COLUMBIA LAW SCHOOL

SABIN CENTER FOR CLIMATE CHANGE LAW

TO NEGOTIATE A CARBON TAX: A ROUGH MAP OF POLICY INTERACTIONS, TRADEOFFS, AND RISKS

DRAFT

By Justin Gundlach

June 2017

© 2017 Sabin Center for Climate Change Law, Columbia Law School

The Sabin Center for Climate Change Law develops legal techniques to fight climate change, trains law students and lawyers in their use, and provides the legal profession and the public with up-to-date resources on key topics in climate law and regulation. It works closely with the scientists at Columbia University's Earth Institute and with a wide range of governmental, non-governmental and academic organizations.

Sabin Center for Climate Change Law
Columbia Law School
435 West 116th Street
New York, NY 10027
Tel: +1 (212) 854-3287
Email: columbiaclimate@gmail.com
Web: http://www.ColumbiaClimateLaw.com
Twitter: @ColumbiaClimate
Blog: http://blogs.law.columbia.edu/climatechange

Disclaimer: This paper is the responsibility of The Sabin Center for Climate Change Law alone, and does not reflect the views of Columbia Law School or Columbia University. This paper is an academic study provided for informational purposes only and does not constitute legal advice. Transmission of the information is not intended to create, and the receipt does not constitute, an attorney-client relationship between sender and receiver. No party should act or rely on any information contained in this White Paper without first seeking the advice of an attorney.

About the author:
Justin Gundlach is an Associate Research Scholar at Columbia Law School and a Climate Law Fellow at the Sabin Center for Climate Change Law.

Acknowledgements:
Work on this paper was supported in part by the Columbia University Center on Global Energy Policy. It is part of a larger, multi-part analysis of key considerations for the development, adoption, and implementation of a carbon tax.

Thanks go to Michael Burger and Michael Gerrard for their comments and suggestions.

DRAFT

CONTENTS

DRAFT

INTRODUCTION

Sooner or later, the federal government will assign a price to carbon dioxide emissions via legislation. The contents of that legislation will reflect negotiated agreement—built on various political tradeoffs—over a host of policy issues, ranging from taxes to energy efficiency standards. These tradeoffs would implicate not only the scope and price assigned by the carbon pricing policy, but also the policies with which it would interact. This paper anticipates that price will take the form of a carbon tax and describes interactions between that tax and various existing and proposed policies relating to climate change, energy, and environmental protection. It proceeds in five parts: Part 1 highlights three key points of background; Part 2 summarizes the universe of policies that can be expected to interact with a carbon tax; Part 3 provides a rough typology of interactions among a carbon tax and other policies, labeling them Complementary, Concurrent, or Conflicting; Part 4 identifies several important potential tradeoffs; and Part 5, which is less descriptive and more prescriptive than the other four, highlights the risks of particular tradeoffs to the effectiveness of a climate change mitigation policy suite that includes a carbon tax. One thing this paper omits is a discussion of the *quantities* of GHG emissions that would likely be reduced by a carbon tax alongside or as a net result of combination with other policies—existing or otherwise.[1] This would be a useful line of further research but is beyond this paper's scope.

---

[1] Several researchers have estimated the reduction in carbon emissions expected from different tax rates. But to the author's knowledge, no one has examined the more complex question of emissions reductions likely to result from tax rates *and* the policies examined in this paper. *See, e.g.*, Carbon Tax Center, Carbon Tax Effectiveness: Estimated CO2 Reductions from a Briskly Rising Carbon Tax, (accessed June 25, 2017); Donald Marron et al., Tax Policy Center, Taxing Carbon: What, Why, and How 11 (June 2015), http://www.taxpolicycenter.org/publications/taxing-carbon-what-why-and-how/full.

Why consider all of this now, in a political climate decidedly averse to addressing climate change at all?[2] This paper takes as its basic premise that several circumstances create a real possibility that Congress could adopt a price on carbon, in the form of a tax, sometime around (most likely after) the 2020 presidential election:

- A substantial number of Republican members of Congress and the Senate privately acknowledge the reality of anthropogenic climate change, and would support effective mitigation policy if doing so became less politically poisonous for them;
- Republicans' control of Congress and the White House makes the present an opportune time to dismantle Obama-era regulatory responses to climate change, namely the Clean Power Plan and other regulations based on an interpretation of the Clean Air Act as requiring the Environmental Protection Agency to regulate greenhouse gas (GHG) emissions;
- Democrats would oppose bitterly any Republican effort to undo all means of mitigating climate change by regulating GHG emissions and some Republicans would defect to join them;
- The Trump campaign promised a large program of infrastructure spending and also income tax cuts, leaving open the question of how to secure new revenues to cover at least some of the promised spending;
- Republicans' complete control of Congress and the White House will not persist, and most Republican politicians recognize this;
- Thus, Republicans currently hold the strongest bargaining position they will have for the foreseeable future on the subject of federal climate change mitigation policy, and at least some of them recognize this to be the case.

[2] *See Trump not now considering value-added tax or carbon tax: White House*, Reuters, Apr. 4, 2017, https://perma.cc/QL3M-6MD3; Exec. Order No. 13,783, Promoting Energy Independence and Economic Growth, 82 Fed. Reg. 16,093 (Mar. 28, 2017) (revoking various Obama-era actions and memoranda aimed at mitigating and adapting to climate change, such as application of the Social Cost of Carbon to the benefit-cost analysis required of signficant federal regulatory actions).

1. THREE KEY POINTS OF BACKGROUND

This paper considers numerous possible interactions among complex policies and is necessarily rife with unspecified parameters. This section clarifies three parameters that are basic to much else in this paper.

First: the primary purpose of the carbon tax described in this paper is singular and Pigouvian, meaning that it is assumed to aim at discouraging activities that generate GHG emissions and thereby cause climate change, and that its other effects (e.g., raising tax revenue) are incidental. This is especially significant for the categorization of policies in Part 3 of this paper as Complementary, Concurrent, or Conflicting because it means that assignment of policies to those categories reflects how they relate to the goal of climate change mitigation and not to other, incidental effects.

Second: the term "carbon tax" as it appears in this paper is specific in two respects and ambiguous in several others. It is specific in that it refers to a price assigned to emissions of carbon dioxide at a rate that would escalate over time without further legislation. As for its ambiguities, this paper does not assume that the tax would:

- also apply—or not apply—to others of the most important GHGs, namely, methane (CH_4), nitrous oxide (N_2O), and fluorinated gases or "F-gases" (HFCs, PFCs, NF_3, SF_6);
- be imposed "upstream" on hydrocarbon producers and importers, or "downstream" at points where consumers purchase emissions-intensive products or services;
- apply uniformly across sectors or be limited by carve-outs for industries especially susceptible to competition from foreign firms not subject to the tax;
- have at the outset a particular rate of dollars per unit of emissions.

Third: What to make of the statements and decisions of the Trump Administration and Congress since President Trump's inauguration in January 2017? To date, much has been said but less has been done.[3] Furthermore, actions that have been taken so far in most instances do not include substantial legislative changes or full-scale reversals of existing regulations.[4] However, two of the most significant deregulatory steps taken thus far do not feature among the negotiable items considered below because they change the regulatory *process* rather than the substance of regulations affecting the economy. They are: the removal of the Intergovernmental Working Group's Social Cost of Carbon (SC-CO_2) from the components of review required of federal agencies when issuing regulations;[5] and the withdrawal of the Council on Environmental Quality's guidance regarding consideration of climate change and GHG emissions in environmental impact assessments.[6] Though this paper recognizes that these tools do not feature in the Trump Administration's regulatory—or deregulatory—decision-making process, it refers to the SC-CO_2 (which continues to be used by several

[3] For a running record of efforts by Congress and the Administration to eliminate regulations with implications for climate change, see the Sabin Center for Climate Change Law's Climate Deregulation Tracker, accessible at http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/.

[4] *See*, *e.g.*, EPA, Review of the Clean Power Plan, 82 Fed. Reg. 16329 (Apr. 4, 2017) (stating that EPA will comply with EO 13,783 by reviewing the Clean Power Plan with an eye to eliminating it); *but see also* NHTSA & EPA, Notice of Intention To Reconsider the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light Duty Vehicles, 82 Fed. Reg. 14671 (Mar. 22, 2017).

[5] E.O. 13,783, *supra* note 3 (rescinding Social Cost of Carbon employed by OMB and federal agencies); *see also* Interagency Working Group on Social Cost of Carbon, United States Government, Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, at 2 (May 2013, revised July 2015) ("The purpose of the 'social cost of carbon' (SCC) estimates presented here is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions. The SCC is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change."). For a description of the process used by several U.S. federal government agencies to estimate the Social Cost of Carbon, see GAO, Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates, GAO-14-663 (July 2014), https://perma.cc/2JM8-9N8M.

[6] *See* E.O. 13,783, *supra* note 3.

DRAFT

state-level actors[7]) as shorthand for the present value of the net damage a marginal unit of CO_2 does to the climate.[8]

2. THE POLICY UNIVERSE AT ISSUE

Though a carbon tax could be said to interact with a broader array of policies,[9] this paper confines its examination to the policies discussed below, all of which address GHG emissions directly, indirectly, or incidentally as they address energy production or consumption, or land uses with clear GHG emissions implications.[10] This Part summarizes those policies' supporting legal authority and structure. It focuses first and primarily on federal policies, but notes several especially relevant state-level policies as well.

2.1 GHG mitigation authorized by the Clean Air Act

[7] The New York Public Service Commission derives the value of Zero Emissions Credits for nuclear generation from the SC-CO2. Order Adopting a Clean Energy Standard, New York Public Service Commission, Case No. 15-E-0302 (Aug. 1, 2016), https://perma.cc/4XSQ-UR63. California's Air Resources Board applies it to climate-related regulations as well, as instructed by state law, which does not specifically name the SC-CO2 developed by the federal government. California Air Resources Board, The 2017 Climate Change Scoping Plan Update 60 (Jan. 2017), https://perma.cc/7DEZ-ESPS ("Consideration of the social costs of carbon is a requirement in AB 197."); Assembly Bill 197 § 3 (Sept. 8, 2016), https://perma.cc/439D-82JP (codified at Cal. Health & Safety Code § 38506 (2017)).

[8] This paper refers to this heuristic even though the Intergovernmental Panel on Climate Change has stated that it understates actual climate damage due to the difficulty of accounting for scenarios involving greater than average warming of 3dC and to the omission of significant impacts that cannot be monetized with precision. IPCC, Climate Change 2014: Synthesis Report; Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change 79, Box 3.1 (R.K. Pachauri & L.A. Meyer eds. 2014).

[9] *See* National Academies of Sciences, Effects of U.S. Tax Policy on Greenhouse Gas Emissions 113–34 (William W. Nordhaus et al., eds., 2013) (examining emissions impacts of mortgage interest tax deduction and tax exemption of employer-sponsored health coverage).

[10] Policies not considered here include the Minerals Leasing Act of 1920, which was recently the legal basis for regulatory limits on methane releases from mineral extraction operations. Bureau of Land Management, Waste Prevention, Production Subject to Royalties, and Resource Conservation, 81 Fed. Reg. 83008 (Jan. 1, 2017).

The Clean Air Act of 1963, as amended in 1970, 1977, and 1990,[11] regulates air pollutants emitted by mobile and stationary sources and is the most substantial source of climate change mitigation authority in the United States. Starting in December 2009 with its finding that GHG emissions cause or contribute to the endangerment of Americans' public health and welfare,[12] EPA began issuing what detractors have called a "cascade" of regulations that apply components of the Act's machinery to sources of GHG emissions.[13] This summary begins with a brief overview of the Act's relevant components. It then describes sectors and types of GHG sources regulated under the Act.

The Clean Air Act instructs EPA to attend to ongoing scientific findings about pollutants' effects on public health and welfare, and to regulate—or update regulations of—those pollutants consistent with what good science demands.[14] In *Massachusetts v. EPA*, the Supreme Court resolved the question of whether the list of air pollutants regulated by the Clean Air Act must include six GHGs.[15] Technically, that case addressed only the question of whether the Act covered GHGs emitted by motor vehicles, but because the regulation of pollutants from motor vehicle emissions under Section 202 of the Act triggers provisions in other Sections, *Massachusetts v. EPA* knocked over the first in a line of regulatory dominoes that have continued to fall since.

---

[11] Clean Air Act of 1963, Pub. L. 88-206, 77 Stat. 392; Clean Air Act Amendments of 1970, Pub. L. 91-604, 84 Stat. 1676; Clean Air Act Amendments of 1977, Pub. L. No. 95-95, 91 Stat. 685; Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 108 Stat. 2399; all *codified at* 42 U.S.C. §§ 7401-7626.

[12] Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66496 (Dec. 9, 2009).

[13] Petition of the U.S. Chamber of Commerce, In re Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Proposed Rule, 74 Fed. Reg. 18,886, at 25 (June 23, 2009), https://perma.cc/4CRM-2MYL.

[14] Clean Air Act §§ 109(d), 202(a)(1), 231(a)(2)(A).

[15] Massachusetts v. EPA, 549 U.S. 497 (2007). The GHGs are: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

First, effective on December 29, 2009, EPA required emitters to report their GHG emissions.[16] Next, in May 2010, EPA and the National Highway Transportation Safety Administration (NHTSA) revised the Corporate Average Fuel Economy (CAFE) standards by which they regulate emissions from passenger- and light-duty vehicles for model years 2012–2016.[17] (EPA and NHTSA have since issued similar standards for 2017–2025 and later model years,[18] and for heavy-duty vehicles as well.[19] The fate of the light-duty vehicle standards for model years 2022–2025 is currently unclear.[20]) The next domino to fall was EPA's inclusion of GHGs among the pollutants emitted by stationary sources regulated under the Prevention of Significant Deterioration (PSD) and Title V permitting programs.[21] That inclusion means that new or modified major sources in

[16] EPA, Mandatory Reporting of Greenhouse Gases, 74 Fed. Reg. 56260 (Oct. 30, 2009) ("The rule does not require control of greenhouse gases, rather it requires only that sources above certain threshold levels monitor and report emissions"), *codified at* 40 C.F.R. pt. 98 (authorized by Clean Air Act Section 114, Recordkeeping, inspections, monitoring, and entry).

[17] EPA & NHTSA, Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, 75 Fed. Reg. 25324 (May 7, 2010). These standards are set in a joint rulemaking issued by EPA and the National Highway Transportation Safety Administration (NHTSA). EPA's authority for the rulemaking comes from the Clean Air Act; NHTSA's comes from the 1975 Energy Policy and Conservation Act (EPCA), Pub. L. No. 94–163, 89 Stat. 871 (Dec. 22, 1975).

[18] EPA & NHTSA, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards; Final Rule, 77 Fed. Reg. 62624 (Oct. 15, 2012).

[19] EPA & NHTSA, Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles—Phase 2, 81 Fed. Reg. 73478 (Oct. 25, 2016).

[20] NHTSA & EPA, Notice of Intention To Reconsider the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light Duty Vehicles, 82 Fed. Reg. 14671 (Mar. 22, 2017); Bob Sussman, *Can President Trump roll back the Obama emissions and fuel efficiency standards for light-duty vehicles?*, Brookings (Feb. 3, 2017), https://perma.cc/83B9-GYJG ("Whatever President Trump does, California will likely have the last word on the MY 2022-2025 emission limits and fuel economy targets.").

[21] EPA, Action To Ensure Authority To Implement Title V Permitting Programs Under the Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 82254 (Dec. 30, 2010); EPA, Limitation of Approval of Prevention of Significant Deterioration Provisions Concerning Greenhouse Gas Emitting Sources in State Implementation Plans; Final Rule, 75 Fed. Reg. 82536 (Dec. 30, 2010); EPA, Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31514 (June 3, 2010).

DRAFT

"attainment areas" (i.e., areas in compliance with National Ambient Air Quality Standards for sulfur dioxide, lead, and other "criteria pollutants") must seek a permit for GHG emissions as well as other pollutants, and must adopt the "best available control technology" (BACT) to limit their GHG emissions.[22] Subsequent dominoes have included performance standards issued pursuant to Section 111 for several types of major new and existing sources of GHG emissions.[23] The most recent domino to fall is another endangerment finding, this one for GHG emissions from aircraft.[24] Regulatory dominoes that have yet to fall pertain to aircraft and marine ships; wastewater treatment plants; and agricultural facilities, including concentrated animal feeding operations.

EPA's Clean Air Act-based GHG regulations place limits on emissions from fossil fuel-fired electricity generating units (EGUs), cement plants and other manufacturing facilities, oil and gas refineries, solid waste landfills, waste incinerators, and vehicles. The regulations that address these sources take diverse approaches. No

---

[22] Like all rules issued by EPA in relation to GHG emissions, these rules, termed the "Timing and Tailoring Rules," were challenged in court. In 2014, the Supreme Court instructed EPA to revise the scope of the rule's implementation of the PSD program slightly, Utility Air Regulatory Group v. EPA, 134 S. Ct. 2427 (2014), which EPA has since done. *See* Prevention of Significant Deterioration and Title V Permitting for Greenhouse Gases: Removal of Certain Vacated Elements, 80 Fed. Reg. 50,199 (Aug. 19, 2015). As currently applied, the PSD program only limits GHGs emitted from "anyway" sources that would have been required to conduct New Source Review owing to their emission of some other regulated pollutant. Sources not subject to the PSD program for emission of a criteria pollutant are not now subject to that program for their emission of GHGs, even if those GHGs exceed the thresholds for program participation specified by EPA in the Tailoring Rule.

[23] EPA, Standards of Performance for Municipal Solid Waste Landfills, 81 Fed. Reg. 59,331 (Aug. 29, 2016); EPA. Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units, 81 Fed. Reg. 40,955 (June 23, 2016); EPA, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 35,823 (June 3, 2016); EPA, Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,509 (Oct. 23, 2015); Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 205 (Oct. 23, 2015).

[24] EPA, Finding that Greenhouse Gas Emissions from Aircraft Cause or Contribute to Air Pollution that May Reasonably Be Anticipated to Endanger Public Health and Welfare, 81 Fed. Reg. 18,399 (Aug. 15, 2016).

DRAFT

GHG-specific performance standard applies to cement plants; performance standards for new coal-fired power plants require the use of carbon capture and sequestration technology but those for new natural gas-fired plants do not;[25] performance standards for new oil and gas facilities specify a host of technological and operational standards to control methane emissions;[26] and performance standards for *existing* fossil-fueled EGUs—better known as the Clean Power Plan[27]—treat EGUs not as solitary facilities but as parts of an integrated electric grid,[28] and require "owner/operators" of one or more EGUs (rather than individual EGUs) to comply.[29] As for road-vehicles, CAFE standards set mandatory, fleet-wide targets for miles per gallon and GHG emissions per mile; these fleet-wide averages take plug-in hybrid electric and other zero-emitting vehicles

[25] 80 Fed. Reg. 205; *see also* Victoria R. Clark and Howard J. Herzog, *Assessment of the US EPA's Determination of the Role for CO2 Capture and Storage in New Fossil Fuel-Fired Power Plants*, 48 Environmental Science & Technology 7723, 7723–29 (2014) (examining EPA's reasons for not imposing requirement on gas- as well as coal-fired plants).

[26] 81 Fed. Reg. 40,955.

[27] The Clean Power Plan is currently stayed pending decision by the U.S. Supreme Court, pursuant to an order of the U.S. Supreme Court. Order in Pending Case, West Virginia v. EPA, 136 S. Ct. 1000 (Feb. 9, 2016).

[28] 80 Fed. Reg. at 64,662, 64,677, 64,725.

> The utility power sector is unlike other industrial sectors. In other sectors, sources effectively operate independently and on a local-site scale, with control of their physical operations resting in the hands of their respective owners and operators. Pollution control standards, which focus on each source in a non-utility industrial source category, have reflected the standalone character of individual source investment decision-making and operations. * * *
>
> The core function of providing reliable electricity service is carried out not by individual electricity generating units but by the complex machine as a whole. Important subsidiary functions such as management of costs and management of environmental impacts are also carried out to a great extent on a multi-unit basis rather than an individual-unit basis. Generation from one generating unit can be and routinely is substituted for generation from another generating unit in order to keep the complex machine operating while observing the machine's technical, environmental, and other constraints and managing its costs

[29] *Id.* at 64,762 ("As a practical matter, the 'source' includes the 'owner or operator' of any building, structure, facility, or installation for which a standard of performance is applicable. For instance, under CAA section 111(e), it is the 'owner or operator' of a source who is prohibited from operating in violation of any standard of performance applicable to such source.").

DRAFT

into account. They also allow manufacturers to claim credits toward emissions compliance by upgrading air conditioning systems—whether by substituting for refrigerants with a high-GWP, or by improving system components in a way demonstrated to reduce the leakage of refrigerant gases.[30] A last point about CAFE standards, which is discussed at greater length in Part 2.9 below: although CAFE standards are codified in *federal* regulations, the Clean Air Act gives California a seat at the table where they are drafted.

Clean Air Act Section 115, which, unlike the Clean Air Act provisions described above, has never been implemented,[31] is unique for providing EPA with authority to address international air pollution. Specifically, it authorizes EPA to instruct a state's governor to revise the state's plan for complying with the Clean Air Act in a way that eliminates pollutants EPA has found endanger public health or welfare in a foreign country, so long as that country has also been found to afford the U.S. essentially the same rights under its laws.[32] Although a regulation based on Section 115 is at this stage hypothetical, because such a regulation would be legally defensible and would arguably provide for cost-optimizing nationwide GHG emissions reductions,[33] Section 115 decidedly belongs on the negotiating table along with other regulatory programs built upon Clean Air Act provisions.

Another *potential* subject of regulation under the Clean Air Act deserves mention here: GHG emissions—particularly nitrous oxide (N_2O)—from agricultural operations.

---

[30] Notably, EPA's authority to make this crediting available to manufacturers not in the Clean Air Act, but in EPCA. 77 Fed. Reg. at 62,639 ("EPA is finalizing, under its EPCA authority, rules allowing the impact of air conditioning system efficiency improvements to be included in the calculation of fuel economy for CAFE compliance.").

[31] Justin Gundlach, *Section 115 in Practice*, *in* Section 115: How an Unsung Provision of the Clean Air Act Can Help the United States Tackle Climate Change (Michael H. Burger ed., forthcoming) (describing EPA's and federal courts' engagement with Section 115, which did not include implementation).

[32] Clean Air Act § 115(a)-(c).

[33] See generally Michael Burger et al., *Legal Pathways to Reducing Greenhouse Gas Emissions Under Section 115 of the Clean Air Act*, 28 Geo. Envtl. L. Rev. 359 (2016).

DRAFT

EPA regulates N_2O emissions from motor vehicles,[34] but not from other sources even though the N_2O emitted by the use of synthetic fertilizers, enteric fermentation, and manure from livestock accounts for roughly 7.7 percent of total annual U.S. GHG emissions.[35] Given the scale of these emissions, and given that N_2O's global warming potential is estimated to be 298 times that of CO_2,[36] potential regulation of these emissions under the Clean Air Act should also be on the negotiating table.[37]

2.2 Incidental mitigation of GHG emissions by non-GHG pollution controls authorized by the Clean Air Act

Although EPA has not issued National Ambient Air Quality Standards (NAAQSs) for GHGs, nor treated any GHG as a Hazardous Air Pollutant (HAP), EPA regulations addressing criteria pollutants and HAPs deserve brief consideration here because they incidentally reduce GHG emissions, and because EPA has counted those incidental reductions among the co-benefits that weigh in favor of imposing such rules. Two key examples are the Cross-State Air Pollution Rule (CSAPR),[38] which addresses

[34] Even that rule allows car manufacturers to treat CO_2 emissions as a proxy for N_2O rather than addressing N_2O emissions directly. 40 CFR § 86.1818-12 (2016).

[35] EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2013*, at 2-23, tbl.2-10 (Apr. 15, 2015), http://bit.ly/1ZMQIod.

[36] *Id.* at ES-3.

[37] Several petitions for rulemakings to regulate N_2O emissions from agricultural sources have been filed. *See, e.g.*, Institute for Policy Integrity (IPI), *Petition for Rulemakings and Call for Information under Section 115, Title VI, Section 111, and Title II of the Clean Air Act to Regulate Greenhouse Gases* (Feb. 19, 2013), http://bit.ly/2aApctz (seeking regulation of agricultural N2O emissions under Clean Air Act Title VI and/or Section 111), Humane Society of the United States et al., *Petition to List Concentrated Animal Feeding Operations Under Clean Air Act Section 111(b)(1)(A), and to Promulgate Standards of Performance Under Clean Air Act Sections 111(b)(1)(B) and 111(d)* (Sept. 21, 2009), http://bit.ly/2aU6UEI.

[38] EPA issued CSAPR in 2011. EPA, Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals, 76 Fed. Reg. 48,208 (Aug. 8, 2011). The D.C. Circuit rejected the rule. EME Homer City Generation, L.P. v. EPA, 696 F.3d 7 (D.C. Cir. 2012), but was reversed by the Supreme Court. EPA v. EME Homer City Generation, L.P., 134 S. Ct. 1584 (2014). The D.C. Circuit's subsequent review of EPA's initial implementation of the rule upheld its key elements. EME Homer City Generation, L.P. v. E.P.A., 795 F.3d 118

criteria pollutants emitted in one state but that impair NAAQS compliance in another, and the Mercury Air Toxics Standard (MATS),[39] which tightens restrictions on emissions of mercury and other HAPs from coal- and oil-fired EGUs. Both of these, by ensuring that new or modified coal-fired power plants cannot operate without incurring substantial pollution-control costs, have indelibly altered those plants' financial profiles in a period of historically low natural gas prices.[40] This combination of market circumstances and regulatory requirements have helped to spur substantial GHG emissions reductions by accelerating closure of existing plants and making investments in new or modified plants unappealing.[41] EPA's cost-benefit justification for both

(D.C. Cir. 2015). EPA has yet to finalize its proposed update of the rule with respect to ozone. EPA, Cross-State Air Pollution Rule Update for the 2008 Ozone NAAQS; proposed rule, 80 Fed. Reg. 75,706 (Dec. 3, 2015).

[39] EPA issued the MATS rule in December 2011; it was published in the Federal Register in February of 2012. National Emission Standards for Hazardous Air Pollutants From Coal- and Oil–Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil–Fuel–Fired Electric Utility, Industrial–Commercial–Institutional, and Small Industrial–Commercial–Institutional Steam Generating Units, Final Rule, 77 Fed.Reg. 9304 (Feb. 16, 2012). The D.C. Circuit upheld the rule, White Stallion Energy Center, LLC v. E.P.A., 748 F.3d 1222 (D.C. Cir. 2014), but that decision was overturned by the U.S. Supreme Court, which ordered the D.C. Circuit to decide whether to vacate or merely remand it to EPA. Michigan v. EPA, 135 S. Ct. 2699 (2015). The D.C. Circuit did not vacate the rule but instead ordered EPA to make a supplemental finding, which EPA did. EPA, Final Supplemental Finding That It Is Appropriate and Necessary To Regulate Hazardous Air Pollutants From Coal- and Oil-Fired Electric Utility Steam Generating Units, 81 Fed. Reg. 24,420 (Apr. 25, 2016), The D.C. Circuit rejected challenges to the EPA's planned response to its order. White Stallion Energy Center, LLC v. EPA, Case No. 12-1101 et al., 2015 WL 11051103 (D.C. Circ. Dec. 15, 2015) (remanding rule to EPA without vacatur and noting that "EPA has represented that it is on track to issue a final finding"). The Supreme Court then denied certiorari from that decision shortly after EPA had issued its Final Supplemental Finding. 136 S.Ct. 2463 (Jun 13, 2016). Industry has filed challenges to EPA's Final Supplemental Finding with the D.C. Circuit. Petition for Review, Murray Energy Corp. v. EPA, Case No. 16-1127 (D.C. Cir. Apr. 25, 2016).

[40] *See* Rafay Ishfaq et al., *Fuel-switch decisions in the electric power industry under environmental regulations*, 48 IIE Transactions 205, 206–07 (2016) (modeling effect of regulations on fuel-switching and plant closure decisions in a time of low natural gas prices).

[41] Benjamin Hulac, *Analysts blame natural gas, not 'war on coal,' for Peabody's demise*, Energy & Environment News, Apr. 14, 2016, http://bit.ly/1SO3j5L; Rich Heidorn Jr., *MATS Challenge Too Late for Targeted Coal Plants*, RTO Insider, Mar. 30, 2015, http://bit.ly/2aPStO4 (reporting plans for

applied the SC-CO_2 to estimate their climate change-related co-benefits.[42] For CSAPR, climate co-benefits accounted for $23 million or 1.9 to 3.4 percent of the rule $1.2 billion total monetized benefits;[43] for MATS, it was $360 million or 0.4 to 0.97 percent of the $37-90 billion total.[44] While the direct benefits from cleaner air dwarfed the climate-related benefits for both rules, the values added to reflect climate benefits were non-negligible.

2.3 Energy subsidies

The federal government subsidizes the production of several sources of energy, including non-hydro renewables, nuclear fission, and fossil fuels. Estimates of these subsidies vary in what they count as a subsidy and consequently in their tally of subsidies' amounts.[45] The Energy Information Administration estimated that the federal government provided $11.9 billion in energy subsidies in 2013, including direct subsidies, loan guarantees, and tax preferences, and that about 55 percent of those went to renewables, 21 percent to nuclear, 10 percent to coal, and 5.5 percent to natural gas.[46] By contrast, one independent estimate concluded that annual federal subsidies for fossil

9,200MW of coal plant closures and that, even before the Supreme Court heard the case, "about 90% of the capital expenditures needed to meet MATS compliance have already been spent.").

[42] 80 Fed. Reg. at 75,757 (reporting "Estimate Global Climate Co-Benefits of CO2 Reductions for the Proposal")

[43] EPA, Regulatory Impact Analysis for the Proposed Cross-State Air Pollution Rule (CSAPR) Update for the 2008 Ozone National Ambient Air Quality Standards (NAAQS), EPA-452/R-15-009, at 6-27 to 6-35 (Nov. 2015). This calculation did not estimate benefits from the reduction of non-CO2 GHG emissions. *Id.* at 6-34.

[44] 77 Fed. Reg. at 9306, 9431.

[45] *Compare* D. Coady et al., International Monetary Fund, How Large Are Global Energy Subsidies? (2015), https://perma.cc/32LC-QS7S (treating untaxed externalities as subsidies), *with* ELI, Estimating U.S. Government Subsidies to Energy Sources: 2002-2008 (Sept. 2009), https://perma.cc/LTR9-264Q (not treating externalities as subsidies), *and* EIA, Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2013 (Apr. 2015), https://perma.cc/8XD3-LZPZ (excluding various measures included by ELI).

[46] EIA, *supra* note 44; *but see also* Doug Koplow, EIA Energy Subsidy Estimates: A Review of Assumptions and Omissions (Mar. 2010), https://perma.cc/CD6C-5DG7 (criticizing EIA's approach to estimating subsidies and arguing that it understates subsidies provided to fossil fuels).

DRAFT

fuels alone amounted to $17.2 billion in 2013–14.[47] Whatever their size, energy subsidies would clearly interact with a carbon tax in foreseeable ways.

Renewable electricity generating facilities benefit from the federal Production Tax Credit (PTC for wind, geothermal, closed-loop biomass, and other technologies) and Investment Tax Credit (ITC for solar, fuel cells, small-scale wind, and other technologies).[48] The PTC, which provides facility owners with a rebate based on the electricity they produce in their first 10 years of operation, will phase out by 2020.[49] The ITC, which provides a rebate based on the amount invested in renewable facilities, will phase out in 2022.[50] Importantly, the renewables sector, like the oil and gas sector, benefits from the domestic manufacturing deduction, a tax preference available not only to other energy producers, but to an array of U.S. industries.[51]

New and existing nuclear reactors receive at least two forms of indirect subsidy: a liability insurance backstop, based on the Price-Anderson Act of 1957, as amended in 1975,[52] and support for waste disposal pursuant to the Nuclear Waste Policy Act of 1982, as amended in 1988 and 1992 (NWPA).[53] New reactors built since 2005 receive additional

[47] Alex Doukas, OilChange International, G20 subsidies to oil, gas and coal production: United States 2–4 (Nov. 2015), https://perma.cc/69HF-EKPK.

[48] These shorthand titles actually refer to the Renewable Electricity Production Tax Credit, the Business Energy Investment Tax Credit, and the Residential Renewable Energy Tax Credit.

[49] Consolidated Appropriations Act, 2016, Pub. L. No. 114-113, Div. Q, 129 Stat. 2242 (Dec. 18, 2015).

[50] *Id*.

[51] *See* Doug Koplow, The Domestic Manufacturing Tax Credit and the Oil and Gas Industry, EarthTrack Blog (Apr. 1, 2011), https://perma.cc/RH8R-VPSW.

[52] Price-Anderson Nuclear Industries Indemnity Act, Pub. L. No. 85-256, § 4, 71 Stat. 576 (1957), *as amended by* Pub. L. No. 100-408, 102 Stat. 1066 (Aug. 20, 1988), *codified at* 42 U.S.C. 2212i.

[53] NWPA of 1982, Pub. L. No. 97-425, 96 Stat. 2201 (Jan. 7, 1983), *as amended by* P.L. 100-203, Title V, Subtitle A (Dec. 22, 1987), Pub. L. No. 100-507 (Oct. 18, 1988), and Pub. L. No. 102-486 (Oct. 24, 1992), *codified at* 42 U.S.C. 10101–10270.

DRAFT

subsidies in the form of loan guarantees.[54] Some estimate that the value of Price-Anderson's indemnification of nuclear generators for accident-related damages above a statutory threshold (currently $500 million per reactor[55]) is zero, others that it is billions of dollars annually.[56] Estimates of the subsidy conferred by the NWPA are also diverse, and reach as high as five to 18 percent of the market value of nuclear-generated electricity sold annually in the U.S.[57] As for the loan guarantees provided for the construction of new reactors and reprocessing facilities, they are more easily calculated: $ 6.184 billion has been obligated to specific recipients as of 2015 from an authorized total of $18.5 billion.[58]

Federal laws make several tax preferences available for activities related to the production, refining, and sale of coal, oil, and natural gas.[59] Unlike the PTC and ITC, the provisions of the tax code relevant here are generally permanent. The largest of them are: expensing intangible drilling costs, the domestic manufacturing tax deduction for

---

[54] Energy Policy Act of 2005 tit. XVII; *see also* Mark Holt, Congressional Research Service, Nuclear Energy Policy 23–25 (Oct. 2014), https://perma.cc/53SD-GZVR.

[55] 42 U.S.C. § 2210(c).

[56] *Compare* Michael G. Faure & Tom Van den Borre, *Compensating Nuclear Damage: A Comparative Economic Analysis of the US and International Liability Schemes*, 33 Wm. & Mary Envtl. L. & Pol'y Rev. 219 (2008) (concluding that Price-Anderson conferred no subsidy after 1975 amendments introduced retrospective premium payments), *with* Doug Koplow, Nuclear Power: Still Not Viable without Subsidies 84 (Union of Concerned Scientists, Feb. 2011) (adopting estimated value of 0.1 and 2.5 ¢/kWh or $800 million to several billion dollars per year).

[57] *Id.* at 104 tbl.27.

[58] Energy Policy Act of 2005, tit. XVII; *see also* Government Accountability Office, GAO-15-438, DOE Loan Programs: Current Estimated Net Costs Include $2.2 Billion in Credit Subsidy, Plus Administrative Expenses 19 tbl.3 (Apr. 2015).

[59] Staff of the Joint Committee on Taxation, Description of Present Law and Select Proposals Relating to the Oil and Gas Industry, JCX-27-11, May 11, 2011, https://perma.cc/6SRU-BVBH; Alan Kovski, Special Report: Tax Provisions Helping Oil and Gas Firms Take Much Criticism but Keep Paying Off, BNA Daily Environment Report No. 136, July 15, 2016) (listing the percentage depletion deduction and the domestic manufacturing deduction for coal and other hard mineral fossil fuels among those tax provisions that the Obama Administration has grouped with tax preferences for oil and gas production). *See also* United States, Fossil Fuels Subsidy Reform: Progress Report on Fossil Fuel Subsidies (Nov. 2014) (identifying 11 U.S. fossil fuel tax preferences and subsidies for consideration by G20).

DRAFT

oil and gas, and percentage depletion for oil and gas wells.[60] One commentator has observed that what sets tax preferences for U.S. fossil fuel production apart is their "sheer variety."[61]

2.4 The "gas tax" and other federal excise taxes on transportation fuels

The federal motor fuel excise tax or "gas tax," currently set at $0.184 per gallon, is imposed on producers, refiners, and importers of gasoline with an octane rating of at least 75 (the diesel tax, set at $0.244 per gallon, is applied similarly).[62] Since its initial passage in 1932,[63] the gas tax has flipped several times (in 1956, 1990, and 1996) from being, formally, a general-purpose source of federal revenue to being chiefly a user fee that finances federal highways and their ancillary costs.[64] For all of that time it has persisted and grown without interruption or reduction. Recently, however, it has not gathered enough revenue to cover the costs of maintaining highway and mass transit systems,[65] and the short-term extensions passed by Congress since 2011 have not made up the gap.[66]

---

[60] Gilbert E. Metcalf, Council on Foreign Relations Discussion Paper: The Impact of Removing Tax Preferences for U.S. Oil and Gas Production 2–3 (August 2016).

[61] Doukas, *supra* note 47, at 3.

[62] IRS, Publication 510: Excise Taxes (Including Fuel Tax Credits and Refunds) 5 (Feb. 19, 2016) http://bit.ly/2avg38i. States also charge taxes (excise and others) on gasoline and diesel. The average rates are $0.25 for gasoline and $0.27 for diesel; the range for gasoline varies from $0.0895 in Alaska to $0.514 in Pennsylvania. U.S. EIA, Frequently Asked Questions: *How much tax do we pay on a gallon of gasoline and diesel fuel?*, https://perma.cc/T9LR-3PU7 (updated Nov. 25, 2015).

[63] Revenue Act of 1932, ch. 209, Pub .L. No. 154, 47 Stat. 169 (June 6, 1932).

[64] James M. Bickley, The Federal Excise Tax on Gasoline and the Highway Trust Fund: A Short History (Washington, DC: Congressional Research Service, Sept. 7, 2012). Ancillary costs include the cleanup of underground gasoline and oil storage tanks, paid for from the Leaking Underground Storage Tank Trust Fund.

[65] Joseph Kile, Assistant Director for Microeconomic Studies, CBO, Before the Committee on Finance United States Senate, "The Status of the Highway Trust Fund and Options for Paying for Highway Spending," June 18, 2015, https://perma.cc/FTU2-3FVP.

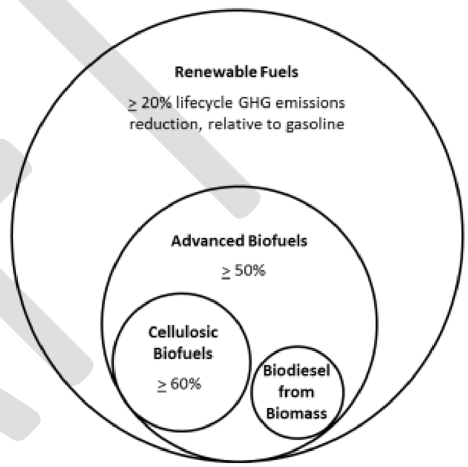
[66] *Id.* at 4 tbl.1 (showing revenues credited to Highway Trust Fund), fig.2 (showing growing shortfall out to 2025).

DRAFT

Comparable federal excise taxes are also assessed on other fuels, including those used in aircraft and watercraft: aviation gasoline, for instance, is taxed at a $0.194, kerosene at $0.244.[67] Some of these taxes, like the gas tax, flow to trust funds, such as the Sport Fish and Boating Restoration Trust Fund and the Airport and Airway Trust Fund.[68] No federal tax is assessed on fuels used in international marine shipping, or, since 2007, by railroads.[69]

2.5 The federal Renewable Fuel Standard

Figure 1. Renewable fuel categories per EISA



The production and sale of biofuels, which derive from corn starch, corn stover (i.e., husks and cobs), sugar cane, or cellulose, have the following potential effects on GHG emissions: they can displace energy-equivalent but higher-emitting fossil fuels, they can cause fuel prices to rise or fall, and they can prompt land use changes that release GHGs from fertilizers or that would have otherwise remained stored in unused soil. An important limitation on these effects is the "E10 blend wall," a chemically based 10 percent limit on the ethanol that can be substituted for gasoline without damaging conventional engines.[70] "Flex fuel" engines that can

DRAFT

[67] IRS, Pub. 150, *supra* note 60, at 4, 5, 8 (the list of fuel taxes includes aviation gasoline, gasoline blendstocks, diesel-water fuel emulsion, kerosene (including kerosene used for aviation), dyed diesel and kerosene, compressed natural gas, alternative fuels, fuels used in commercial transportation on inland waterways, and any liquid used in a fractional ownership program aircraft as fuel).

[68] Federal Aviation Administration, Fact Sheet: Airport and Airway Administration Trust Fund 4 (2016), https://perma.cc/3F3R-J3NM.

[69] GAO-11-134, at 8.

[70] Kelsi Bracmort, Congressional Research Service, *The Renewable Fuel Standard (RFS): In Brief* 7–8 (Jan. 16, 2015) https://perma.cc/GAQ9-V5Q7. Specially designed "flex fuel" engines can handle blends of up to 85 percent ethanol.

handle higher percentages of ethanol (ranging from 51 to 83 percent but generally termed "E85") remain uncommon.[71]

The federal Renewable Fuel Standard (RFS) requires transportation fuel distribution companies to purchase specified volumes of plant-based ethanols and to blend them with the conventional fuels sold to end-users. Parameters for ethanol composition, production volume, and lifecycle GHG emissions estimates were first established by the Energy Policy Act of 2005,[72] and were then revised by the Energy Independence and Security Act (EISA) of 2007.[73] EISA's parameters sort renewable fuels into four categories (see Figure 1 at right). All of them exclude fuels whose lifecycle GHG emissions are not at least 20 percent lower than those of conventional gasoline.[74] "Advanced biofuels" include those whose GHG lifecycle emissions are at least 50

[71] U.S. EIA, Annual Energy Outlook 2016, Table 46. Transportation Fleet Car and Truck Stock by Type and Technology (Aug. 2016) https://perma.cc/9BLL-ZCYD (estimating that as of August 2016 flex-fuel vehicles comprise about 1.36 percent of the total U.S. passenger- and light duty-vehicle fleet).

[72] Energy Policy Act of 2005, Pub. L. No. 109-58 (2005). As California's Air Resources Board has explained, the difference between ethanols for the purpose of a lifecycle emissions analysis is in how they came to be ethanol. CAL. AIR RESOURCES BD., STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING--PROPOSED RE-ADOPTION OF THE LOW CARBON FUEL STANDARD, at III-62 (Jan 2015), https://perma.cc/48A8-P5HT ("a gallon of ethanol made from corn grown and processed in the Midwest will, under a microscope or other analytical device, look identical in every material way to a gallon of ethanol processed from sugar cane grown in Brazil. Both samples of ethanol will have the same boiling point, the same molecular composition, the same lower and upper limits of flammability—in other words, both will have identical physical and chemical properties because both products consist of 100 percent ethanol. On the other hand, the corn ethanol made from the Midwest will have different carbon intensity than the sugar cane ethanol from Brazil. Thus, the relevant inquiry with carbon intensity is not so much what is contained in a fuel, but how that fuel was made, distributed and used.").

[73] Energy Independence and Security Act of 2007, Pub. L. No. 110-140 (2007). EISA's relevant provisions amended the Clean Air Act by creating the Renewable Fuels Program as a subsection "o" of Section 211, *codified at* 42 U.S.C. § 7475(o).

[74] Debate over whether ethanols made from corn starch should qualify as "renewable fuels" has raged for years. BRENT D. YACOBUCCI & KELSI BRACMORT, CALCULATION OF LIFECYCLE GREENHOUSE GAS EMISSIONS FOR THE RENEWABLE FUEL STANDARD 10–16 (Mar. 12, 2010), https://perma.cc/5F4Z-3FEC.

DRAFT

percent lower than those of gasoline.[75] EISA also places a 15 billion-gallon cap, starting in 2015, on the annual volume of corn starch-based ethanol (such ethanol arguably meets the 20 percent threshold but never meets the 50 percent threshold), and makes an aspirational call for increased production of advanced biofuels from about 1.5 billion gallons in 2010 to 21 billion in 2022, when the RFS is set to expire.[76] For 2017, EPA anticipates production of 312 million gallons of cellulosic ethanol (EISA calls for 5.5 billion in that year) and 4 billion gallons of all advanced biofuels (EISA calls for 9.0 billion).[77] Since 2010, EPA has used its statutory authority under EISA to waive these EISA-prescribed production volumes for cellulosic biofuels, but not for advanced biofuels generally; biodiesel and Brazilian sugarcane-based ethanol have made up the difference.[78]

2.6 Energy efficiency requirements

[75] As California's Air Resources Board has explained, the difference between ethanols for the purpose of a lifecycle emissions analysis is in how they came to be ethanol. CAL. AIR RESOURCES BD., STAFF REPORT: INITIAL STATEMENT OF REASONS FOR PROPOSED RULEMAKING--PROPOSED RE-ADOPTION OF THE LOW CARBON FUEL STANDARD, at III-62 (Jan 2015), https://perma.cc/3D78-BW3D ("a gallon of ethanol made from corn grown and processed in the Midwest will, under a microscope or other analytical device, look identical in every material way to a gallon of ethanol processed from sugar cane grown in Brazil. Both samples of ethanol will have the same boiling point, the same molecular composition, the same lower and upper limits of flammability—in other words, both will have identical physical and chemical properties because both products consist of 100 percent ethanol. On the other hand, the corn ethanol made from the Midwest will have different carbon intensity than the sugar cane ethanol from Brazil. Thus, the relevant inquiry with carbon intensity is not so much what is contained in a fuel, but how that fuel was made, distributed and used.").

[76] 42 U.S.C. § 7475(o)(2)(B)(i)(II).

[77] Renewable Fuel Standard Program: Standards for 2017 and Biomass-Based Diesel Volume for 2018; Proposed Rule, 81 Fed. Reg. 34778, 34780 (May 31, 2016). The National Research Council predicted this result in 2011. LESTER B. LAVE ET AL., NAT'L RESEARCH COUNCIL, RENEWABLE FUEL STANDARD: POTENTIAL ECONOMIC AND ENVIRONMENTAL EFFECTS OF U.S. BIOFUEL POLICY 2 (2011).

[78] *See* James H. Stock, The Renewable Fuel Standard: A Path Forward 9–10 (Apr. 2015) (tabulating difference between statutory volumes and volumes authorized by EPA rulemakings).

DRAFT

Federal energy efficiency (EE) laws have accumulated and been amended in fits and starts since 1975,[79] and now amount to a sweeping patchwork of mandates, incentives, and informational requirements, implemented through regulations issued by the Department of Energy (DOE), EPA, the Federal Trade Commission, and state governments. Thus while federal law addresses EE in buildings, industrial and commercial equipment, and consumer appliances, it often does so in fragmentary and indirect ways.

Building codes remain the subject of state authority, and federal statutes do not impose EE performance requirements on commercial or residential buildings, new or existing. Instead, federal law provides several forms of encouragement—chiefly technical support, tax credits, and subsidies[80]—to various actors. The Energy Policy Act of 1992 imposes one of the few federal requirements in this area: state governments must certify that they have determined whether EE improvements would result from adoption of the current American Society of Heating Refrigerating, and Air-Conditioning Engineers (ASHRAE) code for new commercial buildings, and of the Council of American Building Officials' Model Energy Code for new residential buildings.[81] If EE improvements would result, then state governments must adopt the

[79] Energy Policy and Conservation Act, *supra* note 16; Energy Conservation and Production Act of 1976, Pub. L. No. 94-385, 90 Stat. 1142 (Aug. 14, 1976) *codified at* 42 U.S.C. §§ 12, 15b; National Energy Conservation Policy Act of 1978, Pub. L. No. 95-619, 92 Stat. 3206 (Nov. 9, 1978) *codified as amended at* 42 U.S.C. §§ 8201–8284 *and* 42 U.S.C. §§ 12, 15); National Appliance Energy Conservation Act of 1987, Pub. L. No. 100–12, 101 Stat. 103 (Mar. 17, 1987); Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2777 (Oct. 24, 1992); Energy Policy Act of 2005, Pub. L. No. 1009-58, 119 Stat. 594 (Aug. 8, 2005); EISA; Emergency Economic Stabilization Act of 2008, 110–343, 122 Stat. 3765; American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 138.

[80] For a description of DOE's technical assistance program, see DOE, Office of Energy Efficiency & Renewables, *Building Energy Codes Program: State Technical Assistance*, http://bit.ly/2aT7a7M (updated Apr. 2, 2015). As for tax incentives, subsidies from utilities to customers for EE improvements are not taxable, 26 U.S.C. § 136, and tax credits are available to homeowners who install qualified EE-improving building envelope components (e.g., windows or insulation), *id.* § 25C(c), or heating or air conditioning equipment. *Id.* § 25C(d)(3).

[81] 42 U.S.C. §§ 6833(a), (b).

updated version.[82] Most states comply with this requirement, albeit at different paces; some states simply, it seems, do not comply.[83] The American Recovery and Reinvestment Act of 2009 provided a further push by conditioning receipt of State Energy Program (SEP) stimulus funds on each governor's assurance that their state would pursue a bevy of measures to improve EE, including implementation of the most up to date energy code for residential and commercial buildings.[84] All 50 governors provided such assurance and accepted receipt of SEP funds.

The key example of federal law relevant to EE in appliances and equipment is the Energy Policy and Conservation Act (EPCA) of 1975,[85] which was revised significantly in 1987,[86] and amended by EISA in 2007.[87] It instructs DOE to adopt standardized assessments ("test procedures") of energy use, water use (where relevant) and energy efficiency for "covered products,"[88] and also authorizes DOE to set performance standards for those products' energy use based on the "maximum energy efficiency which is technologically feasible and economically justified."[89] EPCA also instructs the Federal Trade Commission to issue a rule requiring disclosure via label of

---

[82] *Id.*

[83] *See* DOE, Office of Energy Efficiency & Renewables, *Building Energy Codes Program: Status of State Energy Code Adoption*, http://bit.ly/1SktOCx (updated July 2016) (commercial tab shows adoption of ASHRAE 2013 / IECC 2015 code by 7 states, of 2010/12 code by 17 states and DC, of 2007/09 code by 19 states, and of an earlier code or no code by 13 states; residential tab shows adoption of IECC 2015 or equivalent code by 4 states, 2012 by 10 states, 2009 by 27 states, and earlier or no code by 15 states).

[84] ARRA § 410(a)(2); *see also e.g.*, Ted Strickland, Gov. of Ohio, Governor's Assurance under ARRA Title VI, Section 410 (Mar. 23, 2009), http://bit.ly/2akEBjf.

[85] Energy Policy and Conservation Act of 1975, Pub. L. No. 94–163, 89 Stat. 871 (Dec. 22, 1975).

[86] National Appliance Energy Conservation Act of 1987.

[87] EISA §§ 142, 301, 303, 306–08, 310–12, 316, 321, 471, 531, 548.

[88] 42 U.S.C. § 6293(b)(3). Examples include: "(9) illuminated exit signs, (10) low voltage dry-type distribution transformers, (11) traffic signal modules and pedestrian modules, (12) medium base compact fluorescent lamps, (13) dehumidifiers, (14) commercial prerinse spray valves, (15) refrigerated bottled or canned beverage vending machines."

[89] *Id.* § 6295.

"the range of estimated annual operating costs or other useful measure of energy consumption" for those products.[90] EPCA applies these requirements to both consumer products and appliances as well as commercial and industrial equipment.[91] The Energy Star program builds upon EPCA's testing and reporting requirements, and encourages the purchase of energy efficient products and homes through voluntary certification and labeling.[92]

2.7 Research and development funding

Economic analyses generally detect underinvestment in R&D—sustainable energy technologies are no exception—because learning and new technologies are socially more valuable than private sector R&D spending would seem to imply.[93] Standard economics explains this underinvestment as a "market failure" resulting from private entities' inability to capture the full benefits of their R&D spending.[94] Consistent with the logical remedy for this failure, the federal government supports R&D for nearly every type of energy source used in the U.S., as well as for technologies that could change how energy is transmitted, or that could capture CO2 emissions for sequestration or utilization. In fiscal year 2015, Congress appropriated $5.4 billion for R&D funded through DOE.[95] Of that, $3.6 billion went to applied research: $1.9 billion to

DRAFT

---

[90] *Id.* § (c)(2)(B).

[91] *See* 10 C.F.R. pt. 430 (listing performance standards for consumer products based on EPCA authority); 10 C.F.R. 431 (listing test procedures and performance standards for commercial and industrial equipment, e.g., commercial refrigerators, freezers and refrigerator-freezers; commercial warm air furnaces; distribution transformers; electric motors; and pumps).

[92] EnergyStar.gov, Origins & Mission, https://perma.cc/UZC9-G3X4 (accessed May 31, 2017).

[93] Darren Acemoglu, Introduction to Modern Economic Growth 411–432, 497–536 (2008).

[94] *Id.*; *see also* Fidel Perez-Sebastian, *Market failure, government inefficiency, and optimal R&D policy*, 128 Economics Letters 43–47 (Mar. 2015) (explaining necessity and complementarity of both R&D funding and intellectual property protections in light of R&D market failures on the one hand and the inevitable inefficiency or "government failure" of public spending on R&D on the other).

[95] CBO, Federal Support for the Development, Production, and Use of Fuels and Energy Technologies 9 (Nov. 2015).

renewables and EE, $700 million to advanced nuclear, $600 million to fossil energy R&D (a category that includes both the development of methane hydrate for energy use and carbon capture, storage, and utilization (CCS/U)), and $100 million to electricity delivery and energy reliability.[96]

2.8 Agriculture

Two sorts of federal interventions are relevant here. First is the set of federal regulations that address GHG emissions, albeit indirectly, from agricultural sources. The U.S. GHG Reporting Program does not require agricultural sources of GHGs to submit complete GHG inventories; only emissions from manure management at large agricultural facilities must be reported to EPA.[97] Federal regulations do not restrict GHGs emitted by agricultural fields, pastures, livestock, facilities, or operations—including concentrated animal feeding operations.[98] The main federal regulatory means of addressing agricultural sources of GHGs are programs that provide technical assistance and modest financial support for ecosystem and resources conservation and for particular farming practices with lower environmental impacts.[99] The U.S. Department of Agriculture's Building Blocks for Climate Smart Agriculture and Forestry, announced in 2015, is a characteristic set of approaches: they are voluntary, not

[96] *Id.* 9 tbl.2.

[97] 40 C.F.R. §§ 98.2 (listing criteria for entities subject to mandatory GHG reporting), 98.360–98.368 (Manure Management), Appendix (animal population thresholds above which emissions must be reported: beef cattle, 29,300; dairy cattle, 3,200; swine, 34,100; poultry: layers, 723,600, broilers, 38,160,000, turkeys, 7,710,000).

[98] *See* Complaint for Declaratory and Injunctive Relief, U.S. Human Society v. EPA, Civil Action No. 15-cv-0141, (D.D.C. Jan. 28, 2015) (alleging EPA may no longer delay in responding to petitions for rulemaking to address GHGs and other emissions from CAFOs).

[99] These include the Conservation Reserve Program, the Conservation Stewardship Program (which includes Resource Conserving Crop Rotations program), the Agricultural Conservation Easement Program (includes Grassland and Wetland Reserve programs), and the Environmental Quality Incentives Program.

mutually contingent or coordinated, and modestly funded.[100] One of those building blocks, "Livestock Partnerships," dovetails with another voluntary program: EPA's AgStar, which encourages farms to install anaerobic digesters to capture and extract GHGs (chiefly methane) from waste products, including manure.[101]

The second federal intervention also gets at GHG emissions indirectly, but pushes in the other direction and does so on a massive scale. That intervention is the morass of farm subsidies that effectively encourage emissions-intensive modes and patterns of food production and consumption.[102] This paper does not specify which subsidies are to blame or the mechanisms by which they encourage or fail to discourage the emission of GHGs from the growing and consumption of particular food, feed crops, or animals. It just notes that agriculture, narrowly defined, accounts for 9–10 percent of annual nationwide anthropogenic GHG emissions,[103] that changes to what that sector produces and how could reduce those emissions substantially,[104] and that federal subsidies drive key decisions by farmers and others.

2.9 State laws

An exhaustive list of state-level laws and policies that would interact with a carbon tax is beyond the scope of this paper, but this sub-part addresses the most salient. Before describing those policies, it first summarizes briefly the legal limits imposed on

[100] USDA, *Building Blocks for Climate Smart Agriculture and Forestry* (Apr. 2015), https://perma.cc/2Z3G-M968.

[101] EPA, AgSTAR: Biogas Recovery in the Agriculture Sector, https://perma.cc/F7YF-7U6P (updated Jan. 11, 2017).

[102] For a discussion of the emissions-intensity of several aspects of U.S. agriculture, see The White House, Climate Change and the Land Sector: Improving Measurement, Mitigation and Resilience of our Natural Resources (Dec. 2015), https://perma.cc/4GVH-S9ZL.

[103] EPA, *Greenhouse Gas Emissions: Sources of Greenhouse Gas Emissions*, https://perma.cc/8XES-KWTV (updated Apr. 14, 2017); USDA Economic Research Service, *Agricultural Production and Mitigation*, http://perma.cc/9N5Z-GBHY (updated Oct. 14, 2016).

[104] *See, e.g.*, Eva Wollenberg et al., *Reducing emissions from agriculture to meet the 2 °C target*, 22 Global Change Biology 3859 (Dec. 2016), http://onlinelibrary.wiley.com/doi/10.1111/gcb.13340/epdf.

DRAFT

all of them by the Constitution's dormant Commerce Clause (dCC) and Supremacy Clause.[105]

The dCC, a corollary to the Commerce Clause inferred by courts, prohibits states from (a) discriminating against commerce because it originates in another state, (b) regulating commercial activity in other states, or (c) imposing an "undue burden" on interstate commerce.[106] This is not a blanket prohibition on all state laws *affecting* extraterritorial or interstate activities, however. Courts apply strict scrutiny only to regulations that expressly advantage intra-state products or services vis-à-vis extra-state competitors or that regulate activities wholly outside a state's borders; they otherwise apply a balancing test to challenged laws and regulations.[107]

Although courts begin a preemption analysis by presuming that federal law does not supersede the state law at issue, federal law preempts in all of the following circumstances:

- Congress has declared that federal law occupies the whole of a given field;
- Even if Congress has not declared a field of state law preempted, federal legislation in a given field is manifestly comprehensive and leaves no room for additions or specifications by states;
- Again, even if Congress has not so stated, federal interests in a given field "are so dominant at the federal system will be assumed to preclude enforcement of state laws on the same subject,"[108]
- State and federal law manifestly conflict, i.e., a state law presents an obstacle to Congress's stated or implied objectives for a federal law or regulations

---

[105] *See generally* Steven Ferrey, *Carbon Outlasts the Law: States Walk the Constitutional Line*, 41 Boston College Envtl. Affairs L. Rev. 309 (2014) (summarizing dCC in context at 313–19, and preemption by the Federal Power Act at 336–41).

[106] Hughes v. Oklahoma, 441 U.S. 322, 325-26 (1979).

[107] *See* Pike v. Bruce Church, Inc., 397 U.S. 137 (1970) (articulating test).

[108] English v. Gen. Elec. Co., 496 U.S. 72 (1990)

DRAFT

implementing that law—a circumstance clearly evidenced by it being impossible for a private party to comply with both federal and state laws.[109]

Not all of the policies discussed below butt up against the legal lines drawn by the dCC and the preemptive authority of the Federal Power Act and the Clean Air Act, but many have come close or been found to have overstepped those lines as states have sought to fill the void left by the federal government with respect to climate change mitigation policy.[110]

Carbon pricing. California and the nine Regional Greenhouse Gas Initiative (RGGI) states have assigned prices to GHG emissions using cap and trade schemes;[111] Oregon is exploring a similar scheme,[112] and Washington State held a referendum on whether to adopt a carbon tax in November 2016.[113] Since 2015, California's cap and trade scheme has covered sources in California's electricity, industrial, transportation, and natural gas sectors, which emit roughly 1.46 million tons of GHGs, 85 percent of the

---

109 *E.g.*, Nantahala Power & Light Co. v. Thornburg, 476 U.S. 953, 969 (1986) (North Carolina utility commission's electricity ratemaking conflicted with rates devised by Federal Energy Regulatory Commission pursuant to Federal Power Act).

110 *See* Ferrey, *supra* note 104, at 309 (collecting and analyzing examples); Michael B. Gerrard, *Federalism Obstacles to Advancing Renewable Energy*, N.Y.L.J. 251(88), May 2014 (similar).

111 California Air Resources Board, *Assembly Bill 32 Overview* (2016), https://perma.cc/3XET-NVRG; *see also* Global Warming Solutions Act of 2006 (setting statewide emissions reduction target and directing California Air Resources Board to implement programs to achieve "the maximum technologically feasible and cost-effective GHG emission reductions" in line with that target); Regional Greenhouse Gas Initiative, *Program Design*, http://www.rggi.org/design/history; Regional Greenhouse Gas Initiative, Memorandum of Understanding (2005), https://perma.cc/EB4G-K37N.

112 Oregon Department of Environmental Quality, Draft Outline: Market Mechanism for Reducing Greenhouse Gas Emissions in Oregon (June 3, 2016), https://perma.cc/UJL9-BCAC.

113 Initiative Measure No. 732 ("Carbon Pollution Tax") (filed Mar. 20, 2015), https://perma.cc/HE6S-BF9N; Carbon Tax Center, States: Washington, https://perma.cc/6G7K-6ST3 (accessed May 24, 2017) (describing lead-up to and results of referendum, which defeated statewide carbon tax proposal).

DRAFT

state's annual total.[114] Notably, it is unclear whether current law authorizes the scheme to run beyond 2020.[115] RGGI covers the 163 facilities located within RGGI-state borders that can generate at least 25 megawatts (MW) of electricity. In 2016, RGGI's cap on those facilities' emissions was 78.5 million tons of CO2 (about 1.1 percent of total U.S. emissions).[116] The cap, which is currently slated to decline by 2.5 percent annually until 2020, does not apply to other emissions, even from 25+MW facilities located in non-RGGI states that generate electricity consumed in RGGI states. The price of a RGGI allowance for one short ton of CO2 emissions has fluctuated between $2.40 and $8.50 since 2014; as of March 2017, the price was $3.00.[117] A fraction of RGGI's proceeds go to support for investments in renewable energy facilities, EE, and other climate change mitigation efforts in RGGI states.

Both California's scheme and RGGI allow for "leakage," meaning that they neglect the emissions emitted beyond their borders as a result of activity within their borders.[118]

Carbon-intensity restrictions. State laws also seek to restrict the carbon intensity of the electricity and transportation sectors by requiring the purchase of electricity or liquid fuels that meet particular standards. The most prevalent form for such restrictions is the Renewable Portfolio Standard (RPS), diverse forms of which have been adopted in 29

---

[114] California Air Resources Board, Overview of ARB Emissions Trading Program (Feb. 2015), https://perma.cc/NNQ3-XHEW.

[115] Keith Goldberg, *Calif. Cap-And-Trade Extension Poised For Legal Fight*, Law360, July 14, 2016, https://perma.cc/RK32-JW3V; CARB statement (stating that no new legislative authority is needed to extend scheme to 2030).

[116] Calculation based on RGGI & US GHG Inventory (2015).

[117] *See* RGGI CO2 Allowance Tracking System, RGGI CO2 Budget Trading Programs: Transaction Price Report, https://perma.cc/H6JE-QD92; Regional Greenhouse Gas Initiative, Auction Results, https://www.rggi.org/market/co2_auctions/results (accessed May 24, 2017).

[118] California Air Resources Board, *California cap-and-trade program, Resolution 12-51, Attachment A* (Oct. 18, 2012) (creating safe harbors for leakage via "resource shuffling"). Danny Cullenward, *How California's carbon market actually works*, 70 Bulletin of the Atomic Scientists 1938 (2014).

states and the District of Columbia.[119] Generally—though no two RPSs are exactly alike—retail utilities subject to an RPS must purchase some percentage of the electricity they sell from renewable sources. States have set widely varying target percentages and dates: Hawaii mandates 100 percent renewable power by 2045, Vermont 75 percent by 2032, and Pennsylvania 15 percent by 2020.[120] In most RPS-states, utilities may meet that percentage requirement by purchasing either RE or Renewable Energy Credits (RECs) from renewable generators. In this way, RPSs amount to an indirect tax on fossil-fueled electricity generators and an indirect subsidy for renewable generators.

Whereas RPSs require utilities to purchase minimum amounts of electricity from renewable generators, other more legally contentious approaches to have sought to limit carbon intensity by *prohibiting* electricity purchases from particular generators. Minnesota's 2007 Next Generation Energy Act, for instance, which proscribed utilities from buying wholesale power from coal-fired facilities, was struck down by a federal court and that decision upheld on multiple grounds by the Eighth Circuit Court of Appeals.[121]

New York's Clean Energy Standard (CES) seeks to steer through these legal shoals of federalism while also propping up the finances of several in-state nuclear plants.[122] It does not formally establish any prohibitions on eligible resources (to avoid dCC limits), nor does it expressly seek to rely on or affect wholesale electricity prices (to avoid conflicts with the Federal Power Act). Instead, the New York Public Service Commission has sought to assign value to the zero-emitting attribute of electricity generated by some "clean" sources (nuclear, hydro, and non-hydro renewables). That value is captured in Zero Emissions Credits (ZECs), whose price is derived from a

[119] Galen Barbose, Lawrence Berkeley National Laboratory, U.S. Renewables Portfolio Standards 2016 Annual Status Report 5 (Apr. 2016), http://bit.ly/29Cl8s6.

[120] *Id.*

[121] N. Dakota v. Heydinger, 825 F.3d 912 (8th Cir. 2016).

[122] *See* Order Adopting a Clean Energy Standard, New York Public Service Commission, Case Nos. 15-E-0302, at 129–134 (Aug. 1, 2016).

formula whose variables include the SC-CO_2, the price of RRGI allowances, and a collar that is based on wholesale electricity prices for one of the wholesale marketplace's subregions. Whether the CES does in fact steer clear of these legal shoals is a question currently before the court.[123] Illinois has also established a program that endows nuclear power plants with ZECs and requires other entities to purchase them in order to participate in the state's retail electricity market.[124] That program has, like New York's, prompted litigation.[125]

EE resource standards (EERSs) and utility rate decoupling. Like RPSs, EERSs require utilities to substitute a lower-emitting alternative for some amount of electricity generation. Unlike RPSs, EERSs require utilities to help their customers consume less of the utilities' product, rather than pushing utilities to make or buy that product from a different source.[126]

Legislation that directs public service commissions to decouple utility rates from volumes of energy sold aims to eliminate utilities' incentive to simply build more capacity and sell more energy.[127] In decoupled states, utilities receive compensation based on a set of performance measures,[128] and so have less reason to prevent their customers from investing in EE and conservation efforts—indeed, in some states

---

[123] *See* Joint letter from parties in Coalition For Competitive Electricity vs. Zibelman, et al., No. 16-CV-8164 (VEC) to Judge Caproni (Dec. 8, 2016), https://perma.cc/S3QT-R2ED (complying with judge's instruction to summarize issues in the case).

[124] FEJA, Public Act 099-0906 (Dec. 7, 2016), https://perma.cc/HRK5-75CU.

[125] *See* State Power Project, Illinois: Commerce Clause and Supremacy Clause Challenge to Nuclear Zero Emission Credit Program, https://statepowerproject.org/illinois/ (accessed June 24, 2017) (summarizing case, *Electric Power Supply Ass'n v. Star*, and providing links to pleadings).

[126] American Council for an Energy-Efficient Economy, State Energy Efficiency Resource Standards (EERS) (May 2016), http://bit.ly/2flob9c.

[127] Richard Sedano, Regulatory Assistance Project, Presentation: "The Basics of Decoupling, A Superior Solution to the Throughput Incentive and remarks on EE Performance Incentives NCSL Webinar," at 8–10 (Feb. 12, 2015), http://bit.ly/2bkqMkO.

[128] *See* Janine Migden-Ostrande et al., Regulatory Assistance Project, Decoupling Case Studies: Revenue Regulation Implementation in Six States 3–6 (June 2014), https://perma.cc/HLF5-28UC (providing background on decoupling and description of challenges of measuring its effects).

support for such investments is among the performance measures that determine utilities' compensation.[129]

Property-Assessed Clean Energy (PACE) programs. PACE programs support EE investments on private property by addressing several impediments: a lack of information about contractors and the performance of EE investments, uncertainty about rates of repayment from prospective energy savings, and a lack of low-interest liquidity or suitable collateral for loans to pay for EE-boosting retrofits.[130] Lawsuits over how PACE funding affected federally-backed mortgage loans interrupted nationwide adoption of PACE programs by all states,[131] but such programs—for residential and commercial properties—persist and remain widespread.[132]

Fossil fuel extraction regulations and severance taxes. In addition to regulating the carbon intensity of their electricity sectors, states also regulate aspects of the process of fossil fuel extraction and set severance tax rates to be charged for such extraction. States' diversity in this regard has recently been illustrated by their disparate approaches to the regulation of unconventional hydrofracture drilling ("fracking"), which range from outright bans to the wholesale adoption of regulatory provisions drafted by the American Petroleum Institute or other oil and gas industry trade associations.[133] There is less diversity in states' approaches to coal mining, which must be consistent with

[129] *See id.* at 35–36 (discussing complementary EE policies employed in case study states).

[130] For an overview of the logic and parameters of PACE programs generally, see American Council for an Energy-Efficient Economy, Property Assessed Clean Energy (PACE), https://perma.cc/HMC4-92AD (accessed June 1, 2017).

[131] Ian M. Larson, *Keeping PACE: Federal Mortgage Lenders Halt Local Clean Energy Programs*, 76 Missouri L. Rev. 599 (2011).

[132] PACENation, C-PACE Market Update Q1 2016 (June 2016) https://perma.cc/8NTQ-PTWH (providing snapshot of financing for project on commercial properties flowing through 40 operating PACE programs in 32 states and D.C.); PACENation, Residential PACE Near You, http://pacenation.us/pace-programs/residential/ (visited June 1, 2017) (showing locations of PACE programs nationwide).

[133] Amanda C. Leiter, *Fracking, Federalism, and Private Governance*, 39 Harv. Envtl. L. Rev. 107 (2015).

provisions of the federal Surface Mining Control and Reclamation Act of 1977—but, notably, that Act gives states "primacy" over implementation.[134] In addition to regulating drilling and mining for fossil fuels, state law also sets the rate at which such extractions are taxed. These rates vary widely and states adjust them actively. The feature of severance taxes most important to this paper's inquiry is states' reliance on them for revenue.[135]

California's Preemption Waiver Under the Clean Air Act. The Clean Air Act preempts state-level regulation of vehicular emissions to ensure that the national marketplace for automotive vehicles is not balkanized by diverse requirements.[136] But the Act also instructs EPA to grant California a waiver of that preemption for more ambitious vehicular emissions standards that meet particular statutory criteria.[137] The Act further permits other states to follow California's lead once that waiver has been granted.[138] Historically, this has meant that California's standards have served as a harbinger of future CAFE standards. Under the Obama Administration, it meant that California regulators were directly involved in the development of national CAFE standards.[139] At present, it means that the Trump Administration's effort to reduce

DRAFT

[134] 95-87, 91 Stat. 445 (Aug. 3 1977), *codified at* 30 U.S.C. §§ 1201–1328; *see also* Bragg v. W. Va. Coal Ass'n, 248 F.3d 275, 289 (4th Cir. 2001), *cert. denied*, 534 U.S. 1113 (Jan. 22, 2002) (contrasting SMCRA with "other cooperative federalism statutes").

[135] U.S. EIA, *Major fossil fuel-producing states rely heavily on severance taxes*, Aug. 21, 2015, https://perma.cc/EU44-ZH4X (comparing severance tax revenues across mineral types and states).

[136] Clean Air Act § 209(a).

[137] *Id.* § 209(e). The most recent grant of a significant waiver related to the regulation of GHGs from vehicles was in 2013. California State Motor Vehicle Pollution Control Standards; Notice of Decision Granting a Waiver of Clean Air Act Preemption for California's Advanced Clean Car Program and a Within the Scope Confirmation for California's Zero Emission Vehicle Amendments for 2017 and Earlier Model Years, 78 Fed. Reg. 2,112 (Jan. 9, 2013).

[138] *Id.* § 177 (authorizing other states to copy California).

[139] *See* EPA, News Release: EPA and DOT Finalize Greenhouse Gas and Fuel Efficiency Standards for Heavy-Duty Trucks (Aug. 16, 2016), https://perma.cc/QF6Z-HMLL ("The agencies have worked closely with the State of California's Air Resources Board in developing and finalizing

CAFE standards for 2022 to 2025 model years will fail if it cannot overcome—politically and legally—California's commitment to the ambitious standards set on a preliminary basis in 2017.

3 A ROUGH TYPOLOGY OF INTERACTIONS: COMPLEMENTARY, CONCURRENT, CONFLICTING

This paper is not the first to consider interactions among environmental, energy, and climate-related policies, but its primary aim in describing those interactions is to highlight important potential policy tradeoffs in regards to a federal carbon tax and the risks that attend them—not just to add another typology of policy interactions to the pile.[140] This Part describes the categories in its typology, setting up Part 3, which describes how the policies summarized above are likely to interact with a federal carbon tax. It should be noted that this typology focuses on stakeholders and goals rather than on the agencies and institutions responsible for implementing particular policies. It is important to recognize that organizational and procedural features of policy interactions can make those policies relatively more likely to complement or conflict—for instance, EPA and FERC both concern themselves with natural gas, but they do so in pursuit of different statutorily-defined goals and by applying different procedures.[141] However,

the standards. All three agencies are committed to the goal of setting harmonized national standards.").

[140] *See, e.g.*, Karoline S. Rogge & Kristin Reichardt, *Policy mixes for sustainability transitions: An extended concept and framework for analysis*, 45 Research Pol'y 1620 (2016) (reviewing "policy mix" literature from several fields: innovation studies, environmental economics, policy analysis, and strategic management); Sofia Simoes et al., *A Tangled Web: Assessing overlaps between energy and environmental policy instruments along the electricity supply chain*, 25 Envtl. Pol'y & Gov 439, 442 (2015); V. Oikonomou & C. J. Jepma, *A framework on interactions of climate and energy policy instruments*, 13 Mitigation & Adaptation Strategies for Global Change 131 (2008), DOI 10.1007/s11027-007-9082-9; OECD & IEA (2007); William M. Lafferty & Eivind Hovden, *Environmental Policy Integration: Towards an Analytical Framework*, 12 Envtl. Pol. 1 (2003).

[141] *See* Sofia Simoes et al., *A Tangled Web: Assessing overlaps between energy and environmental policy instruments along the electricity supply chain*, 25 Envtl. Pol'y & Gov. 439, 442 (2015).

this paper does not treat organizational and procedural features as an independent source of policy complementarity or conflict.

3.1 Complementary

Policies Complementary to a carbon tax do not just push toward the common ultimate goal of GHG emissions reduction, but push in places or to a degree that the carbon tax would not push anyway. Thus this paper considers policies to be Complementary if they (i) bring pressure or incentives to bear on actors and interactions by removing buffers that would absorb or deflect the pressure or informational signals created by a carbon tax; or (ii) intensify the effects or informational signals of a carbon tax to a material degree. In economist's terms, this paper treats as Complementary policies that address a market failure or coordination problem other than the externality of climate change, or that materially improve the carbon tax's response to that externality. The most important and frequently occurring examples of such failures are:

- "network externalities"—a situation where the value of a product or service depends to a user on how many others also use that product or service;[142]
- endemic underinvestment in basic research, learning by doing, and developing new technologies;[143] and
- underinvestment in energy efficiency (EE) owing to one or more of the following: imperfect information, principal-agent problems, asymmetric

---

[142] Kenneth Gillingham & James Sweeney, Barriers to Implementing Low Carbon Technologies, Stanford-Resources for the Future Climate Policy Conference (Feb. 2012), http://stanford.io/2b00Fja ("a critical mass of consumers must adopt in order for the technology to become widespread.").

[143] Joseph E. Stiglitz, Industrial policy, learning, and development, WIDER Working Paper 2015/149, at 6 (Dec. 2015), https://perma.cc/9JV2-TGHW ("Markets, on their own, are not efficient in promoting innovation and learning"); David J. Teece, *Intangible Assets and a Theory of Heterogeneous Firms*, *in* Intangibles, Market Failure and Innovation Performance (Ahmed Bounfour & Tsutomu Miyagawa eds. 2015) (theorizing that firms exist largely because markets provide grossly insufficient incentives for acquisition and combination of intangibles such as technical knowledge).

information, split incentives, and behavioral failures such as bounded rationality.[144]

A policy that makes smart meters widely available to electricity end-users would, for instance, be Complementary with a carbon tax. This is because the carbon tax would make the behavior changes and technological innovations supported by smart metering infrastructure more valuable and thus more likely to occur once that infrastructure was in place. However, the tax itself would not enable a private entity to reap adequate returns from creating that infrastructure.

Another example of a Complementary policy addresses underinvestment in EE. A carbon tax might make future energy costs more predictable, but it cannot do the same for homeowners' concerns that better home insulation will indeed yield material savings, or campus managers' concerns that a facility-wide energy- and emissions budgeting and planning exercise will identify highly cost-effective opportunities to reduce energy consumption. Policies like PACE programs respond to those additional impediments by facilitating complex net present value calculations, reducing search costs for licensed contractors, and providing private property owners with access to financing.[145]

3.2 Concurrent

Whereas Complementary policies pursue the same ultimate goal by seeking to overcome different impediments, Concurrent policies apply more than one instrument not only to the same ultimate goal but to the same impediment. California's AB 32, which authorizes both a suite of command-and-control policies and a cap-and-trade scheme, exemplifies this sort of interaction. As Professor Michael Wara has pointed out,

---

[144] For a discussion of the key sources of this failure see Lisa Ryan et al., International Energy Agency, Energy Efficiency Policy and Carbon Pricing 12–16 (Aug. 2011).

[145] *See generally* DOE, Office of Energy Efficiency and Renewable Energy, Property-Assessed Clean Energy Programs, https://perma.cc/DR6G-LJQT (visited June 1, 2017). Thirty-two states and D.C. have passed legislation authorizing a PACE program. PACENation, *List of all PACE enabling statutes by state* (2016), https://perma.cc/XH6G-YA8X.

DRAFT

by compelling investments of the sort that carbon pricing might—or might not—inspire, the policy suite constrains compliance options while confusing and lowering the carbon price assigned by the cap-and-trade scheme.[146] Meanwhile, by pricing carbon using a cap-and-trade scheme instead of a less cumbersome tax, the California Air Resources Board introduces heavy doses of complexity into the recipe for regulatory compliance. As a consequence, that scheme imposes all the costs of maintaining a carbon marketplace but does not yield the benefits of market actors deciding for themselves how to optimize emissions reduction strategies.

This category of interaction comes with an important caveat: a policy that is Concurrent might nonetheless be invaluable for accomplishing the GHG emissions-reduction goal of a carbon tax. That caveat is usefully illustrated by the fact that establishing a carbon tax would necessarily occur in at least two phases. The first phase, adoption, would end with legislation. The second phase, survival, would only end after the tax—like the income tax or gas tax before it—had become an enduring feature of federal tax policy.[147] After that first phase but before the end of the second, Concurrent policies could serve as backstops or guarantees that emissions reduction efforts would proceed even if a change of political winds compromised the carbon tax shortly after its passage.

3.3 Conflicting

Conflicting policies are the easiest to spot. For instance, eliminating tax preferences for fossil fuel production would in several ways be the same as imposing a carbon tax: while the former uses the tax code to reduce the cost of extracting, refining, and selling sources of GHG emissions, the latter would use the tax code to increase the cost of emitting GHGs. One important nuance of this category relates to the decades-

[146] Michael Wara, California's energy and climate policy: a full plate, but perhaps not a full model, 70 Bulletin of the Atomic Scientists 26 (2014).

[147] This description borrows from the phases experienced by British Columbia's carbon tax. *See* Kathryn Harrison, The Political Economy of British Columbia's Carbon Tax, OECD Environmental Working Paper No. 63 (2013).

DRAFT

long lifespan of energy sector capital equipment and infrastructure. Thus a policy that encourages investment in natural gas-fired electricity generating capacity—instead of coal-fired capacity—could be considered Complementary to a carbon tax in the near term, but Conflicting in the longer term insofar as it locks in an energy source that will foreseeably become relatively emissions-intensive before the end of its useful life.

3.4 A snapshot of the typology, applied

The following table depicts the application of this paper's typology in condensed form. Several of the policies mentioned above fit into more than one category. Part 4 does not discuss all of the policies included in this table.

DRAFT

Table 1. Interactions typology

Sector	Complementary	Concurrent	Conflicting
Fossil fuel production		State severance taxes	Fossil fuel tax preferences
		Leases for extraction from federal lands *if CCS/U technologies become widely available*	Leases for extraction from federal lands *in the absence of widely available CCS/U technologies*
Electricity		Clean Air Act § 111(d)	
	Clean Air Act § 111(b) *if tax is low*	Clean Air Act § 111(b) *if tax is high*	Clean Air Act § 111(b) *if NSPS is poorly specified*
	CSAPR, MATS, etc. *if benefits are not double-counted*		
	EERS	Clean Air Act § 115	
	R&D for renewables, EE, grid improvement	PTC, ITC	
	Nuclear liability and waste subsidies	RPSs, CESs	
		AB 32 (cap-and-trade component); RGGI	
Transportation	CAFE (including Cal. waiver)	CAFE (including Cal. waiver)	
	RFS2 (per EISA); California LCFS		RFS1 (per Energy Policy Act of 2005)
		Gas tax	
	Hybrid, PHEV, EV subsidies		
Agriculture	Resource conservation programs	NO_2 regulation under Clean Air Act	Subsidies for emissions-intensive operations
Built	EE requirements,		

DRAFT

environment	subsidies, *if benefits are not double-counted*	
	State PACE programs	
CCS/U	R&D for CCS/U	Clean Air Act § 111(b)

DRAFT

4 IMPORTANT POTENTIAL TRADEOFFS

This section considers several potential tradeoffs that might accompany adoption of a carbon tax. Its selections reflect the relative importance of tradeoffs in terms of GHG volumes and economic impact.

4.1 The "cascade" of regulations based on the Clean Air Act

The question preliminary to categorizing GHG regulations based on the Clean Air Act is this: could the "cascade" be segmented, or would negotiators need to take or leave that body of regulations as a whole? Under current law, segmentation is not allowed: nothing in the statute authorizes EPA to ignore pollutants if the Act addresses their source—a point that EPA has been loath to acknowledge in relation to emissions from aircraft and CAFOs.[148] But because a carbon tax would be adopted through legislation, such legislation could also amend the Clean Air Act to allow EPA to continue implementing some but not all of the "cascade" regulations. Thus the answer to the preliminary question is "Yes, legislatively." The potential segments considered here are (1) Section 111(b); (2) Section 111(d); (3) Section 115; (4) the PSD program; (5) Section 202, addressing road-based mobile sources and implemented using CAFE standards; and (6) Section 231, addressing aircraft.

4.1.1 Section 111(b): Possibly Complementary, Concurrent, *or* Conflicting

The New Source Performance Standards (NSPSs) called for in this section of the Act prescribe technologies that new construction (or modification) of a given source type

[148] Aircraft endangerment finding; ABJ ruling denying M2D rest of case re undue delay on aircraft emissions; Complaint for Declaratory and Injunctive Relief, Center for Biological Diversity v. EPA, 1:16-cv-00681-ABJ (D.D.C.) (Apr. 12, 2016) ("1. EPA has delayed unreasonably in (1) issuing an "Endangerment Finding" for aircraft determining that carbon dioxide (CO2) emitted by aircraft engines causes or significantly contributes to air pollution which may reasonably be anticipated to endanger public health or welfare; and (2) promulgating regulations limiting such emissions. 2. Plaintiffs petitioned EPA to issue the endangerment finding and promulgate standards in 2007. EPA's delay in this matter so far exceeds eight years."); Complaint for Declaratory and Injunctive Relief, U.S. Human Society v. EPA, Civil Action No. 15-cv-0141, (D.D.C. Jan. 28, 2015) (alleging EPA may no longer delay in responding to petitions for rulemaking to address GHGs and other emissions from CAFOs).

must incorporate into its design to accomplish EPA-specified emission reduction goals. (Notably, adoption of a particular NSPS incidentally sets a minimum performance standard for BACT applicable to that source category.[149]) In contrast to a carbon tax, these standards deprive the developer of that source of at least some options for complying with emissions reduction targets. What this means for trading off depends on the tax rate, the particular BACT, and the emissions that would result from one or the other. Changes to these factors—iterated in the bullets below—could make it appropriate to categorize NSPSs as Complementary, Concurrent, *or* Conflicting with a carbon tax.

- Complementary

  A low tax rate that would not push, say, a new gas-fired power plant to install CCS/U *unless* a NSPS required such installation, would make that NSPS Complementary with the tax. Whereas the tax would only correct for the climate change externality over the long term, the NSPS would correct for the externality over the short term.

  NSPS would also arguably be Complementary for a source type granted an exemption from the carbon tax on the grounds that it faces international competition from sources unencumbered by a carbon tax.

- Concurrent

  A tax rate set high enough to push all source categories to install CCS would make NSPS for a given stationary source category Concurrent, and merely a cause for additional transaction costs, rather than a cause of materially different activities, investments, or emissions levels.

- Conflicting

  A NSPS that steered a particular facility away from installing an innovative and promising non-BACT technological option, or toward an outmoded or ill-conceived option, would potentially conflict with a carbon tax, insofar as it prevented adoption of an optimal approach to GHG emissions reduction. EPA's acceptance in the 1970s of tall smoke stacks as a means of pollution control is one example of this sort of error.[150]

---

[149] 42 U.S.C. § 7479(3); *see also* EPA, PSD and Title V Permitting Guidance for Greenhouse Gases 20–21 (Mar. 2011), https://perma.cc/UYD3-UCE4.

[150] Richard L. Revesz & Jake Lienke, Struggling for Air: Power Plants and the "War on Coal" 85–86 (2016).

This discussion of NSPS highlights the crucial importance of the tax rate, the prospect of exemptions, and the expected useful lifespan of a given facility to any tradeoff between NSPS and a carbon tax.

4.1.2 Section 111(d): Concurrent

The performance standards for GHG emissions imposed on existing stationary sources, with the key exception of existing EGUs, generally fit the same pattern as that described above for NSPSs. Existing EGUs are exceptional because of how EPA has drafted the Clean Power Plan, discussed in Part 2.1 above.

The Clean Power Plan and a carbon tax would not be Complementary. The Clean Power Plan addresses the same climate change externality as would be addressed by a carbon tax, but not in a way that would amplify the price signal sent by a carbon tax. Indeed, notwithstanding EPA's best efforts, the Clean Power Plan is a Rube Goldberg device that would route incentives through an elaborate system of federal- and state-level institutions and requirements and bring those incentives to bear on just one subsector of the economy. By contrast, a carbon tax would deliver the same basic incentive without the intermediaries, constraints, and transaction costs of command-and-control regulations.

It is difficult to find a reason to consider the Clean Power Plan as other than Concurrent with a carbon tax. As explained further in Part 5, below, this categorization should not be read to imply that the Clean Power Plan would be made *wholly* redundant and dispensable by a carbon tax: in the international context in particular, it could provide an important source of credibility in future negotiations over climate change mitigation commitments. But a Concurrent categorization does reflect that the Clean Power Plan is not likely to accomplish the primary aim of emissions reduction better than a carbon tax and further that it would restrict options a carbon tax would make available to regulated entities.

4.1.3 Section 115, International Air Pollution: Concurrent

Clean Air Act Section 115's interaction with a carbon tax is difficult to characterize, as the language of the statute is broad and no regulation has been drafted to implement it. A Section 115 program could be drawn up in a way that closely resembles the Clean Power Plan, in some respects, though it would also potentially be simpler and broader in scope.[151] It would also likely be a highly contentious regulatory approach, and one that would not target market failures other than those addressed by a tax. Thus, this paper categorizes a potential regulation based on Section 115 as Concurrent.

4.1.4 PSD program: Complementary or Concurrent

EPA's application of the PSD program to GHG emissions would be either Complementary or Concurrent with a carbon tax. It would be Complementary if two conditions obtain: the tax is set low enough not to prompt inclusion of CCS/U in the design of new facilities in attainment areas, *and* EPA identifies CCS/U as BACT for those facilities. In such a situation, the PSD program would address a short-term externality not already addressed by the tax. If either of these conditions does not obtain, however, then the PSD program would duplicate some, but not all, of the effects of a tax, and would not create additional effects supportive of climate change mitigation. Here again, however, while Concurrent operation would incur some avoidable costs, these would not be for nothing: they would "buy" retention of the authority to make up for a weak or exemption-riddled tax through a command-and-control backstop.

4.1.5 Section 202, CAFE standards: partly Complementary, partly Concurrent

The automotive sector, which is responsible for about 27 percent of U.S. GHG emissions,[152] must follow particular technological pathways if it is to maintain growing

[151] *See* Michael Burger et al., *Legal Pathways to Reducing Greenhouse Gas Emissions Under Section 115 of the Clean Air Act*, 28 Geo. Envtl. L. Rev. 359, 362 (2016).

[152] EPA, Sources of Greenhouse Gas Emissions: Transportation Sector Emissions, https://perma.cc/MJF8-6RGJ (last updated Apr. 14, 2017).

transport volumes without exceeding the available emissions "budget."[153] These pathways entail one or more basic departures from the fossil-fueled internal combustion engine, such as electrification (for light-duty and passenger vehicles), hydrogen fuels (for heavy-duty vehicles), and replacement of structural steel with carbon fiber to radically reduce vehicle weights.[154] Hewing to these pathways will require changes on both the demand and supply sides of the transportation sector, and vehicle manufacturers will only take the necessary risks if regulatory policy both pushes and protects them—a combination that can theoretically be accomplished by carefully imposing requirements that simultaneously require risky investments and prevent opportunistic risk-avoidance by competing firms.[155]

Since 2011, pursuant to provisions of several statutes (i.e., the Clean Air Act as interpreted in *Massachusetts v. EPA*, EISA, and the Alternative Motor Fuels Act of 1988[156]), CAFE's goals have included climate change mitigation,[157] "reduc[ing] oil consumption,"[158] and "encourage[ing] early adoption and introduction into the

[153] Deep Decarbonization Pathways Project, Pathways to Deep Decarbonization: Executive Summary 3–4, 49–51 (2015).

[154] Chris Gearhart, National Renewable Energy Laboratory, *Implications of sustainability for the United States light-duty transportation sector*, 3 MRS [Materials Research Society] Energy & Sustainability: A Rev. J. 1 (2016); Anant D. Vyas et al., Transportation Energy Futures Series: Potential for Energy Efficiency Improvement Beyond the Light-Duty-Vehicle Sector, DOE/GO-102013-3706 (Feb. 2013), https://perma.cc/U3YB-2ZZF.

[155] *See* Stefan Ambec et al., *The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?*, 7 Review of Environmental & Economic Policy 2, 4 (2013) (examining evidence supporting and challenging hypothesis that regulatory requirements can overcome market failures by pushing firms to make risky but profitable investments in new technologies, as first articulated by Michael Porter & C. van der Linde, *Toward a new conception of the environment-competitiveness relationship*, 9 Journal of Economic Perspective 97 (1995)).

[156] Pub. L. No. 100-494, 102 Stat. 2442 (Oct. 14, 1988).

[157] 76 Fed. Reg. at 74,963 ("2. Why is EPA proposing this Rule? a. Light Duty Vehicle Emissions Contribute to Greenhouse Gases and the Threat of Climate Change").

[158] *Id.* at 74,854.

DRAFT

marketplace of advanced technologies to dramatically improve vehicle performance."[159] The program has implemented these goals by imposing both fuel economy *and* GHG emissions reduction requirements on U.S.-made vehicle fleets, as well as "additional incentives" to encourage the adoption of new technologies. Notably, although EPA and the National Highway Transportation Safety Agency have worked to harmonize the program's GHG-reduction and fuel-economy targets, those targets remain formally discrete.[160] In addition to these legal points, the following empirical points are relevant to the formulation of tradeoffs between CAFE and a carbon tax:

- The CAFE program has induced technology adoption at a rate faster than the "natural" rate at which the automotive sector would otherwise have incorporated new fuel- and energy-efficiency improvements;[161]
- The penetration of new technologies has yielded significant emissions intensity reductions in U.S.-made vehicle fleets[162] and—indirectly—in the Asian-made fleets that have long been marketed to U.S. consumers as relatively fuel-efficient;[163]

---

[159] *Id.* at 75,339.

[160] In addition, although NHTSA has been *authorized* to set fuel economy standards since the 1970s, only since EISA's passage has it been *required* to do so, and to "maximum feasible" levels. Pub. L. 110–140, title I, §§ 102, 104(b)(1), 121 Stat. 1498, 1503 (Dec. 19, 2007), *codified at* 49 U.S.C. § 32902(a), (f). That requirement for passenger and light duty vehicles expires in 2030. *Id.* § 32902(b)(2)(B).

[161] Antonio M. Bento et al., *The Impact of CAFE Standards on Innovation in the US Automobile Industry*, No. 206195, 2015 AAEA & WAEA Joint Annual Meeting, July 26-28 (2015), San Francisco, California, Agricultural and Applied Economics Association, https://perma.cc/P4RL-JCCE ("show[ing] that the changes in the rate of innovation is proportionate to the changes in the CAFE standards").

[162] U.S. EPA, U.S. Department of Transportation, and California Air Resources Board, Draft Technical Assessment Report: Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards for Model Years 2022-2025, EPA-420-D-16-900 [hereinafter TAR 2016], at 3-2, 3-3, 3-12 (July 2016); EPA, Greenhouse Gas Emission Standards for Light-Duty Vehicles Manufacturer Performance Report for the 2013 Model Year, EPA-420-R-15-008a (Mar. 2015), https://perma.cc/GL9R-CQ8Z (reporting that manufacturers consistently exceeded standards).

[163] Bento et al., *supra* note 155, at 9–10.

DRAFT

- Compliance with CAFE standards applicable through 2025 is expected to force manufacturers to either tradeoff between efficiency and horsepower or to avoid sacrificing horsepower by making vehicle fleets that are on average smaller and lighter;[164]
- As EPA itself acknowledged, crediting manufacturers with increments of CAFE compliance for the sale of alternative fuel vehicles—battery-powered, compressed natural gas, flex-fuel, and others—has sacrificed average emissions intensity for technology adoption.[165] Whether this is an efficient means of encouraging alternatives to the tradition internal combustion engine remains an open empirical question;[166]
- EISA revised the CAFE program to allow trading of credits for compliance not only within corporate fleets (e.g., between car and light truck models) but also among manufacturers;[167] this is expected to prompt over-compliance by at least some manufacturers;[168]

---

[164] *Id.* at 12 ("Our simulation of innovation under the new aggressive CAFE standards suggest that automakers will have to do moderate downsizing to meet the 2025 target in cars, and they only need minor downsizing in trucks . . . . This is a much more optimistic prediction than previous studies have shown."); Christopher R. Knittel, *Automobiles on Steroids: Product Attribute Trade-Offs and Technological Progress in the Automobile Sector*, 101 American Economic Review 3368 (2011) (finding that maintaining historic rate of CAFE-driven efficiency gains will require downsizing vehicles).

[165] 75 Fed. Reg. at 62,811 ("EPA believes it is worthwhile to forego modest additional emissions reductions in the near term in order to lay the foundation for the potential for much larger 'game-changing' GHG emissions and oil reductions in the longer term."); *see also* Alan Jenn et al., *Alternative Fuel Vehicle Adoption Increases Fleet Gasoline Consumption and Greenhouse Gas Emissions under United States Corporate Average Fuel Economy Policy and Greenhouse Gas Emissions Standards*, 50 Environmental Science & Technology 2165 (2016), https://perma.cc/7CHB-XAJC.

[166] National Research Council, Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles 345 (2015) ("This incentive may drive additional deployment of PEVs. But this may not be the most cost-effective way to increase the number of alternative fuel vehicles in the long run."); Sanya Carley et al., Rethinking Auto Fuel Economy Policy Technical and Policy Suggestions for the 2016-17 Midterm Reviews 45–47 (Feb. 2016), https://perma.cc/VZ6Q-ZT6E (recommending critical examination of programs encouraging purchase of zero-emission vehicles).

[167] *Id.* at 342–43 (describing credit trading for MY2017-2025).

[168] Virginia McConnell, *The New CAFE Standards, Are They Enough on Their Own?*, Resources for the Future Discussion Paper No. 13-14, at 10 (May 2013), https://perma.cc/764T-H7U7.

- In addition to prompting supply-side changes, CAFE has promoted consumer concern for fuel economy;[169] but
- Improvements in fuel economy are partially offset by drivers driving more—a "rebound effect."[170]

The foregoing suggests several complementarities between CAFE and a carbon tax. One relates to "rebound," which CAFE's efficiency-promoting design cannot avoid, but which a carbon tax would likely frustrate, both by raising fuel costs and by heightening drivers' awareness of those costs.[171] Another relates to the "additional incentives" CAFE can provide to manufacturers for making risky investments in technologies that depart radically from historical norms. A carbon tax imposed on fuel producers, refiners, and importers would provide a general pressure to reduce or altogether avoid fuel consumption, but would not duplicate the more targeted incentives available to EPA, via CAFE, to reward risky but promising design changes. Indeed, their combination would likely *prevent* the sort of tradeoff EPA made for the sake of encouraging "potential game-changing" longer-term results.[172] A third complementarity is the labeling required by the CAFE program.[173] Even if the CAFE program ceased imposing requirements related to GHG emissions, it could continue to require that manufacturers report clearly and consistently their vehicles' performance in

[169] Seung-Pyo Jun et al., *A study on the effects of the CAFE standard on consumers*, 91 Energy Policy 148–160 (2016).

[170] TAR 2016, *supra* note 155, at 10-9 to 10-20.

[171] *See* Kathryn Harrison, The Political Economy of British Columbia's Carbon Tax, OECD Environmental Working Paper No. 63 (2013) (describing how drivers' lower rate of fuel consumption after imposition of carbon tax was disproportionately higher than comparable changes in fuel prices due to market fluctuations).

[172] *See* Valerie J. Karpus et al., *Should a vehicle fuel economy standard be combined with an economy-wide greenhouse gas emissions constraint? Implications for energy and climate policy in the United States*, 36 Energy Economics 322, 327, 331 (2013) (noting that availability of EVs is highly significant to success of ambitious emissions constraints).

[173] *See* Revisions and Additions to Motor Vehicle Fuel Economy Label; Final Rule, 76 Fed. Reg. 39,478 (July 6, 2011);

terms of GHG emissions and thereby encourage comparison by customers eager not to pay the avoidable costs of fuel and a carbon tax.

By contrast, the imposition of GHG emissions reduction requirements roughly in line with the SC-CO_2 via CAFE standards would be Concurrent with a carbon tax. This Concurrent interaction is especially ripe for a tradeoff because the CAFE-based approach would likely be less efficient than a carbon tax at incorporating the climate change externality into the price paid for emissions from driving.[174] Importantly, however, such a tradeoff could eliminate only the component of the CAFE program focused on reducing vehicles' CO_2 emissions, leaving other program elements to persist, including fuel economy standards, implemented by NHTSA in service to the goal of reducing oil consumption and thereby serving energy efficiency and security goals, and incentives that focus on "game-changing" GHG-reducing technology adoption rather than just incremental improvements. Making this tradeoff would require attending to the CAFE program enforcement authority currently available to NHTSA and EPA for their respective standards. Whereas NHTSA is authorized only to impose modest fines for non-compliance, EPA is authorized to rescind authorization to sell motor vehicles for non-compliance with GHG emissions requirements.[175] Negotiators would have to decide whether mothballing or eliminating the GHG emissions portion of the CAFE program would also mean abandoning EPA's stronger degree of enforcement authority, or transferring that authority to NHTSA.

4.2 Non-GHG Clean Air Act regulations: Complementary

As noted above, air pollution regulations that address the direct adverse effects of air pollution on public health and welfare have not only led (incidentally) to significant GHG emissions reductions, but EPA has counted some of those reductions as co-benefits in its cost-benefit analyses of GHG regulations. But for that counting of co-

[174] *See* Karpus et al., *supra* note 166, at 327–28, 331 (observing that fuel tax is far more efficient than fuel economy standard for purpose of affecting rate of fuel consumption).

[175] Benjamin Leard & Virginia McConnell, Nearly Tripled CAFE Fine Highlights Differences in EPA and NHTSA Rules, Resources for the Future, July 25, 2016, https://perma.cc/ZY4M-2D3Q.

benefits using the SC-CO_2, such regulations would be wholly Complementary rather than Concurrent with a carbon tax. Both impute the costs of adverse impacts on public health and welfare to emissions from many of the same sources, but one targets criteria pollutants or HAPs that sicken people and ecosystems when emitted into the ambient air, and the other targets climate change, an intermediate link in the causal chain connecting adverse impacts to emissions. Because the adverse effects resulting from non-GHG and GHG emissions occur largely independently,[176] they are rightly treated as distinct externalities that happen to result from many of the same sources of pollution. Thus, the only valid tradeoff between non-GHG air pollution regulations and a carbon tax would relate to counting—and not double-counting—their respective benefits.

4.3 Tax preferences and subsidies for energy

This sub-part considers interactions with federal support for the three types of energy noted above: fossil fuels, renewables, and nuclear power.

4.3.1 Fossil fuel production: Conflicting

That the conflict between subsidizing fossil fuel production through tax preferences and taxing GHG emissions is direct does not make its resolution simple. The largest fossil fuel tax preferences are not uniquely available to that sector—indeed, as noted above, renewable power generators benefit from the domestic manufacturing deduction as well.[177] Thus simply "trading off" their elimination for a lower carbon tax

[176] Some adverse effects are not independent but synergistic. For instance, higher ambient temperatures means that ozone precursors more readily form ozone, such that the same volume of pollutants yields a larger volume of harmful air pollution. However, while these synergistic effects are likely material in many instances, they are relatively small and sufficiently difficult to quantify that this paper treats does not take them into account.

[177] Metcalf, *supra* note 59, at 3 ("The oil and gas industry argues that these three provisions should not be classified as tax preferences because such tax treatment is not unique. For example, a percentage depletion deduction can also be taken by firms producing other nonrenewable resources, like coal, timber, or minerals. Similarly, the industry points out that the [Intangible Drilling Costs] expensing deduction resembles the research and development tax deduction that firms in other industries can use. Finally, the domestic manufacturing deduction applies to a wide swath of industries—most of which can claim a 9 percent deduction rather than the limit of

rate would mean *adding* a new carve-out to the tax code rather than eliminating a tax preference. For several reasons, this approach is less likely to accompany adoption of a carbon tax than a more encompassing overhaul of tax code provisions.

Whether or not this tradeoff would be part of a larger deal, its negotiation would certainly entail weighing proponents' key arguments in favor of these conflicting tax code provisions: for defenders of fossil fuel tax preferences, energy security; for carbon tax advocates, climate change mitigation and federal tax revenue. With this weighing in mind, Professor Metcalf has estimated how repeal of the three largest tax preferences for oil and gas would affect oil and gas drilling activity, production, prices, and consumption.[178] He found that repeal would have material effects on drilling, but only modest effects on production, prices, and consumption.[179] As for GHG emissions impacts, Professor Metcalf estimates that repeal would likely yield less than a 1 percent reduction.[180] In contrast to these negligible direct effects on energy security and climate change, Professor Metcalf notes that two other effects would be highly significant: first, repeal would yield roughly $4 billion in tax revenue annually;[181] and second, it would greatly strengthen the U.S.'s leadership role vis-à-vis other G20 governments that have lately balked at actually making the fossil fuel subsidy reductions they committed to in

6 percent for oil and gas—making it the third largest corporate tax expenditure by the federal government.").

[178] Metcalf, *supra* note 59, at 1 (accounting for about 90 percent of the roughly $4.5 billion annually recovered by the oil and gas sector from tax preferences).

[179] Specifically, he projects the following results: (i) lower rates of drilling in the near term: 9 percent for oil, 11 percent for gas; (ii) lower rates of domestic production in the long term: 5 percent for oil, 3-4 percent for gas; (iii) higher prices over the long term: 1 percent for oil (global) and 7-10 percent for gas (domestic); and (iv) lower rates of consumption over the long term: less than 1 percent (global) for oil and 3-4 percent (domestic) for gas.

[180] *Id.* at 18.

[181] *Id.* at 19.

2009.[182] In sum, he finds that repeal would have limited direct effects on energy security and climate change mitigation, but substantial fiscal effects.

4.3.2 The PTC & ITC: once Complementary, but increasingly Concurrent

Tax credits for renewable energy installations and a carbon tax both encourage participants in the electricity sector to transition from fossil-fueled to non-emitting resources. When Congress first adopted the PTC as part of the Energy Policy Act of 1992, it would arguably have suited this paper's "complementary" category well: integrating intermittent renewable resources then presented significant technical challenges[183] and the regulatory thickets of the electricity sector—home of powerful incumbents and conservative officials—meant high barriers to entry.[184] Tax credits did not just close a gap between the price charged by GHG-emitting generation and renewables, but bolstered renewable generators as they supplied power, worked to undo the technical and institutional knots that limited grid integration, and developed viable business models through trial and error.[185] Even if renewables are not yet fully competitive with traditional electricity generation in all jurisdictions, they certainly are no longer fledgling technologies,[186] nor are renewables businesses still explorers of an

[182] *Id.*; *Compare* G20 Leaders' Statement, The Pittsburgh Summit, September 24–25, 2009, para. 24 (2009), https://perma.cc/JP97-2H9H ("To phase out and rationalize over the medium term inefficient fossil fuel subsidies while providing targeted support for the poorest."), *with* G20 Energy Ministerial Meeting Beijing Communique, Final draft 4am 29th June 2016, at 7–8 (2016), https://perma.cc/T5QP-SZF3 (reporting no agreement as to deadlines or quantitative targets for phase-out).

[183] *See, e.g.*, Pavlos S. Georgilakis, Technical challenges associated with the integration of wind power into power systems, 12 Renewable & Sustainable Energy Reviews 852 (Apr. 2008); Paul Denholma & Robert M. Margolis, Evaluating the limits of solar photovoltaics (PV) in traditional electric power systems, 35 Energy Pol'y 2852 (May 2007).

[184] *See* Benjamin K. Sovacool, *Renewable Energy: Economically Sound, Politically Difficult*, 21 Elec. J. 18 (June 2008).

[185] *See* Felix Mormann, Requirements for a Renewables Revolution, 38 Ecol. L.Q. 903 (2011) (surveying myriad barriers to entry and arguing that carbon pricing would not overcome them).

[186] Camila Stark et al., Joint Institute for Strategic Energy Analysis, Renewable Electricity: Insights for the Coming Decade 8 (Feb. 2015), https://perma.cc/UK8W-2UYG (illustrating that ranges of

DRAFT

unmapped frontier.[187] As such, tax credits increasingly serve the same purpose as a carbon tax would—crediting renewables for generating power without emitting GHGs—only less efficiently: the National Academies of Sciences calculated in 2013 that roughly $250 in tax revenue are lost for each ton of carbon reduced via the facilities incentivized by the PTC or ITC.[188] (For comparison, the federal government's estimate for the SC-CO_2 in 2015 ranged from $11 per ton (at a 5 percent discount rate) to $56 (at a 2.5 percent discount rate).)

Did the PTC and ITC ever serve a materially different purpose than a carbon tax, or were they merely a politically attainable alternative when first implemented?[189] The question is valuable not because it can be answered with certainty, but because it illustrates that the PTC and ITC have arguably migrated from the Complementary to the Concurrent category, making them better candidates for a carbon tax tradeoff than they were at their inception. Put another way, repeal of the PTC and ITC today would likely be offset by the price-equalizing effects of a carbon tax.

4.3.3 Subsidies for nuclear: Complementary

Subsidies for liability and waste disposal related to nuclear power generation, whatever their effective amounts, fit within this paper's Complementary category for straightforward reasons: they address impediments independent of those leading to the externality of climate change, and their support of nuclear contributes to the supply of

levelized cost of entry of competing generation sources varies across US jurisdictions); *id.* at 42 ("The fundamental driver of rapid renewables deployment in the United States is that cost improvements are making renewable power generation cost competitive with fossil fuels.").

[187] *See, e.g.*, Lars Strupeit & Alvar Palm, *Overcoming barriers to renewable energy diffusion: business models for customer-sited solar photovoltaics in Japan, Germany and the United States*, 123 J. of Cleaner Production 124 (June 2016); Erik Funkhouser et al., *Business model innovations for deploying distributed generation: The emerging landscape of community solar in the U.S.*, 10 Energy Research & Social Sci. 90 (Nov. 2015).

[188] NAS, *supra* note 8, at 70.

[189] For a discussion of the tendency to regulate with less efficient "carrots" instead of more efficient "sticks" in the environmental policy context, see Brian D. Galle, *The Tragedy of the Carrots: Economics & Politics in the Choice of Price Instruments*, 64 Stan. L. Rev. 797 (2012).

low- or zero-emitting electricity. That categorization should not be mistaken as a blanket endorsement of the subsidies that support the existing nuclear fleet's operation, but it can rightly be understood as indicating that those subsidies do not duplicate the effects of a carbon tax and so are not natural candidates for tradeoff.

4.4 Gas tax: Concurrent in the short-term, potentially Conflicting thereafter

The existing gas tax performs a revenue raising function and a user fee function—though political unwillingness to raise its rate has lately kept it from yielding a user fee sufficient for highway upkeep. If the gas tax rate were increased to a level that imputed the SC-CO_2 to gasoline and diesel sales, it would arguably function as a corrective to the externality of climate change. Crucially, however, these functions are not fully compatible beyond the short-term: if the gas tax were raised to a level that incentivizes significant GHG emissions reductions, then it will also reduce fuel consumption over the medium- to long-term (i.e., as drivers invest in substitutes for vehicles powered by an internal combustion engine), and thereby reduce revenues—whether those revenues are treated as user fees for the highway system or just flow to the federal government's General Fund. This would not be improved by imposing a carbon tax as well as a gas tax. If the carbon tax rate is high enough to discourage drivers from emitting GHGs over the medium- to long-term, then it will undermine the revenue-raising functions of the gas tax. That is, the two would initially be Concurrent—using similar instruments to create similar pressures—and eventually Conflicting. Notably, in keeping with the parameters articulated by the Deep Decarbonization Pathways Project, this scenario assumes the development and widespread commercial availability of alternatives to fossil-fuel emitting motor vehicles.

What does this mean for a potential tradeoff? It suggests that a tradeoff could proceed in phases, whereby a gas tax (Concurrent with a carbon tax) or carbon tax (wholly replacing the gas tax) would initially impute the SC-CO_2 to gasoline and diesel, and would incrementally be supplemented and eventually supplanted by some other revenue source—should gasoline and diesel consumption disappear through sector-wide decarbonization.[190] Importantly, the second phase could be entirely contingent, treating the replacement of the gas tax with a carbon tax as a simple tradeoff with no predetermined end-date.[191] This sort of contingency could make the carbon tax indispensable quickly, but could also build in pressure to prevent incremental increases in the tax rate.

4.5 Federal RFS: Complementary with respect to advanced biofuels, Conflicting with respect to corn starch ethanol

Like the CAFE program, the RFS is meant to serve the related goals of reducing the U.S. transportation sector's dependence on petroleum, reducing GHG emissions incident to transportation, and—intermediate to both of those in the long term—facilitating technological and infrastructural developments in support of biofuels' substitution for conventional gasoline. While all biofuels are arguably substitutes for gasoline, the 10 percent blend wall limits the amount of possible gasoline substitution and effectively requires different biofuels to compete for shares of that 10 percent. Also, as noted above, different biofuels have very different lifecycle emissions profiles: ethanol derived from corn starch improves marginally on gasoline, cane ethanol emits at most half as much, and biodiesel and advanced biofuels perform better still.

RFS support for biofuels with lifecycle emissions comparable to gasoline would conflict with a carbon tax in much the same way as tax preferences for fossil fuel extraction: taxpayers would pay twice for a canceled effect. EISA's 15 billion-gallon cap on production of such biofuels reflects Congress's awareness that high-GHG biofuels

DRAFT

---

[190] Parry and Small propose a third option: replace the gas tax with a "mileage tax" that satisfies the need for a user fee and will not erode amid decarbonization of the transportation sector. Ian Parry & Kenneth A. Small, *Implications of carbon taxes for transportation policies*, *in* Implementing a US Carbon Tax, Challenges and debates 211, 221–22 (Ian Parry et al. eds. 2015).

[191] *Cf.* Gas Tax Replacement Act of 2015, https://perma.cc/M49T-HVZT (proposing repeal of excise tax on gasoline and diesel and replacement with carbon tax).

arguably conflict with climate change mitigation goals, and serve only the goal of energy security.[192]

RFS support for advanced biofuels, whose GHG emissions profiles are at least 50 percent lower than that of conventional gasoline, could be Complementary with a carbon tax. This is true even though (i) the tax would push in the same direction as the RFS by making biofuels more cost-competitive relative to standard gasoline based on their respective emissions' profiles; and (ii) advanced biofuels would themselves be subject to the tax. Complementarity in spite of these features would owe to the tax being inadequate to overcome key impediments to the development of advanced biofuel production technology and distribution networks. On the other hand, the tax would only be Complementary with the RFS if the RFS proves capable of overcoming these impediments, which it has yet to do.[193] This paper has no recommendations for changes to the RFS, but notes that the biofuels currently subject to it differ from one another in basic ways: cane-based fuels can be produced cost-effectively on a relatively large scale, but rely on imports, chiefly from Brazil; cellulosic fuels do not rely on imports but cannot yet be produced cost-effectively in large quantities; biodiesel does not face the 10 percent blend wall that limits other biofuels, but producing biodiesel costs substantially more than producing petroleum-based diesel, in large part because oil prices are currently very low. These differences cause each biofuel to collide with different market

---

[192] *See* James H. Stock, The Renewable Fuel Standard: A Path Forward 19 (Apr. 2015). However, the RFS's effect on energy security has been the subject of debate. Analyses that observe a drop in the international price of oil as a result of biofuels production suggest that, by promoting a "rebound" effect, the RFS undermines its goal of averting oil consumption by making oil cheaper to consume. *See* Madhu Khanna & Xiaoguang Chen, *Economic, Energy Security, and Greenhouse Gas Effects of Biofuels: Implications for Policy*, Am. J. Ag. Econ., June 2013, at 2–3 (discussing empirical evidence showing that "[b]y reducing the demand for oil, these policies could lower the world price of oil, and lower the consumer price of gasoline and blended fuel in the United States and lead gasoline consumption to rebound positively and to decrease by less than the energy equivalent increase in biofuel consumption."). This is not an inevitable feature of policies that promote biofuels: unlike the RFS quantity mandate, the blend mandate codified in California's low carbon fuel standard (LCFS) will tend to reduce fuels' overall GHG-intensity while *raising* their price, and therefore will generally not result in rebound. *Id.* at 3.

[193] Stock, *supra* note 191, at 4 (recommending basic changes to RFS).

failures—for instance, biodiesel is hobbled by network externalities (chiefly the chicken-and-egg problem of filling stations carrying biodiesel), cellulosic ethanol by persistent technical incapacity.

4.6 Energy efficiency requirements: Complementary

Of all the interactions considered in this paper, the one examined most thoroughly elsewhere is that of a carbon tax and EE. Indeed, in 2011 the International Energy Agency addressed precisely the question of whether EE policies (e.g., labeling requirements, informational tools, and performance standards) bear upon the same sources of market failure (e.g., principal-agent problems, unavailable energy performance information, bounded rationality) as a carbon tax.[194] Based upon a review of relevant empirical literature, they conclude that EE policies and carbon pricing overlap very little in the sources of market failure they address but are both highly effective in relation to those sources.[195] The authors note that they do overlap in relation to information problems—a carbon tax makes it more valuable for end-users to learn about the same information that EE policies require to be disclosed—but that even this overlap is likely to be a source of synergistic effects rather than redundancy.[196] These observations hold for both appliances and buildings and their equipment systems.

4.7 R&D for CCS/U: more Complementary than Concurrent

There is a clear overlap between efforts to develop CCS/U technologies that make it possible to reduce or avoid GHG emissions and adoption of a carbon tax that makes it more expensive to emit GHGs. That overlap is not complete however: a carbon tax would do little or nothing for developers of Direct Air Capture technologies that filter CO2 from the ambient air—unless Direct Air Capture installations were treated as a

---

[194] Ryan et al., *supra* note 143, at 23–25 (examining question in relation to appliances), 32–33 (buildings).

[195] *Id.* at 23, 32.

[196] *Id.* at 24 ("Better information can thus facilitate [EE] improvements, and policies to increase information can enhance the effectiveness of price signals," such as a carbon tax would send to consumers).

DRAFT

source of CO2 tax credits. Furthermore, private sector investments in R&D for CO2 CCS/U technologies suffer from the classic market failure that affects nearly all R&D: private entities underinvest for lack of assurance that they will capture most or all of the returns from their investments. One might argue that adoption of a carbon tax and continued application of general R&D tax preferences to CCS/U technologies would address both of the market failures relevant to CCS/U technology development, making additional CCS/U R&D subsidies duplicative. However, because many CCS/U technologies are still at pre-commercial stages of development,[197] and because of the urgent need to reduce emissions from existing and new fossil-fueled power plants in particular, further intervention is justified.[198]

4.8 State policies

The state policies that would interact with a carbon tax are diverse; their interactions would also be diverse. Common to them all, however, are the legal parameters discussed in Part 2.9 above relating to the dormant Commerce Clause (dCC) and federal preemption flowing from the Supremacy Clause. Also relevant, though not common to all states, is California's special status under the Clean Air Act as a designated regulatory pioneer.[199]

4.8.1 Carbon pricing: Concurrent

A federal carbon tax would duplicate in several basic respects state laws that assign prices to GHG emissions: both would be adopted to correct for the externality of

---

[197] *See generally* International Energy Agency, Technology Roadmap: Carbon capture and storage 2013 edition (2013), https://perma.cc/E6FZ-E2H7.

[198] For a fuller articulation of this point in relation to renewable energy technology more generally, see Richard G. Newell, *The Role of Energy Technology Policy Alongside Carbon Pricing*, *in* Implementing a US Carbon Tax, *supra* note 189, at 179–190; *see also* Robert N. Stavins, *Repairing the R&D Market Failure*, The Evntl. Forum, Jan./Feb. 2011, at 16, (describing the "R&D market failure" and observing that "[e]mpirical analyses have repeatedly verified the crucial point that combining carbon-pricing with R&D support is more cost-effective than adopting either approach alone.").

[199] Clean Air Act § 209(b).

climate change and would affect some or all of the same prices passed on to consumers by firms in the oil, gas, and electricity sectors. This duplication of both purpose and instrument is a logical basis for a tradeoff. This point cannot be separated from two significant caveats, however. First, state-level carbon pricing would not so much duplicate as provide additionality to a federal carbon tax (the same would not be true of a federal cap-and-trade scheme).[200] Particular states—likely those that have implemented carbon pricing already—might pursue that additionality after concluding that the federal tax does too little to help them achieve their climate change-related goals. The second caveat is that a state-federal carbon pricing tradeoff would not just generalize and homogenize mechanisms that currently exist in a minority of states, but would also redirect tax receipts from state to federal coffers and thereby deprive state-level energy transition policies of an important source of revenue.[201]

Unlike some of the regulatory mechanisms discussed below, existing state carbon pricing schemes have steered clear of the legal limits mentioned above (though they have faced a number of legal challenges on other grounds).[202] This owes in part to the fact that both California's cap-and-trade scheme and RGGI have not taken measures to eliminate their emissions "leakage,"[203] meaning that they do not prevent actors subject

---

[200] L.H. Goulder & Robert N. Stavins, *Challenges from State-Federal Interactions in US Climate Change Policy*, 101 American Economic Review 253–257 (2011) (anticipating "100% leakage" from a combination of state and federal cap-and-trade schemes).

[201] *See, e.g.*, John Myers, *Almost $391 million in cap-and-trade dollars awarded to public transit projects across California*, L.A. Times, Aug. 16, 2016, https://perma.cc/8FPM-HQ26; Regional Greenhouse Gas Initiative, Investment of RGGI Proceeds Through 2013 (Apr. 2015), https://perma.cc/8HC6-XNHA.

[202] For a tabulated list of recent climate change and energy cases dealing with this issue, including several dealing with AB 32 and RGGI, see State Power Project, *State Cases*, http://bit.ly/2aZzx5l (visited May 31, 2017).

[203] Justin Caron et al., *Leakage from sub-national climate policy: The case of California's cap-and-trade program*, 36 Energy Journal 167–190 (2015); Harrison Fell & Peter Maniloff, Beneficial Leakage: The Effect of the Regional Greenhouse Gas Initiative on Aggregate Emissions, Colorado School of Mines Division of Economics and Business Working Paper 2015-06 (June 2015), https://perma.cc/968B-KZZU (estimating that 10 percent of energy demand shifted to sources

to their emissions caps from purchasing from sources located beyond the capped region and thereby causing those sources to emit.[204]

4.8.2 Other carbon-intensity restrictions: Complementary or Concurrent

This paper cannot address the full array of state-law restrictions on carbon intensity, even though they will all interact with a carbon tax. Instead, it considers a handful of important and characteristic examples: California's Low Carbon Fuel Standard (LCFS); RPSs, such as exist in 29 states and the District of Columbia; and New York's newly minted Clean Energy Standard. Notably, these have already been or are expected to face legal challenges.

California's LCFS: Complementary and legally secure. One component of AB 32's implementation requires a 10 percent reduction in the carbon intensity of all motor vehicle fuels supplied or sold in California by 2020.[205] The California Air Resources Board expects that this will be accomplished by blending standard gasoline with ethanol or by replacing petroleum-based diesel with biodiesel. As with the federal RFS, the LCFS's requirements are directed at impediments to low-emissions ethanol production, distribution, and use in a more targeted way that a carbon tax would be, and thus are Complementary with a federal carbon tax. Furthermore, unlike the RFS, the LCFS does not put downward pressure on oil prices and thereby invite rebound.

outside RGGI, but that this shift was beneficial to net emissions because it substituted gas sources outside of RGGI states for coal sources located in RGGI states).

[204] *See* Shelley Welton et al., Regulating Imports into RGGI: Toward a Legal, Workable Solution, Sabin Center for Climate Change Law White Paper (Aug. 2013) (proposing means by which RGGI could reduce leakage while yet avoiding violation of the dCC).

[205] Producers and importers have complied by blending lower-emitting ethanols with standard gasoline. The California Air Resources Board's life cycle emissions analysis of blended fuels takes into account the energy source used for ethanol production as well as the emissions resulting from transport of the fuel from the site of production to sale. Ethanols produced in the Midwest, even if they were chemically identical to ethanols produced in California, receive higher emissions ratings because their production draws to a greater degree on coal-fired power plants and they traveled farther.

DRAFT

The Ninth Circuit Court of Appeals determined that the LCFS did not overstep the bounds of the dCC and was not preempted by the Clean Air Act.[206] That decision "reconfigure[d] the past century of Supreme Court interpretation of the [dCC]" in two respects: it made environmental goals a valid basis for restricting commerce entering the state; and it downgraded discrimination based on product origin from a *per se* dCC violation to something to be weighed by the *Pike v. Brace Church* balancing test.[207] For this paper's purposes, the decision shifts the burden (in the context of a tradeoff negotiation) to the party wishing to argue that a carbon tax *should* preempt an LCFS such as California has adopted, which, as of now, stands on solid legal ground.

RPSs: Concurrent and often legally susceptible. Several economic analyses characterize RPSs as likely to interact in a Concurrent fashion with a carbon tax, and to be less efficient for the purpose of encouraging renewable generation while discouraging emissions-intensive generation. Rausch and Reilly (2013) describe the combination of RPSs and a carbon tax as "redundant" in terms of their effects on emissions, and note also that RPSs would reduce carbon tax revenues by directing money from emitting generators to renewable generators (in payment for RECs) instead of the federal Genreal Fund.[208] Burtraw and Palmer (2013) find that RPSs push in the same direction as a carbon tax but would tend to muddy the signal sent by the tax

---

[206] Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070 (9th Cir. 2013), *rehearing en banc denied*, 740 F.3d 507 (2014), *cert. denied*, 134 S.Ct. 2875 (2014). Similar, if less specific and exacting, requirements for shipping were also upheld by the Ninth Circuit. Pac. Merch. Shipping Ass'n v. Goldstene, 639 F.3d 1154 (9th Cir. 2011) (rejecting arguments based on the Commerce Clause and field preemption against Vessel Fuel Rules, Cal. Code Regs. tit. 13 §2299.2(b)(F) (2016), which mandate that vessels operating within 24 nautical miles of California's coast "use cleaner marine fuels in diesel and diesel-electric engines, propulsion engines, and auxiliary boilers")

[207] Ferrey, *supra* note 104, at 328.

[208] Sebastian Rausch & John Reilly, *Carbon taxes, deficits, and energy policy interactions*, 68 Nat'l Tax. J. 157, 163 (2015).

regarding the "cost" of CO2-intensity for particular generation sources.[209] Furthermore, RPSs generally do not raise—and can even lower—electricity prices, inviting rebound.[210]

In addition to these inefficiencies relative to a carbon tax, RPS legislation often includes preferences for in-state (or in-region) energy sources or RECs.[211] These preferences discriminate against out-of-state sources in ways that make RPSs susceptible to challenge based on the dCC.[212] This susceptibility amounts to a strong legal indication that RPSs depart from the unfettered marketplace that the dCC is generally understood to preserve.[213]

New York's Clean Energy Standard: more Complementary than a RPS, but still Concurrent; also, legally at risk. The CES adopted by New York's Public Service

---

209 Dallas Burtraw & Karen L. Palmer, Resources for the Future, Mixing It Up: Power Sector Energy and Regional and Regulatory Climate Policies in the Presence of a Carbon Tax, RFF DP 13-09, at 14 (Apr. 2013), https://perma.cc/CL2J-P7PP.

210 Carolyn Fischer, *When do renewable portfolio standards lower electricity prices?*, 31 Energy J. 101–120 (2010).

211 Brannon P. Denning, *Environmental Federalism and State Renewable Portfolio Standards*, 64 Case Western Law Review 1519, 1531–33 (2014); *see also* Anne Havemann, *Surviving the Commerce Clause: How Maryland Can Square Its Renewable Energy Laws with the Federal Constitution*, 71 Md. L. Rev. 848 (2012) (proposing options for making Maryland's RPS robust to dCC challenges).

212 For an example of a case not actually adjudicated, but that a state quickly resolved through a settlement, see Complaint, TransCanada Power Marketing Ltd. v. Bowles, No. 4:10-CV-40070 (D. Mass.) (alleging dCC violation for program mandating long-term renewable power purchase agreements with in-state providers). That settlement exempted the plaintiff from compliance with Massachusetts' Green Communities Act of 2008, and the state legislature removed the in-state preference in 2012. Mass. Acts of 2012, Ch. 209 §§ 35 & 36 (amending Green Communities Act § 83 and inserting § 83A); *see also* Harvey Reiter, *Removing Unconstitutional Barriers to Out-of-State and Foreign Competition from State Renewable Portfolio Standards: Why the Dormant Commerce Clause Provides Important Protection for Consumers and Environmentalists*, 36 Energy Law Journal 45, 59–61 (2015) (describing dCC jurisprudence as inferring—rightly or wrongly—the Framers' intent for the Commerce Clause as preservation of a market unfettered by parochial restrictions or protections).

213 Harvey Reiter, *Removing Unconstitutional Barriers to Out-of-State and Foreign Competition from State Renewable Portfolio Standards: Why the Dormant Commerce Clause Provides Important Protection for Consumers and Environmentalists*, 36 Energy L.J. 45, 59–61 (2015) (describing dCC jurisprudence as inferring—rightly or wrongly—the Framers' intent for the Commerce Clause as preservation of a market unfettered by parochial restrictions or protections).

DRAFT

Commission in August 2016 is slightly more Complementary with a carbon tax than the RPSs discussed above, but not enough to shift it out of this paper's Concurrent category. The key distinctions between a standard RPS and New York's CES are these: the CES effectively designates only some (but not all) nuclear generators as sources of Zero Emissions Credits (ZECs; the CES equivalent of RECs), and it sets the price of those ZECs using a formula based in part on the SC-CO_2.[214]

Thus, whereas a RPS is an indirect tax on fossil-fueled generation and an indirect subsidy to renewable generation at rates susceptible to program parameters and electricity market fluctuations, New York's CES is an indirect tax on GHG emissions (a close proxy for fossil-fueled generation) and an indirect subsidy to the three nuclear power plants in the state with ailing financial profiles. The CES otherwise shares most of the features that lead economists to criticize RPSs as both inefficient tools for climate change mitigation and redundancy with the price effects of a carbon tax. However, the example of the CES highlights that state policy tradeoffs in pursuit of a carbon tax will almost certainly have fateful implications for nuclear generators' financial health, which increasingly relies on state-level efforts to assign a value to zero-emitting generation and to thereby limit the effects of cheap natural gas on revenues that might otherwise flow to nuclear generators.

4.8.3 EE Resource Standards and electricity rate decoupling: Complementary

This pair of policies shares a basic goal with, and would have similarly Complementary interactions with a federal carbon tax. Their goal—correcting for existing regulatory institutions' undervaluing of EE and energy conservation by —is one that a carbon tax would support incidentally but not directly. That is, even though a carbon tax would increase the price of some fuels used to generate electricity and

[214] New York Public Service Commission, Order Adopting a Clean Energy Standard, Case No. 15-E-0302, at 51 (Aug. 1, 2016) ("ZEC Price = Social Cost of Carbon (average for each Tranche) - Baseline RGGI Effect (fixed at $10.41/short ton) - Amount by which sum of Zone A Forecast Energy Price and ROS Forecast Capacity Price exceeds $39/MWh.").

DRAFT

average electricity prices in the near- and medium-term, it would not thereby change the basic formula used by public utility commissions to decide what costs regulated utilities may recover. Rather, it would only change a subset of the inputs for a single variable in that formula. By contrast, EE Resource Standards and decoupling revise the formula's basic logic by removing incentives to overspend on generation and transmission capacity and adding incentives to value EE, even though utilities cannot "sell" EE to their customers.

4.8.4 PACE programs

The points made above in Part II.A about market failures affecting EE and in Part II.F about the complementarity of a carbon tax with policies designed to address those failures, apply with equal force in relation to PACE programs for both residential and commercial property owners. In short, these programs' goal of facilitating EE investments promises synergistic rather than duplicative implications for GHG emissions and economic costs.

5 IMPORTANT RISKS ATTENDING POTENTIAL TRADEOFFS

Having identified interactions between existing policies and a federal carbon tax that should inform how one might be traded off for the other above, this part notes briefly how particular tradeoffs could present risks to the basic goal of a carbon tax, namely climate change mitigation.[215]

Mistaking the relationship between a carbon tax and tax preferences for fossil fuels. If tax preferences for fossil fuels are to be part of a tradeoff made in pursuit of political agreement on a carbon tax, then the proper subject of that tradeoff is *not* the incidence or rate of the tax, but availability of tax preferences to all sources of energy, fossil or renewable. Put another way, as repealing fossil fuel tax preferences would not reduce

[215] *Cf.* Paul Twomey, *Rationales for Additional Climate Policy Instruments Under a Carbon Price*, 23 Econ. & Labor Relations Rev. 7, 12 (2012); Samuel Fankhauser et al., *Combining Multiple Climate Policy Instruments: How Not to Do it*, 1 Climate Change Econ. 209 (2010).

DRAFT

the SC-CO_2, an offer to repeal them should not be treated as somehow counterbalancing the need for a carbon tax, in whole or in part.

Trading efficiency for political susceptibility. While it is axiomatic that a carbon tax would, in the abstract, achieve emissions reductions more efficiently than Concurrent command-and-control regulations, it is also true that U.S. tax policy is rife with exceptions, loopholes, and complexities, and that the political economy of environmental regulation tends to favor subsidies—including tax preferences—over simple excise taxes.[216] Thus, one risk of adopting a carbon tax in trade for existing command-and-control regulations is that the tax should be or become compromised by waivers, exceptions, or simple repeal such that it does not materially improve on the rate and level of emissions reductions achievable by the regulations it replaced.

To mitigate this risk, negotiators could provide for a period of transition during which entities subject to command-and-control regulations were deemed to be in compliance so long as the tax collected revenues within prescribed tolerances *and* measures of emissions intensity demonstrated the tax's effectiveness. That period could end either the rescission of those regulations or with their indefinite dormancy.

Abandoning Concurrent policies en toto*, even their Complementary components*. As mentioned in Part 2.1 of this paper, the Clean Air Act operates fundamentally on the basis of what scientific understanding reveals about relationships between air pollution, the environment, and public health. That is, EPA cannot legally ignore new scientific evidence that existing air pollution regulations fail to protect public health. Thus, trading Clean Air Act regulations for a carbon tax would risk departure from this rubric in favor of one that gives Congress a freer hand to adjust key features of the tax in response to political pressures and in spite of scientific evidence. The most obvious feature that Congress might seek to adjust (or fail to adjust) is the tax. This illustrative example gets at a more general risk: that negotiators fail to ensure that key components of a Concurrent policy (re)appear in the carbon tax that replaces it.

[216] Galle, *supra* note 188.

To mitigate this risk in relation to the particular example noted here, negotiators could incorporate an institutional feature of the Clean Air Act into the carbon tax regime: something like the Clean Air Scientific Advisory Committee, which does not make policy, but updates estimates of levels at which particular forms of pollution can be considered safe. Alternatively, and more simply, negotiators could include a legislative provision that tethers the tax rate to the SC-CO_2, as determined by a National Academies of Sciences panel, a reconstituted Interagency Working Group on the Social Cost of Carbon, or some other appropriate body.[217]

Miscounting costs and benefits. This risk is two-fold. On the one hand, there is a risk of over-counting the climate-related benefits of a regulation and under-counting its costs. This could result from failing to adjust the cost-benefit calculation conducted by the Office of Management and Budget pursuant to Executive Order 12,866 to be consistent with a regulatory and economic landscape altered by the presence of a carbon tax. On the other hand, there is also a risk of simply ignoring climate-related benefits and over-counting the costs of a regulation on the grounds that a carbon tax—whatever its rate or scope—makes its purported benefits redundant and its costs duplicative. No proposal to address one of these risks should ignore the other.

Ignoring complementarity. It is not difficult to imagine the desire to cut government spending or to alleviate a particular industry of its regulatory burdens leading members of Congress to insist that "all options" be placed on the negotiating table when discussing a carbon tax. One aim of this paper is to explain that while there is a principled basis for insisting on negotiation of tradeoffs between a carbon tax and Concurrent or Conflicting emissions and energy-related policies, there is little principled basis for insisting on extinguishing Complementary policies through tradeoff. EE performance and labeling requirements are perhaps the clearest example of a

---

[217] *Cf*. Marc Hafstead et al., *Adding Quantity Certainty to a Carbon Tax Through a Tax Adjustment Mechanism for Policy Pre-Commitment*, 41 Harv. Envtl. L. Rev. 41 (2017) (proposing a somewhat more elaborate but also more secure set of standards and procedural measures).

Complementary policy whose trading off would sacrifice synergies rather than creating efficiencies. Another example is R&D to develop CCS/U technologies.

Too much preemption. Myriad institutional dampers can impede the transmission of price signals—such as would be sent by a federal carbon tax—to actors at the state and local levels. As Burtraw and Palmer (2015) observe:

> In a unitary model of government, the introduction of a price signal is assumed to be transmitted instantly to decision makers at all levels of government so that permitting, land use planning, and other functions of government adjust accordingly. * * * But there is in fact little research to indicate how well this would occur. There are many reasons to think that price signals *may not be* transmitted efficiently through levels of government. * * * Even if a tax is used efficiently, it may not work as described in the conventional economic model. In particular, it may not, and we think it most certainly will not, affect all relevant margins of decision making in the economy from consumer behavior to the decisions of state and local governments.[218]

This caveat weighs against making field preemption the mechanism of a tradeoff for a carbon tax in several policy contexts. Field preemption of, say, state-level supplements to federal carbon pricing, low carbon fuel standards, or EE resource standards, would undermine policies that could perform synergistically with a carbon tax.

Too little preemption. Just because some state policies can provide synergistic complements to a carbon tax does not mean that the existing tangle of Concurrent RPSs should continue absorbing indirect subsidies while adding complexity to investors' understanding of renewables versus competing sources of electricity generation. RPSs' relative imprecision, inefficiency, programmatic diversity, and parochialism all weigh in favor of a tradeoff with a carbon tax. One option for a tradeoff would couple adoption of the tax with adoption of a federal RPS that expressly preempts state RPSs. Rather than simply sweeping all state RPSs from the field, a federal RPS could declare that a state

[218] Dallas Burtraw & Karen L. Palmer, *Mixing It Up: Power Sector Energy and Regional and Regulatory Climate Policies in the Presence of a Carbon Tax*, *in* Implementing a US Carbon Tax, *supra* note 189, at 191, 204–206.

RPS conflicts with the federal RPS *unless* the state RPS (i) conforms to various federal parameters, and (ii) does not provide for any parochial preference to in-state generators. This latter approach would allow states to set ambitious renewables targets without encumbering the electricity sector with diverse programmatic requirements and other barriers that might run afoul of the dCC.

Ignoring agriculture. Due to the lack of detailed accounting of the emissions implications of particular subsidies or policy provisions, this paper does not discuss in any detail the nature of the conflict between a carbon tax and federal agriculture policies that currently support emissions-intensive agricultural products and practices. Nonetheless, it counsels that subsidies that can be linked clearly to emissions-intensive agricultural products and practices should be on the negotiating table and earmarked as conflicting with a carbon tax.

CONCLUSION

Carbon tax legislation can only emerge from negotiations that consider a host of policies, chiefly relating to energy, environmental protection, and land use. This paper identifies the most salient of those policies and characterizes their relationship to a carbon tax as Complementary, Concurrent, or Conflicting. This categorization is meant to help inform negotiators, researchers, and others, and to avert facile mischaracterizations of particular policies based on their political optics and popularity rather than their effects. The last part of this paper highlights particular policy tradeoffs that could pose risks to the overarching goal of a legislated carbon tax, namely climate change mitigation.