work in the oil and gas sectors. The state's climate [roadmap](#) depicts in-state oil and gas production each falling 67% by 2050, and direct use of these fuels down 85% or more. This forebodes a major shift across existing Colorado industries, from extraction to processing to distributing these fuels. The state now has planning frameworks for overall [greenhouse gas reductions](#), for [transitioning coal workers](#), and for [climate equity](#), but it has no plan for affected oil and gas workers or others affected throughout the state. Meanwhile, new jobs in the clean energy economy, from solar installation to wind turbine manufacturing, have lower rates of union membership and [lower average wages](#) than the fossil jobs being threatened.

Recommendation

Colorado's governor, Jared Polis, and legislature should advance a policy package to expand the state's just transition planning efforts to address the quality of new clean energy jobs being created and ensure more comprehensive transition support for displaced workers across fossil fuel sectors. Specifically, these policies should include three actions, outlined below.

First, new legislation can direct the Colorado Department of Labor and Employment, in concert with the Office of Just Transition, to conduct a new inclusive planning process to both (a) identify how to ensure the new clean energy economy delivers jobs with family-sustaining wages and inclusive opportunities for accessing these new career fields, and (b) identify the other sectors and workers at risk of displacement during the energy transition and prioritize early interventions to secure their economic future. These plans could take many forms, including supporting apprenticeship requirements or prevailing wage standards for new clean energy employment driven by state policies, or funding programs to mitigate methane leakage at old oil and gas sites or abandoned mines.

Second, the state can expand the membership and role of the Just Transition Advisory Council to address economic sectors beyond coal, including those poised to grow, like wind and solar, and those at risk, like oil and gas. This council can create a venue for constructive engagement among state officials, labor unions most affected by this transition, affected businesses such as utilities and oil and gas producers, environmental advocates, and local government representatives from affected communities around the state. This council should develop a foundation for policies that meet the high ambition of the state's climate goals while supporting displaced workers.

Third, the state should commit substantial new funding for a just worker transition. Legislators recently passed a bill allocating \$8 million to fund coal transition efforts, but more will be needed for a broader program across sectors. Future programs can help more displaced workers build skills, find good jobs, or start businesses.

Conclusion

Colorado has quickly established itself as a climate leader and taken important early steps to support a just transition for coal workers and communities. To solidify its leadership and make lasting progress toward both environmental and labor goals, policymakers should expand the state's just transition efforts to build high quality jobs in the new energy economy, support all workers threatened with disruption by the energy transition, foster improved collaboration on climate and labor policy, and back these commitments up with funding for long-term programs.

The Clean Energy Jobs Act Supports Equitable Economic Growth in Parallel with Environmental Sustainability

By: Jessica Klinge

Recommendation

The Illinois General Assembly should pass HB 3624, the Clean Energy Jobs Act (CEJA), so that Illinois can achieve 100 percent clean energy by 2050 while attracting billions of dollars in renewable energy investment to Illinois, expanding money-saving efficiency programs, and promoting vehicle electrification.

Background

CEJA would expand renewable energy development in Illinois, support vehicle electrification, energy storage development, decarbonization of the power sector, and expand energy efficiency programs. The predecessor to CEJA—the Future Energy Jobs Act—was passed in 2016. It expanded energy efficiency programs, renewable energy development, and started to train individuals for the renewable energy sector. More than 1,300 people were trained for the renewable energy sector.¹ CEJA is intended to expand and build upon the Future Energy Jobs Act's success. It has four goals for Illinois: a carbon-free power sector by 2030, 100 percent renewable energy by 2050, electrification of the transportation sector, and an equitable clean energy economy that allows all citizens to benefit.²

CEJA, HB3624/SB2132, was introduced by Representative Ann Williams and Senator Cristina Castro in the Illinois General Assembly in Spring 2019. The bill was up for a vote during the legislative session held on May 31, 2021; however, it did not pass due to a disagreement about whether or not an exception should be made for the closure of the Prairie State Coal plant. Advocates to keep the plant open say local communities already have partnerships with the plant that would force them to pay for two sources of energy if the coal plant was shut down. They say the communities would pay for the coal energy they already agreed to pay for and the replacement clean energy. However, the State of Illinois has the power to relieve the communities of this contractual obligation under CEJA. Furthermore, the Prairie State Coal plant is the largest carbon polluter in Illinois. Its closure would provide health and environmental benefits.

Justification

There are multiple reasons why CEJA should be passed. This law will help the economy, create equitable job growth, and save the environment.

For the economy, CEJA will bring new investments, more jobs, and better community health.³ There will be a steady investment in new wind turbines, solar panels, electric vehicles, battery storage, electrical infrastructure, and structural components. Tax payments from renewable

¹ Future Energy Jobs Act Delivering Clean Energy Benefits and Savings for ComEd Customers, Morningstar/Business-wire, <https://www.comed.com/News/Pages/NewsReleases/2021-02-18.aspx>.

² League of Women Voters, <https://my.lwv.org/illinois/chicago/article/clean-energy-jobs-act-what%E2%80%99s-it-all-about>

³ An analysis of the new private investment from: Clean Energy Jobs Act, the Accelerate Group, October 28, 2019

energy developers will occur on equipment and supplies during development and long-term from operations costs and property tax payments. These tax payments can benefit future programs to help people in Illinois.

For equitable job growth, all coalitions pushing to get the Clean Energy Jobs Act passed have stated that social justice and equity are top priorities. A great way to ensure these priorities are met is through jobs. Community leaders have felt that the Future Energy Jobs Act did not do enough to ensure equitable access to clean energy jobs, training, and opportunities. CEJA has more specific provisions for creating jobs and opportunities for people of color and to aid communities where coal plants and other fossil fuel plants have closed. Pollution from coal plants is one of the leading contributors to respiratory illnesses such as asthma. The closure of coal plants and the expansion of renewable energy will improve the health of all communities, but especially communities that are near—or were formerly near—coal plants.

One community that should be listed as a priority group is the military veteran community. Since equitable job growth is an important priority for CEJA, veterans should be listed. The veteran community is already employed at twice the rate in energy efficiency jobs than they are represented in the economy as a whole. Energy and energy efficiency jobs are a great fit for many veterans ending their enlistment in the Armed Services. Many have skills that can be transferred, but also many veterans seek a career with a purpose, which being part of a larger clean energy plan can fulfill. Ensuring meaningful employment can help to decrease unemployment and mental health risks in the veterans that are most vulnerable. In 2019, the VA released its National Veteran Suicide Prevention Annual Report, which stated that the suicide rate for veterans was 1.5 times the rate of non-veteran adults. Veterans are at a 50% higher risk to commit suicide. Depending on branch, up to 31% of service members develop PTSD after returning from combat. More than 1-in-10 US veterans have been diagnosed with a substance abuse disorder. More than 40% of female veterans report experiencing military sexual harassment or military sexual trauma. Veterans who have served our nation honorably deserve careers with a purpose that can help them successfully transition and integrate into the civilian world. To help our returning veterans, I believe they should be made a priority group.

For the environment, it is widely understood that to address the climate crisis, we must reduce carbon emissions from our energy sector, transportation sector, and in our buildings, as these are the largest contributors to our changing climate. CEJA addresses each of these and more. Under CEJA, carbon emissions will decrease through the expansion of renewable energy, energy storage, electric vehicles, and energy efficiency. CEJA establishes minimum new build requirements for producers of renewable energy of 5 million MWh of new construction from 2021 to 2030.⁴ One goal of CEJA will be to have enough large-scale solar projects to be able to power two million homes by 2030 and enough large-scale wind projects to be able to power three million homes. Energy storage would also be developed under CEJA. A development of increased energy storage would provide peak reduction and support the integration of renewable energy. CEJA intends to invest in electric vehicles through three ways. First, it will work to ensure everyone has some access to electric vehicles such as through rebates and electric car sharing programs. Second, it will support the electrification of medium to heavy vehicles such as public buses. Finally, CEJA will invest in electric vehicle charging infrastructure in homes and workplaces. The final way CEJA will decrease carbon emissions is through energy efficiency. The law will focus on home retrofits, commercial retrofits, and investments that produce savings through improving the energy efficiency of buildings.

⁴ An analysis of the new private investment from: Clean Energy Jobs Act, the Accelerate Group, October 28, 2019

Conclusion

CEJA should be passed to decrease carbon emissions, improve the health of our communities, and create jobs. As the largest carbon polluter, the Prairie State coal plant should not receive an exception to stay open. Both people and the environment will benefit. If veterans are made a priority group under CEJA, it could help to reduce veteran unemployment rates and provide new careers with a purpose that veterans are seeking. By passing CEJA and making these investments now, Illinois can reach its goal of being 100 percent operated by clean energy by 2050.

A Twelve Billion Dollar Investment in CISA Cybersecurity Capabilities

By: Justin Lau

Recommendation

Congress should provide \$12B of investment over the next 5 years to the Cybersecurity and Infrastructure Security Agency (CISA) to improve their ability to detect and monitor cyber threats within the power industry. This would fund the infrastructure, processes, regulation, and workforce training required by CISA to securely collect, share, and analyze real-time operational technology (OT) data. Successful implementation would result in a healthy and productive public-private partnership (PPP) between US bulk power system operators and the United States Government.

This proposal primarily focuses on four areas:

- 1) The development of required data definitions to perform analysis on OT-data at scale;
- 2) The construction of classified information sharing facilities (SCIF's) to securely deliver OT-data to the US intelligence community;
- 3) Training programs to foster a workforce with the right expertise to administer these initiatives; and,
- 4) Grants and incentives to promote participation by power system operators.

Introduction

As of 2019 in the United States, there were roughly 13,500 power system operators comprised of electric utilities⁵, utility-scale power producers⁶, and regional transmission operators. Each power system operator currently relies on a range of software, networking equipment, and other automation tools to ensure the grid is operated reliably and efficiently.

Current power control systems are not “air-gapped”, meaning they are not physically separated from traditional IT systems. This is not necessarily bad because the advances in connectivity and automation have created leaps in productivity for power system operators. However, each advancement and point of connectivity has also created a new attack surface for cyber-attackers. We must acknowledge the important task of proactively identifying these attack surfaces and protecting them from new threats.

Background

In 1998, the US Government first recognized the economic risk posed by hyperconnectivity of critical infrastructure and the increasingly hostile cyber landscape. At the time, President Clinton issued Presidential Directive 63 announcing the ambitions of creating a PPP focused on the cyber defense of critical infrastructure.⁷

Since then, each following administration has furthered this initiative in their own way. In the wake of 9/11, the Bush administration established the Department of Homeland Security (DHS) to oversee the physical and cyber defense of critical infrastructure.⁸ In 2013, the Obama

⁵ US Energy Information Agency: <https://www.eia.gov/todayinenergy/detail.php?id=40913>

⁶ US Energy Information Agency: <https://www.eia.gov/tools/faqs/faq.php?id=65&t=2>

⁷ [Presidential Directive 63](#) – Critical Infrastructure Protection

⁸ Executive Order 13228: Establishing the Office of Homeland Security

administration renewed DHS's focus on PPP's for cybersecurity.^{9 10} In 2015, the Obama administration created a national cybersecurity information sharing network known as E-ISAC.¹¹ In 2018, the Trump administration specifically highlighted the need to secure the bulk power system against cyber-attacks due to its criticality in operating the rest of the nation's critical infrastructure. To achieve this goal, the Trump administration published the nation's first National Cyber Strategy and created CISA, an agency specifically focused on the security of critical infrastructure.^{12 13}

Most recently, the Biden administration has announced the development of a 100-day action plan to secure the power grid. This was triggered by reports of nation-state actors intensifying their attacks on power systems in hopes of pre-positioning malware for future cyber-attacks.¹⁴

Proposal

It has been nearly 23 years since the United States first announced its PPP ambitions to boost the cybersecurity of our bulk power system, yet we are far from secure. Cyber-attackers continue to demonstrate increasing sophistication and effectiveness in infiltrating industrial systems as they grow their domain experience. Meanwhile, the transition to renewable energy increasingly relies on the capability that automation brings to ensure system stability. We need to invest in the people, processes, and facilities needed to coordinate a proper defense of these systems.

Current efforts are inadequate because of the lack of data standards, the inability to leverage the resources of the US intelligence community, and a workforce shortage with the right training to manage these initiatives. As the US continues their push towards renewable technology (and inevitably the software required to stabilize it), we need to aggressively invest in the infrastructure to protect the bulk power system. This includes:

- 1) The development of data definitions needed to perform analysis on OT-data at scale;
- 2) The construction of SCIF's to securely deliver OT-data to the US intelligence community;
- 3) Training programs to foster a workforce with the right expertise to administer these initiatives; and,
- 4) Grants and incentives to promote participation by owner/operators of power systems.

Data definitions are critical to ensuring OT-data is structured uniformly and routed to the right agency, at the right time, and in the right format for consumption by third-party algorithms. These definitions will provide a much-needed interface to analyze operational data at scale by the intelligence community. A natural place to store this data is within the Cyber Domain of the National Information Exchange Model (NIEM), which assists with cross-agency information sharing between government organizations. CISA recently declared support for NIEM and is currently responsible for the Cyber Domain.

In addition to establishing clear data definitions, there should be funding to equip the roughly 13,500 system operators with classified information sharing facilities. These facilities would enable the flow of structured data to-and-from CISA and promote participation in data sharing

⁹ [Executive Order 13636](#) - Improving Critical Infrastructure Cybersecurity

¹⁰ [Presidential Policy Directive 21](#) - Critical Infrastructure Security and Resilience

¹¹ Executive Order 13691 - Promoting Private Sector Cybersecurity Information Sharing

¹² [National Cyber Strategy of the United States of America](#), September 2018

¹³ [Cybersecurity and Infrastructure Security Agency Act of 2018](#)

¹⁴ Bloomberg: "Biden Rushes to Protect the Power Grid as Hacking Threats Grow"

programs by mitigating the risk of sensitive leaks. While outside the scope of this proposal, these facilities could also be used in separate initiatives to share information on industry software implementations, supply chain changes, and cross-sector threat intelligence. These facilities should be staffed with individuals trained on NIEM Cyber Domain standards and knowledgeable enough in power systems to act on threat intelligence received by CISA.

To ensure this workforce exists, CISA should also provide grants and incentives to universities, power system operators, and other government agencies to train and retain a workforce with expertise in data analysis, cybersecurity, and power system operations. These grants and incentives should focus on foundational education, continued education, penetration testing, and technology research. Without a vibrant and healthy community of cyber professionals in the power industry that are adept across public-private boundaries, these initiatives will not succeed.

Conclusion

The total cost for this program would involve roughly \$12B of investment over the next 5 years and would include capital investments for SCIF's at each of the major power system operators, funding for personnel to operate it, and budgets for ongoing research and training. This would increase CISA's annual budget from \$2.1B in FY22 to \$4.5B through FY26, a relatively minor investment to protect a \$21T economy.

As the power industry increasingly relies on automation to manage the transition to renewable generation, we must also recognize the dire need to invest in processes, infrastructure, and people to protect these systems. The case for power system automation is shifting from that of productivity to operational necessity. This investment would only be the start to ensuring the continued resilience and reliability of the US bulk power system.

The LITE WORK Initiative: Expanding Efforts to Reduce Emissions Across Companies' Value Chains

By: Jesse Medlong

Recommendation

Large employers in the professional services sector should help employees to better understand and address GHG emissions in the companies' value chains by subsidizing residential smart-grid technology and creating incentives for the employees to monitor and reduce their energy consumption. The goal is to make employees stakeholders in the employer's commitment to reducing emissions while simultaneously improving the performance of local grids. This is the LITE WORK Initiative (LWI).

Background

With their market influence and significant resources, large businesses are better equipped than other private actors to invest in effective solutions. Growing acceptance of this reality is accompanying a recent corporate focus on environmental, social, and governance (ESG) in business operations. Regulators and investors want companies to identify, disclose, and address ESG impacts and risks. GHG emissions are a key ESG metric for two complementary reasons. First, the systemic nature and severity of the risk from climate change poses significant risks to both business operations and investment portfolios. Second, GHG emissions are relatively easy to quantify, and our ability to do so continues to improve.

Every segment of society has a role in avoiding catastrophe, so the world cannot afford to write off any man-made source of GHG emissions. Individuals and households must be part of the solution if we are to avoid the worst effects of climate change.¹⁵ At the same time, many large employers have effectively outsourced their workday emissions to employees working remotely during the COVID-19 pandemic. Employees working from home today thus constitute a significant portion of emissions for employers in the professional-services sector, where employees are the primary revenue-generating "asset."

Despite the current lack of legal obligation to account for employee household initiatives, professional-services employers have at least three incentives for adopting LWI. First, many of these companies tout bold commitments to sustainability, and LWI can give those efforts credibility. Second, large clients and employment candidates increasingly cite sustainability as a priority, and LWI provides a way for firms to stand out from the pack in recruiting and business development.^{16,17} Third, regulatory GHG disclosure regimes taking shape around the world suggest an increasingly expansive understanding of Scope 3 (value-chain) emissions to include work-from-home emissions and even, in the case of California's pending SB 260, emissions from employee commuting. Adopting LWI can put employers ahead of the curve as these proposals solidify into legal mandates.

Proposal

¹⁵ https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_Full_Report_High_Res.pdf

¹⁶

<https://www.forbes.com/sites/adp/2016/01/01/is-corporate-social-responsibility-part-of-your-recruiting-emphasis/?sh=3d273fc87f97>

¹⁷ <https://www.lw.com/thoughtLeadership/the-greening-of-the-legal-industry> ("Clients now look to whether an organization has developed, or is taking steps toward developing, more sustainable practices as a factor in deciding where to take its business. Results of a 2012–2013 survey by the Law Firm Sustainability Network reveal that 70 percent of those surveyed use sustainability to distinguish their firms in responses to requests for proposals.")

Taken from the old English adage that “many hands make light work,” LITE WORK stands for Linking Incentives and Technology to Empower Workers to Own, Reduce, and Know their energy consumption and its impacts. The LITE WORK Initiative provides a mechanism for employers to internalize and reduce employee emissions. Companies can use LWI to further reduce emissions by incentivizing employees to monitor, understand, and reduce their energy consumption. Via LWI, employers subsidize smart-home technology for employees and reward better energy consumption. Within these bounds, LWI programs can be constructed flexibly to suit individual employers’ needs.

The equipment subsidies give employees the tools to monitor and reduce energy consumption. They also improve access for employees who might otherwise find the upfront investment out of reach. And performance-based incentives reward employees for reducing household emissions and consumption. Incentives could range from a system of points redeemable for rewards to monetary bonuses or enhanced employer contributions to retirement funds. Employers participating in LWI can integrate their employees’ reductions into their own ESG reporting, which increasingly includes certain kinds of employee emissions. But LWI also provides systemic benefits. By making energy-monitoring technology more pervasive, LWI contributes to smarter and more efficient community grids. Later iterations of LWI can incorporate other sustainability aims, such as improved water consumption or waste disposal.

Because LWI expands the company’s Scope 3 emissions to those resulting from the company’s human capital when outside of work or working from home—the new normal for many—LWI is well suited for employers already on a trajectory to carbon neutrality or looking to stand out from their peers.

Conclusion

Climate change presents challenges on a scale usually solved only over great spans of time. But time is running out. With businesses around the globe competing to showcase their sustainability bona fides, LWI provides a new avenue for action. With LWI, businesses can tackle emissions that had previously lurked out of sight from within their value chains and can fast-track adoption of technology to better monitor energy consumption and improve grid responsiveness; and, by creating incentives for employees to modify their energy consumption habits, companies make their employees partners in the effort.

Author’s Note: The LWI pilot is proposed as a pitch to the management of a large law firm, initially for 12 nonlawyer employees in a single office. In implementing the pilot, efforts will be made to collaborate with local utilities and third parties specializing in household energy consumption, such as OhmConnect or Virimodo. Assuming a successful pilot and proof of principle, scaling LWI may involve, in addition to replication, a branded certification standard.

A Plan to Consolidate Federal Climate, Energy, and Environmental Leadership into a Single Department

By: Mike Petersen

Recommendation

Recognizing that the climate crisis is resultant from anthropomorphic energy production and use and that the US has been the biggest offender in total emissions over the past 150 years—and remains so today on a per citizen basis—the US must have centralized, comprehensive, effective, and enduring administration of national energy policy, programs, and activities to address—and lead the world through—this global crisis. The US Department of Energy, created for just that purpose 44 years ago, has never fulfilled its intended *raison d'être* and must be abolished in its current form through joint action by President Biden and the US Congress, with its nuclear security and commercialization function shifted into the Department of Defense and the rest refreshed under the banner of a new, modernized Department of Energy & Environment structured into Domestic, International and Research & Development secretariats. This new federal department will function to streamline national efforts under an enduring, centralized 'one-stop-shop' for all things climate, energy, and the environment. No longer should dozens of departments and agencies design, fund, and implement domestic and international energy programs in isolation.

Background

When the Department of Energy was established in 1977, its aims were clear: (1) to coordinate the activities and policies of the multiple entities that had been independently (and rather benignly) responsible for federal non-nuclear policy and programs, and (2) centralize nuclear defense and commercialization activities and ambitions.¹⁸ The Congressional findings that justified its creation were centered on a view that the US didn't have enough domestic fossil fuel resources, which Congress considered a national security threat. Congress also believed that the government's fragmented approach to energy required a national program housed in one organization.¹⁹ Over the years, the Department has shifted focus away from its original mandates, moving to energy development and regulation in the 1970s, then onto nuclear weapons in the 1980s, and later, post-Cold War environmental remediation and nuclear stockpile management in the 1990s, while today self-describing as a primarily science and technology organization.²⁰

¹⁸ "DOE 1977-1994 A Summary History_0.Pdf," accessed February 23, 2021, https://www.energy.gov/sites/prod/files/2017/09/f36/DOE%201977-1994%20A%20Summary%20History_0.pdf.

¹⁹ "DOE Organization Act in U.S.C..Pdf," accessed February 23, 2021, <https://www.energy.gov/sites/prod/files/2017/10/f38/DOE%20Organization%20Act%20in%20U.S.C..pdf>.

²⁰ "A Brief History of the Department of Energy," Energy.gov, accessed February 23, 2021, <https://www.energy.gov/lm/doe-history/brief-history-department-energy>.

More than twenty years after the Department's last shift in focus, 72% of global emissions are derived from energy production and use, the US responsible for 15% of it.^{21,22} Recognizing the importance of the issue, President Biden issued an Executive Order focused on the climate crisis in his first week in office. This order stated that the crisis is urgent and to address it the US would take actions to advance clean energy transition initiatives and sectoral decarbonization.²³ Coordination of federal "action" would seem to be imperative to success.

Yet one glance at federal government organization today demonstrates that the Department of Energy has not "brought most federal energy activities under one umbrella", as intended.²⁴ In fact, at least 14 other federal agencies oversee energy divisions, departments, offices, and programs, many of which overlap or compete. These can be found in executive departments such as State, Defense, Agriculture, Transportation and Commerce. They are embedded in wholly owned government corporations like the Millennium Challenge Corporation, Export-Import Bank, and the International Development Finance Corporation. And not to be left out, independent federal agencies like the EPA, NASA, USAID, US Trade and Development Agency, and the National Science Foundation operate and fund their own programs, often without coordination or oversight from the Department of Energy. In fact, the President's own FY22 Budget Proposal, while admirably doubling the Department of Energy's funding to \$76 Billion, includes more than \$44 Billion in other energy programs, and that number does not include Defense, State, and the wholly-owned corporation energy programs, amongst others.²⁵

Justification

The primary reason the US President and Congress should abolish the Department is that the intended and congressionally mandated role assigned to coordinate a national energy program has been ignored by the rest of the Federal government. The Department has largely ceded its authority to coordinate energy-related programs and, therefore, there is no real way to determine if the Federal government has the strong national energy program needed to meet the present and future energy needs of the nation consistent with overall national economic, environmental, and social goals. Instead, multiple agencies have established fragmented energy fiefdoms within their organizations, all with good intent, but wildly inefficient, often duplicative, and rarely coordinated with peer organizations. This is bad for the taxpayer, bad for US climate target achievement, and bad for the rest of the world's flora and fauna which must suffer the ill effects of US emitted greenhouse gases – especially as the US plans to retake a global leadership role. If the Department is unable to coordinate a national energy program with oversight and control over all energy activity, then there is no productive purpose in having a stand-alone federal agency in name only. Equally, President Biden has created, rightfully, very senior Domestic and International Climate Advisor roles to focus on and coordinate policy. Yet,

²¹ "Global Emissions," Center for Climate and Energy Solutions, January 6, 2020, <https://www.c2es.org/content/international-emissions/>.

²² OAR US EPA, "Global Greenhouse Gas Emissions Data," Overviews and Factsheets, US EPA, January 12, 2016, <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>.

²³ "See Executive Order.

²⁴ "A Brief History of the Department of Energy," Energy.gov, accessed February 23, 2021, <https://www.energy.gov/lm/doe-history/brief-history-department-energy>.

²⁵ "President's Budget," The White House, accessed June 26, 2021, <https://www.whitehouse.gov/omb/budget/>.

those roles and organizations are not enduringly protected – and that they were even created highlights a gap in the federal government to address these issues. The next President could very easily cancel those Executive Branch roles, their respective organizations, and quickly undo or end activities, policies, and programs they enact – setting America back all over again.

Conclusion

Abolishing the Department of Energy as it exists in favor of a modern department at the nexus of energy-climate-and-environment will more formally link energy to climate change and ensure a collaborative, efficient, and forward-looking approach to addressing and leading through the climate crisis. This transition may not be smooth. It will be challenging to earn the trust required from other agencies to relinquish budget, policy, and program control, but it can be accomplished with the right leaders, right design, and right commitment. The world depends on it.

An Interagency Policy to Invest in Coastal Communities Through the Decarbonization of Ports

By: Taylor Searcy

Recommendation

The Department of Transportation (DOT) and Environmental Protection Agency (EPA) should work under the leadership of the Department of Energy (DOE) to develop an interagency port decarbonization policy utilizing the \$17 billion investment allocated to port infrastructure under the American Jobs Plan.

The Opportunity

Seaports and neighboring waterfront activities are vital to the economy of the United States, moving goods valued at 26% of total GDP and hosting 31 million jobs.²⁶ The high concentrations of heavy pollutants from ocean going vessels at berth, harbor craft, drayage, and even cargo impose serious health risks on the disproportionately high minority and low-income populations of nearby communities.²⁷ The hard-to-abate shipping sector accounts for 2.4% of global carbon emissions, and with business as usual, emissions from ships in ports are expected to increase 40% by 2030.²⁸ An effective federal policy that addresses air quality and provides targeted funding and incentives for energy efficiency and electrification are key to port decarbonization that will greatly benefit local economies.²⁹

Shore power is one effective solution to reduce at-berth emissions. While the US Navy has made effective use of shore power for decades as part of its Incentivized Shipboard Energy Conservation program, less than 3% of commercial seaports have installed high voltage shore power systems.³⁰ Regional efforts such as the California Air Resource Board (CARB) At-Berth Regulation have proven to be effective drivers in energy efficiency and electrification, having achieved an 80% reduction in at-berth emissions from container ships, reefers, and cruise ships calling to California ports.³¹ Building on this success, CARB recently approved an expansion to include auto carriers and tankers beginning in 2025.³²

²⁶ Martin Associates. (2019). *2018 National Economic Impact of the US Coastal Port System: Executive Summary*. Retrieved from https://aapa.files.cms-plus.com/Martin%20study_executive%20summary%202018%20US%20coastal%20port%20im%20pacts%20final.docx.

²⁷ United States Environmental Protection Agency. (2016). *National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gases at US Ports*. Retrieved from <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P100PGK9.pdf>.

²⁸ Azarkamand, S., Balbaa, A., Wooldridge, C., Darbra, R.M. (2020). Climate Change – Challenges and Response Options for the Port Sector. *Sustainability*. 12, 6941. doi:10.3390/su12176941.

²⁹ Dibella, B. (2016). *Port Electrification Benefits the Local Economy and Environment While Providing New Electric Loads for Utilities*. ICF. Retrieved from <https://www.icf.com/>.

³⁰ United States Environmental Protection Agency. (2017). *Shore Power Technology Assessment at US Ports*. Retrieved from <https://www.epa.gov/sites/production/files/2017-05/documents/420r17004-2017-update.pdf>.

³¹ California Air Resources Board. *At Berth FAQ*. <https://ww2.arb.ca.gov/resources/documents/berth-faqs>.

³² Tan, J. (2020, March 3). California approves updated “At-Berth” regulation to cut pollution. UKP&I. Retrieved from <https://www.ukpandi.com>.

While two federal programs direct funds towards capital investments at ports, the funding falls short of stimulating a deep decarbonization of ports and port-related activity. The EPA launched the Ports Initiative in 2014 to encourage environmental sustainability for ports and improve air quality for near-port communities. This voluntary initiative provides up to \$46 million in Diesel Emissions Reduction Act (DERA) grants in 2021 and recommends tools and techniques for the adoption of clean technologies.³³ Separately, DOT's Port Infrastructure Development Program (PIDP) provides \$230 million discretionary grant funding this year for projects that address climate change and environmental justice.³⁴ Although both programs aim for long-term economic benefits through clean energy projects at ports and neighboring communities, more funding for electrification is required to effectively accelerate air quality improvements and emissions reductions.

The Way Forward

Under the leadership of DOE's Office of Energy Efficiency and Renewable Energy (EERE)—which already has the strategic goals and organizational culture to sustain American leadership in the transition to a global clean energy economy—DOT and EPA should create a joint policy that aims for 100% port decarbonization by 2035. The policy should direct the entire \$17 billion investment allocated to port infrastructure in the American Jobs Plan towards two specific action areas: (1) port electrification incentives and expanded funding for clean energy projects under the Ports Initiative and PIDP, and (2) stringent air quality regulations and emissions reductions targets by 2035 as part of the new proposal for a Healthy Ports program.³⁵ The high price tag for this is justifiable for three main reasons.

First, ports place undue stressors on near-port communities. Port-related emissions from drayage, cargo handling equipment, cargo, and vessels at berth severely impact the health of the marginalized districts surrounding ports. Hampton Roads exemplifies this, with related challenges including neighborhood disinvestment, income inequality, public safety concerns, and coastal-related climate threats.³⁶ Air quality regulations and incentive programs designed to spur investment in shore power for cold ironing and the electrification of port-connected activities will deliver a net benefit to society.³⁷ Cluster organizations that focus on equitable development and collaborative stakeholder engagement can effectively address these disparities in environmental burdens and economic benefits.³⁸ For this reason, ports can be key

³³ United States Environmental Protection Agency. (2021). National Grants: Diesel Emissions Reduction Act (DERA). Retrieved from <https://www.epa.gov/dera/national>.

³⁴ United States Department of Transportation. (2021, March 29). US Department of Transportation Announces Funding Availability for Port Infrastructure Development Program. Retrieved from <https://www.transportation.gov>.

³⁵ The White House. (2021, March 31). Fact Sheet: The American Jobs Plan. Retrieved from <https://www.whitehouse.gov>.

³⁶ United States Environmental Protection Agency. (2020). Environmental Justice Primer for Ports. Retrieved from <https://www.epa.gov/community-port-collaboration/environmental-justice-primer-ports>.

³⁷ Dibella, B. (2016). *Port Electrification Benefits the Local Economy and Environment While Providing New Electric Loads for Utilities*. ICF. Retrieved from <https://www.icf.com/>.

³⁸ An example of an effective cluster organization is Washington Maritime Blue, <https://maritimeblue.org/>.

enablers of securing environmental justice for the disproportionately affected low-income and minority communities around the ports.

Second, ports are increasingly viewed as “green gateways” for decarbonization that can play a pivotal role around the world in the clean energy transition.³⁹ Over 60% of infrastructure projects for major international ports focus on climate, energy, and community outreach for port cities.⁴⁰ In February 2021, a coalition of ten major international ports agreed to a series of new climate actions, with each port committing to implementing at least one energy efficiency measure this year.⁴¹ The three US member ports—Long Beach, Los Angeles, and New York/New Jersey—offer examples of effective consultation in support of their sustainability goals.⁴² If the US is to continue to be a leader in this space, a joint policy on port decarbonization and related funding is crucial.

Lastly, time is of the essence. Voluntary programs, such as EPA’s Ports Initiative, and Congressional efforts such as the Climate Smart Ports Act have gained little traction.⁴³ The Biden administration’s executive order for climate action underscores the urgency required for federal action to obtain its goal of a carbon-free electricity sector by 2035.⁴⁴ Ports are a clear and viable option to catalyze the broader push for decarbonization, but capital must be appropriately channeled now to support the large utility infrastructure costs.

These high initial costs for investments and competing stakeholder interests are major barriers.⁴⁵ To address this, the federal government must promote cluster organizations to develop integrated roadmaps and transition pathways that clearly identify the benefits and incentives for rapid port decarbonization. The roadmaps must include financial mechanisms to enable sharing of cost, risk, and reward between all major stakeholders.

Conclusion

At the intersection of land and sea, ports are major economic hubs vital to coastal communities. Led by EERE, an interagency port decarbonization policy that directs the entire \$17 billion in port infrastructure from the American Jobs Plan will enable US ports to lead the fronts of environmental justice and climate resilience.

³⁹ DNV. (2020). Ports: Green Gateways to Europe. Retrieved from <https://www.dnv.com/Publications/ports-green-gateways-to-europe-179372>.

⁴⁰ World Ports Sustainability Program. (2020). World Ports Sustainability Report 2020. Retrieved from <https://sustainableworldports.org>.

⁴¹ Berry, R. (2021, March). WPCAP sets climate goals for 2021 and beyond. Ship.Energy. Retrieved from <https://ship.energy>.

⁴² For more information, see the respective port websites: <https://polb.com/>, <https://www.portoflosangeles.org/>, and <https://www.panynj.gov/port/en/index.html>.

⁴³ Barragan, N.D. (2020). H.R.7024 – Climate Smart Ports Act. Retrieved from <https://www.congress.gov/bill/116th-congress/house-bill/7024/text>.

⁴⁴ The White House. (2021, January 27). Executive Order on Tackling the Climate Crisis at Home and Abroad. Retrieved from <https://www.whitehouse.gov>.

⁴⁵ DNV. (2020). Waterfront Decarbonization: Win/Win Opportunities for Electric Utilities, Key Customer, and Stakeholder – Shore Power. Retrieved from <https://www.dnv.com/publications/waterfront-decarbonization-182396>.

Utilizing Performance Based Regulation to Align State Utility Financial Incentives with a State's Climate Goals

By: David Tancabel

Recommendation

In the absence of consistent federal policy to combat climate change, state governments have stepped up to lead those efforts in the United States, but state energy regulators at public utility commissions are often disconnected from states' statutory and executive climate commitments.^{46 47} The United States Climate Alliance, which includes governors from 25 states that represent 55 percent of the US. population, needs to draft model legislation that provides the authority, direction, and timeline for public utility commissions (PUCs) to change the utility business model through the implementation of performance based regulation (PBR) that will align states' utilities' financial incentives with attaining the states' climate goals.⁴⁸

Background

State utility regulators at PUCs are economic regulators, ensuring a fair rate of return for utilities and reliable service at a reasonable cost for ratepayers. Many in the industry consider incorporating state climate goals into PUC decision making as blurring the lines of economic and environmental regulation, but the status quo of keeping these two priorities separated will cause both negative economic and environmental impacts with ratepayers funding unneeded infrastructure along with unmet climate commitments. The traditional utility framework of rewarding large capital expenditures and volumetric electricity sales conflicts with states' climate and carbon emission goals by creating a disincentive for energy efficiency, demand response, distributed energy resources, and utility innovation. Piecemeal programs of technology-specific procurement targets become outdated, chasing the next new technology policymakers see as the answer, always at the expense of ratepayers and climate goals.

PBR provides a framework to connect utilities' achievement of specific objectives, such as the state's climate commitments, to their financial compensation.⁴⁹ Performance incentive mechanisms (PIMs) are instruments that provide clear and measurable metrics and incentives to elicit desired performance from utilities.⁵⁰ The PBR framework provides utilities and their investors the opportunity to earn a higher return if they are able to meet their PIMs while

⁴⁶ *Climate Leadership Across the Alliance. 2019 State Factsheet.* United States Climate Alliance, 2019. https://static1.squarespace.com/static/5a4cfbfe18b27d4da21c9361/t/5db99b0347f95045e051d262/1572444936157/USCA_2019+State+Factsheets_20191011_compressed.pdf.

⁴⁷ "State Climate Policy Maps", Center for Climate and Energy Solutions. <https://www.c2es.org/content/state-climate-policy/>. Accessed 18 April 2021.

⁴⁸ US Climate Alliance. <http://www.usclimatealliance.org/>

⁴⁹ Littell et al., NREL, *Next-Generation Performance-Based Regulation: Emphasizing Utility Performance to Unleash Power Sector Innovation*, September 2017. <https://www.nrel.gov/docs/fy17osti/68512.pdf>. Page ix.

⁵⁰ Littell et al., NREL, *Next-Generation Performance-Based Regulation: Emphasizing Utility Performance to Unleash Power Sector Innovation*, September 2017. <https://www.nrel.gov/docs/fy17osti/68512.pdf>. Page x.

providing the state value by meeting public policy goals through mechanisms such as shared savings benefits, fixed rewards, or return of return percentage adders.^{51 52}

Analysis

While there are a few states that have implemented various forms of PBR, such as Illinois, Minnesota, and Rhode Island, most states are still relying on the traditional utility model or are slowly studying and piloting programs for years. Other PUCs lack the authority to implement PBR, so state legislatures must take action to provide them with that authority along with clear direction and timelines to guarantee the comprehensive and timely shift required to align the utilities' interest with those of the states' climate commitments. Hawaii is an example of where clear legislative direction and deadlines compelled the Hawaii PUC to create an achievable roadmap for PBR implementation.^{53 54}

The challenge of meeting state climate goals requires innovation. PBR will unleash utilities to find the most effective method to attain goals set by state regulators by experimenting with new technology deployments or third-party business models.⁵⁵ Authorizing legislation that sets clear goals such as meeting greenhouse gas (GHG) commitments without prescriptive steps will allow regulators to work with stakeholders and utilities to formulate PIMs that can achieve those goals, such as reducing a utility's carbon intensity or accounting for CO₂ avoided by transportation electrification.

Course of Action

Passing legislation that authorizes and directs state energy regulators to implement PBR tied to public policy will provide utilities the financial incentives and freedom to innovate to efficiently meet the states' climate goals and provide better outcomes for the public.

⁵¹ Cara Goldenbuerg, Dan Cross-Call, Sherri Billimoria, and Oliver Tully, *PIMs for Progress: Using Performance Incentive Mechanisms to Accelerate Progress on Energy Policy Goals*, Rocky Mountain Institute, 2020. <https://rmi.org/insight/pims-for-progress/>. Page 18.

⁵² Cara Goldenbuerg, Dan Cross-Call, Sherri Billimoria, and Oliver Tully, *PIMs for Progress: Using Performance Incentive Mechanisms to Accelerate Progress on Energy Policy Goals*, Rocky Mountain Institute, 2020. <https://rmi.org/insight/pims-for-progress/>. Page 26.

⁵³ St. John, Jeff. *Hawaii's First-of-a-Kind Pathway to Performance-Based Regulation*. June 6, 2019. <https://www.greentechmedia.com/squared/dispatches-from-the-grid-edge/hawaiis-first-of-a-kind-pathway-to-performance-based-ratemaking>

⁵⁴ State of Hawaii Public Utilities Commission. Performance Based Regulation. <https://puc.hawaii.gov/energy/pbr/> Accessed 18 April 2021.

⁵⁵ Littell et al., NREL, *Next-Generation Performance-Based Regulation: Emphasizing Utility Performance to Unleash Power Sector Innovation*, September 2017. <https://www.nrel.gov/docs/fy17osti/68512.pdf>. Page 8.

Implementing Marine Hydro-Kinetic Energy in Disadvantaged and Indigenous Communities

By: Robin Tyner

It is widely accepted that an accelerated transition from fossil fuels to renewable energy is required to avert the worst effects of global warming. However, existing renewable technologies are not forecast to grow enough to meet 100% renewable energy goals, and many “clean” technologies also have environmental issues. Solar panel construction depends on quartz mining and hazardous chemical use—with very limited recycling processes for decommissioned panels.⁵⁶ Large-scale hydropower dams (often foreign-owned) flood and destroy boreal carbon-storing forest ecosystems, which release the greenhouse gas methane as they rot.⁵⁷ Producing batteries and motors for electric vehicles requires toxic materials, and emissions savings from these vehicles could be negated if their power comes from dirtier fossil fuels. Nuclear is emissions-free, but very expensive, and the US has no viable solutions for disposing spent reactor fuel. Large solar and wind farms pose increasing land use and siting issues, as they withdraw land from other development or conservation uses.

Meanwhile, some of the greatest reliance on inefficient fossil fuels can be found in rural, disadvantaged and/or indigenous communities.^{58 59 60} These locations often lack modern infrastructure and have smaller, less affluent tax bases for supporting energy upgrades. Building legacy energy infrastructure (such as transmission corridors) to serve remote areas can be extremely costly, infringe on property rights of private land owners and/or indigenous tribes, and can cause extensive, irreparable environmental damage if crossing roadless areas, rivers, mountains, and wetlands.

Fortunately, marine hydro-kinetic (MHK) energy is a clean-energy solution that addresses both of these challenges, and a new Department of Energy (DOE) program could support its implementation. In January 2021, President Biden created the government-wide Justice40 Initiative, with the goal of delivering 40 percent of the overall benefits of relevant federal investments to disadvantaged communities. He appointed a Director for Energy Justice to lead efforts within the DOE. This new Justice40 energy program should focus on supporting state-local partnerships that deploy marine hydro-kinetic (MHK) energy to remote and under-developed communities with poor existing infrastructure. This win-win solution could empower rural, disadvantaged, and indigenous communities while substantially reducing their reliance on fossil fuels.

⁵⁶ Eric Wesoff and Becky Beetz, “Solar Panel Recycling in the US - a looming issue that could harm industry growth and reputation,” *pv magazine*, December 3, 2020, <https://pv-magazine-usa.com/2020/12/03/solar-panel-recycling-in-the-us-a-looming-issue-that-could-harm-growth-and-reputation/>.

⁵⁷ Nikiloruk, Andrew. “Debunking Dams.” *Alternatives Journal; Waterloo*. Volume 42. Issue 1. 2016: 72.

⁵⁸ “US Energy Information Administration - EIA - Independent Statistics and Analysis.” *Alaska - State Energy Profile Analysis - US Energy Information Administration (EIA)*, www.eia.gov/state/analysis.php?sid=AK.

⁵⁹ “US Energy Information Administration - EIA - Independent Statistics and Analysis.” *United States - SEDS - US Energy Information Administration (EIA)*, www.eia.gov/state/seds/data.php?incfile=%2Fstate%2Fseds%2Fsep_sum%2Fhtml%2Frank_use_capita.html&sid=US.

⁶⁰ Lauren Ross, Ariel Drehobl, and Brian Stickles, “The High Cost of Energy in Rural America: Household Energy Burdens and Opportunities for Energy Efficiency,” *American Council for an Energy Efficient Economy*, July 2018,

MHK energy, powered by river and tidal currents, is clean, local, renewable hydropower. Tides and currents—more predictable than wind and sunshine—are an ideal baseload power source, which can be complemented by wind, solar, and battery storage to provide a complete renewable solution. MHK energy has almost no land use issues and is ideally suited to networks of microgrids, which can be managed locally for increased reliability and security. MHK is scalable and proven in off-grid remote locations. The DOE Water Power Technology Office has invested in research, development, and testing to advance this promising marine energy technology. The time is right to bring it to scale.

MHK has demonstrated great promise in many remote scenarios. On the island of Yell, in northern Scotland, tidal turbines have powered local homes and businesses for over five years, and can now power all electric cars on the island. The two leading US renewable marine energy companies, Verdant Power and ORPC, utilize completely different designs that lend themselves to different situations and uses. Both companies can combine turbines to adapt to individual rivers and tidal flows. In October 2020, Verdant Power installed an array of three tidal power turbines in New York City's East River—the first US licensed tidal project and provided 100MW hours in their first 85 days.⁶¹

ORPC developed the RivGen® and TidGen® Power Systems, which generate emissions-free electricity from river and tidal currents, and connect directly into existing local grids. In 2012, ORPC built and operated its TidGen® Power System in Cobscook Bay in Eastport and Lubec, Maine—the first ocean energy project to deliver power to an American utility grid. Since 2014, ORPC has operated RivGen® Power Systems in the remote Alaskan village of Igiugig, providing a third of the community's electricity needs and significantly offsetting diesel fuel use. ORPC turbines break down for transport and are re-assembled onsite, and deployed using local contractors, vessels and standard equipment. They cause no injuries to fish or altered wildlife behavior, as fish easily pass over, around, or through the turbines with no harm. ORPC is pioneering a modular system where stand-alone turbine generator units can be attached to additional modules to form horizontal or vertical arrays to fit specific river geometries.

MHK systems can serve rural and remote communities near major rivers or the ocean with minimal infrastructure investments, and provide reliable, 24x7 baseload power that can be augmented by other sources. Augmenting with wind and/or solar may help meet 100% renewable energy targets.

Deployment of MHK technology can be done as state-community partnerships supported by DOE grants. "Disadvantaged" criteria could relate to town size (e.g. <20K people), remoteness of the community, median income (below the national average), or formal tribal recognition. Although beneficial nationwide, this program may have greatest application in northern tier states with remote communities (like Alaska, Maine, New Hampshire, North Dakota, South Dakota, and Montana). All of these states have major rivers, and three have ocean coastlines where tidal flows through bays or estuaries can be utilized. Five of these states have Native American reservations with territories on major rivers.

The DOE Director for Energy Justice and the DOE Water Power Technologies Office should join forces to create this novel Justice40 program, helping states and indigenous communities bring clean, efficient hydrokinetic power to their communities via modern local grids.

⁶¹ "News: RITE Installation." Verdant Power, www.verdantpower.com/news-rite-install-10-22-20.



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