Powering the Future: An Inclusive National Clean Energy Standard with Negative Emissions Technologies

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I. INTRODUCTION

In spite of ratifying the United Nations Framework Convention on Climate Change in 1992, and thus formally recognizing the threat of climate change, the United States is yet to enact policy commensurate with the scale of the global crisis. The Obama Administration failed in an early attempt at passing comprehensive federal legislation with the American Clean Energy and Security Act (also known as the "Waxman-Markey Bill").[1] The administration later moved on to exercising the federal government's existing regulatory authority to reduce greenhouse gas emissions (GHGs)[2] through what was dubbed

[1] The Waxman-Markey Bill included the following provisions: "(1) . . . requiring retail electricity suppliers to meet 20% of their demand through renewable electricity and electricity savings by 2020; (2) . . . improving overall U.S. energy productivity by at least 2.5% per year by 2012 and maintaining that improvement rate through 2030; and (3) establishing a cap-and-trade system for greenhouse gas (GHG) emissions and setting goals for reducing such emissions from covered sources by 83% of 2005 levels by 2050." American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (as passed by House, Jun. 26, 2009).

[2] As discussed in more detail in Section I(A) of this Note, the Supreme Court's decision in *Massachusetts v. EPA*, 549 U.S. 497 (2007) significantly expanded executive authority to reduce GHG emissions under the Clean Air Act. For an overview of executive authority to regulate GHG emissions under the Clean Air Act and other statutes, *see* Jonathan H. Adler, *Heat Expands All Things: The Proliferation of Greenhouse Gas Regulation Under the Obama Administration*, 34 HARV. J.L. & PUB. POL'Y 421, 423–44 (2011).

the "President's Climate Action Plan."[3] This plan included a patchwork of policies that covered various sectors of the economy with a focus on the electricity sector through the "Clean Power Plan." At its best, the Clean Power Plan's impact on GHGs in the electricity sector would be a modest 32% below 2005 levels by 2030.[4] The Trump Administration has moved to repeal the Clean Power Plan and has proposed rolling back numerous Obama-era climate regulations.[5] Federal climate policy thus continues to fall short of both the near and long-term GHG reduction pledges made by the United States towards the Paris Agreement in 2015.[6]

A new administration may have another hand at federal climate change legislation. While a federal carbon tax has often been touted as the most effective solution to reducing GHG

[3] EXECUTIVE OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN (2013), https://obamawhitehouse.archives.gov/sites/default/files/image/president 27sclimateactionplan.pdf [https://perma.cc/P76X-P229].

[4] *See The Clean Power Plan*, UNION OF CONCERNED SCIENTISTS (Dec. 19, 2019), https://www.ucsusa.org/our-work/global-warming/reduce-emissions/what-is-the-clean-power-plan [https://perma.cc/FS3D-JZPF].

[5] Nathan Rott, *Trump Moves To Let States Regulate Coal Plant Emissions*, NAT'L PUB. RADIO (Aug. 21, 2018, 10:02 AM), https://www.npr.org/2018/08/21/639396683/trump-moves-to-let-states-regulate-coal-plant-emissions [https://perma.cc/AY27-FPP4]. For a comprehensive list of deregulatory efforts taken by the Trump Administration on climate change, *see generally*, *Climate Deregulation Tracker*, SABIN CTR. FOR CLIMATE CHANGE L., http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/ (last visited Mar. 21, 2020).

[6] The Paris Agreement recognizes "the need for an effective and progressive response to the urgent threat of climate change." U.N. Framework Convention on Climate Change, Adoption of the Paris Agreement, U.N. Doc. FCC/CP/2015/L.9/Rev.1 (Dec. 12, 2015). Since its adoption in 2015, 189 Parties have ratified the agreement. As part of the United States' first contribution towards the Paris Agreement, the Obama Administration committed to reduce GHG emissions by 26–28% by 2025, noting that this would put it on a "straight line emission reduction pathway from 2020 to deep, economy-wide emission reductions of 80% or more by 2050." UNITED STATES, NDC SUBMISSION (2015), https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/ United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf [https://perma.cc/38GM-X27F]. The Trump Administration has announced the withdrawal of the United States from the Paris Agreement, but under the terms of the agreement, the withdrawal will not take effect until November 4, 2020, the day after the next U.S. presidential election. *See* Umair Irfan, *The United States Has Filed the Official Paperwork to Withdraw from the Paris Agreement*, VOX (Nov. 4, 2019), https://www.vox.com/energy-and-environment/2019/11/4/20948612/paris-climate-agreement-withdrawal-trump-exit [https://perma.cc/XRJ4-BCRT].

emissions,[7] advocates and some scholars of late have come to accept the political limitations of such a policy, instead championing a National Clean Energy Standard ("NCES") as an alternative.[8] While state-level clean energy mandates (often dubbed "Renewable Portfolio Standards") are on strong legal footing, as evidenced by their presence in twenty-nine states and Washington, D.C.,[9] an NCES would have to co-exist with state mandates and avoid encroaching on the federal-state firewall over energy policy under the existing Federal Power Act.[10] Furthermore, an NCES may need to be more expansive than simply mandating zero-carbon resources, as recent reports have shown that significant levels of Negative Emissions Technologies ("NETs") would need to be deployed at a global level in order to keep global temperature rise to below 1.5°C or 2°C—the two temperature targets enshrined in the Paris Agreement.[11]

7 *See, e.g.*, Jennifer A. Dloughy, *Yellen Touts Carbon Tax as 'Textbook Solution' to Climate Change*, BLOOMBERG (Sep. 10, 2018), https://www.bloomberg.com/news/articles/2018-09-10/yellen-touts-carbon-tax-as-textbook-solution-to-climate-change [https://perma.cc/K2K4-GMC3]; David L. Chandler, *Carbon Taxes Could Make Significant Dent in Climate Change, Study Finds*, MIT NEWS (Apr. 6, 2018), http://news.mit.edu/2018/carbon-taxes-could-make-significant-dent-climate-change-0406 [https://perma.cc/9BHC-P555].

8 *See, e.g.*, Justin Gillis & Jameson McBride, *Here's How to Cut Greenhouse Gas Emissions Without Taxing Them*, N.Y. TIMES (Aug. 14, 2018), https://www.nytimes.com/2018/08/14/opinion/how-to-cut-greenhouse-gas-emissions-without-taxing-them.html [https://perma.cc/8S4P-9NU9] (arguing that putting a price on greenhouse gas emissions would be a "political fantasy"). The authors note "a different approach might stand a better chance in Congress—one that would focus on building more clean energy, rather than taxing emissions. This could be accomplished by setting a national clean-energy standard." *Id*. *See also* Joseph E. Aldy et al., *Willingness to Pay and Political Support for a US National Clean Energy Standard*, 2 NATURE CLIMATE CHANGE 596, 596 (2012) (finding that "an '80% by 2035' NCES could pass both chambers of Congress if it increases electricity rates less than 5% on average.").

9 *See State Renewable Portfolio Standards and Goals*, NAT'L CONF. OF ST. LEGISLATURES, https://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx [https://perma.cc/WF6J-E22P] (last visited Apr. 5, 2020).

10 *See* Joshua P. Fershee, *Changing Resources, Changing Market: The Impact of a National Renewable Portfolio Standard on the U.S. Energy Industry*, 29 ENERGY L.J. 49, 64 (2008) (arguing that a national RPS would have to co-exist with state RPS programs); Giovanni S. Saarman González, *Evolving Jurisdiction Under the Federal Power Act: Promoting Clean Energy Policy*, 63 UCLA L. REV. 1422 (2016) (describing the jurisdictional tensions between federal and state clean energy policy).

11 *See* Umair Irfan, *A Major New Climate Report Slams the Door on Wishful Thinking*,

This Note will propose the most legally robust National Clean Energy Standard that can incorporate NETs. Part II provides background on existing federal and state efforts to reduce GHG emissions and the need for an NCES with NETs. Part III will identify the legal barriers to an NCES and the inclusion of NETs, drawing on the history of federal and state climate policy. Finally, in Part IV, this Note will propose an NCES with a trading mechanism among states that would allow for NETs to compete on par with clean energy resources to reduce the carbon intensity of the electricity sector and promote the commercial viability of NETs.

II. THE INADEQUACY OF EXISTING FEDERAL AND STATE CLIMATE POLICIES AND THE NEED FOR AN NCES WITH NETS

Despite the Trump Administration's unwillingness to engage with global efforts to tackle climate change, U.S. GHG emissions have continued to decline in recent years.[12] This decline has

VOX (Oct. 7, 2018), https://www.vox.com/2018/10/5/17934174/climate-change-global-warming-un-ipcc-report-1-5-degrees [https://perma.cc/NKU3-ZDZH] (citing a recent Intergovernmental Panel on Climate Change report that states any pathway to limiting global warming to 1.5 degrees Celsius will require "upward of 1,000 gigatons of carbon dioxide removed from the atmosphere by the end of the century."); Roz Pidcock*, Two Degree Climate Target Not Possible Without 'Negative Emissions,' Scientists Warn*, CARBON BRIEF (Aug. 3, 2015), https://www.carbonbrief.org/two-degree-climate-target-not-possible-without-negative-emissions-scientists-warn [https://perma.cc/TV87-NVG4] (citing study that states "staying below 2C requires capturing and storing carbon in amounts that exceed the capabilities of current technology . . .").

12 The EPA's most recent U.S. GHG emissions inventory shows a decline in emissions starting in 2014. *See* U.S. ENVTL. PROT. AGENCY, EPA 430-R-18-003, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2016 at 2-1 (2018), https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf [https://perma.cc/CJ7T-UBBA]. The EPA has since announced "overall decreases across sectors and that total U.S. greenhouse gas emissions reported decreased by 2.7 percent from 2016 to 2017." *Data Shows Decrease in U.S. Greenhouse Gas Emissions During Trump's First Year in Office,* U.S. ENVTL. PROT. AGENCY (Oct. 17, 2018), https://archive.epa.gov/epa/newsreleases/data-shows-decrease-us-greenhouse-gas-emissions-during-trumps-first-year-office.html [https://perma.cc/BEH7-P8XE]. Contrary to what the EPA claims, however, independent estimates have found a slowing decline in GHG emissions under the Trump Administration. *See* Louis Jacobson, *Are Greenhouse Emissions Down Under Donald Trump, as EPA Says?*, POLITIFACT (June 18, 2018), https://www.politifact.com/truth-o-meter/statements/2018/jun/18/environmental-protection-agency/are-greenhouse-emissions-down-under-donald-trump-e/ [https://perma.cc/HDZ9-CMVR].

largely been due to market trends as opposed to concerted federal policy.[13] Moreover, major GHG reductions driven by federal policy have been incidental rather than intentional. For example, the Montreal Protocol, a treaty ratified by the U.S. Senate in 1988, was designed to reduce ozone-depleting chlorofluorocarbons (CFCs).[14] To date, implementation of the Montreal Protocol has been one of the most effective federal actions to reduce GHG emissions.[15] While some states have tried to independently make up for the deficit in federal policy, these efforts have been uneven at best, and, in some cases, have been hampered by federal courts.[16] This Part provides a broad overview of current federal and state climate policy and in that context, describes the need for an NCES that includes NETs. Part II(A) lays out the overarching reasons for why climate action at the federal level is urgently needed and particularly why an NCES incorporating NETs needs to be established and streamlined with existing state clean energy mandates. Part II(B) provides background on what an NCES and NETs entail, and explains how an NCES can promote the development of NETs.

[13] Estimates show that "[b]etween 2005 and 2016, almost 80% of the reduction in energy-related CO2 emissions in the US came from the electric power sector." *See* Trevor Houser & Peter Marsters, *Final US Emissions Numbers for 2017,* RHODIUM GRP. (Mar. 29, 2018), https://rhg.com/research/final-us-emissions-numbers-for-2017 [https://perma.cc/5WKL-P72C]. The decline in GHGs in the power sector, however, is "being driven by a number of factors, including steadily falling renewable prices, sustained low natural gas prices, consumer preference, and Congress' extension of tax credits for renewable energy resources." *See* Nicholas Bianco & Martha Roberts, *Experts Agree: The U.S. Power Sector is Rapidly Decarbonizing as a Result of Market Trends*, ENVTL. DEF. FUND (Jan. 5, 2017), http://blogs.edf.org/climate411/files/2017/01/CPP-Combined-3.pdf [https://perma.cc/MH54-XPZ5].

[14] CFCs, in addition to contributing to ozone depletion, are also potent GHGs. The alternative to CFCs—hydrochlorofluorocarbons ("HCFCs") and hydrofluorocarbons ("HFCs")—are also potent GHGs, which are being phased out through two subsequent amendments to the Montreal Protocol agreed to in 1992 and 2016 (known as the "The Kigali Amendment").

[15] *See* Lei Hu et al., *Considerable Contribution of the Montreal Protocol to Declining Greenhouse Gas Emissions from the United States*, 44 GEOPHYSICAL RES. LETTERS 8075, 8075–76, 8082 (2017) (finding that "the overall influence of the Montreal Protocol on U.S. GHG emissions decline from 2005 to 2025 . . . is equivalent to ~25–30% of the GHG emission reduction target previously identified in the U.S. Intended Nationally Determined Contributions (INDCs) to the [Paris Agreement] . . .").

[16] *See infra* section II(A)(2).

A. U.S. Climate Policy: An Inadequate and Uneven Patchwork

1. Federal Climate Policy: Too Little Too Late?

Comprehensive federal climate change policy has been elusive. Early legislative efforts failed during the George W. Bush Administration.[17] Nevertheless, successful energy legislation from this time had discernible impacts on GHG emissions through the promotion of less carbon-intensive fuels, fuel economy, and energy efficiency.[18] In the wake of the Great Recession, the stimulus bill[19]—one of the first signature legislative accomplishments under the Obama Administration—provided over $90 billion in clean energy investment and tax incentives.[20] The Waxman-Markey climate bill, which would have established a renewable energy standard and a cap-and-trade program, stalled in the U.S. Senate after passage in the

17 In 2003, then-Senators John McCain (R-AZ) and Joe Lieberman (I-CT) proposed a bipartisan bill to establish a cap-and-trade system regulating the electricity, industrial, commercial, and transportation sectors. *See* Climate Stewardship and Act of 2003, S. 139, 108th Cong. (2003). They later proposed another bill in 2005 to establish a cap-and-trade system removing the transportation sector and including provisions promoting energy innovation. *See* Climate Stewardship and Innovation Act of 2005, S. 1151, 109th Cong. (2005). Both bills were defeated on the Senate floor.

18 The Energy Policy Act of 2005 brought major reforms to the regulatory framework governing energy but also notably promoted natural gas production. *See* Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005). The Energy Independence and Security Act of 2007 then followed, promoting fuel economy and energy efficiency in buildings. *See* Energy Independence and Security Act of 2007, Pub. L. 110-140, 121 Stat. 1492 (2007).

19 American Reinvestment and Recovery Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009).

20 *See* Press Release, Office of the Press Secretary, The Recovery Act Made the Largest Single Investment in Clean Energy in History, Driving the Deployment of Clean Energy, Promoting Energy Efficiency, and Supporting Manufacturing (Feb. 25, 2016) (on file with Obama White House Archives), https://obamawhitehouse.archives.gov/the-press-office/2016/02/25/fact-sheet-recovery-act-made-largest-single-investment-clean-energy [https://perma.cc/2YA2-95AQ].

House of Representatives.[21] Later attempts at climate legislation during the Obama Administration also failed.[22]

In the absence of federal climate change legislation, a coalition of states and cities filed a lawsuit in 2005 claiming that the Clean Air Act ("CAA") required the U.S. Environmental Protection Agency ("EPA") to regulate GHG emissions, and specifically establish emissions standards for motor vehicles.[23] The Supreme Court subsequently held in *Massachusetts v. EPA* that GHGs fit the definition of an "air pollutant" under the CAA and that the burden was on the EPA to justify its inaction.[24] The EPA later under the Obama Administration formally found GHGs to be "air pollutant[s]" under CAA section 202(b) (also known as the "endangerment finding"),[25] triggering regulation of GHG emissions from motor vehicles.[26] Using the endangerment finding, the Obama Administration employed a

[21] The Waxman-Markey bill, introduced by Congressmen Henry Waxman (D-CA) and Ed Markey (D-MA) passed the House of Representatives but was never introduced for a vote on the Senate floor. *See* Bryan Walsh, *Why the Climate Bill Died*, TIME (July 26, 2010), http://science.time.com/2010/07/26/why-the-climate-bill-died/ [https://perma.cc/WDN6-SYYE]. For a summary of what was included in the Waxman-Markey bill *see supra* note 1.

[22] On the heels of the passage of the Waxman-Markey bill in the House of Representatives, Senators John Kerry (D-MA) and Barbara Boxer (D-CA) introduced a companion bill in the Senate, which failed to gain traction. A final bipartisan attempt by Senators Kerry, Lieberman, and Graham (R-SC)—known as the "Three Amigos"—in 2010 was also shelved. For a fascinating account of the Senate efforts to pass comprehensive climate legislation, *see* Ryan Lizza, *As the World Burns*, NEW YORKER (Oct. 11, 2010), https://www.newyorker.com/magazine/2010/10/11/as-the-world-burns [https://perma.cc/66KW-SEY5].

[23] Massachusetts v. EPA, 415 F.3d 50, 53 (D.C. Cir. 2005), *rev'd*, 549 U.S. 497 (2007).

[24] *Massachusetts*, 549 U.S. 497, 500 (2007) ("Because greenhouse gases fit well within the Clean Air Act's capacious definition of 'air pollutant,' we hold that EPA has the statutory authority to regulate the emission of such gases from new motor vehicles . . . Under the Act's clear terms, EPA can avoid promulgating regulations only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do.").

[25] Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496 (Dec. 15, 2009) (codified at 40 C.F.R. ch. 1).

[26] The Obama Administration raised fuel economy standards to 54.5 miles per gallon for cars and light-duty trucks by 2025. *See* Press Release, Office of the Press Secretary, Obama Administration Finalizes Historic 54.5 MPG Fuel Efficiency Standards (Aug. 28, 2012) (on file with Obama White House Archives), https://obamawhitehouse.archives.gov/the-press-office/2012/08/28/obama-administration-finalizes-historic-545-mpg-fuel-efficiency-standard [https://perma.cc/WUU3-VN28].

patchwork of other GHG regulations covering energy efficiency, hydrofluorocarbon and methane emissions, and, notably, electricity sector emissions through the now-repealed Clean Power Plan.[27] Even under the best of circumstances, this smattering of federal regulations forged through existing CAA authority falls short of the economy-wide effort needed for the United States to reduce its GHG emissions in line with either of the temperature targets enshrined in the Paris Agreement.[28]

Separate from regulations, the federal government has provided targeted subsidies to select renewable energy resources. The Production Tax Credit ("PTC") provides subsidies for the first ten years of production for onshore wind, geothermal, energy produced from landfill gas, and hydroelectric power.[29] The Investment Tax Credit ("ITC") provides a subsidy for the initial investment for offshore wind, solar, small wind turbines, and biomass.[30] Studies have shown that while "renewable electricity tax credits do increase renewable power generation . . . the effect is small relative to the entire generating fleet. The impact of the ITC and the PTC is also reduced by the existence of renewable power mandates in more than half the states."[31] While the federal and state governments appear to be working towards the same objective, federal efforts could have a bigger impact if they are harmonized with state efforts.

[27] The Clean Power Plan established a flexible target to reduce carbon dioxide emissions from power plants by 32% below 2005 levels by 2030. *See* Press Release, Office of the Press Secretary, Fact Sheet: President Obama to Announce Historic Carbon Pollution Standards for Power Plants (Aug. 3, 2015) (on file with Obama White House Archives), https://obamawhitehouse.archives.gov/the-press-office/2015/08/03/fact-sheet-president-obama-announce-historic-carbon-pollution-standards [https://perma.cc/HZ4K-S6NZ]. A summary of other major GHG reduction efforts by the Obama Administration can be found in the President's Climate Action Plan, *supra* note 3.

[28] *See USA: Country Summary*, CLIMATE ACTION TRACKER, https://climateactiontracker.org/countries/usa/ [https://perma.cc/XEU7-Z4Q3] (last updated Nov. 29, 2018) ("Even meeting the US target under the Paris Agreement would, however, be 'Insufficient' to limit warming to 2°C, let alone 1.5˚C.").

[29] *See* Brian C. Murray et al., *How Effective are US Renewable Energy Subsidies in Cutting Greenhouse Gases?*, 104 AM. ECON. REV. 569, 570 tbl.1 (2014).

[30] *Id.*

[31] *Id.* at 573.

2. State Clean Energy Policy: Laboratories or Impediments to Federal Climate Policy?

States have pursued their own climate mitigation strategies, with twenty-nine states and Washington D.C. having some form of a clean energy mandate for electricity generation.[32] Additionally, recognizing the importance of preserving and promoting nuclear power for climate mitigation purposes, some states have created either standalone programs to support nuclear power or expanded their clean energy mandates to include nuclear power. Illinois and New York State, for example, have established Zero Emissions Credits ("ZECs") programs designed exclusively to provide credits to nuclear generators.[33] Modeled after Renewable Energy Credits ("RECs"),[34] these ZECs programs pay nuclear generators per megawatt-hour of energy produced.[35]

Clean energy mandates are considered a legally robust policy option for states insofar as they exclusively affect in-state electricity generation. There are, however, increasing concerns that state climate policies supporting clean energy resources may artificially distort interstate electricity markets, violating the dormant Commerce Clause. The fault line in many of these legal battles is the "extraterritoriality principle," which finds a state law invalid if "it has the 'practical effect' of regulating commerce outside the state's borders, or effectively 'controls the conduct of those engaged in commerce occurring wholly outside

[32] *See State Renewable Portfolio Standards and Goals*, *supra* note 9.

[33] *See* DANIEL SHEA & KRISTY HARTMAN, NAT'L CONF. OF ST. LEGISLATURES, STATE OPTIONS TO KEEP NUCLEAR IN THE ENERGY MIX 25–26 (2017) https://www.ncsl.org/Portals/1/Documents/energy/StateOptions_NuclearPower_f02_WEB.pdf [https://perma.cc/QLZ4-7KW4].

[34] RECs vary from state to state depending on how their RPS programs are structured. *See* JOHN HAMRIN, CLEAN ENERGY STATES ALLIANCE, REC DEFINITIONS AND TRACKING MECHANISMS USED BY STATE RPS PROGRAMS (JUN. 2014), https://www.cesa.org/wp-content/uploads/RECs-Attribute-Definitions-Hamrin-June-2014.pdf [https://perma.cc/WC93-G3BZ].

[35] In New York, independent research showed that "although customers would pay for ZECs, they would avoid a power price increase that is larger than the ZEC cost. This means that customers actually pay less overall for power than if the upstate nuclear plants were to shut down." BRATTLE GRP., PRELIMINARY COMMENT ON NEW YORK DEPARTMENT OF PUBLIC SERVICE "STAFF'S RESPONSIVE PROPOSAL FOR PRESERVING ZERO-EMISSIONS ATTRIBUTES" 2 (July 2016), http://files.brattle.com/files/5799_comment_on_july_8_staff_proposal_-_brattle.pdf [https://perma.cc/HA9B-FDBB].

the State.'"[36] In a dormant Commerce Clause challenge to Colorado's RPS, which required utilities to obtain 20% of their electricity from renewable energy sources, the U.S. Court of Appeals for the Tenth Circuit upheld the RPS on the grounds that the net price impact on out-of-state consumers was not clear enough to be struck down under the extraterritoriality principle.[37]

ZECs programs have also come under legal scrutiny. In order to mitigate the potential wholesale market distortions that would arise from state support for nuclear generation, PJM and NYISO—the interstate grid operators governing Illinois and New York respectively—considered imposing what is known as a "Minimum Offer Price Rule" ("MOPR"), which would establish a price floor only above which nuclear generators could bid into wholesale capacity markets.[38] In two recent cases, the Courts of Appeals for the Seventh[39] and Second[40] Circuits respectively "determined that state support for the environmental attributes of zero carbon emitting resources did not improperly interfere

[36] Alexandra B. Klass & Elizabeth Henley, *Energy Policy, Extraterritoriality, and the Dorman Commerce Clause*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 127, 133 (2013–2014).

[37] Energy & Env't Legal Inst. v. Epel, 793 F.3d 1169, 1174 (10th Cir. 2015).

[38] *See* Marcy Crane, *FERC Pressed to Address Zero-Emission Credits' Impacts on NYISO, PJM Markets*, S&P GLOBAL: MARKET INTELLIGENCE (Sep. 1. 2017), https://www.spglobal.com/marketintelligence/en/news-insights/trending/vt1ocbxoigvlxmdwoyh7fg2 [https://perma.cc/A65F-3L2L]. For more detailed background on how a "MOPR" would function and the effect it would have on nuclear resources, *see* Ann McCabe & Miles Farmer, *How FERC Can Protect Customers and Respect State Energy Policy Authority in its PJM Capacity Market Proceeding*, UTIL. DIVE (Sep. 25, 2018), https://www.utilitydive.com/news/how-ferc-can-protect-customers-and-respect-state-energy-policy-authority-in/533095/ [https://perma.cc/E9E8-9SPF].

[39] Elec. Power Supply Ass'n v. Star, 904 F.3d 518, 522–25 (7th Cir. 2018) ("The [FPA] divides regulatory authority between states and the FERC. The Commission regulates the sale of electricity in interstate commerce . . . while states regulate local distribution plus the facilities used to generate power. . . . Illinois has not engaged in any discrimination beyond what is required by the rule that a state must regulate within its borders.").

[40] Coal. for Competitive Elec., v. Zibelman, 906 F.3d 41, 57 (2d Cir. 2018) ("FERC uses auctions to set wholesale prices . . . with the background assumption that the FPA establishes a dual regulatory system between the states and federal government . . . [and] the states engage in public policies that affect the wholesale markets. Accordingly, the ZEC program does not cause clear damage to federal goals . . . .").

with wholesale markets."[41] The Supreme Court punted on hearing either of these cases, leaving the circuit court decisions to stand.[42] Meanwhile, the Federal Energy Regulatory Commission ("FERC") has exercised its own authority to undercut the Illinois ZEC program ordering PJM to "dramatically expand its [MOPR] to nearly all state-subsidized capacity resources" to preserve the "integrity and effectiveness of PJM's capacity market."[43] Under FERC's order, energy resources supported by the ZEC and RPS programs within PJM's jurisdiction would be subject to price floors when bidding into wholesale capacity markets.[44] These recent legal challenges have highlighted the tension between state climate policies and federal authority to regulate interstate electricity markets under the Federal Power Act. These federalism issues are discussed more extensively in Part III(A)(1).

State clean energy mandates have nevertheless gone forward, engendering a "race to the top."[45] The National Renewable Energy Laboratory estimates that taken in their current form out to 2050, state clean energy mandates provide $97 billion in health and environmental benefits as well as $161 billion in global climate benefits, while only costing $31 billion.[46] There is

[41] Brien J. Sheahan, *When PJM's Capacity Market stops Working for Consumers is it Time to Leave?*, UTIL. DIVE (Oct. 2, 2018), https://www.utilitydive.com/news/when-pjms-capacity-market-stops-working-for-consumers-is-it-time-to-leave/538605/ [https://perma.cc/GN4S-R4VF].

[42] *See* Gavin Bade, *Supreme Court Won't Hear Nuke Subsidy Cases, Clarifying State Energy Jurisdiction*, UTIL. DIVE (Apr. 15, 2019), https://www.utilitydive.com/news/supreme-court-wont-hear-nuke-subsidy-cases-clarifying-state-energy-jurisd/552768/ [https://perma.cc/T2DT-8ULU] ("The Supreme Court's decision not to hear challenges to the nuclear subsidies is the final ruling on the legality of the programs, whose structure has now been replicated in other states.").

[43] *See* Sonal Patel, *The Significance of FERC's Recent PJM MOPR Order Explained*, POWER MAG. (Dec. 26, 2019), https://www.powermag.com/the-significance-of-fercs-recent-pjm-mopr-order-explained/ [https://perma.cc/2A63-8ELY].

[44] *See* Order Establishing Just and Reasonable Rate, 169 FERC ¶ 61,239 at P 69 (Dec. 19, 2019) ("We reiterate that if an out-of-market payment meets the definition of State Subsidy above—including ZEC and RPS programs—then the State-Subsidized Resource is subject to the default offer price floor.").

[45] Thomas P. Lyon & Haitao Yin, *Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation*, 31 ENERGY J. 131, 153 (2010).

[46] TRIEU MAI ET AL., NAT'L RENEWABLE ENERGY LAB. NREL/TP-6A20-67455, A PROSPECTIVE ANALYSIS OF THE COSTS, BENEFITS, AND IMPACTS OF U.S. RENEWABLE PORTFOLIO STANDARDS vii–viii (Dec. 2016), https://www.nrel.gov/docs/fy17osti/67455.pdf [https://perma.cc/97CL-S9EF].

much untapped potential with regard to the benefits state clean energy mandates can provide, however. The strict legal barriers restricting state clean energy policy to operate within the confines of in-state electricity generation have frustrated transmission coordination among states that would facilitate a more economically efficient method for renewable energy to be exported and imported among states.[47] This has made coordinated federal policy—particularly an NCES—imperative.

B. National Clean Energy Standards and Negative Emissions Technologies

A recent Intergovernmental Panel on Climate Change ("IPCC") report describes the grave differences between a world that experiences 2°C versus 1.5°C of warming.[48] All global pathways to hold global temperature rise to 1.5°C require a global phase out of fossil fuels along with varying levels of carbon dioxide removal.[49] This requires every country to take efforts to facilitate this global transition away from fossil fuels and deploy NETs to offset existing and residual GHG emissions.[50] A federal clean energy mandate—an NCES with NETs—is woefully needed for the United States to make meaningful progress in reducing GHG emissions. In addition to the classic free-rider problem caused by uneven policies among states, "nine of the top twenty carbon dioxide emitting states do not have enforceable renewable portfolio standards."[51] Moreover, "[b]ecause of the range of characteristics encompassed by RPSs and the unique

47 Lyon & Yin, *supra* note 45, at 153 ("[A]n efficient renewable energy policy would likely involve transmission of massive amounts of renewable power from one region to another, a goal frustrated by in-state requirements. Thus, it is not enough for state environmental policies to encourage a race to the top; they need to achieve policy coordination as well."). *See also* SHALINI VAJJHALA ET AL., RESOURCES FOR THE FUTURE, GREEN CORRIDORS: LINKING INTERREGIONAL TRANSMISSION EXPANSION AND RENEWABLE ENERGY POLICIES 26 (Mar. 2008), https://media.rff.org/documents/RFF-DP-08-06.pdf?_ga=2.193758821.970362960.1550222239-821454848.1549825468 [https://perma.cc/AAE6-66QT] ("As one would expect, REC prices come down with transmission expansion, making the policy more affordable for consumers everywhere.").

48 *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), GLOBAL WARMING OF 1.5 °C: SUMMARY FOR POLICYMAKERS (Valerie Masson-Delmotte et al. eds., 2018).

49 *See Id.* at 14–17.

50 *Id.*

51 Francesca F. Bochner, *Water, Wind, And Fire: A Call For A Federal Renewable Portfolio Standard*, XXV DUKE ENVTL. L. & POL'Y. FORUM 201, 215–16 (2014).

aspects of each state, as many different RPS designs exist as do jurisdictions that have enacted these policies."[52] An NCES would harmonize policies among states[53] that currently have some form of a clean energy mandate while also ensuring that high-emitting states that do not currently have clean energy mandates are brought under federal regulation.

1. The Potency of a National Clean Energy Standard

Scholars have long debated the best approach to reducing greenhouse gas ("GHG") emissions. The prevailing wisdom says that a price on carbon is the most economically efficient means to reduce GHG emissions.[54] A price on carbon can come in the form of a direct tax on carbon or a cap-and-trade system that establishes a cap on GHG emissions and allows regulated entities to trade credits. However, there are severe political constraints blocking the establishment of a national price on carbon—namely, collective action challenges, regulatory capture, and concerted industry opposition.[55] Additionally, voters also prefer command-and-control regulations and green subsidies,[56] which are thought to be "second-best" policy

[52] Anthony Chavez, *Using Renewable Portfolio Standards to Accelerate Development of Negative Emissions Technologies*, 43 WM. & MARY ENVTL. L. & POL'Y REV. 1, 23 (2018).

[53] For an in-depth look at the breadth of ways in which RPS policies can be developed among states, *see* Felix Mormann et al., *A Tale of Three Markets: Comparing the Renewable Energy Experiences of California, Texas, and Germany*, 35 STAN. ENVTL. L.J. 55 (2016).

[54] *See* WILLIAM NORDHAUS, A QUESTION OF BALANCE: WEIGHING THE OPTIONS ON GLOBAL WARMING POLICIES 148–64 (2008); Gilbert E. Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENVTL. L. REV. 499, 500 (2009) ("Without a carbon tax, individuals face a distorted set of prices . . . A tax forces individuals to consider the full set of consequences from emissions."); Joseph E. Aldy & Robert N. Stavins, *Using the Market to Address Climate Change: Insights from Theory & Experience*, 141 DAEDALUS J. AM. ACAD. ARTS & SCI. 45, 45 ("Externality pricing can promote cost-effective abatement, deliver efficient innovation incentives, avoid picking technology winners, and ameliorate, not exacerbate, government fiscal conditions.").

[55] *See* Jesse D. Jenkins, *Political Economy Constraints on Carbon Pricing Policies: What Are The Implications for Economic Efficiency, Environmental Efficacy, and Climate Policy Design?*, 69 ENERGY POL'Y 467, 468–69 (2014).

[56] Gary M. Lucas, Jr., *Voter Psychology and the Carbon Tax*, 90 TEMP. L. REV. 1, 13–14 (2017) ("Despite the persistent pleadings of economists, polls consistently find that less than 40% of the public favors mitigating climate change via a broad-based carbon tax . . . Instead of a carbon tax, the public strongly supports command-and-control regulations and green subsidies.").

instruments.[57] Among second-best policy instruments, clean energy mandates—particularly Renewable Portfolio Standards ("RPS")—are a significant source of U.S. energy demand, accounting for nearly 58% of renewable energy additions since 2000.[58]

Studies have found that RPSs yield great health and climate benefits that offset the costs of investment.[59] The RPS also turns out to be an "administratively efficient, cost-effective, market-based approach to achieving renewable electricity policy objectives."[60] Some have even argued that the demand-side mandates in lieu of supply-side incentives, such as tax subsidies, would free up public resources for other important clean energy priorities.[61] In comparison to other policy interventions, "[a] clean energy standard would reduce the regulatory uncertainty that could be chilling investment in the power sector."[62] In addition, it has been posited that clean energy mandates may not be second-best policy instruments after all, but instead may be precursors to a price on carbon.[63]

[57] Jenkins, *supra* note 55, at 46869.

[58] GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., U.S. RENEWABLES PORTFOLIO STANDARDS: OVERVIEW OF STATUS AND KEY TRENDS 23 (Nov. 5, 2015), https://www.cesa.org/assets/2015-Files/RPS-Summit/Galen-Barbose-11.5.15.pdf [https://perma.cc/4ZE5-UF33].

[59] *See* Ryan Wiser et al., *Assessing the Costs and Benefits of US Renewable Portfolio Standards*, 12 ENVTL. RES. LETTERS 1 (2017), http://iopscience.iop.org/article/10.1088/1748-9326/aa87bd/pdf [https://perma.cc/V8KR-SG4D].

[60] ENVTL. PROT. AGENCY, EPA ENERGY AND ENVIRONMENT GUIDE TO ACTION 5-2 (2015), https://www.epa.gov/sites/production/files/2015-08/documents/guide_action_full.pdf [https://perma.cc/WT63-LXD5].

[61] *See* Aldy, *supra* note 8. *See also* JOSEPH E. ALDY, PROMOTING CLEAN ENERGY IN THE AMERICAN POWER SECTOR 11 (May 2011) https://www.hamiltonproject.org/assets/legacy/files/downloads_and_links/05_clean_energy_aldy_paper.pdf ("This would enable legislators to allocate future resources to energy programs that complement the clean energy standard (such as R&D on basic energy sciences), to other socially desired policies, or deficit reduction in lieu of clean energy deployment subsidies.").

[62] Aldy *supra* note 8. Aldy also explains that regulatory uncertainty can take two forms: "First, power companies face uncertainty over the general regulatory framework. Second, some regulatory approaches are characterized by more uncertainty than others . . . . For example, moving forward with power sector regulations under the Clean Air Act . . . [introduces] the prospect of extended litigation." *Id.*

[63] Jonas Meckling et al., *Policy Sequencing Towards Decarbonization*, 2 NATURE ENERGY 918, 918 (2017) (Arguing that policies "promoting both the development and deployment of low-carbon technologies . . . . bolster clean-energy industries and reduce the cost of

While RPSs differ from state to state, the hallmark of an RPS is its support for traditional renewable resources such as "[p]hotovoltaic, solar thermal, and wind power," with varying treatment of other resources such as "biogas, biomass, municipal solid waste, and hydropower."[64] Nuclear power is largely an unclaimed resource with "[l]arge amounts of reliable low-carbon nuclear power . . . generated in seventeen of the states with an RPS, yet none of them factor this generation into their grid mandates."[65] Nuclear power, however, accounts for around 20% of total electricity generation in the United States and a little over 50% of zero-carbon electricity.[66] This is in spite of the fact that all nuclear generation capacity (save for a few reactors currently under construction) was built prior to 1990.[67] In addition to the climate benefits of nuclear power, there are additional benefits such as "reliability, fuel diversity within the broader generation portfolio, a relatively small geographic footprint, low air pollution (i.e., no sulfur or nitrogen oxides, or particulates), rural job retention and sizeable local tax revenue, and enhanced national security."[68] Moreover, nuclear power has the potential to support increased penetration of intermittent renewable resources such as solar and wind, providing further climate benefits.[69]

low-carbon technologies, thus building political support for regulatory policy such as carbon pricing.").

64 Miriam Fischlein & Timothy M. Smith, *Revisiting Renewable Portfolio Standard Effectiveness: Policy Design and Outcome Specification Matter*, 46 POL'Y SCI. 277, 285 (2013).

65 RYAN FITZPATRICK ET AL., THIRD WAY, CLEAN ENERGY STANDARDS: HOW MORE STATES CAN BECOME CLIMATE LEADERS (2018), http://thirdway.imgix.net/pdfs/clean-energy-standards-how-more-states-can-become-climate-leaders.pdf [https://perma.cc/AKD2-K6BG].

66 *5 Fast Facts About Nuclear Energy*, U.S. DEP'T OF ENERGY, https://www.energy.gov/ne/articles/5-fast-facts-about-nuclear-energy [https://perma.cc/RND5-WCTJ] (last visited May 2, 2020).

67 *See Nuclear Power in the USA*, WORLD NUCLEAR ASS'N, https://www.world-nuclear.org/information-library/country-profiles/countries-t-z/usa-nuclear-power.aspx [https://perma.cc/X94X-4DPR] (last visited Mar. 22, 2020).

68 DOUG VINE, CTR. FOR CLIMATE AND ENERGY SOLUTIONS (C2ES), SOLUTIONS FOR MAINTAINING THE EXISTING NUCLEAR FLEET 5 (2018), https://www.c2es.org/site/assets/uploads/2018/05/solutions-for-maintaining-existing-nuclear-fleet.pdf [https://perma.cc/U2LP-EGNZ].

69 *See* J.D. Jenkins et al., *The Benefits of Nuclear Flexibility in Power System Operations with Renewable Energy*, 222 APPLIED ENERGY 872, 872 (2018) ("[N]uclear plants are

Studies have shown that disregarding the carbon content among non-renewable energy resources (e.g., nuclear power) in a clean energy mandate can make the imperative to lower GHG emissions more expensive.[70] Additionally, even a modest RPS can result in a considerable cost premium to achieve the same GHG benefits as a mandate that credits zero and low-carbon energy resources.[71] Overall, among the decarbonization pathways studied for the United States to meet its baseline long-term goal of reducing GHG emissions by 80% below 1990 levels by 2050, nuclear power consistently plays a role in the electricity generation mix.[72] Numerous other studies have also supported the view that any meaningful plan to fully decarbonize the US electricity sector must allow for nuclear power.[73] An NCES

technically capable of more flexible operation, changing their power output over time (i.e. ramping or load following) and . . . can help manage daily and seasonal variability in demand or renewable energy output or respond dynamically to hourly market prices . . . .").

70 *See* Allen A. Fawcett et al., *Overview of EMF 24 Policy Scenarios*, 35 ENERGY J. 33, 59 (2014) ("While a RPS forces more non-biomass renewables into the generation mix despite of these cost disadvantages, its failure to differentiate non-renewable energy sources/technologies (nuclear, gas, and coal) according to their carbon content is an important impediment for obtaining cost-effectiveness."); STEVE CLEMMER ET AL., UNION OF CONCERNED SCIENTISTS, THE NUCLEAR POWER DILEMMA: DECLINING PROFITS, PLANT CLOSURES, AND THE THREAT OF RISING CARBON EMISSIONS 33 (2018), https://www.ucsusa.org/sites/default/files/attach/2018/11/Nuclear-Power-Dilemma-full-report.pdf [https://perma.cc/HSJ5-CXHG], (finding that "retiring uneconomic nuclear reactors before their operating licenses expire would result in a net increase in natural gas and coal generation and higher carbon emissions.").

71 David Young & John Bistline, *The Costs and Value of Renewable Portfolio Standards in Meeting Decarbonization Goals*, 73 ENERGY ECON. 337, 343 (2018) ("For the 25% RPS, we find the cost premium is 3.5, and for the existing state renewable portfolio standards, we find the cost premium is as high as 18.6.").

72 The Deep Decarbonization Pathways Project ("DDPP") has presented four different scenarios through which the United States can achieve its long-term decarbonization goal. All four scenarios require at least a fraction of the electricity generation mix to come from nuclear power ranging from 9.6% to 40.3% of total electricity generation. JAMES H. WILLIAMS ET AL., SUSTAINABLE DEV. SOLUTIONS NETWORK & THE INST. FOR SUSTAINABLE DEV. & INT'L RELATIONS, PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES: TECHNICAL REPORT 20 (2015), http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Technical_Report.pdf [https://perma.cc/P4JZ-TC7P].

73 *See, e.g.,* Christopher Clack et al., *Evaluation of a Proposal for Reliable Low-Cost Grid Power with 100% Wind, Water, and Solar,* 114 PROCE. NAT'L ACAD. SCI. 6722, 6727 (2017) (concluding that "it is extremely difficult to achieve complete decarbonization of the energy system, even when using every current technology and tool available, including energy efficiency and wind, hydroelectric, and solar energy as well as carbon

therefore ought to broadly mandate the adoption of zero-carbon resources such as nuclear power in addition to traditional renewable energy resources.

2. The Need for and Benefits of NETs

As far as climate impacts are concerned, atmospheric removal and storage of GHG emissions have the same impact as reducing GHG emissions through fuel switching or energy efficiency measures. Most climate models have consistently found that feasibly meeting the 2°C and 1.5°C temperature targets enshrined in the Paris Agreement require varying levels of active GHG emissions capture and sequestration.[74] That is, "the concentration of atmospheric carbon dioxide would have to stop increasing (and perhaps start decreasing) by the second half of the century for there to be a reasonable chance of limiting warming and the associated dangerous climate impacts."[75] NETs must be seen as part of a broad suite of climate mitigation efforts "rather than a way to decrease atmospheric concentrations of carbon dioxide only after anthropogenic emissions have been eliminated."[76] Recent economic analysis has shown that NETs can play a significant role alongside existing mitigation technologies, "with perhaps 10 [gigatons of CO2 per year (GtCO2/y)] of negative emissions needed approximately at midcentury and 20 GtCO2/y by the century's end."[77] In addition to contributing to net-removal of GHG emissions from the atmosphere, NETs can also provide the added benefit of offsetting GHG emission from sectors that

capture and storage, bioenergy, and nuclear energy."); J.D. JENKINS & SAMUEL THERNSTROM, ENERGY INNOVATION REFORM PROJECT, DEEP DECARBONIZATION OF THE ELECTRIC POWER SECTOR: INSIGHTS FROM RECENT LITERATURE 3 (Mar. 2017), https://www.innovationreform.org/wp-content/uploads/2018/02/EIRP-Deep-Decarb-Lit-Review-Jenkins-Thernstrom-March-2017.pdf [https://perma.cc/YSA4-76RV] (synthesizing recent literature, concludes that "reaching near-zero emissions will require virtually all unabated coal and gas-fired power plants to be replaced by zero-emissions sources. This would necessitate a substantial increase in variable renewable energy from wind and solar, an expansion of nuclear power capacity (even as all existing nuclear reactors retire between now and 2050).").

74 NAT'L ACAD. OF SCI., ENG'G, & MED., NEGATIVE EMISSIONS TECHNOLOGIES AND RELIABLE SEQUESTRATION: A RESEARCH AGENDA 1–2 (2018).

75 *Id.*

76 *Id.* at 4.

77 *Id.* at 21.

currently do not have a viable pathway to decarbonization, such as aviation.[78]

Various types of NETs have been given prominence in the literature, including leveraging land use and management practices (such as afforestation and reforestation), bioenergy with carbon capture and sequestration, direct air capture, and carbon mineralization.[79] This Note focuses on bioenergy with carbon capture and sequestration ("BECCS") and direct air capture and storage ("DACS"), as they have the potential to be substantially scaled up and "would enable a gentler transition to a low-carbon economy."[80] Land use and management practices are not included in this Note as they are considered part of classical mitigation technologies.

DACS is distinct among NETs as its final product is concentrated CO_2 that can then be sequestered.[81] DACS is a necessary component of long-term climate mitigation as "reaching near-zero emissions will require virtually all unabated coal and gas-fired power plants to be replaced by zero-emissions sources . . . [including] significant penetration of coal or gas with CCS (with nearly 100% CO2 capture rates) . . . ."[82] The federal government has shown early signs of providing support for DACS through the Bipartisan Budget Act of 2018, which extended tax credits to facilities that sequester more than 100,000 metric tons of CO_2 in a given year.[83] BECCS involves

[78] *Id.* at 3–4 ("One option for zero net aviation emissions would be deployment of $100/tCO2 NETs to capture and store 2.5 kg of CO2 for each liter of aviation fuel consumed. This will add ~25 cents per liter of fuel. This is just one example of how NETs might be conceptually bundled with emissions sources that are difficult to eliminate.").

[79] *Id.* at 4–5.

[80] Tracy Hester, *Legal Pathways to the Broad Use of Negative Emissions Technologies and Direct Air Capture of Greenhouse Gases*, 48 ENVTL. L. REP. NEWS & ANALYSIS 10,413, 10,416 (2018) (citing SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK & INSTITUTE FOR SUSTAINABLE DEVELOPMENT AND INTERNATIONAL RELATIONS, PATHWAYS TO DEEP DECARBONIZATION INTERIM REPORT 2 (2014), https://www.iddri.org/sites/default/files/import/publications/ddpp_interim_2014_report.pdf [https://perma.cc/F86B-N2XZ]).

[81] For more information on how DACS works as a process, *see Direct Air Capture (Technology Factsheet)*, GEOENGINEERING MONITOR, http://www.geoengineeringmonitor.org/2018/05/direct-air-capture/ [https://perma.cc/ERP4-4B4R] (last visited Mar. 22, 2020).

[82] Jenkins & Thernstrom, *supra* note 73, at 3.

[83] *See* Hester, *supra* note 80, at 10,416.

the capture of CO_2 from the atmosphere through the photosynthetic process and subsequent sequestration of the captured carbon for geologic timescales.[84] However, it should be noted that BECCS can only function as a NET if the captured carbon is sequestered as opposed to being burned for energy use, which would not result in a net reduction of atmospheric CO_2.[85] The limiting factor to BECCS is the land availability and transportation constraints for processing.[86] Overall, "NETs are still struggling to get out of the laboratory. Initial feasibility studies have yet to verify that these techniques can reliably and safely work at a bench scale . . . before we can assess their potential for mass deployment and their economic efficiency."[87]

3. How an NCES can Stimulate NETs Development

As NETs are still in their nascent stages, an NCES can play a critical role in stimulating their development, just as clean energy mandates across the country have stimulated growth in renewable energy technology. Clean energy mandates by nature are "market-oriented policies that establish general targets, but they allow market actors—such as utilities, other electricity suppliers, project developers, and other private sector participants—to determine their methods of compliance."[88] Furthermore, clean energy mandates are uniquely equipped to promote specific technologies that are yet to be independently cost competitive.[89] NETs can benefit from a carve-out in an NCES. For example, specific carve-out provisions for solar in state RPSs have been found to promote solar development.[90]

[84] James S. Rhodes & David W. Keith, *Biomass with Capture: Negative Emissions Within Social and Environmental Constraints: An Editorial Comment*, 87 CLIMATIC CHANGE 321, 321 (2007).
[85] NAT'L ACAD. OF SCI., ENG'G, & MED, CLIMATE INTERVENTION: CARBON DIOXIDE REMOVAL AND RELIABLE SEQUESTRATION 66 (2015).
[86] *See id.* at 63–64 (2015) ("Both the availability of land for biomass cultivation and the need to transport bulky biomass to processing facilities severely limit the feasible use of bioenergy.").
[87] Hester, *supra* note 80, at 10,421.
[88] *See* Chavez, *supra* note 52, at 28.
[89] *See id.* at 29–30.
[90] *See* Andrea Sarzynski et al., *The Impact of State Financial Incentives on Market Deployment of Solar Technology*, 46 ENERGY POL'Y 550, 556 (2012) ("We found that states with RPS policies installed an average of 95% more PV capacity than states without RPS

Wind technology, in contrast, was more established and commercially viable prior to the RPS effect.[91] RPSs, however, have had a discernible impact on spurring wind deployment.[92] Overall, the data supports the proposition that "RPSs help drive technologies to maturity, at which point their deployment becomes widespread."[93]

NETs are not constrained by the traditional economic difficulties faced by fossil fuel energy sources coupled with carbon capture and storage ("CCS"). "By contrast, negative emissions technologies and direct air capture need not satisfy a similar cost metric (although they still face the more fundamental challenge of how they can be paid for without government funding, a price on carbon, or a regulatory mandate)."[94] An NCES would provide a regulatory mandate as well as an established accounting system that would allow the climate mitigation benefits provided by NETs to be properly quantified and priced. NETs can be given a specific carve-out in an NCES in the short term to provide investors with certainty.[95] In the long term, as NETs become more cost-competitive they can directly compete with clean energy resources for their climate mitigation benefits. Furthermore, similar to how RPS programs overcome the geographic constraints of renewable energy technologies through the use of Renewable Energy Credits (RECs), NETs can also benefit from the same regulatory framework due to their own potential geographic constraints.[96]

policies, while states with specific solar set-asides installed over 722% more PV capacity, on average, than states without solar carve-outs.").

91 *See* Chavez, *supra* note 52, at 39.

92 *Id.* at 40 ("79% of wind power additions either were in RPS states but exceeded RPS mandates or were installed in non-RPS states.").

93 *Id.* at 41 ("Just as wind was used primarily to meet RPS requirements and subsequently came to be installed as additional capacity in RPS states or as new capacity in non-RPS states, solar is beginning to follow a similar trajectory.").

94 *See generally* Michael Gerrard & Tracy Hester, *Going Negative: The Next Horizon in Climate Engineering Law*, 32 NAT. RESOURCES & ENV'T 4 (2018).

95 *See* Chavez, *supra* note 52, at 45–46.

96 *Id.* ("Some NETs technologies are geographically constrained as to where they can be effectively implemented. BECCS is an example of a technology that is regionally dependent.").

III. THE POTENTIAL LEGAL BARRIERS TO AN NCES AND DESIGN ISSUES IN INCORPORATING NETS

An NCES raises many of the legal questions that have animated not just discourse within the energy sector, but constitutional law at large over the years. At its core, energy law is constantly contending with the constitutional "firewall" between federal and state jurisdiction. The famous "*Attleboro* Gap" arose from a dispute over the Rhode Island public utility's ability to raise rates on a Massachusetts-based company.[97] The Supreme Court found that as a result of being "a direct burden upon interstate commerce, from which the state is restrained by the force of the commerce clause, it must necessarily fall, regardless of its purpose."[98] The *Attleboro* Gap was coined out of a recognition that "state commissions were powerless to regulate any interstate transactions by electric utilities" and no federal entity was yet in existence that could regulate interstate electricity transactions.[99] Congress addressed this gap by passing the modern Federal Power Act (FPA).[100] Broadly speaking, the FPA attempted to draw a line between federal and state jurisdiction at the wholesale and retail levels of electricity markets.[101] As recent cases have shown, however, this line has grown considerably less clear as states have begun to take a more active role in mandating and promoting energy resources that have inevitable impacts on interstate wholesale markets.[102]

97 Pub. Utils. Comm'n v. Attleboro Steam & Elec. Co., 273 U.S. 83 (1927).

98 *Id.* at 89.

99 Jim Rossi, *The Brave New Path of Energy Federalism*, 95 TEX. L. REV. 399, 408 (2016).

100 Federal Power Act, ch. 687, 49 Stat. 838 (1935) (codified as amended at 16 U.S.C. §§ 824–824w (2012)). "The statute's legislative history makes clear that closing the 'Attleboro gap'—a regulatory void where neither the forwarding state nor the receiving state could regulate the pricing of electricity sold across state lines—was the legislation's primary impetus." Rossi, *supra* note 99, at 409.

101 The FPA gave:

> the Federal Energy Regulatory Commission (FERC) . . . jurisdiction to regulate wholesale energy sales but preserved state authority over retail transactions. Courts traditionally refer to this allocation of authority between wholesale (federal) and retail (state) energy sales as the jurisdictional 'bright line' that defines spheres of exclusive authority based on a fixed, legalistic inquiry.

Rossi, *supra* note 99, at 400.

102 *See* Alexandra B. Klass, *Federalism "Collisions" in Energy Policy*, REG. REV. (Nov. 19, 2018), https://www.theregreview.org/2018/11/19/klass-federalism-collisions-energy-

This Section delves into the legal issues to be considered in designing an NCES that must co-exist with state energy policies.

A. Marrying Federal and State Climate Policy

1. State Preemption and Potential Federal Power Act Conflicts

An NCES must either fit within the existing framework of the Federal Power Act ("FPA"), specifically the Regional Transmission Organization ("RTO")/Independent System Operator ("ISO") construct that FERC has put in place, or it must reform the FPA with the lightest touch so as to avoid upending the interstate electricity markets as they currently exist. FERC issued Order 2000 in 1999 creating RTOs to manage interstate electricity grids.[103] Among the benefits of RTOs, FERC highlighted efficient transmission planning, increased coordination among regulatory agencies, and reduced transaction costs.[104] As discussed in Section II(A)(2), comprehensive transmission planning has been inhibited by disparate state energy policies. While Order 2000 relied on voluntary participation in RTOs, Order 1000 was issued in 2011 with the express purpose of establishing an "affirmative obligation in these transmission planning regions to evaluate alternatives that may meet the needs of the region more efficiently or cost-effectively."[105] FERC has thus been on a steady march towards harmonizing disparate state energy planning through RTOs and ISOs, but even these efforts face limitations as the "current regulatory structures were all designed for one-way power flows."[106] The design of an NCES—

policy/ [https://perma.cc/B8RE-Y9RP] ("As states continue to enact policies to promote clean energy and to block fossil fuel transport projects, federalism tensions will only increase. The courts will be busy.").

103 Regional Transmission Organizations, 89 FERC ¶ 61,285 (Dec. 20, 1999) [hereinafter Order 2000].

104 *See id.* at 1999 WL 33505505, at *29.

105 Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 136 FERC ¶ 61,051, at P 80 (July 21, 2011) [hereinafter Order 1000].

106 *See* David Roberts, *Clean Energy Technologies Threaten to Overwhelm the Grid. Here's How it Can Adapt.*, VOX (updated Nov. 11, 2019), https://www.vox.com/energy-and-environment/2018/11/30/17868620/renewable-energy-power-grid-architecture [https://perma.cc/SFZ9-HFPC] (explaining how the rise of Distributed Energy

with a potential influx of clean energy resources that may intermittently be feeding into the electricity grid—must fit within this increasingly anachronistic regulatory structure.

Furthermore, the question of how a federal policy can productively interact with existing state clean energy standards will be critical in any NCES design. The Supreme Court in *Hughes v. Talen*, recently waded into the state preemption debate, striking down a Maryland law that tethered support for an in-state power generator to the clearing price of the interstate wholesale capacity auction.[107] The *Hughes* decision highlighted the supremacy of the Federal Power Act over interstate electricity markets by stating that it rejected the Maryland program "only because it disregards an interstate wholesale rate required by FERC."[108] Conversely, the Supreme Court also affirmed the vast expanse of state authority over energy policy: "Nothing in this opinion should be read to foreclose Maryland and other States from encouraging production of new or clean generation through measures 'untethered to a generator's wholesale market participation.'"[109]

As long as existing state clean energy mandates pertain to in-state generation and do not have a discernible impact on interstate electricity markets, they will not be preempted by an NCES, unless it is explicitly written into NCES legislation. An NCES in its design should also seek to minimize administrative redundancy with existing state clean energy mandates.[110] Legal ambiguity can also be minimized if an NCES "contain[s] express provisions accommodating (rather than preempting) state-level

Resources—e.g. rooftop solar panels and small-scale wind turbines—which introduce third-party electricity customers as potential sellers into the market stresses the current regulatory framework.).

107 Under the Maryland program, the in-state power generator would bid into the interstate wholesale capacity market auction, but through a "contract for differences" mandated by the state, the generator would be paid by the utility an established contract price. *See* Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288, 1290 (2016).

108 *Id.* at 1299.

109 *Id.* (quoting Brief for Respondents at 40, Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288 (2016)).

110 *See* Fershee, *supra* note 10, at 65 ("A national RPS would mean new federal reporting requirements for retail electricity suppliers. For those operating in RPS states, a federal RPS would mean a second, potentially duplicative, reporting requirement.").

RPS initiatives."[111] The overall objectives of an NCES would ultimately be best served when states go beyond the federal "floor" and undertake more ambitious clean energy targets.

2. Harmonizing Federal and State Clean Energy Standards

Two major components of a clean energy standard must be harmonized for federal and state standards to co-exist: first, how clean energy credits (or their equivalent) are tracked and quantified; and second, what constitutes a "clean energy" resource. In the absence of harmonization of these two components, the development of clean energy resources can be hindered due to uncertainties over sources of funding.[112] The primary concern with the tracking and quantification of clean energy credits is the possibility of double-counting. Ideally, a federal NCES would allow states to trade clean energy credits among themselves in order to meet their clean energy obligations at the least cost. For example, double counting can occur when a clean energy credit representing 1MWh of a renewable resource for example is "used for compliance in one state and purchased for compliance in another."[113] Furthermore, what constitutes a "clean energy" resource at the federal level can conflict with states' definitions, as some states include only renewable energy resources (e.g., solar and wind) and others have opted for a more expansive definition that also includes zero-carbon resources such as nuclear and hydropower. This is closely related to how clean energy credits are tracked and quantified—without a clear definition, states would be unable to effectively trade credits with each other. This may necessitate a federal definition that preempts state definitions. In order to effectively promote clean energy and emissions offsets, NCES legislation would need to provide uniformity and certainty for states and investors.[114]

[111] James M. Van Nostrand & Anne Marie Hirschberger, *Implications of A Federal Renewable Portfolio Standard: Will It Supplement or Supplant Existing State Initiatives?*, 41 U. TOL. L. REV. 853, 864 (2010).
[112] *See id.* at 866.
[113] *Id.* at 867.
[114] *See id.* at 874.

B. Legal Issues Arising from the Inclusion of NETs in an NCES

1. Fitting NETs within a Legal Framework

There are a number of legal considerations in facilitating the integration of NETs into an NCES.[115] First, if a carve-out were to be made for NETs in an NCES, "states will need to identify the parties required to consider or comply with [the] NETs requirement."[116] Second, most NETs are "non-generation" resources—that is, resources that do not generate electricity but are still given value in wholesale electricity markets for the benefits they confer. These NETs would offset the GHG emissions associated with existing fossil fuel-based energy generation resources. BECCS are unique among NETs because they can produce electricity, allowing them to directly substitute for other clean energy resources. For other NETs that do not have the capacity to produce electricity, this accounting would perhaps have to occur through the quantity of GHG emissions captured and sequestered—or some proxy that can adequately measure the benefit conferred by NETs. Another legal issue to be considered is what kind of entity should be allowed to obtain credits for building NETs and how such an entity can operate alongside energy producers, such as utilities and retail electricity suppliers, under an NCES. For the full potential of NETs to be achieved, they must also offset the emissions from other sectors. The housing of NETs under an NCES framework is primarily to leverage the established tracking and accounting mechanism and, in the short-term, to allow NETs to compete with existing clean energy technologies where NETs provide climate mitigation benefits at a lower cost.

2. Drawing on the Corollaries

Demand response and energy efficiency are two different non-generation resource corollaries that can be drawn on to address

[115] For a summary of the broader legal issues surrounding NETs, *see* Hester, *supra* note 80, at 10,413–15. While the legal issues, such as implications for property law, are important factors in determining the feasibility of NETs, this Note focuses exclusively on the legal issues related to the integration of NETs into an NCES.
[116] Chavez, *supra* note 52, at 49.

the legal issues presented by introducing NETs into electricity markets.[117] For example, in some states, energy efficiency is considered an eligible resource under the state RPS and offers "substantial cost savings over building or contracting for new renewable resources and can change the nominal renewable goal."[118] Similarly, demand response also offers substantial benefits, especially as the presence of intermittent clean energy resources rises in electricity markets.[119]

In *Federal Energy Regulatory Commission v. Electric Power Supply Association (EPSA)*, the Supreme Court ruled in favor of FERC's authority to regulate demand response participation in interstate wholesale markets.[120] At issue in *EPSA* was the statutory authority of FERC under the Federal Power Act to allow wholesale market operators to compensate customers for curtailing their electricity usage at times of peak demand.[121] FERC's demand response rule allegedly crossed the jurisdictional line because of its impacts on retail electricity markets, which are regulated by states. The Supreme Court ruled in favor of FERC, but the decision laid bare the need for "congressional action (and perhaps a broader Supreme Court decision) to update a U.S. electricity market framework that is over 80 years old."[122] The establishment of an NCES that allows for the integration of NETs offers a prime opportunity to clarify the regulatory uncertainties that have made federal and state energy policy equally difficult.

117 Demand response pertains to conferring a financial benefit on large-scale electricity consumers to curtail their usage at peak demand times to reduce the need for ramping up more expensive (and often high-polluting) energy generation resources.

118 Fischlein & Smith, *supra* note 64, at 285.

119 *See* Niamh O'Connell et al., *Benefits and Challenges of Electrical Demand Response: A Critical Review*, 39 RENEWABLE & SUSTAINABLE ENERGY REV. 686, 688 (2014) (explaining how demand response can be "used to meet the fluctuations of renewable generation and facilitate a higher penetration than could be achieved by relying on conventional generation alone. Although the energy cost of renewable resources, for example wind generation, is typically quite low, the associated system costs can be substantial.").

120 FERC v. EPSA, 577 U.S. ___, 136 S.Ct. 760 (2016).

121 *Id.* at 767.

122 *See* Varun Sivaram, *The Supreme Court's Decision on Demand Response Is More Complicated Than You Think*, GREEN TECH MEDIA (Feb. 1, 2016), https://www.greentechmedia.com/articles/read/the-supreme-court-just-clarified-rules-for-modern-power-regulation#gs.JlcgoFTz [https://perma.cc/4ESD-RBGV].

IV. AN NCES THAT WORKS

Part III explored the legal barriers that must be contended with in developing an NCES. This Part puts forward a proposal for the design of an NCES that can fit within the existing federal legislative framework that governs the electricity sector while still promoting "energy federalism" by allowing states to continue to pursue more ambitious policies. This Part will also describe how NETs can be effectively included in this framework.

A. Design of an NCES

1. Defining "Clean Energy Resources"

In establishing an NCES, the question of what constitutes a "clean energy resource" must be answered and leave little room for legal ambiguity. As discussed in Section II(B)(1), states have employed varying forms of clean energy standards that are predominantly focused on mandating renewable energy resources such as solar and wind energy.[123] Of the twenty-nine states that have some form of a "clean energy standard," only two states—California and Indiana—define clean energy broadly.[124] California recently enacted S.B. 100—also known as "The 100 Percent Clean Energy Act of 2018"—mandating that "eligible renewable energy resources and zero-carbon resources supply 100 percent of all retail sales of electricity to California end-use customers."[125] The specific inclusion of "zero-carbon resources" was notable as California had only included "eligible renewable energy resources" in its earlier clean energy targets for 2024, 2027, and 2030.[126] The intent behind the broader clean

[123] *See* Fischlein & Smith, *supra* note 64, at 285 ("Photovoltaic, solar thermal, and wind power seem to be unobjectionable and can be counted in all states."). A small subset of states (Michigan, North Carolina, and Vermont) explicitly include energy efficiency in their clean energy standard. *See State Renewable Portfolio Standards and Goals*, *supra* note 9.

[124] *See State Renewable Portfolio Standards and Goals*, *supra* note 9.

[125] CAL. PUB. UTIL. CODE § 454.53 (West 2019).

[126] *See* 2015 Cal. Legis. Serv. Ch. 547 (S.B. 350) (West). The "eligible renewable energy resources" included solar, wind, and a smattering of other energy resources such as biomass, geothermal, and small hydroelectric energy. Notably missing from the list of eligible resources are nuclear energy and large-scale hydroelectric energy. *See* CAL.

energy mandate was to prioritize achieving greenhouse gas reductions as opposed to supporting specific energy resources.[127] Indiana's clean energy standard goes further than California's and defines "clean energy resource" to include all forms of hydropower, electricity generated by natural gas "which displaces electricity generation from an existing coal fired generation facility," and methane captured from coal beds.[128] The definition also includes "[d]emand side management or energy efficiency initiatives."[129] This broad definition of "clean energy resource" recognizes any form of fuel switching or electricity demand reduction that reduces GHG emissions.

An NCES can combine the best elements of California and Indiana's broad definitions as to what constitutes clean energy. "Zero-carbon resources" should qualify under the clean energy standard, while noting that demand-side interventions such as energy efficiency can qualify as zero-carbon resources as well. California intentionally left the term "zero-carbon resources" undefined in S.B. 100 to allow for technologies that would not qualify under traditional definitions of renewable energy.[130] Recent congressional proposals for an NCES have included an emissions intensity benchmark,[131] providing partial credit for

ENERGY COMM'N, RENEWABLES PORTFOLIO STANDARD ELIGIBILITY (June 2015), https://www.energy.ca.gov/2015publications/CEC-300-2015-001/CEC-300-2015-001-ED8-CMF.pdf [https://perma.cc/3Q24-6JBD].

127 *See* David Krause, *SB 100 Zero-Carbon Definition Still Up in the Air; Large Hydro Undecided*, NEWSDATA (Oct. 4, 2019), https://www.newsdata.com/california_energy_markets/regulation_status/sb-zero-carbon-definition-still-up-in-the-air-large/article_2a0f3e54-e6d5-11e9-81fa-03d5ff0c7f4d.html [https://perma.cc/NP7E-5R8L] ("The zero-carbon portion of SB 100 is intended to be more inclusive than the RPS portion in terms of the types or resources that are eligible . . . If an energy generation resource does not produce greenhouse gas emissions, it would be eligible to meet the 100 percent renewable and zero-carbon target.").

128 IND. CODE § 8-1-37-4 (2011).

129 IND. CODE § 8-1-37-4(a)(16) (2011).

130 *See* Debra Kahn, *Bill to Establish 'Carbon-Free' Grid Advances*, CLIMATE WIRE (July 5, 2018), https://www.eenews.net/stories/1060087891 ("The term 'zero-carbon' is undefined; lawmakers intend it to encompass more than the dozen types of renewable resources that are currently eligible for the RPS." The article further quotes the author of the bill, state Senator Kevin de León, as stating the bill seeks to provide "flexibilities for technologies that are on the horizon" and citing carbon capture and sequestration and nuclear power as potential options.).

131 *See* DISCUSSION DRAFT, CLIMATE LEADERSHIP AND ENVIRONMENTAL ACTION FOR OUR NATION'S (CLEAN) FUTURE ACT, 116th Cong. (2020), https://energycommerce.house.

fossil fuel generators to distinguish the differing climate impacts, for example, between a coal power plant and a natural gas power plant.[132] Any definition of "clean energy," or benchmark, that an NCES adopts should be viewed as a minimum standard. States should be given the flexibility to determine whether they meet the standard through exclusive use of renewable energy resources or through a mix of renewable energy resources, demand-side measures, non-renewable but zero-carbon resources such as nuclear energy, or perhaps even less carbon-intensive energy resources. As discussed in Section IV(B), NETs can also qualify under this broad definition of clean energy.

2. State-Level Clean Energy Mandates

Perhaps the most vexing question of an NCES is how targets will be set among states and at what pace these targets will ratchet up until deep decarbonization of the electricity sector in each state is achieved.[133] The Obama Administration's Clean Power Plan offers guidance. Under the authority of Section 111

gov/sites/democrats.energycommerce.house.gov/files/documents/0128%20CLEAN%20Future%20Discussion%20Draft.pdf [https://perma.cc/5CMD-45MG] [hereinafter CLEAN Future Act]; CLEAN ENERGY STANDARD ACT OF 2019, 116th Cong. (2019), https://smithsenate.app.box.com/s/pnq9j3rmxdxlk7nigu58710b8xrlcmk5 [https://perma.cc/NTN5-6PWJ] [hereinafter CESA 2019].

132 The CLEAN Future Act sets an emissions intensity benchmark of 0.82 metric tons/MWh which would result "in more natural gas use and less coal use" compared to CESA 2019, which sets "a benchmark [0.4 metric tons/MWh] that is low enough to preclude natural gas (without carbon capture) from earning credit." PAUL PICCIANO ET AL., RESOURCES FOR THE FUTURE, TWO KEY DESIGN PARAMETERS IN CLEAN ELECTRICITY STANDARDS 1–2 (Feb. 2020), https://media.rff.org/documents/IB_20-03.pdf. [https://perma.cc/6BKV-ZL56].

133 Scholars have alternatively proposed the point of regulation for an NCES to be at the level of electric utilities or power plants. *See* CTR. FOR CLIMATE AND ENERGY SOLUTIONS (C2ES), AN ILLUSTRATIVE FRAMEWORK FOR A CLEAN ENERGY STANDARD FOR THE POWER SECTOR 2 (Nov. 2011), https://www.c2es.org/site/assets/uploads/2011/11/CES-framework.pdf [https://perma.cc/73K2-AJQ9] ("CES is an electricity portfolio standard with a point of regulation at (compliance obligation on) electric utilities."); Aldy, *supra* note 8, at 10,136 ("The point of regulation for the NCES would be at the power plant."). As argued in Section III(A)(1), the Federal Power Act conflicts can be minimized if the point of regulation of an NCES is at the state level. Moreover, the strength of an NCES would come from providing states with broad authority to design their own clean energy portfolios. *See* FITZPATRICK ET AL., *supra* note 65 ("A smartly designed Clean Energy Standard would provide states with maximum flexibility in their paths toward decarbonization.").

of the Clean Air Act, the Obama Administration sought to regulate GHG emissions from power plants.[134] To that end, the Administration established a framework of cooperative federalism in which each state would develop and submit standards of performance for new and existing sources.[135] The Administrator would also have the authority "to prescribe a plan for a State in cases where the State fails to submit a satisfactory plan."[136] Foundational to the Clean Power Plan is the idea that "each state has differing policy considerations—including varying regional emission reduction opportunities and existing state programs and measures—and that the characteristics of the electricity system in each state (e.g., utility regulatory structure and generation mix) also differ."[137] An NCES can emulate the cooperative federalism model employed by the Clean Power Plan, establishing a federal standard that states must meet by either developing their own plan or allowing the federal government to develop a plan for the state. The federally established standard for each state would serve as a floor upon which states can build if they choose.

Although the Clean Power Plan relied on the EPA's statutory authority to regulate emissions from stationary sources (power plants), it provided flexibility to states to meet the emissions intensity targets for power plants through an emission budget approach. Through what are commonly known as "outside the fence line" measures, states could meet their emission budgets outside the confines of just regulating individual power plants, and also through energy efficiency measures or investment in other low-carbon energy sources, for example. While the "outside the fence line" provision of the Clean Power Plan caused

[134] *See* Gabriel Pacyniak, *Making the Most of Cooperative Federalism: What the Clean Power Plan Has Already Achieved*, 29 GEO. ENVTL. L. REV. 301, 308 (2017) (Section 111 of the CAA . . . is generally concerned with the establishment of performance standards for categories of new stationary sources of air pollution . . . . However, Section 111(d)] charges the EPA with regulating pollutants from categories of *existing* sources under certain circumstances.").

[135] Clean Air Amendments of 1970 § 111, 42 U.S.C. § 7411(c)–(d) (2018).

[136] Clean Air Amendments of 1970 § 111, 42 U.S.C. § 7411(d)(2)(A) (2018).

[137] Carbon Pollution Emissions Guidelines for Existing Stationary Sources: Electricity Utility Generation Units, 80 Fed. Reg. 64,662, 64,666 (Oct. 23, 2015) [hereinafter *Clean Power Plan*].

it much legal consternation,[138] an NCES that is passed through legislation would avoid such legal challenges by exclusively giving states an emission budget mandate that can be achieved through a broad range of compliance measures.

Each state's obligation under the NCES can be determined by developing a state-specific clean energy target based on the state's current fossil fuel generation mix.[139] The aggregate national clean energy target can be pegged to the Deep Decarbonization Pathways Project's scenarios for decarbonization of the U.S. electricity sector.[140] The state clean energy mandate should be established in the form of a percentage of retail electricity sales that must come from clean energy resources (or commensurate NETs to offset emissions from non-clean energy resources). Every five years, the mandate can be updated, synchronizing with the five-year cycles of the Paris Agreement.[141] By establishing the mandate as a percentage of total retail electricity sales, states have the opportunity to harmonize their existing clean energy mandates using the federal mandate as a floor. Additionally, by regulating states at the level of overall retail electricity sales, as opposed to regulating individual retail suppliers, the proposed NCES would avoid encroaching on state authority over the regulation of retail electricity as described in Section III(A)(1). Wholesale electricity markets, which fall under FERC jurisdiction, would be able to

138 *See* LINDA TSANG & ALEXANDRA M. WYATT, CONG. RESEARCH SERV., R4480, CLEAN POWER PLAN: LEGAL BACKGROUND AND PENDING LITIGATION IN WEST VIRGINIA V. EPA 19–20 (Mar. 2017), https://fas.org/sgp/crs/misc/R44480.pdf [https://perma.cc/TK5F-W4GP] (summarizing "outside the fence line" legal challenges to the Clean Power Plan).

139 While the exact formula of a state-specific clean energy target is beyond the scope of this Note, EPA's calculation of state-specific emissions rates for the Clean Power Plan can provide guidance. For a summary of EPA's state-specific emission rate formula, *see* JONATHAN L. RAMSEUR & JAMES E. MCCARTHY, CONG. RESEARCH SERV., R44145, EPA'S CLEAN POWER PLAN: HIGHLIGHTS OF THE FINAL RULE 4–8 (Sep. 2016), https://fas.org/sgp/crs/misc/R44145.pdf [https://perma.cc/D83J-N6UT].

140 *See* WILLIAMS ET AL., *supra* note 72.

141 The Paris Agreement requires each Party to "communicate a nationally determined contribution every five years . . . informed by the outcomes of the global stocktake" which also occurs on a recurring five-year basis. Paris Agreement to the United Nations Framework Convention on Climate Change art. 4, ¶ 9, Dec. 12, 2015, T.I.A.S. No. 16-1104 [hereafter Paris Agreement]. Despite the Trump Administration's withdrawal from the Paris Agreement, a future administration that seeks to rejoin the Paris Agreement may want to use the NCES as a tool to deliver on its pledges towards the agreement.

adapt to any upward pressure placed by the NCES mandate on retail electricity sales.[142] In form, the NCES mandate would not operate differently from an RPS mandated by a state legislature. Based on the mandate, state regulators can accordingly dictate how retail electricity suppliers and individual power generators reorient themselves to meet the state's NCES obligation.

3. A National Clean Energy Credit Trading System Among States

One of the greatest strengths of an NCES regulated at the state level is the ability for states to reduce compliance costs by trading clean energy credits. After all, states are not equally endowed in their access to clean energy resources.[143] It has been argued that a national RPS mandate—an NCES—"would result in a significant transfer of wealth from states with scarce renewable energy resources to those with an abundance of renewables."[144] In the proposed NCES, the broader definition of "clean energy" and the inclusion of NETs for NCES compliance provide an opportunity for clean energy-scarce states to avoid being at a financial disadvantage. These states can invest in NETs to meet their clean energy mandates and sell credits to clean energy-rich states that may see cost curves significantly rise after reaching higher levels of renewable penetration in the electricity grid.[145]

142 *FERC Perspectives: Questions Concerning EPA's Clean Power Plan and Other Grid Reliability Challenges*: *Hearing Before the Subcomm. on Energy and Power of the H. Comm. on Energy and Commerce*, 113th Cong. 45 (2014) (statement of Cheryl LaFleur, Acting Chairman, Federal Energy Regulatory Commission) (answering the question of Rep. Joe Barton (R-Tex.), Acting Chairman of FERC Cheryl LaFleur responded, "the EPA makes environmental rules and those become the baseline within which the system is planned, and we have to make certain that within those rules the rates are done in a just and reasonable way and that we will be paying attention to that as well as paying attention to reliability.").

143 *See* Felix Mormann, *Clean Energy Federalism*, 67 FLA. L. REV. 1621, 1649 (2015) ("Based on regional climate conditions, topography, and other land characteristics, the endowment with renewable energy resources varies significantly between states and across different strands of renewable energy technologies.").

144 *Id.* at 1650.

145 *See* Jorge Blazquez et al., *The Renewable Energy Policy Paradox*, 82 RENEWABLE AND SUSTAINABLE ENERGY REV. 1 (2018) (arguing that the value of renewable energy on the grid can significantly drop at high penetration levels).

The federal government can establish a Clean Energy Credit ("CEC") system to facilitate trading among states. The CEC system should be "unbundled," meaning the purchaser and seller of CECs do not have to be connected in the same grid.[146] Such a system would not only reduce compliance costs,[147] it would also "support robust, accurate, and efficient tracking and accounting" of clean energy generation and NETs.[148] Independent power generators or NET operators can directly apply for certification from a federal CEC system. Depending on how a state decides to pursue its compliance measures, either a state itself can directly purchase CECs from the federal entity, or state-regulated retail electricity suppliers can purchase CECs.

A federal CEC system must avoid double counting CECs and harmonize with existing state systems.[149] Double counting can occur where both a state and the national system provide a project with credits. While participation in the federal CEC system would be voluntary for states, some states—especially those with existing trading systems—may be compelled to participate to avoid the double counting issue and also harmonize their systems with other states.[150] The backbone of

146 *See The Bottom Line on Renewable Energy Certificates*, 11 WORLD RESOURCES INST. 2 (Nov. 2008), https://wriorg.s3.amazonaws.com/s3fs-public/pdf/bottom_line_renewable_energy_certs.pdf?_ga=2.137170928.1142123797.1549996242-1126424856.1549573550 [https://perma.cc/F3RF-Z3GK].

147 *See* WARREN LEON, CLEAN ENERGY STATES ALL., DESIGNING THE RIGHT RPS: A GUIDE TO SELECTING GOALS AND PROGRAM OPTIONS FOR A RENEWABLE PORTFOLIO STANDARD 30 (Mar. 2012), https://www.cesa.org/assets/2012-Files/RPS/CESA-RPS-Goals-and-Program-Design-Report-March-2012.pdf [https://perma.cc/8WR4-4AJZ] ("In general, RECs provide verification of compliance with an RPS, reducing the risk of double counting and fraud.").

148 SADIE COX & SEAN ESTERLY, NAT'L RENEWABLE ENERGY LAB., NREL/TP-6A20-65507, RENEWABLE ELECTRICITY STANDARDS: GOOD PRACTICES AND DESIGN CONSIDERATIONS 4 (Jan. 2016), https://www.nrel.gov/docs/fy16osti/65507.pdf [https://perma.cc/27VY-YC2E].

149 "Twenty-four (24) U.S. states and territories explicitly recognize [Renewable Energy Credits] as representing 'attributes' of generation (or similar); twenty-four (24) recognize them as mechanisms for 'tracking' or 'trading' (or equivalent) electricity or attributes." TODD JONES ET AL., CTR. FOR RESOURCE SOLUTIONS, THE LEGAL BASIS FOR RENEWABLE ENERGY CERTIFICATES 3 (June 2015), https://resource-solutions.org/wp-content/uploads/2015/07/The-Legal-Basis-for-RECs.pdf [https://perma.cc/8T77-UVLU].

150 *See* TODD JONES, CLEAN ENERGY STATES ALL., TWO MARKETS, OVERLAPPING GOALS: EXPLORING THE INTERSECTION OF RPS AND VOLUNTARY MARKETS FOR RENEWABLE ENERGY IN THE U.S. 15 (2017), https://resource-solutions.org/wp-

a federal CEC system is a robust tracking and verification apparatus. PJM—a regional grid operator that serves up to 14 states[151]—operates a Generation Attributes Tracking System ("GATS") that can be emulated.[152] Under GATS, credits "are created for every one megawatt-hour, or every 1,000 kilowatt-hours (kWh), of electric generation. Every specific megawatt-hour of electric generation is individually certified with a unique serial number."[153] While this would in fact impose additional administrative burdens, these burdens are minimized by the fact that the technological know-how to track CECs already exists due to established state and regional trading systems.[154] CECs under this system will be credited on a per megawatt-hour basis and traded as such.

B. How NETs can be included in an NCES

1. Defining "NETs"

As described in Part II(B)(2), NETs can encompass a broad range of technologies. In order for an NCES to achieve its stated objective of reducing GHG emissions, if NETs are to be included in this scheme, the definition as to what constitutes "NETs" must be clearly defined.[155] This definition must also leave room for new technologies that have not yet been proven to be

content/uploads/2017/08/RPS-and-Voluntary-Markets.pdf [https://perma.cc/AMQ4-MLBW] ("[S]tandardization and consistency between markets and states with respect to what a tradable REC is and attributes are included has benefits with respect to overall liquidity and participation."). A streamlined voluntary federal CEC system can also provide spillover benefits in the form of private participation in clean energy investment. *See id.* at 12 ("The existence of a national voluntary market can make it financially feasible for businesses and institutions to finance renewable energy projects that help a state meet its RPS compliance goals while allowing the financing organization to claim use of renewable energy.").

151 *See Who We Are*, PJM, https://www.pjm.com/about-pjm/who-we-are.aspx [https://perma.cc/VUT8-4UQU] (last visited Mar. 23, 2020).

152 *See*, *About GATS*, PJM, https://www.pjm-eis.com/getting-started/about-GATS.aspx [https://perma.cc/MEL3-WSTW] (last visited Mar. 23, 2020).

153 *Id.*

154 *See* Fershee, *supra* note 10, at 70 ("Given that the predominant technology for tracking RECs is already working across regions with significant differences, a national solution should be feasible, if not simple.").

155 *See* Jan C. Minx et al., *Negative Emissions—Part 1: Research Landscape and Synthesis*, 13 ENVTL. RES. LETTERS 3 (May 2018) (providing a survey of the broad range of definitions for "negative emissions").

viable.[156] Additionally, this definition of NETs should account for the potential that "even if negative emission options prove feasible, and can be undertaken at large scale without adverse ecological and social consequences, they could still prove less effective than expected at reducing climate impacts."[157] In particular, the sequestration of carbon can be reversed through human action and natural forces.[158] Using the IPCC[159] and National Academies of Sciences, Engineering, and Medicine's[160] definitions as a basis, NETs should be defined as *any technology that naturally or artificially enhances the sinks of greenhouse gas emissions on a time scale that positively impacts climate change*.[161] This definition is inclusive of both currently viable and potentially viable NETs. Most importantly, it also establishes a requirement that the GHG reduction benefit provided by any technology must be discernible and irreversible on a time scale that ensures an overall climate benefit. The definition of what constitutes a "time scale that positively impacts climate change" will have to be further refined by a regulatory agency—perhaps the EPA—through a rulemaking after comprehensive study.

156 *See* Sabine Fuss et al., *Negative Emissions—Part 2: Costs, Potentials and Side Effects*, 13 ENVTL. RES. LETTERS 34 (May 2018) (summarizing the "nascent stage" of some NETs and "emerging ideas for removing greenhouse gases").

157 SIVAN KARTHA & KATE DOOLEY, STOCKHOLM ENV'T. INST., THE RISKS OF RELYING ON TOMORROW'S 'NEGATIVE EMISSIONS' TO GUIDE TODAY'S MITIGATION ACTION 5 (Aug. 2016).

158 *See id.* ("vulnerable to release either through human action (e.g. land clearing) or natural forces outside of human control (drought, fire, pests, and other factors").

159 The IPCC's definition of "mitigation" is "a human intervention to reduce the sources or *enhance the sinks of greenhouse gas emissions*." IPCC, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE, WOKRING GROUP III CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT OF THE IPCC 37 (Ottmar Edenhoffer et al. eds., 2014) (emphasis added).

160 National Academies of Sciences, Engineering, and Medicine posits that for "direct air capture systems to be considered a negative emissions technology, they should sequester the captured CO2 *on a time scale that positively impacts climate change*." NAT'L ACAD. OF SCI., ENG'G, AND MED., *supra* note 74, at 189 (emphasis added).

161 The IPCC's definition of "mitigation" applied to NETs would subsume NETs that rely on natural processes such as "afforestation and reforestation (AR), soil carbon sequestration (SCS), ocean fertilization (OF), biochar (BC) or enhanced weathering (EW)" but would exclude "NETs that geologically store the sequestered CO2 such as BECCS or direct air capture with carbon capture and storage (DACCS)." Minx et al., *supra* note 155, at 3. The proposed definition of NETs would be all-inclusive of both natural and artificial technologies that sequester carbon.

2. Integrating NETs into a National Trading Mechanism

The most significant challenge in integrating NETs into a federal CEC system is tracking and accounting for the removed GHG emissions.[162] There must be a system "to measure the carbon captured, the amount successfully sequestered, the permanence of sequestration, and provide comparable measurements across different environments and technologies."[163] Proposals for the integration of NETs into trading mechanisms have all pertained to mechanisms that quantify credits based on eschewed GHG emissions.[164] However, the proposed CEC system operates on a per megawatt-hour basis. NETs can be integrated into this system through a conversion factor that varies based on state. Depending on the state that a specific NET is located, the NET will be credited based on the average GHG emissions intensity of the electricity system in that state.[165]

This would have two practical effects: first, it would encourage states that have a high penetration of clean energy in their electricity grid to continue investing in clean energy, as NETs in these states would not provide significant value on the national CEC trading system; second, for states that have high GHG emissions intensity (primarily fossil fuel-rich states), it incentivizes them to deploy NETs as an alternative means to fulfill their clean energy obligations. Another effect of a dynamic system of accounting for NETs is that it would provide early incentives for GHG-intensive states to invest in NETs without disincentivizing compliance with the state's clean energy

[162] *See* Guy Lomax et al., *Investing in Negative Emissions*, 5 NATURE CLIMATE CHANGE 498, 499 (June 2015) ("The task of accounting for the removed greenhouse gases poses a considerable challenge to practical policy integration . . . . Especially with approaches based on ecosystems, soils and biomass, the greenhouse-gas storage varies with time and external factors, making it difficult to accurately measure the amount of carbon stored.").

[163] *See* Chavez, *supra* note 52, at 49.

[164] *See* Paul Zakkour et al., *Incentivising and Accounting for Negative Emission Technologies*, 63 ENERGY PROCEDIA 6824 (2014) (summarizing existing GHG emissions trading systems and their accounting frameworks that can be applied to NETs).

[165] The average GHG emissions intensity for the electricity sector in each state is available at *State Carbon Dioxide Emissions Data,* U.S. ENERGY INFO. ADMIN. (last updated Oct. 31, 2018), https://www.eia.gov/environment/emissions/state/ [https://perma.cc/K7ZD-TMAH].

obligation through the use of traditional clean energy technologies.[166]

V. CONCLUSION

As legal battles continue to saddle states that desire to pursue their own clean energy policies,[167] this Note puts forward a pragmatic proposal for an NCES that clearly delineates between federal and state authority over the electricity sector, minimizing legal uncertainty. Under the proposal, while the federal government would establish clean energy mandates for each state, states would then have the autonomy to comply with the mandates in the manner they deem fit. States may choose a straightforward path to compliance drawing on prior RPS experience to mandate clean energy investment. States may also pursue a mixed approach of mandating clean energy investment while also participating in a national Clean Energy Credit trading system, which would benefit states that are rich in clean energy as well as those that must transition from a carbon-intensive electricity sector. Critically, states are also given the option of pursuing compliance and selling CECs through the use of Negative Emissions Technologies. State obligations are tailored to the circumstances of each state with the intent to avoid disproportionately burdening carbon-intensive states. Flexibility is ultimately the defining feature of the proposed NCES.

This Note's contribution to the literature is the incorporation of NETs in the proposal for an NCES. As recent climate reports have highlighted, any hope of preventing catastrophic global warming requires some form of NETs.[168] Recognizing the need for NETs, particularly in making them more commercially viable, the proposed NCES provides an avenue through which NETs can, at an early stage, be incentivized. States with carbon-

166 These early incentives to develop NETs will be critical as they "need to be developed soon because uncertainty remains over the ability of many of these technologies to be utilized at the scale necessary. None of the NETs currently operate at scale, and, in fact, none of them have been developed as a commercial product." Chavez, *supra* note 52, at 20.

167 *See supra* Sections II(A)(2) and III(A)(1).

168 *See supra* Section II(B)(2).

intensive electricity sectors will have a strong interest in investing in NETs to avoid having to make major infrastructural changes in the short term. This would benefit the NETs industry at large and could provide the critical function of making these technologies commercially viable when the United States and other countries must begin to reach net-negative GHG emissions in the second half of this century. The proposed method of integration of NETs into the CEC trading system is novel in its use of a dynamic method to incentivize investment in NETs during the early years of an NCES and slowly phasing out the incentive allowing for a dedicated federal system for NETs to be established later. Future scholarship can shed further light on the legal mechanisms to track and regulate NETs as they become a more prominent pillar of decarbonization policy.