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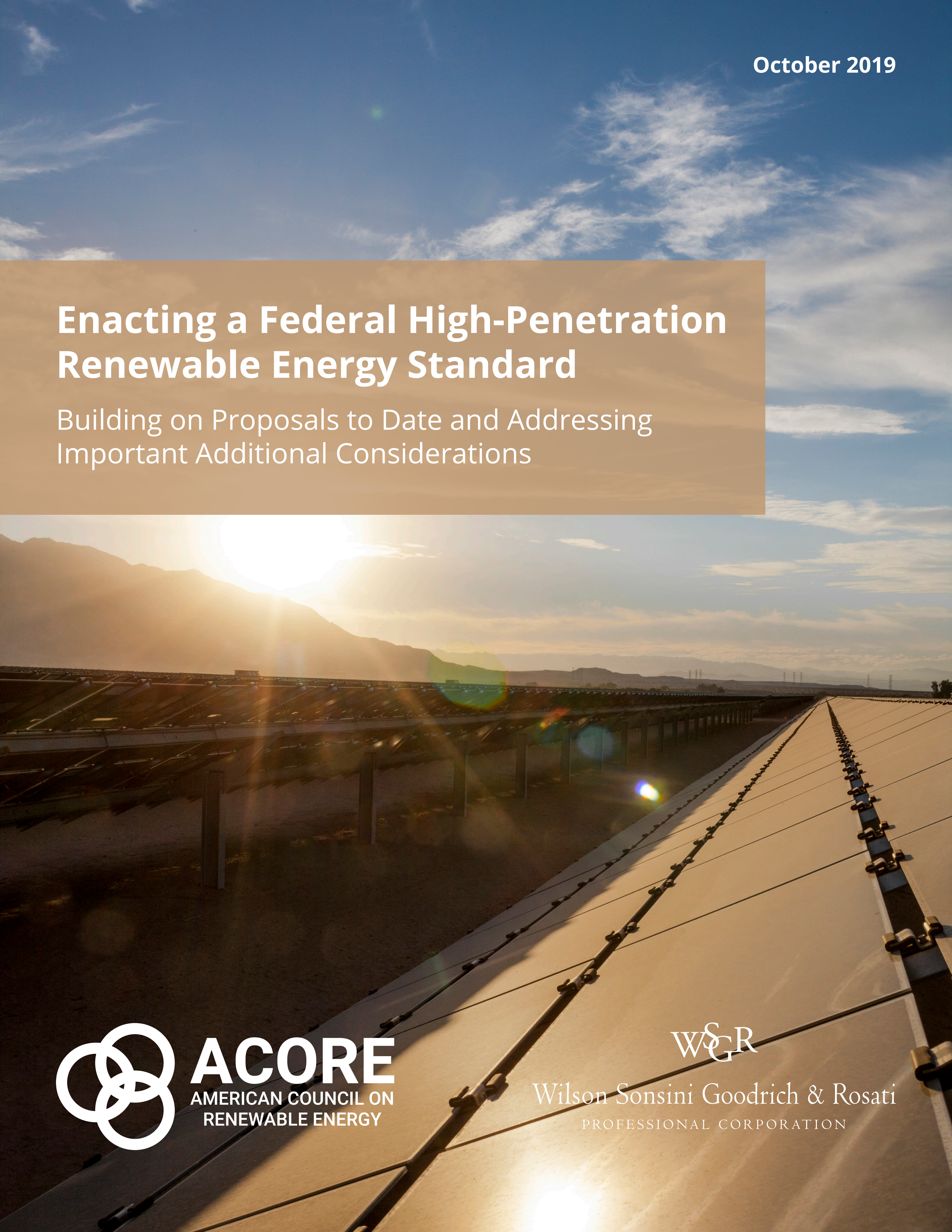

Enacting a Federal High-Penetration Renewable Energy Standard

Building on Proposals to Date and Addressing Important Additional Considerations

ACORE
AMERICAN COUNCIL ON RENEWABLE ENERGY

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Acknowledgements

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Introduction

Following the recent enactment of multiple state-level 100% clean energy standards (CES),[1] and fueled by debate regarding a Green New Deal and other recently introduced federal legislation,[2] policymakers and the public are increasingly interested in national initiatives to accelerate the transition to a renewable energy economy.[3] Participants in this conversation cite not only the need for action to avoid increasingly severe impacts from climate change,[4] but also the opportunity for America to increase its twenty-first century global economic competitiveness, to generate good-paying jobs at home, and to provide reliable, resilient, and affordable power.

While there are many potential legislative pathways to expand the growth of renewable energy,[5] a high-penetration renewable energy standard (RES) presents a straightforward and tested policy option. We define *a federal high-penetration RES* as a federal law that requires a high percentage of renewable energy (generally, over 50%) in electricity supply companies' electricity sales, generating capacity or electricity purchases.

Compared to other policies that aim to replace fossil fuel generation, the RES approach is particularly noteworthy because it increases demand for renewable energy *directly*; provides investment certainty for renewable projects; drives forward commercialization, cost reductions, and innovation for renewable technologies; and ensures that customers receive clean electricity. An RES has these effects without favoring specific renewable energy technologies and without dictating prices or specific technological use cases – thereby encouraging innovation and competition in the electric power industry. An RES approach also has the benefit of having been proven effective at the state level and subject to serious study and debate at the federal level.

In this paper, we begin with background on previous federal RES and CES legislative efforts and provide an overview of important features found in those proposals. We then focus on

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[1] For an up-to-date list of states and territories that have enacted 100% CES (or similar policies) – currently including California, District of Columbia, Hawaii, Maine, Nevada, New Mexico, New York, Puerto Rico, and Washington – see Sierra Club, *Ready for 100: 100% Commitments in Cities, Counties, & States*, available at https://www.sierraclub.org/ready-for-100/commitments.

[2] *See* E. Tillett and G. Segers, *Senate fails to pass vote on "Green New Deal" resolution*, CBS News (Mar. 26, 2019); M. Matthews, *Second Democratic Debate Highlights Divergence on Green Deal*, E&E News (June 28, 2019).

[3] In this context, "clean electricity" and "clean energy" generally refer to electricity that is produced without emitting greenhouse gases (including through the storage and capture of such gases).

[4] According to the Intergovernmental Panel on Climate Change, limiting global warming to 1.5°C versus 2°C: "could reduce the number of people both exposed to climate-related risks and susceptible to poverty by up to several hundred million by 2050"; "is projected to result in smaller net reductions in yields of maize, rice, wheat, and potentially other cereal crops"; "may reduce the proportion of the world population exposed to a climate change-induced increase in water stress by up to 50%"; and avoids increased "[e]xposure to multiple and compound climate-related risks." Intergovernmental Panel on Climate Change, *Summary for Policymakers* 9-10 (2018). A "robust feature" of pathways consistent with limiting global temperature increase to 1.5°C is a "virtually full decarbonization of the power sector around mid-century," coupled with "additional emission reductions . . . from the transport and industry sectors." Intergovernmental Panel on Climate Change, *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development* 112 (2018).

[5] Alternative paths that have been proposed include various forms of carbon pricing, utilizing the Clean Air Act (e.g., the Clean Power Plan), tax credits and other financial incentives, and investment in research and development.

recommendations and additional policy options for consideration when designing a comprehensive federal high-penetration RES, including the stranded costs of retiring power plants, grid reliability and resilience, transmission and related infrastructure expansion, a socioeconomically fair transition to a clean energy economy to ensure widespread benefits, and other policies that would be complementary to an RES.

Notable Efforts to Pass Federal RES/CES Legislation

Federal RES legislation has passed, on separate occasions, both in the House of Representatives and the Senate over the past two decades.[6] The idea of a national RES garnered widespread attention through the American Clean Energy and Security Act of 2009, also known as Waxman-Markey. While that legislation was only approved by the House of Representatives, it nonetheless created the framework for several subsequent legislative attempts to enact a national RES or CES. They include the Clean Energy Standard Act of 2010, introduced by Sen. Lindsay Graham (R-SC); the Clean Energy Standard Act of 2012, introduced by Sen. Jeff Bingaman (D-NM) in response to President Barack Obama's call for a federal CES in his 2011 and 2012 State of the Union addresses;[7] the Clean Energy Standard Act of 2019, introduced by Sen. Tina Smith (D-MN) and Rep. Ben Ray Luján (D-NM); and the National Renewable Electricity Standard Act of 2019, introduced by Sen. Tom Udall (D-NM). The key features of these notable proposals are summarized in the Appendix to this paper.

Recommendations and Policy Options for a Federal High-Penetration RES

Building on the proposals described above and in the Appendix, we identify the following as important features of any federal high-penetration RES:

- Qualifying technologies should, at a minimum, include wind, solar, hydropower, ocean, tidal, hydrokinetic, and geothermal energy.
- The required percentage of compliant electricity should be at least 50%, on a timeline consistent with climate commitments, recommendations from scientific experts, and other policy goals.
- Alternative Compliance Payments (ACPs) and penalties should be sufficient to achieve RES objectives.
- A federal high-penetration RES should recognize, build upon, and not preempt successful state renewable energy standards.

[6] *See* H.R. 4 – Energy Policy Act of 2002, 107th Cong. (as amended and passed by Senate, April 25, 2002); H.R. 6 – Energy Policy Act of 2005, 109th Cong. (as amended and passed by Senate, June 28, 2005); H.R. 2454 – American Clean Energy and Security Act of 2009, 111th Cong. (as passed by House, June 26, 2009).

[7] *See* White House Archives, *A Clean Energy Standard for America* (Mar. 2, 2012), available at https://obamawhitehouse.archives.gov/blog/2012/03/02/clean-energy-standard-america.

In addition to the key features of a federal high-penetration RES described above, there are additional policy questions Congress may wish to consider when legislating in this area. Specifically, as explained below, policymakers may want to address issues related to the stranded costs of retiring power plants, grid reliability and resilience, electric transmission and related infrastructure, a fair transition to a clean energy economy through robust benefits that are shared by all regions and communities, and other complementary policy options.

Stranded Costs of Retiring Power Plants

A recent analysis by the organizations Vibrant Clean Energy and Energy Innovation showed that nearby wind or solar could produce the same amount of electricity more cheaply than 74% of the nation's coal capacity.[8] By 2025, this will be true for nearly the entire fleet of coal capacity in the U.S.[9] This means that, in general, transitioning to clean energy will save money, as evidenced by electric utilities' rush to renewable power in recent years.[10]

The calculations by Vibrant Clean Energy and Energy Innovation, however, only take into account the marginal cost of operating power plants and do not take into account money that electric utilities may still owe to investors or lenders.[11] Even where an electric utility does not own a fossil fuel power plant or owe investors or lenders in connection with that fossil fuel power plant, the electric utility may have remaining years under a fossil fuel power purchase agreement for which it is responsible or must otherwise face a termination payment.

These remaining amounts owed to investors, lenders, and power plant owners in connection with uneconomic fossil fuel generation represent potential "stranded costs" that electric utilities could face during the transition to clean energy. In cost-of-service regulation states – where the "regulatory compact" dictates that electric utilities be allowed to recover from ratepayers the cost of its regulator-approved investments plus a financial return[12] – electric utilities will seek approval from state

[8] E. Gimon et al, *The Coal Cost Crossover: Economic Viability of Existing Coal Compared to New Local Wind and Solar Resources* 2 (Mar. 2019) [hereinafter *The Coal Cost Crossover*].

[9] *Id.*

[10] Just avoiding the new construction of certain proposed natural gas plants by building clean energy portfolios is estimated to provide $29 billion in savings. C. Teplin et al, *The Growing Market for Clean Energy Portfolios: Economic Opportunities for a Shift from New Gas-Fired Generation to Clean Energy Across the United States Electricity Industry* 7, Rocky Mt. Inst. (Sept. 2019) [hereinafter *Rocky Mountain Institute*]. For an overview of recent utility and regulator decisions to shift from fossil fuels to clean energy portfolios, *see Rocky Mountain Institute* 18-20.

[11] *Id.* at 4.

[12] *See* E. Hammon and J. Rossi, *Stranded Costs and Grid Decarbonization* 647, Brooklyn Law Review, Vol. 82, Issue 2, Art. 9 (Jan. 1, 2017) [hereinafter *Stranded Costs and Grid Decarbonization*]; U. Varadarajan et al, *Harnessing Financial Tools to Transform the Electric Sector* 3, Sierra Club (Nov. 2018) [hereinafter *Financial Tools*].

regulators to be compensated for those stranded costs through retail customer rates, notwithstanding the retirement or uneconomic operation of the relevant fossil fuel power plants.[13]

In their analysis, Vibrant Clean Energy and Energy Innovation acknowledge that potential stranded costs for the uneconomic (or soon-to-be uneconomic) coal plants that they studied reach "into the tens of billions [of dollars]."[14] This figure does not include the stranded costs associated with natural gas power plants, which are often newer and therefore could have significantly greater outstanding financial obligations associated with them.[15] According to a recent study by the Rocky Mountain Institute, portfolios of clean energy resources (including wind energy, solar energy, energy storage, energy efficiency, and demand response) are already cheaper than 90% of currently proposed new natural gas power plants, and by 2035 the combined construction and operating costs of new clean energy portfolios will likely be cheaper than just the ongoing operating costs of 90% of combined-cycle gas power plant capacity that is proposed today.[16] The Rocky Mountain Institute's findings demonstrate that the construction of new natural gas plants poses a significant risk of stranded costs that could be borne by customers.[17]

A federal high-penetration RES presents an opportunity to consider how to address the potential stranded costs associated with fossil fuel power plants, including (1) whether to facilitate stranded cost recovery by electric utilities, (2) if so, through what tools, and (3) how to prevent the creation of additional stranded assets.

Whether to Facilitate Stranded Cost Recovery

When a regulated electric utility has a power resource that should no longer be utilized – either because the power resource has become uneconomic or because policy goals dictate otherwise – the electric utility will argue to regulators that it should nonetheless be made whole for any stranded costs associated with that power resource because the electric utility acted prudently in procuring the power resource in the first place.[18] Others will argue that the need to transition away from fossil fuel generation has been evident for some time, and that electric utilities and financing parties are therefore not entitled to be made whole for predictably unwise investments.[19]

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[13] In contrast, merchant generators owned by entities not subject to cost-of-service regulation can generally be retired upon becoming unprofitable without impact on retail customers. *See Financial Tools* 2.

[14] *The Coal Cost Crossover* at 4*.*

[15] *Cf.* S. Weissman, *Natural Gas as a Bridge Fuel: Measuring the Bridge* 8-10, Ctr. for Sustainable Energy (Mar. 2016).

[16] *Rocky Mountain Institute* 32, 35.

[17] *Id.* at 48.

[18] For a more nuanced explanation of cost recovery accounting and mechanics, see *Financial Tools*.

[19] *See Stranded Costs and Grid Decarbonization* 666 (internal citations omitted).

While the question of whether to allow cost recovery is worthy of debate,[20] experts observe that it is often answered on pragmatic – rather than policy – grounds. In a 2017 *Brooklyn Law Review* article, Hammon and Rossi note that "a failure to address stranded costs…risks the possibility that [decarbonization] may never occur."[21] For that reason, they argue that "some stranded cost recovery [by electric utilities] might be a worthwhile price to pay for [utility] industry cooperation or even stakeholder buy-in in the midst of a transition."[22] Other climate advocates have noted that disallowance of electric utility cost recovery could lead to credit rating downgrades for those electric utilities and thereby increase the cost of financing projects that will facilitate the transition to high penetrations of renewable energy.[23]

Given that electric utilities could serve as important allies and implementers in the transition to America's renewable energy future, drafters of a federal high-penetration RES should consider allowing utilities to recover prudently incurred stranded costs. At the same time, Congress should also ensure that imprudent costs are not unfairly borne by electricity consumers.

Approaches to Facilitating Cost Recovery

Cost recovery is traditionally achieved by allowing electric utilities to recoup stranded costs directly through the rates that they charge retail customers.[24] Various specific methods of direct recovery through retail rates allow costs to be recouped at different speeds and with varying levels of cost-sharing between utilities and retail customers.[25]

Securitization is an alternative approach to cost recovery that emerged in the 1990s in connection with the electric industry deregulation movement.[26] It generally allows electric utilities to remove stranded costs from their books through the issuance of bonds by a bankruptcy-remote special purpose entity,[27] with the bonds being backed by the obligation of retail customers to continue paying rates associated with the stranded asset.[28] In this approach, the benefit to the retail customers is that the interest rate demanded by bondholders on a ratepayer-backed bond is

[20] Even committed climate advocates acknowledge that outright disallowance of cost recovery for fossil fuel power plant investments can have negative unintended consequences. *See*, *e.g.*, *Financial Tools* 4-7.

[21] *Stranded Costs and Grid Decarbonization* 679 (internal citations omitted).

[22] *Id.*; *see also Financial Tools* 5 ("While there are certainly individual circumstances in which poor utility behavior may warrant disallowances [of stranded cost recovery], the prospect of a large disallowance incentivizes a utility to fight the requirement of an uneconomic asset, not support it.").

[23] *Financial Tools* 5.

[24] *See id.*

[25] *See id.*

[26] *Id.* at 10; *see also Stranded Costs and Grid Decarbonization* 676 (internal citations omitted).

[27] Technically the bond debt remains on electric utilities' balance sheets, but it is treated as an obligation of the special purpose entity and not of the electric utility for credit rating purposes. *Financial Tools* 14-15 (citing J. Paul Forester, *Unstranding "Stranded Cost" Securitizations: New Applications for a Proven Technology* (2008)).

[28] *See Financial Tools* 11-12.

cheaper than the return on equity generally expected by electric utilities and their investors.[29] As a result, retail customers can make the electric utility whole through securitization at a lower cost as compared to direct cost recovery through retail rates.[30]

Newer approaches to stranded cost recovery are now being considered specifically in the context of the transition to renewable energy. Green bond financing is similar to securitization, but likely at a higher financing cost due to the bond obligation remaining in the hands of the electric utility (as opposed to a bankruptcy-remote special purpose entity) and due to the remaining possibility of future regulatory interference with cost recovery. Retirement-linked green tariffs are another tool that allows retail customers to pay an optional rate specifically for the addition of renewable energy and the retirement of fossil fuel generators.[31]

Alternatively, policymakers can endeavor to "unstrand" otherwise stranded assets by enabling plant owners to recoup costs through incentives or power procurements that value certain attributes of legacy power plants that, in the short- to medium-term, enable the build-out of more renewable energy resources.[32] In competitive, non-regulated markets, this could involve trying to avoid stranded assets through ongoing capacity market reforms.

In light of these varying cost recovery methods and their associated pros and cons, drafters of a federal high-penetration RES could consider an approach to stranded costs that allows state regulators to implement the cost recovery methods they believe are best suited for each state's unique circumstances.[33] The federal government could require that each state study methods of addressing stranded costs and report to FERC or DOE on the implementation method that will best serve the citizens of that state consistent with the federal RES and the minimization of ratepayer costs. Such an approach by the federal government would be similar to Congress' undertakings in the Public Utility Regulatory Policies Act of 1978, the Energy Policy Act of 1992, the Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007, which direct the states to study and consider the implementation of certain policies and then report back to the Secretary of Energy on the results of those studies and their implementation efforts.[34]

Preventing the Creation of Additional Stranded Assets

While addressing stranded costs from existing assets, policymakers should also consider putting in

[29] *See Financial Tools* 13.

[30] *Id.*

[31] *See id.* at 17-19.

[32] *See Stranded Costs and Grid Decarbonization* 686. If doing so at the state level, policymakers should be mindful of the state-federal jurisdictional boundaries articulated in *Hughes v. Talen Energy Mktg., LLC*, 136 S. Ct. 1288 (U.S. 2016).

[33] *Cf. New State Ice Co. v. Liebmann*, 285 U.S. 262, 311 (1932) ("It is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.")

[34] *See* 16 U.S.C. §§ 2621-2627.

place a framework to prevent the creation of new stranded assets. In light of the need to transition to a net-zero emission electricity sector by midcentury,[35] and the typical 30-plus year operating life of most power plants, one policy option to achieve this objective would be to cease construction of new power plants that emit greenhouse gases as soon as reasonably practicable.[36] As discussed above, this could save consumers $29 billion just in the case of certain natural gas power plants that are proposed for construction today but which could be replaced at a lower cost by portfolios of clean energy resources.[37]

To avoid the creation of additional stranded assets by ensuring that every newly constructed power plant is emission-free as soon as reasonably practicable (i.e., within a handful of years in order to avoid the disqualification of facilities currently under development), policymakers could include a restriction in federal RES legislation that electric utilities may not buy electricity from greenhouse gas-emitting power plants built more than two years after the law's enactment. Alternatively, policymakers can evaluate whether an aggressive RES timeline would provide a strong enough market signal to render such an approach unnecessary because the financing of such assets would no longer be attractive.

Grid Reliability and Resilience

Faced with inevitable questions regarding variability in generation from the sun and the wind, policymakers advocating for a federal high-penetration RES will understandably want to ensure robust grid reliability and resilience during the transition to a cleaner and more sustainable power supply. It is, however, important to keep in mind that federal and state regulators – as well as grid operators and electric utilities – already have effective regulatory frameworks in place to safeguard the reliability of day-to-day grid operations, as well as the ability of the grid to withstand and recover from storms and other sources of outages.

Moreover, as set forth in an October 2018 ACORE issue brief, renewable energy generation facilities in fact have important characteristics that inherently boost grid reliability, including: (1) zero reliance on global fuel supply lines or volatile global fuel markets; (2) free and inexhaustible fuel; (3) greater decentralization; (4) relative fuel proximity to generation (as compared to generators dependent on distant fuel sources); and (5) the ability to deploy rapidly.[38]

Due to these grid-enhancing characteristics of renewable energy generation and the continual attention being paid to renewable energy integration and grid reliability under existing regulatory

[35] *See* Intergovernmental Panel on Climate Change, *Summary for Policymakers* 9-10 (2018); Intergovernmental Panel on Climate Change, *Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development* 112 (2018).

[36] *See* S. Weissman, *Phasing Out the Use of Fossil Fuels for the Generation of Electricity* 1, 4-5, Ctr. for Sustainable Energy (Mar. 2017).

[37] *Rocky Mountain Institute* 7.

[38] *See* ACORE Issue Brief *The Role of Renewable Energy in National Security* (Oct 2018), available at https://acore.org/wp-content/uploads/2018/10/ACORE_Issue-Brief_-The-Role-of-Renewable-Energy-in-National-Security.pdf.

frameworks, the need for additional policies aimed at grid reliability and resilience from Congress in the context of a federal high-penetration RES will be limited.[39]

Grid Reliability Can Be Maintained and Bolstered by High Penetration of Renewables

As ACORE and the American Wind Energy Association (AWEA) articulated in comments to FERC during its 2018 grid resilience proceeding, high penetrations of renewables have been demonstrated to be reliable.[40] In fact, renewables enhance reliability with the right market mechanisms in place.[41]

A recent study of the Eastern Interconnection by the U.S. National Renewable Energy Laboratory (NREL) found that 99.99% of required electric generation reserves for all states east of Colorado (excluding Texas, which has separate grid operations) can be maintained in a scenario contemplating 68-73% penetrations of combined solar and wind energy if grid operation improvements and significant expansions of the interstate transmission network are made.[42] Importantly, this NREL Eastern Interconnection analysis did not take into account the additional grid operational flexibility that can be achieved by utilizing energy storage, demand response, and other advanced technical solutions to complement variable renewable generation.[43] A number of other regional studies have also affirmed that systems with high renewable penetration can operate reliably.[44] In contrast, according to the North American Electric Reliability Corporation (NERC), fossil generation facilities relying on natural gas and coal are the largest sources of cold weather-related power outages, as low temperatures damage natural gas pipelines and freeze coal stockpiles.[45]

Nonetheless, regulators and system operators will need to manage the transition to America's renewable energy future purposefully and with an eye on reliability. This does not mean there is a need to replace or revamp the nation's regulatory frameworks for the grid to ensure that the lights stay on. Policymakers crafting a federal high-penetration RES should instead rely and build upon the existing frameworks briefly described below. Improvements to grid reliability and resilience should be expected to continue through iterative processes already underway at NERC, FERC, the ISOs and RTOs, and state public utility commissions, and through the expansion of transmission and related infrastructure as described in the next section.

[39] The opportunity for cost savings and grid operational improvements through the buildout of transmission and related infrastructure (like energy storage) is discussed separately in the next section below. This section focuses strictly on the ability of existing regulatory frameworks to ensure a reliable and resilient grid.

[40] *See Reply Comments of the Am. Wind Energy Ass'n and the Am. Council on Renewable Energy*, *Grid Resilience in Regional Transmission Orgs. And Indep. System Operators* 4-20, Docket No. AD18-7-000 (filed May 9, 2018) [hereinafter *ACORE and AWEA Resilience Comments*].

[41] *See id.*

[42] J. Novacheck et al, *Operational Analysis of the Eastern Interconnection at Very High Renewable Penetrations* vi, Nat'l Renewable Energy Lab. (Sept. 2018).

[43] *Id.* at viii.

[44] M. Ahlstrom et al., *Relevant Studies for NERC's Analysis of EPA's Clean Power Plan 111(d) Compliance*, Nat'l Renewable Energy Lab. (June 2015) available at https://www.nrel.gov/docs/fy15osti/63979.pdf.

[45] Bade, Gavin, *Polar Vortex set to test Midwest grids amid FERC resilience debate*, Utility Dive (Jan. 30, 2019), available at https://www.utilitydive.com/news/polar-vortex-set-to-test-midwest-grids-amid-ferc-resilience-debate/547231/.

Reliability Framework	Role
NERC Oversight	In accordance with the Energy Policy Act of 2005, the North American Electric Reliability Corporation (NERC) is the FERC-certified and FERC-overseen organization responsible for establishing and enforcing reliability standards for the U.S. electric transmission network.[46] NERC "develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the [bulk power system] through system awareness; and educates, trains, and certifies industry personnel."[47] The eight NERC regional entities certify reliability coordinators within the applicable region to provide monitoring and coordination services for the applicable transmission systems.[48] NERC is already specifically studying the impacts of renewables on the grid and updating reliability standards to reflect our modernizing grid.
Regional Transmission Planning	In accordance with FERC Orders No. 890 and 1000, any entity providing transmission service must engage in regional transmission planning processes to ensure sufficiency of the transmission system. This includes requiring transmission owners to build out transmission resources when needed for reliability purposes.
ISO/RTO and State Resource Adequacy Requirements	Depending on the extent of electricity market deregulation in a given state, either the state public utility regulator or the applicable ISO/RTO (and sometimes both) have authority and responsibility for ensuring that adequate electric generation resources are procured by electric utilities.[49] This is achieved through extensive planning (*e.g.*, state-mandated integrated resource planning, as well as ISO-led processes) and often through robust market constructs (*e.g.*, resource adequacy and other capacity attribute markets) that are constantly being refined. Several of these state and ISO/RTO authorities are already enabling flexible resources to address the variable load profiles of solar and wind resources, and they will continue to improve upon resource adequacy requirements, especially in states that have already enacted a 100% RES or CES.
Interconnection Procedures and Agreements	To interconnect to the grid, any generator (including variable renewable generators) must meet certain technical requirements and go through a series of studies and (if needed) system upgrades to ensure system reliability. In 2016, FERC specifically found that wind generators are capable of providing reactive power as an ancillary service for reliability purposes and therefore amended the standard large generator interconnection agreement to require wind farms to be capable of providing such reliability attributes to the grid.[50]

[46] 16 U.S.C. § 824o; 18 C.F.R. § 39.3.

[47] N. Am. Elec. Reliability Corp., *Essential Reliability Services: Whitepaper on Sufficiency Guidelines* iii (2016).

[48] *See* Cal. Independent System Operator, *Reliability Coordinator FAQ* (2019).

[49] *See* John P. Perkins, *Elec. Capacity Markets and Resource Adequacy: Recommendations to Properly Balance Competition and Reliability in RTO and ISO Regions* 30-31, Journal of Energy & Environmental Law (Winter 2014).

[50] *Reactive Power Requirement for Non-Synchronous Generation* 5-6, 18-21, Order No. 827, Docket No. RM16-1-000 (Fed. Energy Reg. Comm'n June 16, 2016).

Expansion of Transmission System and Related Infrastructure (including Energy Storage)

Initiatives to expand transmission lines and related enabling infrastructure (including energy storage) can play an important role as part of comprehensive federal high-penetration RES legislation. A 2019 Brattle Group study, for example, concluded that "building transmission to access high quality but distant renewable resources is often more cost effective than making use of more local, but lower quality resources."[51] Similarly, a 2016 Nature Climate Change study found that a large transmission network would be the most cost-effective way for the nation to reach a wind and solar penetration of around 55%.[52] These findings suggest that pairing a federal high-penetration RES with policy efforts to build out regional and interregional transmission could allow for greater financial savings than an RES alone. Moreover, well-designed transmission provides large and diverse additional benefits including progress toward more competitive and cost-effective electricity markets, heightened grid resilience, and increased grid reliability.[53]

Enhanced transmission planning, coordination, and incentivization policy efforts would not be starting from scratch. Rather, they would be built upon the extensive existing framework described below.

Transmission Planning

FERC Order No. 1000 required, among other things, "participat[ion] [by transmission service providers] in a regional transmission planning process that produces a regional transmission plan" and "coordination between neighboring transmission planning regions for new interregional transmission facilities."[54]

Although these planning and coordination efforts are already underway, they have to date been inadequate. As described by ACORE in recent comments to FERC, implementation efforts too often do not allow for the use of advanced technologies and grid optimization methods that could benefit the build-out of clean energy resources by increasing capacity at lower cost, ignore the full regional benefits of transmission such as new renewable interconnection and lowered delivered energy costs,

[51] WIRES, *The Coming Electrification of the North American Economy: Why We Need a Robust Transmission Grid* 13-14 (Mar. 2019).

[52] A. MacDonald et al., *Future cost-competitive electricity systems and their impact on US CO_2 emissions*, Nature Climate Change (Jan. 2016), available at https://www.nature.com/articles/nclimate2921.

[53] AWEA, *Grid Vision*, (May 2019), available at https://www.awea.org/Awea/media/Resources/Publications%20and%20Reports/White%20Papers/Grid-Vision-The-Electric-Highway-to-a-21st-Century-Economy.pdf.

[54] *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities* 1, Order No. 1000-A, Docket No. RM10-23-001 (Fed. Energy Reg. Comm'n May 17, 2012).

and employ metrics that disincentivize interregional transmission.[55]

In adopting a federal high-penetration RES, Congress should additionally direct FERC to update Order No. 1000 to address these issues.[56] For example, the Commission should consider revising Order No. 1000 to develop a more robust and efficient transmission system by incorporating advanced technologies and grid optimization in the planning process, ensuring more standard and broad cost allocation in light of regional benefits, and harmonizing cross-region planning processes to increase inter-RTO transfer capability. If planning and cost-sharing challenges can be overcome, studies have shown that greater grid interconnections – at least connecting the Eastern Interconnection and the Western Interconnection – will result in significant net benefits.[57]

Transmission Incentives

Order No. 1000-mandated transmission planning and coordinating processes are not the only way FERC encourages the build-out of transmission resources. The Energy Policy Act of 2005 required that FERC establish incentive-based transmission rates that (1) promote cost-effective investment in reliability-improving transmission infrastructure, (2) provide a sufficient financial return to incent investment, (3) encourage the deployment of transmission technology enhancements, and (4) allow the recovery of prudently incurred costs by transmission providers.[58]

In response, FERC established the transmission incentives policy required by the Energy Policy Act of 2005 through Order Nos. 679 and 679-A and issued a follow-up policy directive in 2012 that reinforced the "risks and challenges framework." In March 2019, FERC issued a Notice of Inquiry in which it sought comments on potential improvements to those policies, including potentially awarding incentives automatically to transmission projects "with a demonstrated likelihood of benefits," or, alternatively, using project characteristics as a proxy for expected benefits instead of examining the expected benefits of each transmission project individually.[59] By contrast, the Commission currently awards incentives on the basis of special risks or challenges incurred by a project. In its Notice of Inquiry, FERC specifically mentioned the possibility of systematically favoring "transmission projects located in regions with persistent needs, interregional transmissions projects, or transmission projects that unlock constrained resources."[60] FERC additionally sought comments

[55] ACORE Comments on *Inquiry Regarding the Commission's Electric Transmission Incentives Policy*, Docket No. PL19-3-000 (Fed. Energy Reg. Comm'n June 25, 2019).

[56] Frequent state and local obstacles to transmission siting and permitting present additional challenges in building out the nation's transmission infrastructure. Federal transmission planning revisions can reduce these barriers, both by directly lessening these state and local obstacles and by streamlining federal regulations in a way that allows developers to refocus resources on effectively addressing state and local concerns.

[57] *See* Nat'l Renewable Energy Lab., *Interconnection Seams Study Presentation* (July 2018), available at https://register.extension.iastate.edu/images/events/transgridx/TransGrid-X-pre-Symposium-document-from-NREL---web.pdf.

[58] *See* 16 U.S.C. § 824s.

[59] *Inquiry Regarding the Commission's Electric Transmission Incentives Policy* 13, Docket No. PL19-3-000 (Fed. Energy Reg. Comm'n Mar. 21, 2019).

[60] *Id.* at 15.

on how it should incentivize reliability attributes, economic efficiency, transmission system flexibility, interregional transmission projects, and transmission projects that have been identified through an Order No. 1000 transmission planning process.

In comments filed on FERC's March 2019 Notice of Inquiry, ACORE detailed the advantages of moving towards a benefits framework:

> *Transmission incentives need reform to promote necessary investment in the transmission system, ensure grid reliability and resilience, promote economic growth, harness the nation's abundant domestic renewable energy and other resources, and mitigate environmental and greenhouse gas emissions… The Commission should shift from a "risks and challenges" to a "benefits" framework, which can unlock private-sector investment with minimal regulatory reform. A specific technology incentive utilizing this benefits framework would help promote new transmission investment, grid optimization, and the deployment of advanced technologies, including energy storage.*[61]

If improvements to transmission incentives policy have not already been adopted by FERC at the time Congress moves to enact a federal high-penetration RES, legislators could supplement RES legislation with a statutory directive to FERC to adopt the recommendations described above.

Transmission System and Distribution System Interaction and Management

Congressional consideration of electric grid improvements in connection with a federal high-penetration RES could also include potential pilot programs, studies by the Department of Energy and its national laboratories, and other mechanisms for exploring advanced grid operational architectures that will enable more efficient interaction among resources at the transmission and distribution system levels. For example, simplified participation of distribution system operators, demand response aggregators, and distributed energy resources in the overall power system may help to counter variability in transmission-system-level renewable generation.[62] Relatedly, further advancements in algorithmic grid optimization technologies could allow for more efficient and autonomous balancing of power demand and supply.[63] A federal high-penetration RES could prove an appropriate vehicle for expanding the Department of Energy's and others' studying and testing of such new distribution system operational architectures.

Energy Storage

A grid with high-penetration renewable energy can be balanced by a strong transmission system that allows electrons to flow where needed, but increased deployment of energy storage can significantly

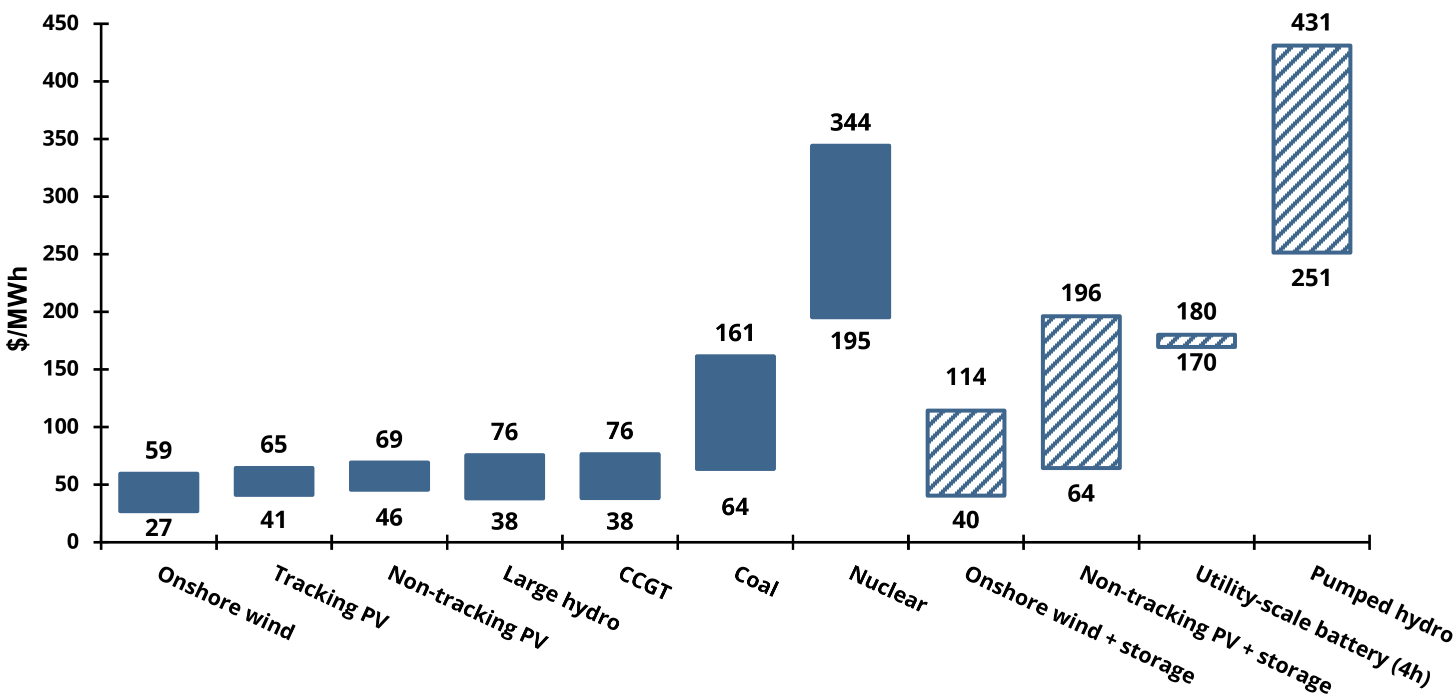
[61] ACORE Comments on *Inquiry Regarding the Commission's Electric Transmission Incentives Policy*, Docket No. PL19-3-000 (Fed. Energy Reg. Comm'n) June 25, 2019.

[62] *See* L. Kristov, P. De Martini, and J. Taft, *A Tale of Two Visions: Designing a Decentralized Transactive Electric System*, IEEE Power and Energy Magazine, Volume: 14, Issue: 3, May-June 2016.

[63] *See* Nat'l Renewable Energy Lab., *From the Bottom Up: Designing a Decentralized Power System*, available at https://www.nrel.gov/news/features/2019/from-the-bottom-up-designing-a-decentralized-power-system.html.

supplement this capability. Specifically, energy storage can help facilitate high renewable penetrations by increasing system flexibility to respond to increased variability and uncertainty, reducing the need for expensive and polluting "peaker" power plants by replacing the role those resources play at times of high electric demand, and elevating resilience by allowing the grid to better weather storms. Energy storage is declining in cost and being deployed rapidly, but it is not yet universally economic across the full range of applications where it can provide benefit.[64]

Levelized Cost of Electricity by Resource in $/MWh, 2019



Source: BloombergNEF

By acting as both capacity and load, energy storage helps the grid respond to unanticipated changes to the power system, reducing risk through increased resource optionality. Despite these capabilities, the value of storage is only partially recognized in today's electricity markets. In fact, the system and non-energy benefits of storage are often excluded in cost-benefit analyses, and regulatory frameworks inadvertently limit energy storage.[65] For these reasons, policymakers pursuing a federal high-penetration RES could additionally consider ways to accelerate the deployment of energy storage.

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[64] *See* BloombergNEF's *1H 2019 Lowest Cost of Electricity Data Viewer* at https://www.bnef.com/core/insights/20425.

[65] *See* ACORE and ScottMadden, *Beyond Renewable Integration: The Energy Storage Value Proposition* (Nov. 2016), available at https://acore.org/wp-content/uploads/2017/12/Beyond-Renewable-Integration_The-Energy-Storage-Value-Proposition.pdf.

A federal tax credit for energy storage is a policy tool that would have a transformative impact on this market, promoting private-sector investment and helping monetize the value of energy storage technology. Currently, energy storage can only qualify for the federal investment tax credit (ITC) when integrated with ITC-eligible solar resources under specific conditions. This tax treatment creates uncertainty for investors, and significantly limits energy storage deployment. Modifying the existing ITC to clarify that all storage technologies (e.g., batteries, pumped hydro, compressed air, flywheels, thermal storage, hydrogen storage, etc.) are eligible for the credit, whether integrated into a hybrid project or deployed on a stand-alone basis, would accelerate the deployment of energy storage and thereby facilitate the implementation of a federal high-penetration RES.

Additional policy tools for accelerating the deployment of energy storage that legislators could consider in connection with a federal high-penetration RES include increased R&D funding and the installation of energy storage equipment at federal (including military) facilities. At the same time that legislators consider these tools to promote the installation of energy storage, it is also critical that FERC and grid operators continue to reform and expand electricity markets to allow energy storage and demand response resources to provide grid reliability attributes and ancillary services on equal footing with traditional power resources.

A Fair Transition

Disadvantaged communities and economically struggling regions stand to gain a variety of potential benefits from increased renewable power – including health benefits,[66] enhanced economic activity and new employment opportunities.[67] At the same time, a federal high-penetration RES will undoubtedly present a shifting landscape to communities that currently rely on fossil fuel generation or production for jobs. This imposes a duty on lawmakers to foresee and address near-term challenges that such communities may face in the transition to a clean energy economy. A federal high-penetration RES also provides an opportunity to recognize and counter the disproportionate health and economic burdens that certain groups, communities, and regions have borne for years from fossil fuel extraction and generation.[68] For these reasons, policymakers should include

[66] As one regional example, ten Midwestern states could see $4.7 billion in health benefits from a $3.5 billion build-out of renewable energy. *See* E. Dimanchev et. al. *Health co-benefits of sub-national renewable energy policy in the US* (August 12, 2019), IOP Publishing Ltd, available at https://iopscience.iop.org/article/10.1088/1748-9326/ab31d9.

[67] In 2016, for example, 8,000 new renewable energy jobs were created in the rural Midwest. That doubled to more than 17,000 additional new jobs in 2017. More rural Midwesterners are now employed by the clean energy industry than the fossil fuel industry. *See* NRDC, *Clean Energy Sweeps Across Rural America* (November 2018), available at https://www.nrdc.org/sites/default/files/rural-clean-energy-report.pdf.

[68] *See*, *e.g.*, E. Massetti et al, *Envt'l Quality and the U.S. Power Sector: Air Quality, Water Quality, Land Use, and Envt'l Justice* x, Oak Ride Nat'l Lab. (Jan. 4, 2017) ("[A] greater percentage of minorities and people living below the poverty level live within a three-mile radius of coal- and oil-fired power plants, compared to the U.S. population overall. Additionally, existing health disparities and other inequities in these communities increase their vulnerability to the health effects of degraded air and water quality and climate change."). As described by Senator Joe Manchin (D-WV), "coal communities . . . have done the heavy lifting that produced the energy that powered our country to greatness." Office of Sen. J. Manchin, *Manchin Leads Group of Senators in Reintroducing RECLAIM Act to Invest in Coal Communities* (April 30,

provisions in legislation accompanying a federal high-penetration RES that ensure *all* Americans benefit from the transition to a renewable energy economy.

The following are examples of fair transition proposals and policy tools that Congress can evaluate and consider when crafting a federal high-penetration RES:

- Vocational training, job relocation allowances, and other reemployment services for fossil fuel workers akin to the Trade Adjustment Assistance Program, as previously proposed in the bipartisan HELP Act.[69]

- Regionally targeted investments in clean energy-related infrastructure and R&D.[70]

- Elements of the Clean Power Plan, which contemplated a Clean Energy Incentive Program and other measures to reward investments in low-income communities, required states to ensure low-income community and minority community participation in planning, and called for continuing EPA monitoring of impacts on vulnerable communities.[71]

- Increased funding for the Appalachian Regional Commission, which has invested almost $150 million in grants to spur economic development in communities adversely affected by the closing of uneconomic coal assets through the Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative started in 2015, with grantees concentrated in West Virginia, Kentucky, Ohio, and Pennsylvania.[72]

- Disbursement of funds from the Abandoned Mine Reclamation Fund to be spent on joint clean-up and economic development projects in coal communities, as set forth in the bipartisan RECLAIM Act.[73]

- Bipartisan proposals to strengthen pension protections for fossil fuel industry workers whose employers go out of business.[74]

2019), available at https://www.manchin.senate.gov/newsroom/press-releases/manchin-leads-group-of-senators-in-reintroducing-reclaim-act-to-invest-in-coal-communities.

[69] H.R. 5529, 113th Cong. (2014).

[70] For example, with funding from the U.S. Department of Energy, West Virginia University is developing ways to extract rare earth elements that are critical to the development of clean energy technologies from abandoned coal mines. *See* P. Ziemkiewicz, *Recovery of Rare Earth Elements from Acid Mine Drainage*, Written Testimony to Sen. Cmte. on Energy and Natural Res. (May 14, 2019), available at https://www.energy.senate.gov/public/index.cfm/files/serve?File_id=AC6480D2-9A7F-4160-BE77-086CC84C7489.

[71] 80 Fed. Reg. 64662 (Oct. 23, 2015).

[72] *See* Appalachian Regional Commission, *POWER Initiative*, available at https://www.arc.gov/funding/POWER.asp.

[73] *See* RECLAIM Act of 2019, H.R. 2156, S. 1232, 116th Cong. (2019).

[74] See, for example, President Obama's FY2016 budget request, which aimed to increase transfers from coal mining revenues to the Pension Benefit Guaranty Corporation and to the United Mine Workers of America Health and Retirement Funds, and similar legislative

- Provisions in Washington State's recently enacted 100% clean energy standard to perform a cumulative impact analysis of environmental and health disparities; require utilities to provide energy assistance to low-income customers; and support job creation for women, minorities, veterans, and other workers.[75]

- Using frameworks akin to Opportunity Zones to further incentivize clean energy projects (including distributed energy resource installations) in low-income communities.

- Returning revenue from RES Alternative Compliance Payments and/or penalties to communities needing investment in connection with the transition to clean energy.

Other Complementary Policies to a Federal High-Penetration RES

As reported to ACORE by leading financial institutions, adequate private capital exists to finance the new clean energy projects that will power the transition to an emission-free electricity sector.[76] Policymakers might consider, however, whether there are complementary policy options to accelerate the deployment driven by a high-penetration RES, reduce its cost, or both.

Carbon Pricing

One policy option already in place in eleven states and in over 40 countries and subnational jurisdictions around the world is carbon pricing.[77] By putting an appropriate price on carbon in combination with a federal high-penetration RES, policymakers could internalize the external costs of carbon pollution and further catalyze market forces to deploy carbon-free and low-carbon electricity at the lowest possible cost. Additionally, to prevent regressive impacts and build durable political support for carbon pricing, members of Congress from both parties have proposed using revenue from carbon pricing to create a "carbon dividend" that would provide a new source of income for all Americans during the renewable energy transition.[78]

Technology-Neutral Tax Credit for Carbon-Free Generation

In response to the ongoing phaseout of existing federal tax credits for wind, solar, and other

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efforts supported by Senators Joe Manchin (D-WV), Shelley Moore Capito (R-WV), and Sherrod Brown (D-OH), and Rep. David McKinley (R-WV).

[75] Washington Governor Jay Inslee, Policy Brief, May 2018, https://www.governor.wa.gov/sites/default/files/documents/clean-electricity-policy-brief-bill-signing.pdf.

[76] ACORE, *$1T 2030: The American Renewable Investment Goal* (June 2019).

[77] *See* World Bank, *Pricing Carbon*, available at https://www.worldbank.org/en/programs/pricing-carbon.

[78] *See* H.R. 763 – 116th Cong., *Energy Innovation and Carbon Dividend Act of 2019*, available at https://www.congress.gov/bill/116th-congress/house-bill/763.

renewable energy technologies, there is growing support in the renewable sector and on Capitol Hill for a new technology-neutral tax credit based on carbon emissions.[79] If enacted alongside a federal high-penetration RES, a technology-neutral tax credit based on carbon emissions could attract more capital to renewable energy investment, lower project costs, and help the United States meet its climate goals.

Conclusion

A federal high-penetration RES is a straightforward approach for delivering clean energy to American consumers, while enhancing the reliability and resilience of the nation's power grid, creating jobs domestically, and increasing American economic competitiveness globally. A review of past legislative efforts reveals a number of key features that policymakers should include in any future federal high-penetration RES proposal. Among the most important: allowing for participation by a broad range of renewable energy technologies, incorporating generation and timeline requirements consistent with climate commitments and other policy goals, including meaningful ACPs and penalties to achieve desired objectives, and ensuring effective interaction with existing state policies. Additional issues that policymakers should consider when crafting federal high-penetration RES legislation include the disposition of stranded asset costs, efforts to minimize creation of new stranded assets, the need for expanded transmission and energy storage, the importance of a fair transition so *all* American benefit from America's renewable energy economy, and the value of complementary measures like appropriate carbon pricing and a technology-neutral tax credit to further accelerate and lower costs for the new federal high-penetration renewable energy standard.

[79] *See* United States Senate Committee on Finance, *Wyden, Colleagues Introduce Legislation to Overhaul Energy Tax Code, Combat Climate Change, available at* https://www.finance.senate.gov/ranking-members-news/wyden-colleagues-introduce-legislation-to-overhaul-energy-tax-code-combat-climate-change-.

Appendix

Notable Past RES/CES Legislation

	The American Clean Energy and Security Act of 2009 (Waxman-Markey)	The Clean Energy Standard Act of 2010 (Graham)	The Clean Energy Standard Act of 2012 (Bingaman)	The Clean Energy Standard Act of 2019 (Smith-Luján)	The National Renewable Electricity Standard Act of 2019 (Udall)
Qualifying Technologies	Combined efficiency and renewable electricity standard. Qualifying technologies include wind, solar, geothermal, qualifying renewable biomass, biogas from renewable biomass, biofuel from renewable biomass, qualified hydropower, marine and hydrokinetic renewable energy, landfill gas, wastewater treatment gas, coal mine methane, and qualified waste-to-energy.	Combined clean energy and energy efficiency standard. Qualifying technologies include solar, wind, geothermal, ocean, qualified biomass, landfill gas, qualified hydropower, marine, hydrokinetic, incremental geothermal, coal-mined methane, qualified waste-to-energy, qualified nuclear, advanced coal generation, eligible retired fossil fuel generation, and other clean energy technologies as determined by the Secretary of Energy.	For facilities placed in service after December 31, 1991, qualifying technologies include solar, wind, ocean, current, wave, tidal, geothermal, qualified renewable biomass, natural gas (excluding landfill methane and biogas), hydropower, nuclear and qualified waste-to-energy. For facilities placed in service after date of enactment, additional qualifying technologies include qualified combined heat and power, qualified efficiency improvements or capacity additions, carbon capture and sequestration, and any source of energy (other than biomass) with a carbon intensity of less than .82 MTC02e per megawatt-hour.	Qualifying technologies include solar, wind, ocean, current, wave, tidal, geothermal, qualified renewable biomass, hydropower, nuclear, qualified waste-to-energy, qualified low-carbon fuels, qualified combined heat and power systems, qualified carbon capture and storage, and any other source of electricity that does not exceed .4 MTC02e per megawatt-hour.	Qualifying technologies include solar, wind, ocean, tidal, geothermal, renewable biomass, landfill gas, incremental hydropower, and hy-drokinetic energy.

	The American Clean Energy and Security Act of 2009 (Waxman-Markey)	The Clean Energy Standard Act of 2010 (Graham)	The Clean Energy Standard Act of 2012 (Bingaman)	The Clean Energy Standard Act of 2019 (Smith-Luján)	The National Renewable Electricity Standard Act of 2019 (Udall)
Required Percentage of Compliant Electricity	Retail electricity suppliers required to achieve 6% renewable energy in 2012, which gradually increases to 20% in 2021 and thereafter. Energy efficiency can constitute up to 25% of total annual requirement, or up to 40% of total annual requirement upon an approved request from a state. While one (1) federal renewable energy credit (REC) is issued for each megawatt hour of qualifying renewable energy generation, distributed renewable energy generation facilities receive three (3) federal RECs for each megawatt hour generated.	Retail electricity suppliers required to achieve 13% clean energy in 2013-2014, 15% from 2015-2019, 20% from 2020-2024, 25% from 2025-2029, 30% from 2030-2034, 35% from 2035-2039, 40% from 2040-2044, 45% from 2045-2049 and 50% in 2050. Energy efficiency can be used to meet up to 25% of annual requirements. CECs are issued for each kWh of clean energy generated. Multiple credits are awarded for clean energy generated on Indian land, distributed clean energy generation, and the first five (5) advanced or retrofitted coal generation facilities. Partial CECs are awarded for eligible retired fossil fuel generation.	Retail electricity suppliers required to achieve 24% clean energy in 2015, with a three (3) percentage point annual increase each year thereafter, until 84% clean energy is reached in 2035. CECs are issued to utilities based on number of megawatt hours sold with a carbon intensity of .82 MTC02e or less. A utility that sells electricity from hydropower or nuclear power placed in service before December 31, 1991 may reduce their applicable clean energy requirement by the amount of electricity so generated.	Retail electricity suppliers over 2 million MWh required to increase clean electricity by 2.75% annually until clean energy delivered to customers hits 60%, 1.75% annually until clean energy delivered to customers hits 90%, and, starting in 2040, 1% annually until clean energy delivered to customers hits a maximum of 100%. Retail suppliers under 2 million MWh required to increase clean electricity 1.5% annually. Annual clean energy percentage increase requirement may vary within 0.5% depending on price of Alternative Compliance Payments and Clean Energy Credits. While one federal CEC is issued for each megawatt-hour of clean energy generation, multiple credits are awarded for qualified dispatchable low- and zero-emission technologies. Emitting resources can receive partial credit based on carbon intensity.	Retail electricity suppliers over 1 million MWh required to increase their base quantity of electricity generated by renewable energy by 1.5% in 2020, 2% annually from 2021-2029, and 2.5% annually from 2030-2035. Retail electricity suppliers that sell under 1 million MWh required to increase their base quantity of electricity generated by half the annual increase above. While one (1) federal REC is awarded for each new kWh of electricity generated from a renewable resource, two (2) federal RECs are issued per kWh of new renewable electricity generated on Indian Land or in impacted communities.

	The American Clean Energy and Security Act of 2009 (Waxman-Markey)	The Clean Energy Standard Act of 2010 (Graham)	The Clean Energy Standard Act of 2012 (Bingaman)	The Clean Energy Standard Act of 2019 (Smith-Luján)	The National Renewable Electricity Standard Act of 2019 (Udall)
Trading/Banking/Borrowing	Trading of federal RECs is permitted. Federal RECs can be banked for up to three (3) years.	Trading of federal Clean Energy Credits (CECs) is permitted. Federal CECs can be banked without limitation. Federal CECs can be borrowed for up to three (3) years, with approval from the Secretary of Energy.	Trading of federal CECs is permitted. Federal CECs can be banked without limitation.	Federal CECs can be banked for up to two (2) years after the CEC is issued. After 2040, banking is permitted for only one year after the year of issue. After 2050, federal CECs are only valid for their year of issue.	Trading of federal RECs is permitted, unless the federal REC was issued as a result of having complied with a more stringent state program. Federal RECs can be banked for up to three (3) years. Federal RECs can be borrowed for up to three (3) years, with approval from the Secretary of Energy.
Alternative Compliance Payments (ACPs)	$25/megawatt hour, adjusted annually for inflation. ACPs sent back to states in proportion to where they were generated and required to be used for deploying technologies that generate electricity from renewable sources and implementing cost-effective energy efficiency programs.	$35/megawatt hour, adjusted annually for inflation, subject to utility waiver petitions. ACPs are sent to back to states in proportion to the retail suppliers' base quantity of electricity in each state to increase clean energy production, promote the deployment and use of electric vehicles, and offset consumer costs through direct grants or energy efficiency investments.	$30/megawatt hour, increased by 5% each year starting no later than 2016, and also adjusted annually for inflation, as deemed necessary by the Secretary of Energy. ACPs used to fund a state Energy Efficiency Program. Without further appropriation or fiscal year limitation, 75% of ACPs returned to states in proportion to amounts collected from each state for implementation of state energy efficiency plans.	$30/megawatt hour, increased by 3% annually through 2029 and then by 5 percent annually, and adjusted annually for inflation, as deemed necessary by the Secretary of Energy. ACPs are directed to a state energy efficiency, clean energy deployment and electric consumer bill program. Without further appropriation or fiscal year limitation, 75% of ACP funds are used to implement state energy efficiency plans, conduct state clean energy programs and carry out incentives to reduce electricity bills for households below 300 percent of the poverty line.	$30/megawatt hour, adjusted annually for inflation, or 200 percent of the average market value of Federal RECs for the applicable compliance period. ACPs are deposited into a state renewable energy account and, subject to appropriations, used to provide grants to state agencies responsible for promoting renewable energy generation or state energy conservation plans.

	The American Clean Energy and Security Act of 2009 (Waxman-Markey)	The Clean Energy Standard Act of 2010 (Graham)	The Clean Energy Standard Act of 2012 (Bingaman)	The Clean Energy Standard Act of 2019 (Smith-Luján)	The National Renewable Electricity Standard Act of 2019 (Udall)
Penalties	Failure by an electric utility to comply with its annual RES requirement or make an applicable ACP results in a penalty equal to its requirement shortfall multiplied by 200% of the ACP.	Failure by an electric utility to comply with its annual CES requirement or make an applicable ACP results in a penalty equal to its requirement shortfall multiplied by 200% of the ACP. Federal penalties are reduced by amounts paid for failure to comply with state law, if the state requirement is more stringent than the federal requirement. federal penalties may be reduced to limit rate impact on consumers. Federal penalties may be waived if compliance failure was outside of utility's reasonable control.	Failure by an electric utility to comply with its annual CES requirement or make an applicable ACP results in a penalty equal to its requirement shortfall multiplied by 200% of the ACP. Penalties used to fund a state Energy Efficiency Program. Without further appropriation, 75% of penalty funds returned to states in proportion to amounts collected from each state for implementation of state energy efficiency plans. Federal penalties are reduced by amounts paid for failure to comply with state law, if the state requirement is more stringent than the applicable federal requirement.	Failure by an electric utility to comply with its annual CES requirement or make an applicable ACP results in a penalty equal to its requirement shortfall multiplied by 200% of the ACP. Penalties are directed to a state energy efficiency, clean energy deployment and electric consumer bill program. Without further appropriation or fiscal year limitation, 75% of penalty funds are used to implement state energy efficiency plans, conduct state clean energy programs and carry out incentives to reduce electricity bills for households below 300 percent of the poverty line. Federal penalties are reduced by amounts paid for failure to comply with state law, if the state requirement is more stringent than the federal requirement. Federal penalties may be waived if compliance failure was outside the retail electricity supplier's reasonable control.	No provision.

	The American Clean Energy and Security Act of 2009 (Waxman-Markey)	The Clean Energy Standard Act of 2010 (Graham)	The Clean Energy Standard Act of 2012 (Bingaman)	The Clean Energy Standard Act of 2019 (Smith-Luján)	The National Renewable Electricity Standard Act of 2019 (Udall)
Interaction with State Programs	No preemption of state laws regarding renewable electricity, energy efficiency, or any other law, including environmental and licensing requirements. Additionally, states retain the authority to adopt renewable energy incentives. When implementing the federal program, FERC is directed to incorporate best practices of state programs, rely on state and regional tracking systems, and coordinate with states to minimize burden and costs to retail electricity suppliers.	No preemption of state laws regarding clean energy, energy efficiency, or the regulation of electric utilities. The Secretary of Energy is directed to promulgate regulations such that a utility's compliance with a state RES or CES would generate corresponding federal CECs in an amount equal to the quantity of clean energy generated. The Secretary of Energy is directed to facilitate coordination between the federal program and state clean energy and energy efficiency programs to the maximum extent practicable.	No preemption of state laws regarding clean or renewable energy, or the regulation of electric utilities. The Secretary of Energy is directed to facilitate coordination between the federal clean energy program and relevant state and clean and renewable energy programs to the maximum extent practicable.	No preemption of state laws regarding clean or renewable energy, or the regulation of any retail electricity supplier. The Secretary of Energy is directed to facilitate to coordination between the federal clean energy program and relevant state clean and renewable energy programs to the maximum extent practicable.	States may opt-out if more than 60% of their electricity is generated from new or existing renewable resources, or if the annual percentage increase requirement for renewable energy and the mechanisms needed to enforce the requirement are at least as stringent as the federal RES. Retail electricity suppliers in states that have opted out may not receive federal program RECs. Payments made to comply with state RESs count towards federal compliance based on the quantity of electricity generated from renewable resources. No preemption of state laws regarding renewable energy that do not conflict with the federal RES. The Secretary of Energy is directed to preserve the integrity of state programs and facilitate coordination between the federal program and state programs.

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