3-9-2018

Energy, Governance, and Market Mechanisms

Alice Kaswan
San Francisco School of Law

Energy, Governance, and Market Mechanisms

ALICE KASWAN*

As climate modelers' projections materialize through intense storms, catastrophic flooding, unprecedented heat waves, and more, the need for substantial decarbonization within the next few decades has become increasingly clear. Transitioning to clean energy will bring benefits and drawbacks and will create winners and losers. Who will decide how we transition? Our choice of policy tools will have significant implications for who controls the transition and how it unfolds.

Many economists promote the role of market-based mechanisms like carbon taxes or cap-and-trade, mechanisms that rely largely on private actors to make crucial decisions. Under this view, government measures would fill in as necessary; they would complement market-based decarbonization mechanisms.

Although market advocates treat the autonomy of private decisions as one of the market's central virtues, I argue that that approach could shortchange collective deliberation on critical questions about our future path. I argue that government-driven climate action planning and prescriptive strategies should play a central role. Governmental institutions have the capacity to engage in expansive deliberation over the many values and tradeoffs at stake, the capacity for long-term planning, and a greater capacity for public engagement

* Professor, University of San Francisco School of Law. My thanks to Simon Hurd '17 and Ryan Louie Manuel '19 for their very helpful research assistance. I am grateful for generous and thoughtful comments from Eric Biber, William Boyd, Ann Carlson, Jason Czarnezki, Alexandra Klass, Michael Pappas, David Spence, Joseph Tomain, and Shelley Welton. In addition, I benefited from many insightful comments from students in the Spring 2017 Maryland-Pace Environmental Law Colloquium and the Fall 2017 UCLA Climate Change and Energy Law class.

and democratic accountability than atomized decision-making in the energy marketplace. In this view, a carbon pricing mechanism could play an important role—but one that complements governance rather than the other way around.

INTRODUCTION

Climate change challenges the status quo. In the long term, experts agree that decarbonization is necessary[1] and suggest that, to avoid climate catastrophe, the United States should reduce greenhouse gas emissions to 80% below 1990 levels by 2050.[2] A comprehensive assessment of specific pathways to reach that goal by the Deep Decarbonization Pathways Project anticipates that "[t]he carbon intensity of electricity must be reduced by at least 97% . . . ."[3] Over the next few decades, transitioning to clean electricity will have widespread implications across society, with benefits and drawbacks, winners and losers.[4]

Energy infrastructure decisions made now will have long-term and short-term consequences.[5] In the long term, it matters whether utilities invest in natural gas, locking in reliance on fossil fuels for decades, or instead invest primarily in low- or no-carbon alternatives that would accelerate a clean energy transition.[6] In the shorter term, how we transition has widespread consequences not only for green-

---

1 *See* OTTMAR EDENHOFER ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS 20 (2014), https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf; *see also* John C. Dernbach, *Creating Legal Pathways to a Zero-Carbon Future*, 46 ENVTL. L. REP. 10780, 10780–83 (2016) (summarizing the scientific evidence showing the need for drastic carbon emission reductions).

2 *See* William Boyd, *Public Utility and the Low-Carbon Future*, 61 UCLA L. REV. 1614, 1632 (2014); JAMES H. WILLIAMS ET AL., ENERGY & ENVTL. ECON., INC., POLICY IMPLICATIONS OF DEEP DECARBONIZATION IN THE UNITED STATES 8 (2015), http://deepdecarbonization.org/wp-content/uploads/2015/11/US_Deep_Decarbonization_Policy_Report.pdf (stating that the United States government has set a goal of reducing carbon to 80% below 1990 levels by 2050).

3 WILLIAMS ET AL., *supra* note 2, at 10. The deep decarbonization study indicates that electricity-sector emissions must move from 500 g CO_2/kWh in 2014 to less than 15 g CO_2 in 2050. *Id.* at 49.

4 *See infra* Part I.

5 *See infra* Section I.B.

6 *See infra* notes 81–82 and accompanying text.

house gas emissions but for their associated co-pollutants, like mercury and particulates from coal-fired power plants.[7] From a socio-economic perspective, energy choices will intensely impact opportunities across the nation, from the coal mines facing waning demand to urban centers investing in weatherization.[8] The structure of the electricity sector is facing unprecedented change as large centralized utilities confront a dramatic increase in distributed resources, like rooftop solar, dispersed wind power, and consumer efficiency.[9]

Who will decide how we transition? Both the "who" and the "how" are critical. As for "who," what roles should private market players and governance institutions play? Under a carbon price, set through a carbon tax or a cap-and-trade program, private actors select what they view as the most efficacious mechanisms.[10] Under a more governance-centered approach, government institutions play a greater role in envisioning and prescribing a future pathway.[11] And, as for "how" we transition, to what degree do we rely upon private actors' individual decisions in response to price signals, and to what degree do we engage in more sustained and government-driven long-term planning that charts a course toward decarbonization?[12]

Market advocates argue for the primacy of a carbon price, with complementary government-driven "prescriptive measures" only to the degree necessary to address potential market failures.[13] In contrast, I suggest that long-term comprehensive planning for decarbonization, and some degree of prescriptive measures to achieve it, will be essential and desirable, and that market measures could then complement more direct decarbonization strategies. Few would deny the need for both governance and market-based approaches; the question is the relative primacy of these mechanisms.[14]

---

7 *See infra* notes 85–94 and accompanying text.
8 *See infra* notes 95–102 and accompanying text.
9 *See infra* notes 105–07 and accompanying text.
10 *See infra* Section II.A.
11 *See infra* Section II.B.
12 *See infra* Section III.B.
13 *See infra* Section II.A.3.
14 *See infra* Section IV.B.

In California, for example, the foundation for the state's climate action is its comprehensive agency-led planning process. This process has been supplemented by more specific legislative and agency initiatives that direct the state toward a sustainable pathway and integrate economic, equity, and environmental considerations.[15] California has adopted limits on coal-fired power, stringent renewables requirements, and ever-increasing energy-efficient building standards.[16] The state is also directing the benefits of a clean energy transition to disadvantaged communities by committing to renewable energy development and revenue deployment in disadvantaged communities.[17]

California does have a cap-and-trade program,[18] which complements these prescriptive measures by establishing an emissions cap backstop, filling gaps, providing a modest ongoing reduction incentive, and generating revenue that is reinvested in climate action and equity initiatives. Instead of planning and prescriptive measures complementing cap-and-trade, the state's cap-and-trade program complements the state's planning and prescriptive agenda.[19] Although California's efforts have not yet attempted to reach electricity-sector decarbonization, its model—planning and governmental direction, coupled with a market-based price signal—demonstrates the viability of a governance-driven melding of prescriptive and market mechanisms.[20]

But some suggest that a carbon price should be the central climate policy mechanism and that governments should hold back on more direct measures.[21] In comments on Europe's multifaceted climate policies, economist Robert Stavins has argued that the Europeans should achieve reductions through cap-and-trade and forego renewables and energy efficiency policies.[22] Economists tout the

---

15 *See infra* Section IV.C.

16 *See infra* notes 458–62 and accompanying text.

17 *See infra* notes 475–80 and accompanying text.

18 *See infra* note 466 and accompanying text.

19 *See infra* notes 467–69 and accompanying text.

20 *See infra* Section IV.C.

21 *See infra* note 144 and accompanying text.

22 Robert Stavins, *Will Europe Scrap Its Renewables Target? That Would Be Good News for the Economy and for the Environment*, HUFFINGTON POST (Jan. 18, 2014, 5:21 PM), http://www.huffingtonpost.com/robert-stavins/will-europe-

benefits of market mechanisms, like cap-and-trade or a carbon tax, that let private entities make the hard choices.[23] Market advocates point out that market mechanisms have multiple benefits: they internalize the external costs of pollution, they are cost-effective, they induce innovation and transformation, and they shift time and resource-intensive decision-making from overworked government agencies to the private entities that know their industries best.[24] On this view, except for designing and operating the market-based system, government institutions should leave most key substantive decisions to the private sector.[25] More prescriptive government mechanisms could potentially undermine the benefits of market-based mechanisms, and so substantive, complementary government measures should be adopted only where markets will be ineffectual.[26]

In contrast, I argue that the invisible hand of the market cannot and should not be the prime driver for achieving decarbonization; government institutions are best placed to make the fundamental political and practical decisions decarbonization requires. Legislatures, state energy commissions, state public utility commissions (PUCs), and federal energy agencies should continue to step up and address the transition ahead. Government institutions have the capacity to engage in multifaceted decision-making that can address the wide range of environmental and socioeconomic benefits and tradeoffs associated with a clean energy transition.[27] And, although utilities, power companies, transmission organizations and other electricity-sector players do engage in some degree of long-term

scrap-its-ren_b_4624482.html [hereinafter Stavins, *Will Europe Scrap Its Renewables Target?*]. David Driesen has observed that economists' concerns about the impact of renewables mandates on the European Union (EU) Emissions Trading Scheme (ETS) may have influenced the EU to refrain from enacting a stricter renewables policy. *See* David M. Driesen, *Emissions Trading Versus Pollution Taxes: Playing "Nice" with Other Instruments*, 48 ENVTL. L. (forthcoming 2018) (manuscript at 27–28), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2985669 (noting that policy papers arguing that renewables policies interfere with a least-cost market-based approach have sparked a debate about rescinding renewables policies in Australia).

23 *See infra* notes 135–36 and accompanying text.

24 *See infra* Section II.A.2.

25 *See infra* note 132–36 and accompanying text.

26 *See infra* Section II.A.3.

27 *See infra* Section III.A.

planning, it is not at the scale necessary to achieve decarbonization.[28] Rather than waiting for private action, government institutions should actively engage in the planning and coordination necessary to transform the electricity sector.[29] Government initiative is also necessary to the degree that private entities might fail to take decarbonization strategies, like distributed generation or energy efficiency, that could potentially compromise their current business models.[30]

Government institutions also have democratic and process benefits.[31] At least relative to privatized decision-making, legislative and agency decision-making offer opportunities for public participation and increase the democratic legitimacy of decarbonization pathways.[32] And, although "cost-effective" and flexible market mechanisms have been designed in part to attract business support for carbon controls, their uneven uptake suggests that a different political strategy may be in order.[33] Efforts to develop a long-term vision for a clean energy future could potentially garner more political support than mechanisms that are framed primarily in terms of an economy-threatening "price."[34]

Of course, government decision-making is not without its risks.[35] A government role does not ensure a just, clean energy transition.[36] Vested interests with significant political power could prop up unsustainable energy choices. Indeed, the Trump Administration's desire to reinvigorate the coal industry and promote fossil fuels provides a case in point.[37] For those committed to long-term

---

28 *See infra* Section III.B.2.
29 *See infra* Section III.
30 *See infra* Section III.C.
31 *See infra* Section III.D.
32 *See id.*
33 *See infra* Section III.E.
34 *See id.*
35 *See infra* Section III.F.
36 *See id.*
37 *See* Dino Grandoni, *The Energy 202: Trump Administration Has New Energy Buzzword*, WASH. POST (May 25, 2017), https://www.washingtonpost.com/news/powerpost/paloma/the-energy-202/2017/05/25/the-energy-202-trump-administration-has-new-energy-buzzword/5925c045e9b69b2fb981db8a/?utm_term=.d74e1569676f; *see also* Daniel Cusick, *Trump in Iowa Praises 'Beautiful' Coal, Criticizes Wind*, CLIMATEWIRE (June 22, 2017), https://www.eenews.net/climatewire/stories/1060056425/print.

decarbonization and a just transition, significant engagement in political and administrative settings will be necessary to avoid the risk of distorted government decision-making.[38]

Though I argue that governance should not be considered a mere "complement" to market mechanisms, market mechanisms could nonetheless complement government decision-making, as they do in California.[39] Given the importance of reducing greenhouse gas emissions, some redundancy and overlap would be more likely to achieve climate goals than reliance on a single instrument.[40] If government decision-making proves incomplete, or ends up skewed toward unsustainable fossil fuels, then a price on carbon, while unlikely to be sufficient, could nonetheless provide at least a partial safety net.[41] In a cap-and-trade program, an emissions cap could establish a backstop limit to emissions, whatever the fate of prescriptive measures.[42] Under a carbon tax, the tax would provide an ongoing incentive for utilities and power companies to reduce emissions, whatever the effectiveness of government programs.[43] Under either approach, having a price on carbon generates revenue that could be used to further reduce emissions and adapt to climate change.[44]

Although these issues were recently front and center as states worked to comply with the Obama Administration's Clean Power Plan (CPP) for controlling power plant greenhouse gas emissions,[45] the likely demise of that rule[46] might lead some to question whether

---

[38] *See infra* notes 382–83 and accompanying text.

[39] *See infra* Section IV.C.

[40] *See infra* Section IV.B.1.

[41] *See infra* note 412 and accompanying text.

[42] *See infra* notes 393–96, 467 and accompanying text.

[43] *See infra notes* 397–98 and accompanying text.

[44] *See infra* notes 399–403 and accompanying text.

[45] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

[46] Under the Obama Administration, litigation over the CPP had already led to a Supreme Court stay of EPA implementation of the CPP in February 2016. Robert Barnes & Steven Mufson, *Supreme Court Freezes Obama Plan to Limit Carbon Emissions*, WASH. POST (Feb. 9, 2016), https://www.washingtonpost.com/politics/courts_law/supreme-court-freezes-obama-plan-to-limit-carbon-emissions/2016/02/09/ac9dfad8-cf85-11e5-abc9-ea152f0b9561_story.html?utm_term=.37a8f35c1250. Now, President Trump has initiated efforts to repeal

these policy questions remain salient. Whatever happens at the federal level, however, the states continue to play a vital role in energy choices and have the opportunity to continue the momentum generated by the CPP.[47] In doing so, the states will face the same choices among regulatory and market mechanisms they contemplated in their previous CPP planning efforts.

Alternatively, some may argue that the debate is unnecessary because a clean energy transformation is already underway[48] and that further government initiatives—with whatever mix of market mechanisms or government measures—are unnecessary. Existing markets are moving away from coal and toward natural gas and renewables.[49] Renewables investments are growing rapidly,[50] and the Energy Information Administration (EIA) predicts that, with federal tax credits, wind and solar power will be competitive with fossil fuel sources in 2022.[51] However, reliance on renewables entails costs in addition to the generation itself, including transmission, storage, and back-up generation capacity that could increase the net cost of renewables.[52] Moreover, cost alone does not determine investments;

---

the CPP. *See* Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 48,035 (proposed Oct. 16, 2017) (to be codified at C.F.R. pt. 60); *see also* Andrew Childers, *Clean Power Plan Review Tests EPA's Climate Change Obligations*, BLOOMBERG (June 9, 2017), https://www.bna.com/clean-power-plan-n73014453126/ (noting that EPA has sent a proposal to reconsider the CPP to the White House Office of Management and Budget); *see also* Hannah Hess, *Greens Search for Silver Linings in Executive Action*, GREENWIRE (Mar. 28, 2017), https://www.eenews.net/greenwire/2017/03/28/stories/1060052207 (noting Executive Order asking EPA to review the Clean Power Plan and other environmental regulations).

47 *See* Hess, *supra* note 46 (suggesting that state actions to control power plant emissions that were initiated under the CPP are likely to continue); Emily Holden & Daniel Cusick, *Regulators Still Planning for CO_2 Cuts, Despite Trump's Order*, CLIMATEWIRE (Apr. 3, 2017), https://www.eenews.net/climatewire/stories/1060052460 (same).

48 *See, e.g.*, *infra* notes 220–29 (describing multiple state and local clean energy generation initiatives).

49 *See, e.g.*, *infra* notes 97–98 (sources describing transition).

50 Renewables are predicted to have the fastest percentage growth. *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2017 10 (2017), https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf.

51 *Id.* at 85–86 (basing prediction on the levelized cost of electricity).

52 *See* David. B. Spence, *Paradoxes of "Decarbonization"*, 82 BROOK. L. REV. 447, 469–70 (2017) [hereinafter Spence, *Paradoxes*].

as discussed below, generation investments are affected by multiple factors, including certainty in obtaining an adequate rate of return on investment, access to transmission, the presence or absence of tax incentives (and their certainty), and the momentum associated with existing infrastructure.[53] By 2040, and in absolute terms, the EIA predicts that natural gas production will increase the most, to levels significantly higher than renewables.[54] Thus, even if existing energy investments appear to be trending toward decarbonization, it is unwise to assume that this trend will simply continue or will proceed at the rate necessary to avoid catastrophic climate change.[55]

The Article differs from several other "governance" strands in the energy law literature. Shelley Welton and Joe Tomain each explore the democratic potential inherent in a clean energy transition, with Welton analyzing and assessing the various strands of participation that characterize calls for "energy democracy,"[56] and Tomain lauding the opportunities for local and citizen control associated with new, more distributed energy options.[57] In addition, William Boyd and Ann Carlson have explored the critical governance roles that PUCs can play in decarbonization efforts.[58] In contrast to these scholars' focus on specific types of public engagement, I focus on the role of public governance (whether legislative, administrative,

---

[53] *See infra* notes 323–27 and accompanying text (describing factors affecting generation investment decisions).

[54] *See* U.S. ENERGY INFO. ADMIN., *supra* note 50, at 13.

[55] *See, e.g.*, Christa Marshall, *DOE Study Shows Rapid Growth, but Trouble Looms*, GREENWIRE (Aug. 8, 2017), https://www.eenews.net/greenwire/2017/08/08/stories/1060058528 (noting increased development of wind resources, but observing that development will likely slow when tax credits expire and if natural gas prices remain low).

[56] *See* Shelley Welton, *Grasping for Energy Democracy*, MICH. L. REV. (forthcoming 2018) (manuscript at 5–6), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2935331. Welton unpacks the three forms of democratic participation underlying recent calls for energy democracy: (1) consumer choice; (2) increased local control; and (3) access to existing processes. *See id.*

[57] Joseph P. Tomain, *The Democratization of Energy*, 48 VAND. J. TRANSNAT'L L. 1125, 1129–30 (2015).

[58] William Boyd & Ann E. Carlson, *Accidents of Federalism: Ratemaking and Policy Innovation in Public Utility Law*, 63 UCLA L. REV. 810, 813–14 (2016) (describing the critical role that state public utility commissions' ratemaking authority is playing in the nation's transition to lower-carbon electricity); Boyd, *supra* note 2, at 1709–10 (recognizing and encouraging PUCs to fulfill their historic "public interest" mandate by fostering decarbonization).

or citizen-initiated) in relation to the private decision-making that characterizes market-based pollution control mechanisms.[59]

Nor does the Article attempt to resolve challenging federalism questions. Because the federal government is not pursuing climate initiatives at the time of this writing, the Article assumes that states, or states acting together on a regional basis, will be the primary players.[60] That does not mean that a federal role is not, or will not be, necessary to achieve decarbonization, especially given the reluctance of some states to act and the important role that the Federal Energy Regulatory Commission (FERC), the Environmental Protection Agency (EPA), and the Department of Energy play in influencing energy choices.[61] Ideally, federal, regional, and state efforts would be coordinated if not integrated, but this Article does not attempt to sketch the details of any such structure.

Lastly, although a transition to a clean energy economy will touch many sectors, including transportation and heating, this Article focuses on the electricity sector. Given a long history of government regulation of utilities due to their quasi-monopoly character, governance in this sector presents unique opportunities and challenges that deserve separate treatment. In addition, although electricity generation currently accounts for just under 30% of the United States' greenhouse gas emissions,[62] its role in the economy is likely to increase as decarbonization efforts prompt increasing electrification of transportation and heating.[63]

In Part I, I begin by briefly describing a range of options for transitioning to clean energy and their pervasive environmental, social, and economic consequences. Part II introduces the primary policy mechanisms for reducing carbon. It first describes market-based

---

[59] This Article does not attempt to analyze the best institutional setting for developing transitional policy. An analysis of the political economy of legislative bodies and administrative agencies, and the many variables that could determine their relative suitability, is beyond the scope of this Article. *Cf.* David B. Spence, *Naïve Energy Markets*, 92 NOTRE DAME L. REV. 973, 1029 (2017) [hereinafter Spence, *Naïve Energy Markets*] (suggesting a preference for agency action over legislative action).

[60] *See infra* Section II.B.2.i.

[61] *See id.*

[62] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2015 ES-24 (2017).

[63] WILLIAMS ET AL., *supra* note 2, at 8–10.

approaches to climate policy, including cap-and-trade programs and carbon taxes. It highlights the benefits of market-based mechanisms, and then explores market advocates' criticisms of combined market and regulatory approaches. It then turns to prescriptive governance mechanisms, first explaining the governance structures that influence electricity-sector choices and then identifying the government's role in each of the key features of the electricity system: generation, transmission, distribution, and demand reduction. Part II ends by observing that, although the distinction between market-based and prescriptive measures is more aptly seen as a continuum rather than a dichotomy, the starting point nonetheless matters.

Part III explains why a government role in creating a long-term vision, and planning and implementing a clean energy transition, is desirable. Part III concludes by recognizing some of the potential drawbacks to government decision-making, including interest-group capture, and emphasizes the critical importance of public engagement to counter the potential influence of vested interests.

Part IV then explores how market mechanisms could complement government measures by filling gaps, establishing a backstop, and by generating revenue. Part IV revisits and responds to market advocates' concerns about the compatibility of prescriptive and market measures. Lastly, to help envision what climate policy driven by prescriptive measures but backed up by market mechanisms could look like, Part IV introduces California's multifaceted climate policy—not as a blueprint but as an example of the type of thoughtful governance that, complemented by market signals, can guide a clean electricity transition.

I. A CLEAN ENERGY TRANSITION

What's at stake in a transition to clean electricity? To answer that question, I begin by noting the primary practical mechanisms utilities or other actors could use to reduce electricity-sector emissions. The review reveals the significant impacts these choices will have on the distribution of the costs and benefits of transition, as well as the speed with which we will accomplish the decarbonization necessary to avert catastrophic climate change.

A. *The Path to Clean Energy*

No silver bullet will accomplish decarbonization; there are many ways to reduce carbon emissions, mechanisms that address both the supply of and the demand for electricity.[64] Because coal combustion is carbon-intensive—burning coal generates more than twice the carbon per unit of energy as natural gas[65]—reducing coal combustion is a key step to reducing carbon. Retiring coal-fired power plants and replacing their generation with less carbon-intensive sources is the most direct way to relinquish coal combustion.[66] Even if not shut down, the interconnected nature of the electricity grid means that more generation could come from natural gas plants and less from coal-fired plants.[67] In addition, fossil-fuel sources could continue to operate but be coupled with carbon capture and storage:

---

64 *See* JESSE D. JENKINS & SAMUEL THERNSTROM, ENERGY INNOVATION REFORM PROJECT, DEEP DECARBONIZATION OF THE ELECTRIC POWER SECTOR: INSIGHTS FROM RECENT LITERATURE 1 (2017), http://innovationreform.org/wp-content/uploads/2017/03/EIRP-Deep-Decarb-Lit-Review-Jenkins-Thernstrom-March-2017.pdf; *see also* WILLIAMS, ET AL., *supra* note 2, at 77–78 (table listing mechanisms); *see generally* JOHN RANDOLPH & GILBERT M. MASTERS, ENERGY FOR SUSTAINABILITY: TECHNOLOGY, PLANNING, POLICY 7–28 (2008). Needless to say, views on the appropriate mix of measures differ.

65 U.S. ENVTL. PROT. AGENCY, OFFICE OF AIR & RADIATION, GREENHOUSE GAS MITIGATION MEASURES 3 – 4 (2015), https://www.epa.gov/sites/production/files/2015-11/documents/tsd-cpp-ghg-mitigation-measures.pdf [hereinafter GREENHOUSE GAS MITIGATION MEASURES] (stating that coal-fired power plants emit carbon at the rate of 2,217 lbs/MWh, in comparison with 905 lbs/MWh from combined cycle natural gas power plants).

66 For example, Nevada legislation required the state's largest utility to retire a substantial amount of coal-fired power plants by 2019. *See* HAMPDEN MACBETH ET AL., GEO. CLIMATE CTR., STATE LEADERSHIP DRIVING THE SHIFT TO CLEAN ENERGY: 2016 UPDATE, 24 (2016), http://www.georgetownclimate.org/files/report/Final_GCC_State_Leadership_Driving_the_Shift_to_Clean_Energy_11Nov2016v2_1.pdf.

67 In developing the Clean Power Plan, EPA documented that many natural gas plants are substantially underutilized and that shifting generation from coal to natural gas plants could substantially reduce emissions. *See* GREENHOUSE GAS MITIGATION MEASURES, *supra* note 65, at 3 – 4 to – 11. Nationally, the average annual capacity factor, or extent to which a plant's capacity is exercised, is 46%. *See id.* at 3 – 5 to – 6. The EIA assumes that natural gas combined cycle (NGCC) facilities can operate at 87% capacity, and data indicates that many could operate at 92% capacity. *See id.*

technology to divert carbon dioxide from the emissions stream, and then transport the captured carbon to underground storage sites.[68]

Because natural gas emits less carbon than coal, greater investment in new natural gas generation is another possibility.[69] As natural gas has become cheaper due to increased supply from hydraulic fracturing and coal has become more expensive due to new environmental regulations, many utilities and power companies have been shifting investment to natural gas, even in the absence of direct carbon regulation or a carbon price.[70]

Utilities and power companies could also invest in various forms of low- or no-carbon alternatives, including solar, wind, and nuclear power. Investments in renewable energy could take very different forms, from centralized utility-run solar or wind generation connected to interstate transmission grids[71] to distributed resources like household solar generation to microgrids operating at the neighborhood or local levels.[72]

Electricity-sector emissions are determined not only by choices among types of energy supply, but also by demand for electricity. Demand-side energy-efficiency measures, like better-insulated homes, south-facing windows, cool roofs, and more efficient appli-

---

68 *See* RANDOLPH & MASTERS, *supra* note 64, at 373–74. For the purposes of this Article, I treat carbon capture and storage as a mechanism for decarbonization, even though it continues the combustion of fossil fuels.

69 JEFF DEYETTE ET AL., UNION CONCERNED SCIENTISTS, THE NATURAL GAS GAMBLE: A RISKY BET ON AMERICA'S CLEAN ENERGY FUTURE 13–14 (2015), http://www.ucsusa.org/sites/default/files/attach/2015/03/natural-gas-gamble-full-report.pdf.

70 *See id.* at 1, 5–6, 9–10; *see also* U.S. DEP'T OF ENERGY, STAFF REPORT TO THE SECRETARY ON ELECTRICITY MARKETS AND RELIABILITY 13, 24, 33 (2017), https://energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf (observing the increase in reliance on natural gas is due to its lower costs, the ease and efficiency of building efficient NGCC generating plants, and the higher relative costs of coal plants).

71 *See* RANDOLPH & MASTERS, *supra* note 64, at 461–88.

72 *See* ALEXANDRA B. KLASS & HANNAH J. WISEMAN, ENERGY LAW 228–30 (2017) (describing microgrids, some of which are being powered by renewables); Hannah J. Wiseman & Sara C. Bronin, *Community-Scale Renewable Energy*, 4 SAN DIEGO J. CLIMATE & ENERGY L. 165, 166 (2013).

ances and technology would all reduce the need for generating electricity, indirectly reducing emissions.[73] In addition, mechanisms that reduce demand during peak periods through pricing or other incentives could reduce the need to run polluting sources to meet peak demand and allow utilities to rely on less-polluting alternatives.[74]

B. *The Pervasive Consequences of Emission-Reduction Choices in the Electricity Sector*

Each of these choices has significant environmental, socioeconomic, and political consequences that include and extend beyond reductions in greenhouse gases. The path to decarbonization is not simply a technical question; it will require a multitude of complex policy and ethical choices.[75] These choices differ in the degree to which they provide a glide path to long-term decarbonization, and they differ in their more immediate impacts and their socioeconomic implications. The literature on energy alternatives and their implications is vast; here, I survey a few examples to illustrate the long- and short-term repercussions of energy choices.

As noted above, decarbonization will likely be necessary in the long term, with many suggesting that greenhouse gas emissions should be reduced to 80% below 1990 levels by 2050[76] and that we must achieve a 97% reduction in electricity-sector emissions.[77] Energy investment decisions made today could have long-term impacts on the shape of our energy future.[78] The Deep Decarbonization

---

73 *See* KLASS & WISEMAN, *supra* note 72, at 213–62 (describing energy efficiency for buildings).

74 *See* KLASS & WISEMAN, *supra* note 72, at 219–20 (describing energy-efficiency initiatives); RANDOLPH & MASTERS, *supra* note 64, at 396–97 (describing demand-side management to lower demand and reduce emissions).

75 *See* BENJAMIN K. SOVACOOL ET AL., ENERGY SECURITY, EQUALITY, AND JUSTICE 128 (2014) (arguing that energy choices implicate fundamental questions of social justice); David Roberts, *5 Reasons There's More to Climate Policy than a Price on Carbon*, VOX (June 28, 2016, 10:00 AM), https://www.vox.com/2016/6/28/12045860/carbon-tax (describing multiplicity of values that a clean energy transition will implicate); Welton, *supra* note 56 (manuscript at 3–4, 20) ("The question of how to transform energy is one of values . . . .").

76 *See* WILLIAMS ET AL., *supra* note 2, at 8.

77 *See id.* at 10.

78 The Intergovernmental Panel on Climate Change notes, "Infrastructure developments and long-lived products that lock societies into greenhouse gas-intensive emissions pathways may be difficult or very costly to change, reinforcing the

study suggests that as existing infrastructure reaches the end of its useful life, all new investment should promote decarbonization.[79] Because many components of electricity infrastructure, like power plants, pipelines, and transmission lines, have long life spans, failing to replace these existing fossil fuel sources with non-fossil fuel sources would perpetuate reliance on fossil fuels.[80] For example, although some continued investment in natural gas may be warranted to avoid continued coal use,[81] the Deep Decarbonization study tells us that "[p]olicies that produce incremental changes without facilitating transformation can lead to technology lock-in and emissions reduction dead ends that make deep decarbonization by mid-century unattainable."[82]

---

importance of early action for ambitious mitigation." EDENHOFER, *supra* note 1, at 18.

79 WILLIAMS ET AL., *supra* note 2, at 10.

80 Once long-term investments in fossil fuels and fossil-fuel infrastructure are made, efforts to require increasingly stringent carbon reductions that necessitate shutting down assets before the end of their useful lives would encounter stiff political resistance and would likely be very expensive. *See id.* at 7.

81 David Spence notes that, if regions with little natural gas capacity invest in renewables, they could end up using coal rather than natural gas as an inefficient and heavily polluting back-up fuel to maintain reliability. Spence, *Paradoxes*, *supra* note 52, at 462, 474. Thus, when determining appropriate investments, decision-makers must consider the full emissions profile necessary to achieve reliable service.

82 WILLIAMS ET AL., *supra* note 2, at 52–54, 85 (noting that, by 2050, natural gas should be used only to play a very limited back-up role for lower-carbon sources, and that an overall conversion from coal to natural gas would fail to achieve a sufficient transformation); *see* DEYETTE ET AL., *supra* note 69, at 14–15; Jennifer A. Dlouhy & Mark Chediak, *Natural Gas Moves to the Naughty List*, BLOOMBERG (Apr. 20, 2017, 4:00 AM), https://www.bloomberg.com/news/articles/2017-04-20/natural-gas-moves-to-the-naughty-list. While some call natural gas a "bridge" fuel to a low-carbon future, others suggest that investing in natural gas is more like walking a gangplank," because natural gas production results in leaks of methane, a powerful greenhouse gas, and because current investments in natural gas would lock in our reliance on fossil fuels for decades to come. *Compare* Richard J. Pierce, *Natural Gas: A Long Bridge to a Promising Destination*, 32 UTAH ENVTL. L. REV. 245, 245 (2012), *with* Zeke Hausfather, *Is Natural Gas a Bridge Fuel?*, YALE CLIMATE CONNECTIONS (Aug. 8, 2016), https://www.yaleclimateconnections.org/2016/08/is-natural-gas-a-bridge-fuel/, *and* Anthony R. Ingraffea, Opinion, *Gangplank to a Warm Future*, N.Y. TIMES (July 28, 2013), https://nyti.ms/13RSWIf (describing risks from methane leaks).

Energy choices also have a wide range of short-term environmental and socioeconomic impacts. Most obviously, emission reduction strategies vary significantly in the degree of greenhouse gas reduction they would achieve.[83] For example, switching to natural gas would reduce greenhouse gas emissions relative to coal but not by as much as zero-emission renewable energy sources like solar and wind power.[84]

Greenhouse gas reduction strategies will also significantly implicate air pollution caused by co-pollutants. For example, reducing reliance on coal will improve air quality because coal combustion emits much more pollution per unit of energy than natural gas, notwithstanding recent efforts to control coal pollution.[85] Similarly, although natural gas generates much less pollution than coal, natural gas combustion nonetheless has co-pollutant consequences for local and regional air quality,[86] and hydraulic fracking may cause localized air pollution releases.[87] Biomass combustion for electricity, though sometimes considered neutral from a carbon perspective, generates co-pollutants.[88] Although electricity generation from solar and wind energy has much lower co-pollutant consequences, there

---

83 *See* Dlouhy & Chediak, *supra* note 82.

84 *See id.* From a lifecycle perspective, the construction of renewables does generate carbon emissions, but the subsequent operation of these resources is largely zero-emission. *See* 2 NAT'L RENEWABLE ENERGY LAB., RENEWABLE ELECTRICITY FUTURES STUDY 10-47 to -48 (M.M. Hand et al. eds., 2012), https://www.nrel.gov/docs/fy12osti/52409-2.pdf; NAT'L RESEARCH COUNCIL, HIDDEN COSTS OF ENERGY: UNPRICED CONSEQUENCES OF ENERGY PRODUCTION AND USE 139, 143 (2010).

85 A report by the National Research Council found that the co-pollutant damages associated with coal-fired power plants are 3.2 cents per kWh, in comparison with mean damages of 0.16 cents per kWh for natural gas power plants. *See* NAT'L RESEARCH COUNCIL, *supra* note 84, at 7–8, 87–99 (detailing air pollution consequences of coal-fired power).

86 *See id.* at 112–13, 116–23.

87 *See* DEYETTE ET AL., *supra* note 69, at 18; Hannah J. Wiseman, *Risk and Response in Fracturing Policy*, 84 U. COLO. L. REV. 729, 803 (2013).

88 *See* RICHARD L. BAIN ET AL., BIOPOWER TECHNICAL ASSESSMENT: STATE OF THE INDUSTRY AND TECHNOLOGY 6-1 to -7 (2003), http://www.nrel.gov/docs/fy03osti/33123.pdf; M.M. Rahman et al., *Environmental Impact Assessment of Different Renewable Energy Resources: A Recent Development*, *in* CLEAN ENERGY FOR SUSTAINABLE DEVELOPMENT: COMPARISONS AND CONTRASTS OF NEW APPROACHES 29, 40–55 (Mohammad G. Rasul et al. eds., 2017) (providing lifecycle analysis of biofuels and biogas).

are short-term greenhouse gas and air-quality consequences associated with constructing and installing these technologies.[89]

These choices present non-air environmental concerns as well. To name a few, fracking for natural gas could jeopardize water quality.[90] Coal-mining has significant impacts on industry workers, landscapes, and water quality.[91] Wind turbines jeopardize bird and bat populations,[92] and wind, centralized solar, and hydropower regularly confront tensions with protecting endangered species.[93] Nuclear presents radiation and terrorism risks in mining and operation, and there is still no long-term secure solution for nuclear waste.[94] The list goes on.

Energy choices have significant socioeconomic as well as environmental consequences. Reducing reliance on coal means that regions heavily dependent on coal, like some mid-Atlantic states and the Midwest, could lose the industry that has defined regional employment and identity for generations.[95] At the same time, new de-

---

89 *See* NAT'L RENEWABLE ENERGY LAB., *supra* note 84, at 10-47 to -48 (describing minor lifecycle greenhouse gases from solar power development); NAT'L RESEARCH COUNCIL, *supra* note 84, at 139, 143 (outlining emissions associated with the production and transport of wind turbines and noting that solar manufacturing uses toxic materials and is energy-intensive).

90 The extent to which injecting fracking fluids into shale formations poses a water quality threat is highly contested. *See* Wiseman, *supra* note 87, at 738–41. Regardless of the level of risk posed by fluid injection, Wiseman notes that fracking presents numerous additional water quality risks throughout the fracking cycle. *See id.* at 741–808.

91 *See, e.g.*, NAT'L RESEARCH COUNCIL, *supra* note 84, at 75–82.

92 *See id.* at 139–40 (describing wind power's threats to bird and bat populations).

93 *See* Kalyani Robbins, *Responsible, Renewable, and Redesigned: How the Renewable Energy Movement Can Make Peace with the Endangered Species Act*, 15 MINN. J.L. SCI. & TECH. 555, 560–61 (2014); Ronald H. Rosenberg, *Diversifying America's Energy Future: The Future of Renewable Wind Power*, 26 VA. ENVTL. L.J. 505, 530–31 (2008) (describing environmental risks posed by wind power).

94 *See, e.g.*, NAT'L RESEARCH COUNCIL, *supra* note 84, at 127–31 (describing environmental risks associated with nuclear power).

95 Patrick McGinley, *Collateral Damage: Turning a Blind Eye to Environmental and Social Injustice in the Coalfields*, 19 J. ENVTL. & SUSTAINABILITY L. 304, 334 (2013); Francine Kiefer, *In Coal-Mining Kentucky, Shock and Dismay over Clean Power Plan's New Targets*, CHRISTIAN SCI. MONITOR (Aug. 4, 2015),

velopment, whether fracking, wind farms, energy efficiency, or otherwise, could bring new employment opportunities and resources.[96] Indeed, according to some studies, renewable energy and energy efficiency create more jobs per unit of energy than fossil fuels.[97] In addition, certain alternatives present at least some potential to spread opportunities to the communities struggling the most, whether it is fracking in the Rust Belt or energy efficiency jobs in the urban core.[98]

The cost of energy choices also has short- and long-term impacts on the economy in general. Because most manufacturing and commercial uses rely on electricity, increasing electricity costs could have ripple effects throughout these sectors. Increased costs could have negative distributional impacts on poor households, which devote a larger share of income to electricity costs than wealthier households.[99] Thus, cost-effective policies are desirable to reduce

---

https://www.csmonitor.com/USA/Politics/2015/0804/In-coal-mining-Kentucky-shock-and-dismay-over-Clean-Power-Plan-s-new-targets.

[96] *See, e.g.*, Richard Martin, *The One and Only Texas Wind Boom*, MIT TECH. REV. (Oct. 3, 2016), https://www.technologyreview.com/s/602468/the-one-and-only-texas-wind-boom/ (describing how wind farms, facilitated by the state's investment in transmission lines, have brought new economic opportunities to struggling west Texas farmers).

[97] Max Wei et al., *Putting Renewables and Energy Efficiency to Work: How Many Jobs Can the Clean Energy Industry Generate in the US?*, 38 ENERGY POL'Y 919, 928 (2010) (finding that "all renewable energy and low carbon sources generate more jobs than the fossil fuel sector per unit of energy . . . . [e]nergy efficiency investment offers a high payoff in induced jobs"); Daniel Lopez, *Fact Sheet: Jobs in Renewable Energy and Energy Efficiency*, ENVTL. & ENERGY STUDY INST. (Feb. 2017), http://www.eesi.org/files/FactSheet_REEE_Jobs_021517.pdf. Energy-sector employment claims are not without controversy. *See, e.g.*, Shelley Welton, *Clean Electrification*, 88 U. COLO. L. REV. 571, 573 & n.2 (2017) (describing studies and claims on renewable energy and jobs). Notwithstanding the controversies, it is clear that a clean energy transition will have employment consequences worth considering in the development of energy policy.

[98] *See* VAN JONES, THE GREEN-COLLAR ECONOMY: HOW ONE SOLUTION CAN FIX OUR TWO BIGGEST PROBLEMS 9 (2008); Nelson D. Schwartz, *Boom in Energy Spurs Industry in the Rust Belt*, N.Y. TIMES (Sept. 8, 2014), https://www.nytimes.com/2014/09/09/business/an-energy-boom-lifts-the-heartland.html; Kate Sheppard, *The Green Gap*, AM. PROSPECT (Apr. 18, 2008), http://prospect.org/article/green-gap (discussing green jobs in the inner city).

[99] *See* ARIEL DREHOBL & LAUREN ROSS, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., LIFTING THE HIGH ENERGY BURDEN IN AMERICA'S LARGEST CITIES: HOW ENERGY EFFICIENCY CAN IMPROVE LOW INCOME AND

negative impacts on the economy and reduce disproportionate impacts on low-income communities.

Options that rely on dispersed resources, like distributed energy generation or energy efficiency, could have additional socioeconomic impacts. Once renewables or energy-efficiency measures are installed, they can reduce household energy costs. To the extent these options require a certain degree of wealth to access, then they could be available to and benefit wealthier households more than the poorer households who need them most.[100] Climate justice advocates argue that all should have access to the benefits of distributed resources.[101] Meanwhile, as increasing numbers of households and businesses install distributed solar and contribute less to utilities, the question of who could be left "holding the bag" of fixed utility infrastructure costs is looming large.[102]

In the energy world, maintaining reliability is a central concern.[103] Certain options, like coal, natural gas, and nuclear power, provide steady baseload power at all times. Other resources, like solar and wind, are more variable. Energy choices could thus require new mechanisms, like increased energy storage or widespread grid

---

UNDERSERVED COMMUNITIES 3–6, 8–9 (2016), http://energyefficiencyforall.org/sites/default/files/Lifting%20the%20High%20Energy%20Burden_0.pdf (finding that low-income households spend a disproportionately greater percentage of their income on electricity bills); Diana Hernández & Stephen Bird, *Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy*, 2 POVERTY & PUB. POL'Y 5, 7 (2010) (same).

[100] Boyd & Carlson, *supra* note 58, at 863–64; Welton, *supra* note 56 (manuscript at 33).

[101] *See* BEN BOVARNICK & DARRYL BANKS, CTR. FOR AM. PROGRESS, STATE POLICIES TO INCREASE LOW-INCOME COMMUNITIES' ACCESS TO SOLAR POWER (2014), https://cdn.americanprogress.org/wp-content/uploads/2014/09/LowIncomeSolar-brief.pdf; Deborah Behles, *From Dirty to Green: Increasing Energy Efficiency and Renewable Energy in Environmental Justice Communities*, 58 VILL. L. REV. 25, 35 (2013); Welton, *supra* note 97, at 573–74, 573 n.4, 594–95.

[102] *See* Boyd & Carlson, *supra* note 58, at 864.

[103] Reliability refers to both having sufficient energy supply to meet customer demand and maintaining transmission-line functionality, which can be undermined if supply and demand are not properly balanced. *See* Amy L. Stein, *Reconsidering Regulatory Uncertainty: Making a Case for Energy Storage*, 41 FLA. ST. U. L. REV. 697, 700, 710–12 (2014).

integration, to ensure reliability from sources that are inherently intermittent.[104]

Different energy choices also have significant implications for the structure of the energy industry. Continued investment in coal, natural gas, nuclear power, or utility-scale renewables retains control in existing large utilities and fossil fuel companies and retains the model of centralized power distributed on the grid.[105] More distributed opportunities, whether distributed solar and wind power or consumers' energy efficiency, disrupt the existing model of centralized control by large utilities,[106] potentially transferring more power and control to citizens and local governments.[107] These choices have important implications for how energy would be managed and regulated. Recognizing the degree to which energy choices dictate who has power and control over the energy system highlights the political stakes of our energy choices.

---

[104] *See* U.S. DEP'T OF ENERGY, *supra* note 70, at 73, 126 (describing current trends and future reliability challenges); Stein, *supra* note 103, at 715 (describing how energy storage could facilitate the integration of intermittent renewable energy by capturing extra energy when renewable generation is high and releasing that power when renewable generation is low); Robert Fares, *Renewable Energy Intermittency Explained: Challenges, Solutions, and Opportunities*, SCI. AM.: PLUGGED IN (Mar. 11, 2015), https://blogs.scientificamerican.com/plugged-in/renewable-energy-intermittency-explained-challenges-solutions-and-opportunities/ (explaining how a sufficiently large number and diverse array of renewable generators can even out the intermittency associated with individual renewable sources).

[105] *See* KLASS & WISEMAN, *supra* note 72, at 13 (describing centralized generation and transmission).

[106] *See* Tomain, *supra* note 57, at 1136; *see also* AL WEINRUB & ANTHONY GIANCATARINO, TOWARD A CLIMATE JUSTICE ENERGY PLATFORM: DEMOCRATIZING OUR ENERGY FUTURE 8–10 (2015), http://www.localcleanenergy.org/files/Climate%20Justice%20Energy%20Platform.pdf; Welton, *supra* note 56 (manuscript at 22).

[107] *See* Tomain, *supra* note 57, at 1138–39 (arguing that distributed renewable energy and consumer energy efficiency allow control over electricity choices to shift from utilities and power companies to more decentralized community and citizen control); *see also* JOSEPH P. TOMAIN, CLEAN POWER POLITICS: THE DEMOCRATIZATION OF ENERGY 193–213 (2017). Utilities fear that these shifts will send them into a "death spiral," as they lose the capacity to pay for large infrastructure investments. *See* Boyd, *supra* note 2, at 1676–77 (describing death spiral claims).

Van Jones has articulated the profound environmental, social, and economic implications of a clean energy transition. He states that "we have the chance to build this new energy economy in ways that reflect our deepest values of inclusion, diversity, and equal opportunity for everyone."[108] He observes that "[t]oday the 'clean-tech' revolution and the transformation of our aging energy infrastructure are poised to become *the* next great engines for American innovation, productivity and job growth, and social-equity gains."[109] With so much at stake, both positively and negatively, it matters who decides how we decarbonize.

II. POLICY MECHANISMS TO ACHIEVE DECARBONIZATION

There are a wide range of policy mechanisms for accomplishing the transition ahead. For the purposes of this Article, I focus on two categories: (1) government policies that rely on market signals to induce the private sector to achieve goals, and (2) government policies that use more direct planning and prescriptive measures to achieve goals.[110] Although the sketch of these options implies a sharp dichotomy, I conclude by observing that actual policies often evince a blend of strategies, suggesting more of a continuum than a dichotomy. Even as a continuum, however, policymakers must consider where on that continuum they choose to fall.

---

108 JONES, *supra* note 98, at 11.

109 *Id.* at 180.

110 Debates about the relative value of "markets" and "regulation" have a long history in energy law. *See* KLASS & WISEMAN, *supra* note 72, at 2; *see generally* Bernard S. Black & Richard J. Pierce, Jr., *The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry*, 93 COLUM. L. REV. 1339 (1993); Spence, *Naïve Energy Markets*, *supra* note 59, at 974, 977. The classic debate is whether government should maintain a firm hand on the supply and distribution of electricity or whether a freer market in electricity supply would better assure reliable and affordable electricity. These debates have addressed the provision of electricity itself. In contrast, this Article assumes an environmental objective—decarbonization of electricity—and evaluates the relative roles of prescriptive approaches, like requiring renewable energy, versus market-based regulatory tools, like pricing carbon, at achieving the desired environmental outcome.

A. *Market-Based Approaches to Reducing Electricity-Sector Emissions*

Whether in the context of climate change or other environmental problems, economists frequently advocate "market mechanisms."[111] They argue that market mechanisms give private actors more autonomy in achieving a given environmental objective and can achieve the goal more efficiently—at the lowest cost and with the lowest administrative burden.[112] In the climate context, the dominant market mechanisms are cap-and-trade policies and carbon taxes.[113]

1. Introduction to Market-Based Emission Control Mechanisms

In cap-and-trade, the government determines the overall emission reduction goal and sets the emissions cap to match. Cap-and-trade programs to reduce greenhouse gases are characterized by a long-term goal—like achieving 1990 levels by 2020. They usually establish a series of yearly caps that gradually move toward the ultimate emissions objective. The government entity managing the program generates "allowances" that represent the total emissions permitted in a given year. The managing agency either distributes these allowances to regulated entities for free, auctions the allowances to purchasing entities, or a combination of the two.

If the agency distributes allowances for free, then the agency would achieve emissions reductions by giving existing entities

---

111 *See, e.g.*, Robert N. Stavins, *A Meaningful U.S. Cap-and-Trade System to Address Climate Change*, 32 HARV. ENVTL. L. REV. 293, 296 (2008) [hereinafter Stavins, *U.S. Cap-and-Trade System*]; Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1349–50 (1985); Daniel J. Dudek & John Palmisano, *Emissions Trading: Why Is This Thoroughbred Hobbled?*, 13 COLUM. J. ENVTL. L. 217, 234–36 (1988); Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era from an Old Idea?*, 18 ECOLOGY L.Q. 1, 13 (1991).

112 I focus here on market mechanisms designed to *curb* emissions. Tax credits and subsidies designed to encourage lower-emitting sources arguably present another type of "market mechanism." I note the important role of tax credits for renewables below. *See infra* notes 238–43 and accompanying text. For the purposes of this Article, however, I analyze only market policies designed to deter high emissions.

113 *See* Stavins, *U.S. Cap-and-Trade System*, *supra* note 111, at 296, 348.

fewer emissions allowances than necessary to cover current emissions.[114] Each regulated entity would then have three choices. First, it could reduce its emissions to match the number of allowances it received.[115] Second, it could reduce its emissions by more than necessary and sell the extra allowances for a profit.[116] And third, it could keep emitting at the same level (or even increase emissions) and buy allowances to cover the emissions not accounted for by the initial allowance distribution.[117] Option two (selling allowances) and option three (buying allowances) constitute the "trade" feature of cap-and-trade programs.

If the agency auctions allowances rather than distributing them for free, then regulated entities could purchase enough allowances to cover their emissions.[118] If their actual emissions differ from the number of purchased allowances, then they could sell any excess, purchase any needed allowances from other entities, or purchase at allowance auctions held by the controlling agency.[119]

Under a carbon tax, the government agency sets the tax rate.[120] Utilities and other regulated entities then factor that tax into their decision-making.[121] The more they reduce emissions, the less tax they must pay; the more they maintain or increase emissions, the more tax they must pay.

A carbon tax clearly generates a "carbon price" intended to incentivize emissions reductions,[122] but so does a properly functioning cap-and-trade program.[123] The carbon price in a cap-and-trade program is determined by the relationship between the supply of and

---

114 U.S. ENVTL. PROT. AGENCY, TOOLS OF THE TRADE: A GUIDE TO DESIGNING AND OPERATING A CAP-AND-TRADE PROGRAM FOR POLLUTION CONTROL 3-15 (2003), https://www.epa.gov/sites/production/files/2016-03/documents/tools.pdf [hereinafter TOOLS OF THE TRADE] (describing programs that have ratcheted down allowance allocations to achieve environmental objectives).

115 *See* Stavins, *U.S. Cap-and-Trade System*, *supra* note 111, at 298.

116 TOOLS OF THE TRADE, *supra* note 114, at 1-3.

117 *Id.*

118 *See id.* at 3-16.

119 *See id.* at 5-8 (describing allowance markets).

120 *See id.* at 2-6.

121 JONATHAN L. RAMSEUR & LARRY PARKER, CONG. RESEARCH SERVS., CARBON TAX AND GREENHOUSE GAS CONTROL: OPTIONS AND CONSIDERATIONS FOR CONGRESS 2 (2009).

122 *See id.*

123 *See id.*

demand for allowances.[124] If the cap is close to existing emissions, or if there are many low-cost options for reducing emissions, then regulated entities will require few allowances and the carbon price will be low. If the cap is significantly below existing emissions or the cost of emissions reduction is high, then there will be more demand for allowances relative to supply, and the carbon price will be higher. Thus, in a cap-and-trade program, the stringency of the cap and availability of low-cost emission reduction opportunities significantly impact the carbon price.

2. THE BENEFITS OF MARKET-BASED EMISSION-CONTROL MECHANISMS

From an economist's viewpoint, carbon pricing meshes with the economics paradigm for defining the problem (pollution as an externality) and conceptualizing its solution (internalizing the externality by placing a price on harm).[125] Carbon taxes represent the most direct embodiment of the economics-based conception.[126] Because cap-and-trade programs generate a carbon price, they similarly fit within the economics paradigm.

An essential benefit of market-based mechanisms is their cost-effectiveness, which lowers the cost of achieving a given environmental goal.[127] The emissions cap establishes the environmental goal.[128] Then, under a cap-and-trade program, generators that can reduce emissions cheaply will do so and sell excess emission allowances to entities facing higher costs.[129] Under a carbon tax, facilities that can reduce for less than the tax rate will reduce, while those facing costs higher than the tax rate will pay the tax. Thus, under

---

124 *Cf.* Stavins, *U.S. Cap-and-Trade System*, *supra* note 111, at 315–16 (observing that allowing entities to bank or borrow allowances would permit adjustments in supply and demand that could reduce price volatility).

125 *See* WILLIAMS ET AL., *supra* note 2, at 81; Spence, *Naïve Energy Markets*, *supra* note 59, at 989.

126 Spence, *Naïve Energy Markets*, *supra* note 59, at 1017.

127 *See* Ann E. Carlson, *Designing Effective Climate Policy: Cap-and-Trade and Complementary Policies*, 49 HARV. J. ON LEGIS. 207, 210 (2012) (observing that cap-trade programs are designed to "find the cheapest emissions reductions"); Hahn & Stavins, *supra* note 111, at 12–13; Stavins, *U.S. Cap-and-Trade System*, *supra* note 111, at 298.

128 *See* TOOLS OF THE TRADE, *supra* note 114, at 3–8.

129 *See* Stavins, *U.S. Cap and Trade System*, *supra* note 111, at 298.

both a carbon tax and cap-and-trade, emissions reductions are achieved by the lowest cost reducers rather than the higher-cost reducers.[130]

In addition, market advocates argue that market-based mechanisms generate technology innovation incentives.[131] Having a price on carbon would create an incentive to avoid carbon emissions by prompting entities to switch to lower-carbon alternatives and develop new, lower-polluting technologies. If allowances are distributed for free, then entities will look for new ways to reduce emissions so that they can generate extra allowances to sell. If allowances are sold by auction or there is a carbon tax, then entities will have an incentive to find new ways to reduce emissions to reduce the cost of allowance purchases or tax payments. In power markets that dispatch power sources based on the lowest-cost source, a carbon price would increase the relative cost of power from carbon-heavy sources and reduce the relative cost of power from low- or no-carbon sources, reducing demand for high-carbon sources and creating systemic incentives for lower-carbon power.

The core feature of market-based mechanisms, for the purposes of this essay, is that they delegate considerable substantive decision-making authority to the private sector.[132] Of course, the government role is important: in a cap-and-trade program, the government sets the emissions cap, establishes the terms and conditions for allowance distribution and trading, and is responsible for monitoring and compliance.[133] Under a carbon tax, the government sets the tax rate, determines exceptions, collects the tax payments, and monitors compliance.[134] In both systems, government decisions determine revenue allocation.

Market-based mechanisms, however, devolve the question of *how* to reduce emissions to the private sector, to be guided by the

---

130 *See id.* at 298, 329.

131 *See, e.g.*, Ackerman & Stewart, *supra* note 111, at 1349–50; Dudek & Palmisano, *supra* note 111, at 234–36; Hahn & Stavins, *supra* note 111, at 13.

132 *See* Ackerman & Stewart, *supra* note 111, at 1342–43.

133 *See generally* TOOLS OF THE TRADE, *supra* note 114 (describing the wide array of design parameters governments must consider in developing a cap-and-trade program).

134 *See generally* RAMSEUR & PARKER, *supra* note 121, at 16–17 (describing government role in implementing a carbon tax).

incentives created by the carbon price.[135] That devolution is valuable, according to economic theory, because social welfare is best served by allowing individuals (or individual entities) to make decisions in the market, rather than attempting to discern the public interest through government institutions.[136]

As a practical matter, devolving authority to the private sector lessens the government's rulemaking burden.[137] For some types of technology-based regulations, the traditional rulemaking process is long and resource-intensive, requiring government agencies to develop expertise in pollution-control technologies for the industries they regulate.[138] Moreover, regulations, once adopted, often face time- and resource-consuming legal challenges.[139] Market mechanisms that devolve decision-making to industry could avoid the expense and delay of government rulemaking processes and ensuing litigation.[140]

---

135 Zachary Liscow and Quentin Karpilow state in a recent Article on environmental policy and innovation that, under a traditional economics perspective, once a carbon tax has internalized the harm from burning fossil fuels the government should "let the cards lay where they fall" and let the private sector solve the problem "in the cheapest, most efficient way." Zachary Liscow & Quentin Karpilow, *Innovation Snowballing and Climate Law*, 95 WASH. U. L. REV. 387, 391 (2017). An editorial critiquing Ontario's decision to couple a cap-and-trade program with additional measures stated that the province, after adopting the cap-and-trade program, "could have left it up to millions of people and businesses to figure out . . . how to most efficiently reduce their individual fossil-fuel costs and consumption." Mark Blinch, Editorial, *Ontario Is Fighting Climate Change the Wrong Way*, GLOBE & MAIL (June 10, 2016), https://beta.theglobeandmail.com/opinion/editorials/ontario-is-fighting-climate-change-the-wrong-way/article30399356/?ref=http://www.theglobeandmail.com&.

136 *See* Spence, *Naïve Markets*, *supra* note 59, at 999 (describing an assumption among certain economists that one can only determine what serves social welfare by looking at individual decisions in the market).

137 *See* Ackerman & Stewart, *supra* note 111, at 1342–43; Carlson, *supra* note 127, at 215.

138 *See* Carlson, *supra* note 127, at 215 (observing that one advantage of cap-and-trade is that "the regulating government need not identify potential control technologies and thus the burden of administering the system should be lower"); *see also* Ackerman & Stewart, *supra* note 111, at 1336–37.

139 *See* Ackerman & Stewart, *supra* note 111, at 1337.

140 *See* Carlson, *supra* note 127, at 215; *see also* Ackerman & Stewart, *supra* note 111, at 1336–37, 1342.

For their part, industry players welcome market mechanisms that let them decide how and when to reduce emissions, since they have the most expertise and familiarity with their own day-to-day technical and economic circumstances.[141] Private sector flexibility also reduces the negative impacts of more rigid requirements and creates space for industry innovation.[142] As a California legislator stated in debates over extending California's cap-and-trade program, cap-and-trade "is better than Soviet-style command and control. Markets are better than the government coercing people into doing things they don't want to do."[143]

3. THE ECONOMIC PERSPECTIVE: THE INCOMPATIBILITY OF PRESCRIPTIVE AND MARKET-BASED MEASURES

Market advocates suggest that a carbon price should be the dominant mechanism prompting emissions reductions.[144] As Carlson notes, in a purely market-based system, "the price of allowances should provide the necessary signal to the utility to guide its behavior. Those reductions that are cost-effective should be made; otherwise other emitters that can make cheaper reductions should make

---

141 *See* Ackerman & Stewart, *supra* note 111, at 1342–43.

142 *See* Lesley K. McAllister, *Beyond Playing "Banker": The Role of the Regulatory Agency in Emissions Trading*, 59 ADMIN. L. REV. 269, 277 (2007). Economic theorists laud the private autonomy and flexibility offered by markets, and are correspondingly skeptical of more direct regulatory measures they view as impinging upon freedom. *See* Spence, *Naïve Energy Markets*, *supra* note 59, at 984–85 (describing pro-market conservatives' reliance on economic theory).

143 George Skelton, *Gov. Brown's Climate Change Deal Was a Lesson in Compromise That Should Be Studied in the White* House, L.A. TIMES (July 20, 2017), http://www.latimes.com/politics/la-pol-sac-skelton-cap-and-trade-climate-change-california-bipartisan-vote-20170720-story.html.

144 *See, e.g.*, 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 U.S. CARBON TAX: CHALLENGES AND DEBATES 191 (Ian Parry et al. eds., 2015) (noting economists' position); Jesse D. Jenkins, *Political Economy Constraints on Carbon Pricing Policies: What Are the Implications for Economic Efficiency, Environmental Efficacy, and Climate Policy Design?*, 69 ENERGY POL'Y 467, 468 (2014); Stavins, *U.S. Cap-and-Trade System*, *supra* note 111; *see also* David Schoenbrod & Richard B. Stewart, *The Cap-and-Trade Bait and Switch*, WALL ST. J. (Aug. 24, 2009, 12:42 PM), https://www.wsj.com/articles/SB10001424052970203609204574314312524495276.

the reductions."[145] Of course, utilities and other energy players do not operate in an unbounded market; as Boyd observes, public utility law is designed to exert "social control over private business."[146] State PUCs and FERC play important roles in structuring and guiding the electricity system in both traditionally regulated states and restructured states.[147] Nonetheless, in all of these contexts, state legislatures and their PUCs can choose the degree to which they affirmatively direct utility investment decisions toward a clean energy transition instead of allowing power companies, utilities, and other energy system players to lead the way in response to market signals and internal business factors.

Market advocates do not rule out some role for prescriptive planning and regulation, but see such efforts primarily as a necessary complement to the dominant market-based mechanism.[148] Direct planning or regulation that attempts to direct how and where emissions reductions should occur would interfere with the ideal operation of market-based mechanisms, which allow regulated entities to choose their preferred and least-costly compliance paths.

First, assuming an adequate carbon price, market advocates would argue that direct planning or regulation would be overkill. Such a "belt and suspenders" approach would lead to duplicative signals and unnecessary administrative and industry burdens.[149] Industry would argue that a cap and the associated carbon price will

---

[145] Carlson, *supra* note 127, at 229.

[146] Boyd, *supra* note 2, at 1616.

[147] Some states have retained the traditional model of vertically integrated utilities regulated by state PUCS, some have partially deregulated by creating a market for generation but retaining utility control over distribution, while some states have entirely deregulated, creating markets for both energy generation and distribution. *See infra* notes 216–28 and accompanying text.

[148] *See generally* Carlson, *supra* note 127, at 209–17. In later scholarship, Carlson has recognized the critical role of public utilities in facilitating and shaping the path toward decarbonization. *See generally* Boyd & Carlson, *supra* note 58.

[149] Regulations would be redundant if the carbon price drove reductions to the same level as regulations, or farther. This would occur if the carbon price exceeded the cost of regulatory compliance, since the entity, in response to the carbon price, would likely reduce by more than required by the regulation. *See* Arik Levinson, *Belts and Suspenders: Interactions Among Climate Policy Regulations* 4–5 (Nat'l Bureau of Econ. Research, Working Paper No. 16109, 2010),

drive the necessary reductions, and any additional requirements and interference are burdensome and unnecessary to achieve reduction goals.

Second, planning and regulation could undermine the cost-effectiveness of market-based mechanisms. As discussed above, market-based mechanisms generate a price signal that stimulates the least-cost reduction opportunities, wherever they may be.[150] But planning or regulatory measures require that certain steps be taken, even if those steps are not the most cost-effective.[151] As a result, achieving the environmental goal becomes more expensive than it otherwise would be.[152] Given the scale of necessary reductions, the relative cost of available mechanisms is a critical variable.[153]

Policy analysts have explored the relative costs of reducing a given level of emissions through renewable portfolio standards (RPSs), which require utilities to use a certain percentage of renewable energy as opposed to a cap-and-trade approach. As Carlson reports, an MIT study concluded that achieving a certain level of reductions through cap-and-trade combined with an RPS would cost 25% more than achieving reductions through cap-and-trade alone.[154] A 2010 California Public Utilities Commission study evidences an even higher cost differential: the study estimated that achieving reductions to comply with the state's then-extant 33% renewable portfolio standard would cost more than four times the cost of allow-

http://www.nber.org/papers/w16109.pdf. It should be noted that Levinson predicts that such scenarios would be unusual because carbon prices are likely to be lower than regulatory costs, and so a carbon price is unlikely to force action that goes beyond simultaneous regulatory requirements. *See id.* at 5.

150 *See supra* notes 127–30 and accompanying text.

151 *See* Carlson, *supra* note 127, at 228–30.

152 *See id.* at 210–11; *see also* Burtraw & Palmer, *supra* note 144, at 206 (noting the renewable portfolio standards are less cost-effective than a carbon price). Levinson observes that regulatory measures defeat the cost-effectiveness goals of a market-based policy when regulatory requirements force entities to reduce their carbon emissions by more than they would in response to a carbon price, assuming, as is commonly the case, that the carbon price is less than the cost of regulatory compliance. Levinson, *supra* note 149, at 5–6 (describing studies showing the greater cost associated with non-market regulations).

153 *See* Carlson, *supra* note 127, at 216–17.

154 *See id.* at 235–36.

ances in the cap-and-trade program—$133 per metric ton as compared to $30 per ton of reduced carbon.[155] Although these studies were completed when renewable energy costs were higher than they are at present,[156] the basic premise remains: a price signal steers investment toward the least expensive options, while prescriptive measures risk requiring more expensive means for achieving the same level of greenhouse gas emission reductions.

In addition, if a cap-and-trade program is coupled with regulatory measures, the regulatory measures will induce direct reductions and reduce demand for allowances, lowering allowance prices.[157] Lower allowance prices could reduce the innovation incentive, that is, the incentive to develop new mechanisms for lowering emissions beyond those that are already required by regulation.[158] Analysts of low carbon allowance prices in California's cap-and-trade program observe that direct measures have driven most of the reductions, thereby lowering the demand for, and the price of, carbon allowances.[159]

Even market advocates recognize, however, that planning or regulation may be necessary under certain circumstances. Because effective enforcement of market measures requires highly effective emissions monitoring, prescriptive measures may be more appropriate to control fugitive emissions and other difficult-to-measure

---

155 *Id.* at 238.

156 *See, e.g.*, Robert Fares, *The Price of Solar Is Declining to Unprecedented Lows*, SCI. AM.: PLUGGED IN (Aug. 27, 2016), https://blogs.scientificamerican.com/plugged-in/the-price-of-solar-is-declining-to-unprecedented-lows/.

157 Carlson, *supra* note 127, at 236.

158 *See* Burtraw & Palmer, *supra* note 144, at 204; Carlson, *supra* note 127, at 236, 240. Carlson notes that the net impact of prescriptive measures is uncertain: although prescriptive regulations would reduce allowance prices, the prescriptive measures could create their own innovation incentives. *See id.* at 240. *See also infra* notes 431–42 and accompanying text (discussing innovation incentives created by prescriptive measures).

159 *See* Chris Busch, *Carbon Prices Rise in California's Cap-and-Trade Program as Legal Certainty Grows*, FORBES (Feb. 8, 2017, 8:00 AM), https://www.forbes.com/sites/energyinnovation/2017/02/08/carbon-prices-rise-in-californias-cap-and-trade-program-as-legal-certainty-grows/#782babc62355 [hereinafter Busch, *Carbon Prices Rise*] (describing how California's multiple climate policies, along with the 2008–09 recession, reduced demand for allowances and allowance prices).

emission sources.[160] In addition, regulation may be necessary when market failures prevent the price signal from inducing the desired response.[161] For example, where tenants pay for utilities, landlords have little incentive to install efficient appliances or increase energy efficiency.[162] Tenants, in turn, do not control the initial investments that determine their unit's efficiency.[163] The same "split incentives" occur between developers and subsequent building owners.[164] Moreover, building occupants are often unaware of their specific energy use or mechanisms to reduce consumption,[165] or may lack the ability to finance efficiency measures.[166] To overcome these market failures, measures that require or incentivize landlords and building developers to increase energy efficiency could, therefore, be justified.[167] But any such measures would be "complementary" to the primary market mechanism—useful additions rather than co-equal measures.[168]

In sum, from an economics' perspective, market mechanisms are the best way to internalize externalities, achieve goals cost-effectively, incentivize innovation, and give industries the flexibility and autonomy to use their in-depth knowledge to advance public goals. Coupling a market mechanism with additional prescriptive measures would dampen or sacrifice all of these benefits. Under this

---

160 *See* Driesen, *supra* note 22 (manuscript at 22); *see also* Byron Swift, *U.S. Emissions Trading: Myths, Realities, and Opportunities*, 20 NAT'L RESOURCES & ENV'T 3, 3 (2005).

161 *See* Carlson, *supra* note 127, at 216; R. Denniss et al., *Complementary Climate Change Policies: A Framework for Evaluation*, 23 ECON. & LAB. REL. REV. 33, 39 (2012); Driesen, *supra* note 22 (manuscript at 22); Benjamin Görlach, *Emissions Trading in the Climate Policy Mix – Understanding and Managing Interactions with Other Policy Instruments*, 25 ENERGY & ENV'T 733, 745 (2014). In Australia, a government organization specified that "complementary measures" to the planned market mechanism should target and be tightly linked to market failures. *See* Denniss et al., *supra* note 161, at 35; *see generally* Burtraw & Palmer, *supra* note 144, at 204 (discussing debate over the degree to which market failures reduce the effectiveness of a carbon price on consumer efficiency).

162 *See* Carlson, *supra* note 127, at 244.

163 *See id.* at 244.

164 *See id.*

165 *See id.*

166 *See id.* at 245.

167 *See id.* at 247–48.

168 *See id.* at 210.

view, complementary planning and regulation should be embraced only when monitoring concerns impede the proper functioning of a market-based mechanism or to compensate for some sort of market failure.

B. *Prescriptive Measures to Reduce Electricity-Sector Emissions*

To analyze governance opportunities in the electricity sector, I first lay the groundwork by providing an overview of electricity-sector governance, and then introduce a wide range of governance strategies for reducing carbon emissions.

1. THE ROLE OF GOVERNMENT IN THE ELECTRICITY SECTOR

As Welton has observed, "the United States has a byzantine bureaucratic structure for governing electric energy," with a complex mix of federal, regional, state, and local oversight over various dimensions of energy generation, supply, and demand.[169] In simplistic terms, the federal government has power over wholesale electricity sales and interstate transmission,[170] while the states retain primary authority to choose sources of electricity and regulate infrastructure siting and retail distribution.[171] The more complex reality will be elaborated below as relevant.

Respective governance roles have emerged from a long history of federal and state energy initiatives. For most of the twentieth century, utilities were vertically integrated monopolies, with utilities owning and operating generation (traditionally large fossil-fuel

---

[169] Welton, *supra* note 56 (manuscript at 16). Some scholars recognize the benefits of having a diverse range of actors at multiple governance levels. *See generally, e.g.*, Boyd & Carlson, *supra* note 58.

[170] Federal Power Act, 16 U.S.C. § 824(a) (2012).

[171] *See* 16 U.S.C. § 824(b) (retaining state authority over retail sales). Although I have delineated "federal" and "state" roles quite crisply in this Article, the relationship between federal and state prerogatives is, in fact, often blurred. For example, the Supreme Court has held that state programs incentivizing renewable energy are preempted by the Federal Power Act because the additional energy would drive down wholesale prices in RTO auctions, thus infringing upon FERC's authority over wholesale power markets. *See* Hughes v. Talen Energy Mktg., LLC, 136 S. Ct. 1288, 1299 (2016); *see generally* Jim Rossi, *The Brave New Path of Energy Federalism*, 95 TEX. L. REV. 399 (2016); Amy L. Stein, *Pitfalls Along the Brave New Energy Federalism Path*, 95 TEX. L. REV. 114 (2017).

power plants), transmission, and the distribution system to individual customers.[172] State PUCs closely regulated their monopoly utilities, and the federal government's role was largely limited to its power to set wholesale prices for electricity in interstate commerce.[173]

As Boyd describes, the pervasive deregulatory impulses of the 1970s and 1980s led to partial electricity deregulation in the 1990s.[174] To spur competition among electricity generators, the 1992 Energy Policy Act encouraged states to require their utilities to sell off their generating facilities and purchase power through wholesale electricity markets.[175] The Energy Policy Act further supported generator competition by requiring open access to interstate transmission lines.[176] In states that chose to deregulate, the wholesale power markets are run by Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs).[177] RTOs and ISOs play an intermediary role, facilitating the interactions between generators, transmission line owners, and utilities and other customers within their jurisdictions.[178] The RTOs and ISOs are regulated by FERC.[179]

The deregulation effort addressed not only energy supply, but distribution as well. Although state utilities retained control over the actual distribution lines, states could authorize multiple Retail Electricity Providers (REPs), giving consumers the choice of obtaining

---

[172] *See* Boyd & Carlson, *supra* note 58, at 836.

[173] *See id.* at 822–24.

[174] *See* Boyd, *supra* note 2, at 1651–56 (describing neoliberal critique of regulation and preference for markets); *id.* at 1661–63 (describing electricity deregulation).

[175] *See* Boyd & Carlson, *supra* note 58, at 831 & n.79 (tracing deregulation to the 1992 Energy Policy Act, which gave states the option of partially or fully deregulating their utilities and participating in FERC-regulated wholesale power markets).

[176] *See id.* The expectation was that competition among generators in wholesale power markets would provide "just and reasonable" prices, rather than relying on PUCs or FERC to set the rates. *See id.*

[177] KLASS & WISEMAN, *supra* note 72, at 77–78.

[178] *See id.* at 75–77.

[179] *See* Boyd, *supra* note 2, at 1663.

power from the incumbent utility or a new provider.[180] The REPs are regulated by state PUCs.[181]

The Energy Policy Act allowed, but did not require, states to deregulate.[182] Some states embraced the full deregulatory restructuring enabled by the Energy Policy Act, restructuring their electricity systems at both the wholesale and retail levels.[183] Other states have various types of hybrid structures, structures which usually retain utility control over retail sales and participation in RTO-run wholesale markets but vary in the degree to which they have required utilities to divest their generation assets.[184] And many other states, primarily located in the Mountain West and Southeast, have chosen not to deregulate and have retained the traditional regulated monopoly structure, with vertically integrated generation, transmission, and retail distribution.[185]

Shifts in the electricity sector and deregulation have had federalism impacts. Federal regulation of the RTOs and ISOs, and the associated increase in wholesale electricity sales subject to federal jurisdiction, has given the federal government a greater role than it has had historically.[186] In addition, recent Supreme Court case law on the degree to which state energy policies can impact wholesale power markets has created considerable uncertainty about the boundaries of permissible state action.[187] Notwithstanding uncertainty, however, the states continue to exercise jurisdiction over generation and many other features of the electricity sector,[188] and continue to have an important role to play in directing decarbonization pathways.

---

180 *See* Boyd & Carlson, *supra* note 58, at 837. Most residential consumers have, however, retained the incumbent utility as their default service provider. *Id.* at 833.

181 *See* Boyd & Carlson, *supra* note 58, at 837.

182 *See id.* at 834.

183 *See id.* at 831–33.

184 *See id.* at 838.

185 *See id.* at 836 & n.95.

186 *See id.* at 824–25.

187 *See, e.g.*, Hughes v. Talen Energy Marketing, LLC, 136 S. Ct. 1288 (2016) (holding that Maryland's guarantee of a certain price to generators who built capacity in a needed location was preempted by the Federal Power Act's authority over wholesale prices).

188 *Id.* at 1298.

2. GOVERNANCE MECHANISMS FOR PROMPTING AND SHAPING DECARBONIZATION

Prescriptive measures to reduce electricity-sector carbon emissions must account for the underlying complexity of electricity-sector governance. In addition to overarching planning, government measures can address generation, transmission, distribution, and demand reduction, singly or in combination. I note numerous examples but do not contend that they provide a roadmap or that existing structures and initiatives are sufficient. In some cases, existing governance mechanisms may require significant reform to achieve deep decarbonization.

The analysis reveals that governance initiatives will be important with or without market mechanisms. Because of the complexity of the underlying grid and the interweaving of private and public control to serve public ends, even a largely market-based program for carbon reduction must grapple with underlying electricity-sector governance parameters.[189] The description demonstrates the backdrop in which a carbon price might fall and lays the groundwork for understanding the kinds of governance initiatives that may be necessary to achieve a clean energy transition.

a. Federal and State Roles

Given the complexity and variety of institutions shaping the electricity sector, the wide variety of potential governance mechanisms is not surprising. And the question of the appropriate roles for federal, regional, and state governance is fraught and much debated.[190] In this Article, I simply outline existing governmental institutions and the roles they have been playing, without opining on

---

[189] *See* TOMAIN, *supra* note 107, at 157–90 (describing the need for regulatory innovation to manage a clean energy transition).

[190] *See, e.g.*, Boyd & Carlson, *supra* note 58, at 881–92 (describing federalism implications of state and federal agency energy decisions); Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 CONN. L. REV. 1339, 1341 (2010) (describing this debate as "an 'ossified' stalemate, a 'long congressional deep freeze'" (citation omitted)); *see generally* Hari M. Osofsky & Hannah J. Wiseman, *Dynamic Energy Federalism*, 72 MD. L. REV. 773 (2013); Rossi, *supra* note 190; *see also* Jim Rossi, *The Limits of a National Renewable Portfolio Standard*, 42 CONN. L. REV. 1425, 1427–29 (2010).

or otherwise analyzing the important federalism dimensions that questions of "governance" inevitably raise.

At the federal level, the EPA has authority to address power plant carbon emissions under the Clean Air Act.[191] As noted above, the Obama Administration had promulgated the Clean Power Plan, a far-reaching effort to encourage states to integrate their environmental and energy decision-making to achieve significant reductions.[192] However, these efforts have stalled under the Trump Administration.[193]

Other federal initiatives remain important. Congress has authorized tax credits for wind and solar energy that have been significant drivers of renewable energy development.[194] In addition, the Department of Energy has supported research on renewables, efficiency, clean coal, and other options.[195] Moreover, the federal government has provided funding for expensive and innovative pilot projects, including carbon capture and storage.[196] As discussed further below, FERC regulation of wholesale electricity sales and its oversight over RTOs and ISOs provide additional levers for promoting decarbonization.[197]

Notwithstanding these significant federal levers, much of the authority to shape a low-carbon future remains with the states.[198] Key

---

[191] *See supra* note 45 and accompanying text (describing the federal Clean Power Plan, which was promulgated under the federal Clean Air Act). *Id.*

[192] *See id.*

[193] *See* Grandoni, *supra* note 37; *see also* Cusick, *supra* note 37.

[194] *See* KLASS & WISEMAN, *supra* note 72, at 140–48 (describing wide array of federal tax credits for energy development); RANDOLPH & MASTER, *supra* note 64, at 692–96 (same).

[195] *See* KLASS & WISEMAN, *supra* note 72, at 6.

[196] *See id.* (describing federal funding for research and development); RANDOLPH & MASTERS, *supra* note 64, at 696–99 (describing federal research funding and institutions).

[197] *See infra* Section II.B.2.a.

[198] That authority is not unbounded; some state initiatives may be preempted by the Federal Power Act. *See supra* note 190 (discussing preemption of state renewables incentives). State actions are also limited by the Dormant Commerce Clause. *See* Steven Ferrey, *Threading the Constitutional Needle with Care: The Commerce Clause Threat to the New Infrastructure of Renewable Power*, 7 TEX. J. OIL, GAS, & ENERGY L. 59, 85, 90–98 (2012); David R. Hodas, *State Law Responses to Global Warming: Is It Constitutional to Think Globally and Act Locally?*, 21 PACE ENVTL. L. REV. 53, 67–72 (2003); *see generally* Alexandra B.

players include state legislatures, public utility and energy commissions, as well as environmental agencies.[199] State legislatures have varied in their degree of engagement, with many leaving most of the hard decisions to state agencies,[200] and others providing more substantial guidance. Even without significant legislative direction, PUC's broad delegations of power often give them the discretion to play a key role in shaping a state's energy path.[201] In addition, because addressing electricity-sector pollution requires not only controlling pollution at the end of the pipe, but also influencing energy supply decisions at the front end, environmental regulators and energy regulators will need to increasingly coordinate their initiatives.[202]

The path to decarbonization will require extensive planning as well as measures to address generation, transmission, distribution, and demand reduction. Whether in restructured or traditional states, numerous governmental measures are underway and could continue to play a critical role in decarbonization.[203]

Klass & Elizabeth Henley, *Energy Policy, Extraterritoriality, and the Dormant Commerce Clause*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 127 (2014).

199 *See* KLASS & WISEMAN, *supra* note 72, at 6–7.

200 *See* Welton, *supra* note 56 (manuscript at 13–14) ("[R]arely do politicians pass legislation making the 'hard' decisions over which many in the energy field disagree. They often leave to energy bureaucrats decisions over how to achieve the (often divergent) goals of abundant, affordable, and clean energy."); *see also id.* (manuscript at 51) (describing broad energy legislative mandates that leave many of the hard decisions to state regulators).

201 Welton, *supra* note 56 (manuscript at 48).

202 *See Energy Activities*, CAL. AIR RES. BOARD, https://www.arb.ca.gov/energy/energy.htm (last visited Jan. 28, 2018) (describing how CARB, an environmental agency, is collaborating extensively with the California PUC, the energy agency, to implement environmental initiatives to lower emissions and promote renewables). Scholars have been exploring the opportunities and impediments to this emerging confluence between environmental and energy regulation. *See generally, e.g.*, Jody Freeman, *The Uncomfortable Convergence of Energy and Environmental Law*, 41 HARV. ENVTL. L. REV. 339 (2017); Alexandra B. Klass, *Climate Change and the Convergence of Environmental and Energy Law*, 24 FORDHAM ENVTL. L. REV. 180 (2013).

203 *See generally* MACBETH ET AL., *supra* note 66 (describing numerous state initiatives to facilitate a clean energy transition).

b. Climate Action Planning

As Boyd notes, "planning has long been at the heart of traditional utility regulation and is a major focus of the RTOs and ISOs."[204] This planning and more will be essential to achieving decarbonization.[205] Planning includes generating a vision of the ultimate goals and an implementation pathway.[206] Whether direct government planning or government requirements for utility or RTO planning, planning will be necessary to integrate the many interrelated components essential to successful climate action, including generation, transmission, and demand reduction.

Government entities have the institutional capacity to develop an overarching vision and engage in comprehensive and long-term planning to achieve that vision. States actively addressing climate change have developed climate action plans that attempt to scope out, in more or less detail, their states' respective pathways to a greener economy.[207] Notable examples include California, described below,[208] New York's Reforming the Energy Vision initiative, embodied in a comprehensive State Energy Plan,[209] and Massachusetts' Clean Energy and Climate Plan for 2020.[210] Given the

---

[204] Boyd, *supra* note 2, at 1693. Boyd notes further that planning "will be a critical part of the electric power sector under almost any future organization form," and that it is "a vitally important fundamentally pragmatic knowledge practice for dealing with complex, highly interdependent systems that require intense coordination and management across various spatial and temporal scales." *Id.* at 1698.

[205] *See* WILLIAMS ET AL., *supra* note 2, at 72.

[206] *See* Dernbach, *supra* note 1, at 10788 (suggesting that policies should focus less on what is currently feasible and, instead, start with the desired result and "backcast" to identify the steps needed to get there).

[207] *See, e.g.*, MACBETH ET AL., *supra* note 66, at 17–20, 22–23, 34, 40 (describing the planning processes and energy plans of multiple states including Massachusetts, Michigan, Minnesota, Nevada, Rhode Island, and Vermont); *Climate Action Plans*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, https://www.c2es.org/us-states-regions/policy-maps/climate-action-plans (last visited Nov. 3, 2017) (indicating that, as of February 2016, 34 states have or are completing climate action plans).

[208] *See infra* Section IV.C.

[209] *See The Energy to Lead: 2015 New York State Energy Plan*, N.Y. ST. ENERGY PLAN, https://energyplan.ny.gov/ (last visited Feb. 10, 2018).

[210] EX. OFFICE OF ENERGY AND ENVTL. AFFAIRS, MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN FOR 2020, 2015 UPDATE (Dec. 31, 2015),

increasing regionalization of the grid, many states are not only engaging in state-centered planning, but coordinating their planning with other states in the same electricity grid.[211] Similarly, although the Clean Power Plan has been stayed, the state implementation plans the rule had required represent at least a modest version of the necessary forward-thinking assessment of electricity-sector emissions.[212]

States have also required some degree of private sector planning. Traditional vertically-integrated states require their utilities to engage in "integrated resource planning" (IRP) to assess available generation options, identify transmission needs, integrate the role of demand-reduction measures like energy efficiency, and integrate environmental requirements, including the need to meet RPSs, with planning horizons ranging from ten to twenty years.[213] As of 2014, twenty-eight states required utilities to file IRPs.[214] In restructured states, where utilities purchase rather than generate power, some states require utilities to engage in "long-term procurement planning" to identify future needs and determine how to meet regulatory requirements, generally with a ten-year planning horizon.[215]

---

https://www.mass.gov/files/documents/2017/12/06/Clean%20Energy%20and%20Climate%20Plan%20for%202020.pdf.

[211] *See* Felix Mormann, *Clean Energy Federalism*, 67 FLA. L. REV. 1621, 1634–35 (2015).

[212] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60); U.S. EPA, *Fact Sheet the Clean Power Plan: The Role of States*, https://archive.epa.gov/epa/sites/production/files/2015-08/documents/fs-cpp-states-decide.pdf (archiving document).

[213] *See* RACHEL WILSON & BRUCE BIEWALD, REGULATORY ASSISTANCE PROJECT, BEST PRACTICES IN ELECTRIC UTILITY INTEGRATED RESOURCE PLANNING 6 tbl.1 (2013), http://www.raponline.org/wp-content/uploads/2016/05/rapsynapse-wilsonbiewald-bestpracticesinirp-2013-jun-21.pdf; Boyd, *supra* note 2, at 1693–94; *see also* MACBETH ET AL., *supra* note 66, at 12 (describing Delaware agency requirements that utilities account for emissions and externalities in their integrated resource planning).

[214] *See* WILSON & BIEWALD, *supra* note 213, at 5 fig.2.

[215] *See* Boyd, *supra* note 2, at 1694–95 (noting that eleven states require long-term procurement plans and noting a ten-year planning horizon is common); WILSON & BIEWALD, *supra* note 213, at 8–9 (describing evolution of long-term procurement planning requirements).

Planning can provide the overall vision and direction for government actions. Prescriptive measures to reduce generation, develop necessary transmission, and reduce consumer demand can then take many different forms, as described below.

c. Governance Mechanisms to Promote Low-Carbon Generation

Shifting generation away from carbon will require envisioning and committing to a low-carbon energy supply and mechanisms to finance and promote investment in alternatives.[216] Government actors, including FERC, state legislatures, and state PUCs, all play key roles in facilitating a transition to new sources of electricity.

The specific pathways to achieve a transition vary depending upon the structure of the states' electricity systems. In traditional, vertically integrated states, state PUCs play a critical role in determining generation investments.[217] The states review utility generation investments and allow new sources only where there is a certificate of need or its equivalent.[218] In traditional states, utilities' Integrated Resource Plans provide a template for future generation needs.[219]

In both restructured and traditional states, state RPSs that require utilities to use or purchase a certain percentage of renewable power are a primary state legislative mechanism to express a state's renewables goals and steer a transition to clean energy.[220] Over half the states have RPSs.[221] They vary significantly in ambition, with some requiring only a small percentage of renewables and others, like California, requiring up to 50% renewables.[222] The generation sources

216 *See* Boyd, *supra* note 2, at 1682–83.

217 *See* Boyd & Carlson, *supra* note 58, at 827–28.

218 *See* KLASS & WISEMAN, *supra* note 72, at 187.

219 *See supra* note 213 and accompanying text.

220 *See* KLASS & WISEMAN, *supra* note 72, at 149. RPSs apply to utilities or other electricity providers. *See id.*

221 *See* KLASS & WISEMAN, *supra* note 72, at 149–52 (describing state RPSs and associated renewable energy credits); RYAN WISER ET AL., LAWRENCE BERKELEY NAT'L LAB., NAT'L RENEWABLE ENERGY LAB., A RETROSPECTIVE ANALYSIS OF THE BENEFITS AND IMPACTS OF U.S. RENEWABLE PORTFOLIO STANDARDS vii (2016), https://emp.lbl.gov/sites/default/files/lbnl-1003961.pdf.

222 *See* DATABASE OF STATE INCENTIVES FOR RENEWABLES AND EFFICIENCY, U.S. DEP'T ENERGY, RENEWABLE PORTFOLIO STANDARDS POLICIES (Feb. 2017),

considered "renewable" also vary considerably, as does the degree to which the state controls choices among available renewable options.[223]

In addition to RPSs, states could also initiate direct measures to address high-carbon sources, measures that could be designed to reduce both carbon and co-pollutant emissions. In 2006, California established an electricity performance standard that rules out new in-state coal plants or new contracts for importing coal.[224] Oregon has prohibited the use of coal-fired power after 2035,[225] and the state of Washington negotiated the closure of the state's only coal-fired power plant by 2025.[226] Recognizing the environmental harms caused by coal-fired power, Colorado's Clean Air Clean Jobs Act of 2010 set demanding criteria pollutant reduction requirements that led to coal-plant retirements and shifts from coal to natural gas, a shift that has also reduced carbon.[227] To address the reliability concerns associated with intermittent renewables, which depend upon uncertain and episodic sun and wind conditions, some states have begun to require utilities to invest in energy storage.[228]

---

http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/03/Renewable-Portfolio-Standards.pdf (depicting a map of state renewables policies indicating differing goals and noting inclusion of non-renewables in some standards).

[223] *See, e.g.*, DATABASE OF STATE INCENTIVES FOR RENEWABLES AND EFFICIENCY, U.S. DEP'T ENERGY, RENEWABLE PORTFOLIO STANDARDS (RPS) WITH SOLAR OR DISTRIBUTED GENERATION PROVISIONS (Feb. 2017), http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2017/02/RPS_carveout_4.pdf (depicting a map indicating states with RPSs that separately promote solar and distributed generation).

[224] *See infra* note 462 and accompanying text.

[225] *See* MACBETH ET AL., *supra* note 66, at 30.

[226] *See id.* at 43.

[227] COLO. REV. STAT. § 40-2-124 (2017); *see* MACBETH ET AL., *supra* note 66, at 6. The law shows the connection between criteria and greenhouse gas reduction efforts: although targeting criteria pollutants, the law also served to reduce greenhouse gases.

[228] *See, e.g.*, CAL. PUB. UTIL. CODE §§ 2835–2839, 9506 (2017) (California's energy-storage law); *see also* CAL. INDEP. SYS. OPERATOR, CAL. PUB. UTILS. COMM'N, & CAL. ENERGY COMM'N, ADVANCING AND MAXIMIZING THE VALUE OF ENERGY STORAGE TECHNOLOGY: A CALIFORNIA ROADMAP 1–2 (2014), https://www.caiso.com/Documents/Advancing-MaximizingValueofEnergyStorageTechnology_CaliforniaRoadmap.pdf.

Although local citizens and governments have not historically played a strong role in controlling electricity generation, local governments and, in some cases, local citizens are playing an increasing role. For example, in some hybrid states, where regulated utilities are responsible for distribution, citizens are voting to opt out of the utility's supply and obtain their energy from "community choice aggregators," which often (although not necessarily) supply a higher percentage of renewable energy than the local utility.[229] In these cases, through local government action, citizens are directly exercising their preference for renewable energy.

No matter how vaunted the goals and precise the planning, transitioning to new generation sources requires financing. According to one expert, financing can be difficult for capital-intensive investments, including low- and no-carbon assets.[230] In both traditional and restructured states, government agencies play a critical role in creating conditions that could either facilitate or frustrate financing.

In traditional jurisdictions, states and their PUCs set the rules determining how and when utilities recover the costs of their generation investments.[231] These rules determine whether utilities will have sufficient certainty about their cost recovery to obtain financing.[232] Several traditional states have revised their cost-recovery rules to enable their utilities' investment in expensive nuclear power and carbon-capture-and-storage projects.[233] Although the wisdom of these investments has been deeply controversial,[234] they demonstrate the key role PUCs play in determining the viability of generation investments.

---

229 *See* Welton, *supra* note 56 (manuscript at 36–39).

230 *See* Boyd, *supra* note 2, at 1692 ("Given the higher capital intensity of a low-carbon electricity system compared to the current fossil-based system, and given the long-lived nature of many of these assets, finding ways to de-risk and thus reduce the cost of capital for these investments is a critical task for policy."). Financing presents a difficult challenge for all new large-scale electricity generation, including fossil-fuel generation. *See* Spence, *Naïve Markets*, *supra* note 59, at 1010.

231 *See generally* KLASS & WISEMAN, *supra* note 72.

232 *See* Boyd & Carlson, *supra* note 58, at 827–28.

233 *See id.* at 853.

234 *See, e.g.*, Jim Pierobon, *At Least in the Southeast, the Future of Nuclear Is Brightening*, SOUTHEAST ENERGY NEWS (Jan. 26, 2017), http://southeastenergyn-

In restructured states, the utilities no longer control generation and the state no longer controls cost recovery for generation investments.[235] However, the wholesale markets run by the RTOs and ISOs are structured by FERC, and the pricing structure significantly affects the ease or difficulty of assuring generators that they will be able to recover their costs through sales in the wholesale power markets.[236] FERC's authority over RTO and ISO's wholesale pricing structure could prove to be a critical lever for encouraging investment in new renewable generation, investment that may be hampered by the current pricing mechanism.[237]

In addition to utility-scale renewables, distributed generation at the consumer level could play an important role in decarbonizing the grid. Distributed generation, particularly distributed solar power, has surged in recent years due to decreasing costs, attractive federal tax credits, and new financing mechanisms that have reduced the barriers to investing in residential solar power.[238] At the state level, "net metering," which requires utilities to pay households and other distributed generators the retail price for power they add to the grid, has been a critical governmental mechanism for promoting distributed generation.[239] As of 2016, forty-four states and the District of Columbia have established net metering programs.[240] States and local governments have also actively facilitated distributed generation by developing programs to help finance solar panels[241] and other

ews.com/2017/01/26/at-least-in-the-southeast-the-future-of-nuclear-is-brightening/ (describing ability to commit funds for nuclear power in regulated states as well as controversy over asking ratepayers to finance that commitment).

235 *See* Boyd & Carlson, *supra* note 58, at 831, 837–38.

236 *See* Boyd, *supra* note 2, at 1688–90.

237 *See id.* As discussed further below, *infra* note 366 and accompanying text, current pricing mechanisms are unpredictable and could make it difficult for generators to recover their costs, hindering needed investment in expensive renewables; *see also infra* note 456 and accompanying text (describing need for government to shift pricing mechanisms in order to facilitate investment in renewables).

238 *See* U.S. ENERGY INFO. ADMIN., *supra* note 50, at 113–14.

239 *See* KLASS & WISEMAN, *supra* note 72, at 153–54.

240 Boyd & Carlson, *supra* note 58, at 861.

241 *See* KLASS & WISEMAN, *supra* note 72, at 162–64; MACBETH ET AL., *supra* note 66, at 9, 11, 13 (describing Connecticut, Delaware, and Louisiana financing programs).

measures to promote distributed generation.[242] And, as distributed generation increases and utility sales decrease, numerous states are struggling to determine appropriate measures for ensuring a reliable grid and distributing its costs fairly.[243]

d. Governance Mechanisms to Promote the Transmission and Distribution of Low-Carbon Electricity

Government measures can also play a critical role in facilitating the transmission grid necessary to access and accommodate available renewable resources. State PUCs are primarily responsible for siting both intrastate and interstate transmission lines.[244] In traditional states, PUCs can require utilities to plan for and develop the transmission necessary for renewable resources.[245] In Texas, a restructured state, the legislature tasked the state's PUC to oversee the development of transmission lines to enable renewables development, enabling Texas wind power to surge.[246] More broadly, FERC has required all transmission providers to participate in regional transmission planning, including planning for the development of renewables currently lacking transmission.[247] For example, the Midcontinent Independent System Operator (MISO), which operates the

---

242 Connecticut has required utilities to establish an auction that allows smaller-scale distributed generation projects to compete for long-term power purchase agreements. *See* MACBETH ET AL., *supra* note 66, at 8–9.

243 A key issue in the rise of distributed generation has been the risk that those who remain on the grid will end up bearing a disproportionate cost of maintaining the grid on which everyone relies. *See supra* note 102 and accompanying text.

244 *See* KLASS & WISEMAN, *supra* note 72, at 18–21. In theory, FERC has the authority to site transmission lines in "National Interest Electric Transmission Corridors" if states along the corridor have withheld approval. *See id.* at 21. However, FERC's authority has been narrowly construed so, for the most part, transmission line siting remains a matter of state control. *See id.*

245 *See* KLASS & WISEMAN, *supra* note 72, at 18.

246 *See id.* at 19–20; Martin, *supra* note 96, at 7 (describing the state's crucial role in establishing "Competitive Renewable Energy Zones," often in less populated areas, and then developing transmission lines to connect them with the state's urban centers).

247 *See* KLASS & WISEMAN, *supra* note 72, at 21–22 (discussing FERC Order 1000, which requires regional transmission planning, including planning to accommodate emerging renewable energy and energy efficiency); Shelley Welton & Michael B. Gerrard, *FERC Order 1000 as a New Tool for Promoting Energy Efficiency and Demand Response*, 42 ENVTL. L. REP. 11025 (2012). Execution of transmission plans remains difficult because primary authority for transmission

electricity transmission system for ten Midwestern states, has been working with state regulators and planners to develop transmission that would bring wind energy from the western MISO member states to the higher-population eastern MISO states.[248]

Government could also play an essential role in ensuring that the distribution system—the grid connecting consumers and electricity suppliers—facilitates decarbonization. The distribution system is critical to integrating distributed generation. Because distributed generation could be perceived as a threat to the utilities' business,[249] government action requiring utilities to allow and plan for distributed generation may be needed to overcome any resistance. For example, California requires its major utilities to plan for and incorporate distributed resources in their planning exercises.[250]

Numerous states have passed legislation or promulgated plans and requirements that facilitate the development of a smart grid to enhance renewable integration and enable demand-response mechanisms for enhancing efficiency.[251] In addition to pushing utilities to integrate distributed renewable resources, PUCs can work with utilities to adapt the grid to manage "bidirectional power flows," that is, flows both to and from consumers.[252] Numerous states, through legislative or PUC action, have developed strategies for requiring and helping utilities modernize the grid.[253]

---

line siting lies with the states, which have the power to resist interstate transmission lines, especially if they do not perceive direct benefits from the transmission line. *See* Alexandra B. Klass & Elizabeth Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 VAND. L. REV. 1801, 1820 (2012).

[248] *See* Alexandra B. Klass, *Future-Proofing Energy Transport Law*, 94 WASH. U. L. REV. 827, 867–68 (2017).

[249] *See* Boyd, *supra* note 2, at 1676–77 (describing utilities' "death spiral" claims).

[250] Boyd & Carlson, *supra* note 58, at 866.

[251] *See id.* at 858–60 (describing legislative and PUC initiatives in Illinois, Massachusetts, Maryland, Pennsylvania, New York, California, and Texas to require utilities to modernize the grid to better enable integration of distributed resources and efficiency).

[252] *See id.* at 855–56.

[253] *See id.* at 857–60 (describing initiatives in Illinois, Massachusetts, Maryland, Pennsylvania, New York, California, and Texas).

e. Governance Mechanisms to Reduce Consumer Demand

Investing in a "smart grid" would not only facilitate the integration of distributed generation and distributed storage, but would also allow utilities to use price signals to reduce consumer demand for energy. At the federal level, FERC has exercised its authority over RTOs and ISOs to require them to accept bids and provide payment for not only electricity supply but promises to reduce demand.[254] At the state level, through their control of utility retail pricing, PUCs can encourage or require utilities to adjust prices to reduce consumer demand when doing so would optimize the use of grid resources.[255] In addition to enabling price-based incentives, a "smart grid" distribution system could enable energy suppliers to remotely adjust thermostats to reduce demand during peak times.[256]

Government measures can reduce consumer demand through numerous other mechanisms. They can require their utilities to facilitate consumer efficiency through energy efficiency resource standards (EERSs), which require utilities to achieve a percentage reduction in electricity sales by facilitating consumer energy efficiency improvements, and other measures that facilitate consumer

---

254 The FERC Order allowing demand-response bids, Order No. 719, was upheld by the Supreme Court in Fed. Energy Reg. Comm'n v. Elec. Power Supply Assoc., 136 S. Ct. 760, 771 (2016).

255 Utilities and system operators must ensure sufficient capacity to provide energy during times of peak demand, which could require the use of high-carbon sources or, in many cases, prompts investment in fossil-fuel peaker plants designed to generate power only at times of peak demand. Incentives to reduce power use during peak times could reduce investment in and operation of fossil fuel sources serving peak demand. *See, e.g.*, Boyd & Carlson, *supra* note 58, at 870–77 (describing time-variant pricing and initial implementation efforts).

256 *See generally* Joel B. Eisen, *Smart Regulation and Federalism for the Smart Grid*, 37 HARV. ENVTL. L. REV. 1 (2013).

efficiency.[257] More than half the states have adopted such measures.[258]

Government measures can directly improve efficiency through green building standards, like insulation and tight window requirements.[259] Federal and state appliance efficiency standards can also play an important role—though, as federal appliance efficiency initiatives have increased, state efforts increasingly face the risk of preemption.[260] In addition to standards, requiring building developers and appliance manufacturers to provide energy efficiency information supports informed consumer choice. Rebates, loans, and tax credits for energy-efficient appliances or buildings could spur consumer efficiency investments.[261]

C. *Markets versus Governance: From Dichotomy to Continuum*

It is important to recognize that a strict dichotomy between market-based and prescriptive measures oversimplifies the reality of these policy mechanisms. Market-based mechanisms are the product of government decisions and frequently operate within a governance-structured environment, while many prescriptive measures

---

[257] *See* KLASS & WISEMAN, *supra* note 72, at 219; MACBETH ET AL., *supra* note 66, at 15–16, 18–19, 21, 27, 30, 32, 34 (describing Maryland's 2008 legislation that required utilities to achieve significant improvements in energy efficiency; Massachusetts's energy-efficiency initiatives; Minnesota's energy-efficiency program requirements; New Hampshire's initiatives, including but not limited to an EERS; Oregon's investments in energy-efficiency programs; Pennsylvania's energy-efficiency programs; and Rhode Island's programs).

[258] DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, U.S. DEP'T OF ENERGY, ENERGY EFFICIENCY RESOURCE STANDARDS (AND GOALS) (Oct. 2016), http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2016/10/Energy-Efficiency-Resource-Standards.pdf (displaying twenty states with mandatory requirements and eight states with EERS goals).

[259] *See, e.g.*, MACBETH ET AL., *supra* note 66, at 25 (describing Nevada's green building standards).

[260] States have the authority to develop appliance efficiency standards unless and until the federal government develops standards for the same appliances. *See generally* Alexandra B. Klass, *State Standards for Nationwide Products Revisited: Federalism, Green Building Codes, and Appliance Efficiency Standards*, 34 HARV. ENVTL. L. REV. 335 (2010).

[261] *See* MACBETH ET AL., *supra* note 66, at 11–12, 18–19 (describing Delaware's financial assistance for home efficiency improvements and Massachusetts's use of greenhouse gas auction revenue to support energy efficiency efforts).

provide substantial flexibility to regulated entities and include market features like trading.

In a cap-and-trade program, for example, setting the emissions target and yearly caps are essential and controversial governance decisions. Many features of program operation require careful governmental deliberation. Government institutions must determine the appropriate scale (local, state, regional, international) as well as the program's scope (what economic sectors to include). They must decide whether to distribute allowances for free or to sell them by auction (and to whom, and through what mechanism, and with what terms and conditions on purchases, prices, and transactions). Cap-and-trade program designers also decide whether to allow carbon offsets and, if so, what kind, from where, and what standards and procedures to establish for measuring their validity. Carbon taxes are simpler in operation, but the level of the tax becomes the all-important question, as does the scope of its applicability and the degree and basis for any exceptions. Moreover, determining how to distribute revenue from cap-and-trade and tax programs presents central governance questions and opportunities for deliberation.

Market-based mechanisms do not operate in isolation; they operate within the context of existing electricity regulatory structures. Thus, a carbon price not only creates an amorphous incentive to reduce carbon, it can impact the functioning of regulated electricity markets. For example, a carbon price increases the relative operating cost of high-carbon fuel and makes it less likely to be dispatched than a lower-carbon fuel. In addition, as utilities and transmission organizations engage in their PUC- or FERC-required planning exercises, carbon prices reduce the desirability of higher-carbon resources by increasing their cost relative to lower-carbon resources.[262] Moreover, the highly structured nature of electricity markets means that government will have a role to play even if policymakers choose to rely on a price signal to generate carbon reductions. Looking forward, as generation sources shift from centralized

262 *See* Carlson, *supra* note 127, at 229; *see also* Boyd, *supra* note 2, at 1695–96 (noting the impact of "carbon adders" on electricity planning).

fossil fuel generation to increasing levels of renewables and distributed generation, existing electricity market rules will require government-led revision.[263]

For their part, prescriptive regulations vary considerably in the degree to which they dictate behavior or allow flexibility. Most climate governance does not rely on the kind of "command and control" technology standards that market proponents envision as the regulatory alternative to market-based approaches.[264] For example, state RPSs do not dictate particular technologies; they set a percentage goal and identify a range of renewables that could meet the standard.[265] States vary in the types of options available and the degree to which they direct their utilities to choose certain options, but all leave some choice to market players. Moreover, many RPSs have explicit trading features: most states allow their utilities to fulfill at least some portion of the RPS obligation with "renewable energy credits."[266]

Tax incentives for particular types of energy also share both prescriptive and market features. By providing tax credits only to certain forms of energy, tax credits have a strongly prescriptive character: they represent a value judgment to reward a particular type of energy production. However, they do not require a specific level of production, and instead rely on market forces to respond to the incentive. Net metering, which allows distributed generators to receive payment for their contributions to the grid, is prescriptive in the sense that it is offered to encourage a particular form of energy, but relies on the "market" of consumers to respond to the incentive.[267]

Nevertheless, as we contemplate the decarbonization challenge, we face fundamental questions about the role of government and the role of private actors in charting a course toward decarbonization.

---

263 For example, as discussed above, if prices on wholesale markets are determined by relative operating costs and renewables have zero operating costs, then high renewables penetration could undermine generators' ability to obtain a return on their investments. *See infra* note 305 and accompanying text.

264 *See, e.g.*, Ackerman & Stewart, *supra* note 111, at 1335–39 (noting drawbacks to technology-based "command and control" regulations).

265 *See* Carlson, *supra* note 127, at 231.

266 *See id.* at 231–32; Mormann, *supra* note 211, at 1631 (noting that RPSs create a market for renewable energy credits).

267 *See* KLASS & WISEMAN, *supra* note 72, at 153–54.

The choice is not either/or, but the conceptual starting point matters and affects the way strategies unfold. Although governments establish the parameters for market operation, market advocates nonetheless seek to leave the choices about the specific mechanisms for reducing carbon to private actors in the marketplace, with prescriptive measures included to complement the central market mechanism as necessary. In contrast, governance advocates suggest the need for a vital government role in conceptualizing, planning, and implementing a transition to clean electricity, with markets supporting rather than leading the effort.

III. THE CRITICAL IMPORTANCE OF PRESCRIPTIVE GOVERNANCE

Even the most diehard market advocate would be hard-pressed to deny some role for governance. At a minimum, decarbonization will require adjustments in government rules controlling underlying electricity markets. Government institutions provide necessary fora for coordinating all forms of infrastructure investments. And some market advocates might even advocate for post-market social welfare measures that respond to potential disruptions caused by a carbon price signal, like measures to address the loss of regional employment in coal states or higher electricity costs for low-income residents.

But I argue for a greater role for governance: that states should facilitate planning and establish direct guidance in furtherance of those plans. Market measures focused on autonomy and efficiency miss the fundamental political and value issues at stake—missing these issues constitutes, in Spence's words, economics' "blind spot."[268] A government-led agenda could well include market components and would likely rely on revenue from market mechanisms. But the question is the degree to which public institutions deliberate over a larger vision for a clean energy transition and play a significant role in guiding that transition.

Although market advocates treat the privatization of decision-making as one of the market's central virtues, that approach could shortchange collective deliberation on critical questions about our

268 *See* Spence, *Naïve Energy Markets*, *supra* note 59, at 978, 995, 1001–06.

future path.[269] Transitioning to a clean energy economy will have profound environmental, socioeconomic, and political impacts.[270] As governments and private actors choose among energy options—among coal, natural gas, nuclear, biofuels, solar, wind, geothermal, hydropower, and increasing energy efficiency—those decisions will determine how quickly and effectively we transition away from fossil fuels and will impact associated co-pollutant emissions, the cost of energy, regional employment, and the structure of the energy industry overall. Moreover, the electricity sector is so complex—technically, economically, and administratively—that planning, coordination, and thoughtful governance initiatives at multiple levels will be essential to achieve the energy transition ahead. From a democratic governance perspective, government deliberation provides opportunities for public engagement and creates some measure of democratic accountability. And efforts to establish a longer-term and more compelling vision of a clean energy future could garner political support that has been slow in coming for price-based mechanisms.

A. *The Benefits of Multifaceted and Multi-Factor Decision-Making*

Decarbonization will have extensive environmental, economic, and social consequences. Transitioning to a clean energy economy will cause both disruptions and opportunities to the environment, workers, and communities. Under a market-centered approach, government programs could attempt to address some of these issues after the fact: the market could do what it does, and then social welfare programs could address the consequences. However, a more integrated approach up front—with a market mechanism as part of rather than the core of the approach—could more effectively anticipate and address the multitude of issues at stake in clean electrification.

---

[269] *See* TOMAIN, *supra* note 107, at 72–74 (summarizing argument that markets alone will not achieve a clean energy future and stressing the importance of governance).

[270] *See supra* Section I.B.

When considering future pathways, government institutions have the capacity to maximize the benefits associated with the transition to a clean economy.[271] Under a more governance-driven planning approach, government institutions can select transition pathways that serve multiple objectives.[272] The emerging "climate justice" movement advocates for deliberate climate strategies that reduce pollution and bring new opportunities to disadvantaged communities.[273]

So, for example, in traditionally regulated states, a state commission could work with utilities to retire coal-fired power plants located in the most populated areas or otherwise causing the worst air pollution while simultaneously achieving greenhouse gas and co-pollutant benefits.[274] In restructured states, environmental agencies could develop multi-pollutant control strategies to reduce both

---

[271] *See* Roberts, *supra* note 75.

[272] *See generally* JONES, *supra* note 98.

[273] *See id.*; *see generally* SOVACOOL ET AL., *supra* note 75; Behles, *supra* note 101; Alice Kaswan, *Climate Change, the Clean Air Act, and Industrial Pollution*, 30 UCLA J. ENVTL. L. & POL'Y 51, 57–74 (2012) [hereinafter Kaswan, *Industrial Pollution*] (explaining the value of comprehensive climate polices that integrate multiple environmental and socioeconomic factors); Uma Outka, *Fairness in the Low-Carbon Shift: Learning from Environmental Justice*, 82 BROOK. L. REV. 791, 814–16 (2017) [hereinafter Outka, *Fairness*] (describing environmental justice community comments on the CPP that emphasized the need to reduce co-pollutants in and spread the benefits of clean energy to disadvantaged communities and to spread the benefits of clean); Uma Outka, *Environmental Justice Issues in Sustainable Development: Environmental Justice in the Renewable Energy Transition*, 19 J. ENVTL. & SUSTAINABILITY L. 60 (2012); *Environmental Justice Leadership Forum on Climate Change*, EJNET.ORG, http://ejnet.org/ej/ejlf.pdf (last visited Nov. 22, 2017) [hereinafter *Forum on Climate Change*].

[274] *See* Kaswan, *Industrial Pollution*, *supra* note 273, at 65, 76–77 (noting the high greenhouse gas and co-pollutant benefits of shifting away from coal-fired power and that choosing to control greenhouse gases where they provide the greatest co-pollutant benefits could contribute to the policy's net benefits). Washington state recently reached an agreement with its utility to close the state's last coal-fired power plant, simultaneously improving climate and co-pollutant outcomes. *See* Mike Lindblom & Craig Welch, *Agreement Reached to Stop Burning Coal at Centralia Power Plant*, SEATTLE TIMES (Mar. 5, 2011, 9:44 PM), http:/www.seattletimes.com/seattle-news/agreement-reached-to-stop-burning-coal-at-centralia-power-plant/.

greenhouse gas and co-pollutants from the state's most harmful generators.[275]

In contrast, a carbon price, by definition, prices only carbon and cannot include other associated variables in its signaling. And, from a distributional perspective, market-based mechanisms do not provide a direct mechanism for channeling greenhouse gas reductions to maximize their co-pollutant benefits.[276] Although other laws more directly address co-pollutants and have achieved significant progress, in some areas they have failed to achieve air quality standards,[277] and a more integrated approach to achieving both greenhouse gas and co-pollutant reductions could prove more successful.[278]

As advocated by the climate justice movement, state decision-makers can choose options that create new opportunities for communities, particularly communities in need.[279] Energy-efficiency and distributed-renewables policies not only reduce carbon but may

---

275 *See, e.g.*, BAY AREA AIR QUALITY MGMT. DIST., SPARE THE AIR, COOL THE CLIMATE: A BLUEPRINT FOR CLEAN AIR AND CLIMATE PROTECTION IN THE BAY AREA 5/3–5/29 (2017), http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en.

276 *See* Alice Kaswan, *Environmental Justice and Domestic Climate Change Policy*, 38 ENVTL. L. REP. 10287, 10302 (2008) [hereinafter Kaswan, *Environmental Justice*]. The inability of market mechanisms to optimize distributional impacts is a central environmental justice concern. *See id.*

277 *See* AM. LUNG ASSOC., STATE OF THE AIR 2017 4 (2017), http://www.lung.org/assets/documents/healthy-air/state-of-the-air/state-of-the-air-2017.pdf (reporting that 38.9% of the U.S. population (125 million people) live in areas that fail to meet air quality standards for ozone and particulate matter).

278 *See infra* notes 417–19 and accompanying text (noting that economists' preference for single-issue approaches might maximize the efficiency of resolving that single issue but fail to provide an optimal solution where a multiplicity of issues are raised by a given industry or practice). The San Francisco Bay Area's integrated greenhouse gas and co-pollutant plan provides an example of integrated planning. *See* BAY AREA AIR QUALITY MGMT. DIST., *supra* note 275.

279 *See* ROBERT POLLIN, JEANNETTE WICKS-LIM & HEIDI GARRETT-PELTIER, GREEN PROSPERITY: HOW CLEAN-ENERGY POLICIES CAN FIGHT POVERTY AND RAISE LIVING STANDARDS IN THE UNITED STATES 5–7 (2009), https://www.nrdc.org/sites/default/files/glo_09062504a.pdf.

provide socioeconomic benefits if coupled with job training programs in communities with high unemployment.[280] As noted above, disadvantaged communities seek not only jobs, but access to the efficiency investments and distributed renewables that can reduce household energy bills and allow all communities to participate in a clean energy transition.[281]

Government entities are also better positioned than private entities to weigh and resolve the inevitable tradeoffs among energy strategies.[282] There is no silver bullet. As noted above, wind energy could hurt birds.[283] Natural gas production increasingly relies upon fracking, which presents a mix of economic opportunities and environmental threats.[284] The variability of renewable sources will require difficult strategic decisions about how to manage intermittency on the path to clean energy. For example, David Spence observes that, should the eastern states forego developing natural gas or nuclear capacity, they could end up using their existing coal-fired resources as back-up power, leading to greater carbon and co-pollutant emissions than would have occurred had they invested in natural gas.[285] He notes that other backup options, like various forms of

---

280 *See id.*

281 *See* JACQUI PATTERSON ET AL., NAACP, JUST ENERGY POLICIES: REDUCING POLLUTION AND CREATING JOBS, (2014), http://www.naacp.org/wp-content/uploads/2014/03/Just-Energy-Policies-Compendium-EXECUTIVE-SUMMARY_NAACP.pdf; Behles, *supra* note 101; Outka, *Fairness*, *supra* note 273, at 812–13; Welton, *supra* note 56 (manuscript at 40–45); *Forum on Climate Change*, *supra* note 273. As discussed below, California has enacted multiple provisions to direct clean energy environmental and economic benefits to disadvantaged communities. *See infra* Section IV.C.

282 *See* Driesen, *supra* note 22 (manuscript at 21–22) (noting that regulations are better suited to addressing policies that require a consideration of risk/risk tradeoffs than price-based mechanisms).

283 NAT'L RESEARCH COUNCIL, *supra* note 84, at 10.

284 *See* Wiseman, *supra* note 87, at 736; *see also* Michael B. Gerrard, *What Does Environmental Justice Mean in an Era of Global Climate Change?*, 19 J. ENVTL. & SUSTAINABILITY L. 278, 301–02 (2013) (describing difficult risk tradeoffs presented by climate change mitigation options).

285 *See* Spence, *Paradoxes*, *supra* note 52, at 471–74. Spence observes that coal is not only more polluting when operating; coal-fired power plants do not ramp up and down efficiently, and so could end up running even when their power is not being used, and then running inefficiently when they must suddenly increase and decrease generation. *See id.* at 462. The risk of coal as a back-up power source

storage or variable nuclear power, are, at present, expensive, creating a tension between pollution control and cost.[286]

From a larger political perspective, some view distributed generation and consumer control as a step toward a power shift from centralized utilities to more local control.[287] As explained above, government policies like net metering, tax credits, financing rules, and smart grid development have played a significant role in promoting such distributed opportunities, and local governments have fostered more localized control over generation sources through community choice aggregation entities.[288]

At the same time, these initiatives have proved politically controversial. A fraught issue at the time of this writing is the degree to which net metering and other policies favoring distributed generation benefit the rich who can afford to install renewables.[289] Will income determine the ability to participate in clean energy,[290] leaving poorer residents and communities to pay for collective grid infrastructure and reliability costs? Or do all consumers benefit from some consumers' distributed generation investments?[291] Developments in the smart grid also raise equity concerns, as policymakers consider pricing and technology policies to control energy use that might be unavailable to and impose higher costs on low-income consumers.[292] Whatever the merits of a shift to distributed resources and

---

is smaller in the west because the western states rely more on natural gas. *Id.* at 464.

286 *See* Spence, *Paradoxes*, *supra* note 52, at 463, 469.

287 *See* TOMAIN, *supra* note 107, at 193–213; WEINRUB & GIANCATARINO, *supra* note 106, at 4.

288 *See supra* notes 236–41 and accompanying text.

289 *See* Welton, *supra* note 97, at 634–35.

290 *See id.*

291 *See* KLASS & WISEMAN, *supra* note 72, at 154; Outka, *Fairness*, *supra* note 273, at 808–13; Troy A. Rule, *Solar Energy, Utilities, and Fairness*, 6 SAN DIEGO J. CLIMATE & ENERGY L. 115, 117–18 (2015); Spence, *Paradoxes*, *supra* note 52, at 476–77 (describing the "Fairness Paradox" inherent in distributed generation); Welton, *supra* note 97, at 594–96 (discussing debate over the impact of net metering on poorer utility customers). As distributed electricity storage technology develops, it becomes increasingly possible that consumers with sufficient means could go off the grid entirely, increasing the potential impact on poorer customers who must continue to rely on, and pay for, the grid. *See id.* at 601–02.

292 *See* Welton, *supra* note 97, at 631–33. To address the risk of income disparities in access to clean energy opportunities, Welton advocates for a "clean

more local control, government institutions could play a central role in addressing access, ensuring reliability, addressing the distribution of costs, and adjusting utilities' changing role.

From a socioeconomic perspective, decarbonization will negatively impact workers and businesses in the fossil fuel industry;[293] workers and businesses in new industries will experience gains.[294] The recently emerging "just transitions" movement has focused on the importance of transitioning workers in the fossil fuel economy to new opportunities in clean energy.[295] While "the market" can manage such transitions to some degree, as unemployed people move to new opportunities on their own, or as government programs respond to market-induced dislocation, a governmental role in anticipating displacements and facilitating the transition could more effectively reduce adverse consequences and maximize benefits.

In addition, to the degree some measures increase energy costs, carefully planned government programs could alleviate impacts on the poor, by, for example, subsidizing energy efficiency retrofits in poor households, to allow poor households to lower energy use and keep energy expenditures constant, notwithstanding increasing prices.[296] To address this need, government decision-makers could

---

electrification" commitment extending opportunities to all, similar to the electrification ambitions of earlier public utility initiatives. *See id.* at 640–42.

[293] *See* Anabella Rosemberg, *Building a Just Transition: The Linkages Between Climate Change and Employment*, 2 INT'L J. LAB. RES. 125, 134–36 (2010); *see also supra* note 93 and accompanying text (noting job losses likely to be associated with an energy transition).

[294] *See* Rosemberg, *supra* note 293, at 134, 137–39; *see also supra* notes 95–96 and accompanying text (noting new employment opportunities associated with an energy transition).

[295] *See generally* David J. Doorey, *Just Transitions Law: Putting Labour Law to Work on Climate Change*, 30 CAN. J. ENVTL. L. & PRACTICE 201 (2017); Gerrard, *supra* note 284, at 302; Rosemberg, *supra* note 293, at 140–48; *see also* McGinley, *supra* note 95, at 401–03 (discussing impact of multiple environmental regulations on the coal industry and coal workers); *Forum on Climate Change*, *supra* note 273 (discussing the principle of creating the opportunity for all Americans to experience a just transition and ensuring that the green economy has enough jobs for those who have been historically been chronically underemployed).

[296] *See* WILLIAMS ET AL., *supra* note 2, at 10, 70; DREHOBL & ROSS, *supra* note 99, at 25–28; *see also Forum on Climate Change*, *supra* note 273 ("[Principle] 8. Provide an economic and social safety net for low-income, people-of-color, Indigenous Peoples and those vulnerable in the middle-income from the structural

opt for a limited market-based mechanism to generate revenue, as California and the eastern states' trading programs have done.[297]

Whatever the merits of these difficult debates, government institutions can play a central role.[298] Rather than leaving many of these determinations to the fortuities of largely private choices, or addressing them only by governmental reactions to private initiatives, government legislative or administrative processes could provide deliberative fora for more systemic debates.[299]

B. *Long-term Planning and Transformation*

Whether at the macro or the micro level, electricity-sector planning, generation investments, transmission development, and distribution systems require extensive preparation and coordination. Setting an emissions cap or carbon tax and then expecting atomized decisions by solo actors—even major actors like utilities—to achieve the target cannot replicate the systematic conceptualization and regulation necessary to re-craft the electricity sector.[300] As Williams and his co-authors state, it is necessary to "[h]ave a plan[;] . . . .

---

adjustments in the economy as we transition from the pollution generating fossil fuel economy to the green, clean and renewable economy."). It should be noted that the same measures could also be enacted if prices increased due to market measures, not just prescriptive measures.

[297] *See, e.g.*, JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41836, THE REGIONAL GREENHOUSE GAS INITIATIVE: LESSONS LEARNED AND ISSUES FOR CONGRESS 12 (2017) (describing allocation of eastern states' trading program revenue for energy efficiency and renewable energy); *see also Disadvantaged Communities*, CAL. CLIMATE INV., http://www.caclimateinvestments.ca.gov/disadvantaged-communities/ (last visited Nov. 10, 2017) (describing use of California cap-and-trade program's auction revenue to help disadvantaged communities).

[298] The Environmental Justice Leadership Forum on Climate Change's "Principles of Climate Justice" emphasize the importance of emission reduction mechanisms "that are controlled by the *public sector*." *See Forum on Climate Change*, *supra* note 273 (emphasis added).

[299] *Cf.* Spence, *Paradoxes*, *supra* note 52, at 481 (responding to those who argue that transitioning to a clean energy transition will be straightforward, Spence argues that "it would be better if policymakers tackled these reliability and cost questions head-on, and chose their favored transition paths with explicit recognition of the potential environmental, cost, and distributional effects of their choices").

[300] *See* WILLIAMS ET AL., *supra* note 2, at 12 ("[d]eferring all responsibility to a carbon market or relying on *ad hoc* decision-making and inconsistent incentives

[d]eep decarbonization will not occur as a byproduct of undirected market activity. Planning is required to coordinate decarbonization measures within and across sectors, regions, and time periods."[301]

1. GOVERNANCE AND LONG-TERM PLANNING AND TRANSFORMATION

To effectively decarbonize, some overarching vision of the end-game is necessary. And to achieve that vision, policymakers and regulators need to carefully assemble the jigsaw puzzle pieces; they will not fall into place on their own. Markets can create incentives and encourage some aspects of the transition, but they cannot replicate the larger-scale vision and coordination government institutions can provide. As noted above, many states have begun this process with climate action plans[302] —plans that may not yet fully grapple with full decarbonization, but which reflect the states' institutional capacity to conceptualize a vision and consider pathways for achieving it.

In addition to macro-level long-term planning, government planning and regulation of many facets of electricity generation and distribution will be necessary. New generation will not emerge if it is not coordinated with transmission investments and if access to transmission is not facilitated through fair rules and careful oversight.[303] Utilities and power companies do not make generation and transmission investments solely on the basis of a price signal; their return on investment is determined by the way regulators have structured

---

will not produce a sustained long-term transition"); Boyd, *supra* note 2, at 1692; Spence, *Naïve Energy Markets*, *supra* note 59, at 1013.

[301] WILLIAMS ET AL., *supra* note 2, at 72; *see also* Dernbach, *supra* note 1, at 10788 (suggesting that policies should focus less on what is currently feasible and, instead, start with the desired result and "backcast" to identify the steps needed to get there).

[302] *See supra* Section II.B.2.b.

[303] *See* KLASS & WISEMAN, *supra* note 72, at 14–15 (observing that the most abundant renewable energy resources are not located near existing populations or existing transmission corridors); *id.* at 74–85 (describing numerous FERC initiatives to encourage long-term planning for adequate transmission and ensure fair access and pricing); *id.* at 176–81 (describing numerous FERC initiatives to increase access to transmission lines and encourage a fair market for energy generation and transmission).

payments in electricity markets and by utilities' rate structures.[304] Commentators recognize that, under current rules, greater penetration of renewables will undermine future investments, requiring regulatory agencies to rethink and restructure electricity markets and rate-making rules.[305]

The variability of renewables also creates new challenges to reliability and a balanced grid that will require government planning and coordination to resolve.[306] Multiple options are possible, including expanded transmission networks with redundant capacity so that sources in one area can cover when others are not producing,[307] mechanisms to reduce consumer demand when needed,[308] new energy storage technologies,[309] or backup fossil fuel power plants.[310] A carbon price alone, operating through electricity markets, cannot resolve these questions.

And interactions among resources and sectors will be critical; for example, water needed for centralized steam-generation power

---

304 *See* Boyd, *supra* note 2, at 1618, 1688 (observing that "[c]urrent auction designs in the wholesale power markets create additional challenges for efforts to drive investments into low-carbon alternatives").

305 According to Boyd, under the existing price structure, adding renewables to the generation mix undermines future investment in renewables or other expensive generation sources. *See* Boyd, *supra* note 2, at 1688–89. The wholesale market price is determined by the marginal cost of energy supplied. *See id.* Because renewables cost little to operate, they are used first, promoting renewables use over other sources. *See id.* But adding more renewables to supply is likely to lower the marginal costs, and the prices generators receive. *See id.* That, in turn, hurts the ability of new generators to obtain a return on their investment and jeopardizes continued financing for renewables. *See id.*; *see also* Spence, *Paradoxes*, *supra* note 52, at 464–67 (explaining "the 'missing money' problem" that increasing renewables will drive down prices, decreasing the ability of generators to raise capital for new investments, and noting that this trend will trigger "the need for more administrative intervention into the market for new supply"); WILLIAMS ET AL., *supra* note 2, at 86.

306 *See* Boyd, *supra* note 2, at 1627, 1700–01; Spence, *Paradoxes*, *supra* note 52, at 468.

307 *See* Spence, *Paradoxes*, *supra* note 52, at 468–69 (observing that large grids would even out risks).

308 *See id.* at 464; Amy L. Stein, *Distributed Reliability*, 87 U. COLO. L. REV. 887, 926–30 (2016) [hereinafter Stein, *Distributed Reliability*].

309 *See* Spence, *Paradoxes*, *supra* note 52, at 462–63; Stein, *Distributed Reliability*, *supra* note 308, at 916–26.

310 Spence, *Paradoxes*, *supra* note 52, at 461–62.

plants, including solar, will require planning that integrates water and energy considerations.[311] Moreover, the demands on the electricity sector are not static. As transportation and buildings move toward electrification to reduce carbon, the demands on the electricity sector will increase substantially,[312] and agencies and entities responsible for electricity must integrate projections based on developments in other sectors.

Nor is the market alone likely to drive necessary and appropriate transmission capacity, due to fragmented control by states and existing rules that limit how transmission developers are paid for their investment in transmission lines.[313] Consumer distributed generation and smart grid investments require planning, coordination, and innovative ratemaking techniques to be properly integrated into the electricity system. As Boyd makes clear, incorporating variable renewable energy and distributed resources effectively and reliably will require more, not less, of the extensive planning and coordination that government institutions can foster.[314]

2. THE LIMITS OF RELYING ON A CARBON PRICE TO GENERATE LONG-TERM PLANNING AND ACHIEVE TRANSFORMATION

But, conceding the importance of planning, could a carbon price prompt existing utility and private stakeholders to engage in the necessary planning? A carbon price would not fall on a blank slate; it could intersect with existing electricity-sector planning exercises. Or, more broadly, could the invisible hand of a market price on carbon push investments into the best paths, without the need for extensive government direction?

a. The Effectiveness of a Carbon Price on Existing Planning Mechanisms

State legislatures, PUCs, and FERC have all required most utilities and RTOs to engage in planning, such as integrated resource plans, long-term procurement plans, and regional transmission

311 *See* KLASS & WISEMAN, *supra* note 72, at 14.
312 *See* WILLIAMS ET AL., *supra* note 2, at 65 fig.34.
313 *See* Spence, *Naïve Energy Markets*, *supra* note 59, at 1020–23.
314 *See* Boyd, *supra* note 2, at 1683.

plans,[315] but will these processes suffice to achieve decarbonization? To be sure, a carbon price could play a helpful role in steering planning entities toward low-carbon choices. However, at least as currently operating, even a robust carbon price is unlikely to lead to adequate planning for decarbonization.[316] IRP planning processes differ considerably in the range and specificity of issues utilities must consider, and will not necessarily lead to plans capable of achieving decarbonization.[317] Although utilities could, in theory, incorporate current and projected future increases in carbon prices in their future planning, those prices are likely to be shrouded in uncertainty.[318] And the planning horizons, particularly the ten-year horizons associated with long-term procurement plans, may be too short.[319] One study suggests that IRPs have a poor record in incorporating potential future environmental controls and their impacts.[320] Unless and until states or the federal government impose more concrete goals and specifications, an uncertain price, on its own, is unlikely to push utility and RTO planning to the extent necessary to plan for decarbonization[321] and is unlikely to induce the larger systemic planning that decarbonization will require.

---

315 *See supra* note 213 and accompanying text (IRP planning), note 215 and accompanying text (long-term procurement planning); and notes 245–47 and accompanying text (describing state and FERC transmission planning requirements).

316 One commentator notes that current integrated resource planning is insufficient to achieve long-term sustainability, in part due to the lack of a clear sustainability goal. *See* Pamela Lesh, *Planning for the Future*, 22 ELECTRICITY J. 45, 48 (2009). Lesh states: "[I]t becomes fair and necessary to ask how [the planning processes we are using] best can serve us going forward into the next decades." *Id.* Her answer, with current IRP processes, is a resounding no. *See generally id.*

317 *See* WILSON & BIEWALD, *supra* note 213, at 4–5, 7 (describing variety of considerations states require in IRPs).

318 *See id.* at 31.

319 *See id.* at 30.

320 *See id.* (noting that "few utilities" incorporate potential future environmental regulations and their impacts into their IRPs "in a comprehensive manner").

321 An example from an existing local trading program is illustrative. Designers of a market-based program to control criteria pollutants in Los Angeles had expected that the program's steadily tightening cap would prompt utilities to engage in long-term compliance planning and adopt needed pollution-control technologies. *See* McAllister, *supra* note 142, at 292–97 (describing regulators' expectations of industry planning and pollution control, expectations that were frustrated by low allowance prices, inadequate information, and a lack of interest in

b. Can the Market's Invisible Hand Substitute for Planning?

More broadly, we confront the question of whether a carbon price alone would trigger investments that could lead to decarbonization. On a practical level, as market advocates would agree, a carbon price would have to be accompanied by extensive planning to coordinate generation, transmission, and distribution, and, given the existing role of government in rate-making and other features of electricity operation, government institutions would have to manage the economic and reliability implications of investments. But can we at least rely upon a carbon price to trigger the fundamental and underlying energy choices, like whether to invest in natural gas and its infrastructure, in wind, or in other sources?

Even assuming a robust carbon price, the price uncertainty in a cap-and-trade program could impede large-scale decarbonizing investments, since cap-and-trade programs specify only the emissions cap, not the cost of allowances.[322] Allowance prices are likely to be affected by not only the cap's stringency and the availability of low-cost abatement options, but by a multiplicity of uncertain factors like economic growth, population, and weather patterns, all of which significantly affect electricity demand and, for renewable resources, electricity supply. In addition, for power companies selling into wholesale markets, the likelihood of selling power depends upon the array of other sources bidding into the system over time, leading to

---

or ability to engage in long-term planning and investments). However, utilities and other participating companies purchased inexpensive allowances instead of adopting pollution controls. *Id.* at 293–94. And regulators had to affirmatively require control measures and review long-term compliance plans in order to achieve long-term emission reduction goals. *Id.* at 309–10.

[322] *See* WILLIAMS ET AL., *supra* note 2, at 81 (noting that "[c]arbon prices are an unstable price signal for attracting large-scale, long-term capital investment, which is essential to deep decarbonization"); *See* Spence, *Naïve Energy Markets*, *supra* note 59, at 1008–11 (describing how uncertainty regarding costs can chill generation investments). Cap-and-trade programs can establish both carbon price floors and ceilings to contain price uncertainty. *See* HARRISON FELL ET AL., SOFT AND HARD PRICE COLLARS IN A CAP-AND-TRADE SYSTEM 1 (2010). However, such floors and ceilings are likely to span a significant range of potential prices. *See id.* at 1–3. In contrast, carbon taxes provide greater price certainty. But, even under a carbon tax, the electricity sector faces the risk that a given tax will be changed in the future to better meet carbon reduction goals. For example, if a given tax level is failing to reduce emissions sufficiently, a jurisdiction could increase the tax to encourage additional reductions.

endemic uncertainty about the ability to obtain a return on investment and increasing the cost of financing.[323] And although carbon taxes provide greater price certainty in theory, regulated entities face the possibility that, if a tax-setting entity finds the tax insufficient to goad needed change, the tax rate could be revised.

Moreover, carbon prices may not be fully effective in guiding energy investment decisions and behavior because of the wide range of factors that affect investment decisions, including but not limited to a carbon price.[324] In traditional, vertically-integrated states, the ability to pass costs along to consumers could render utilities in these states less sensitive to carbon price signals.[325] In competitive contexts, power companies are unlikely to incorporate potential long-term prices as they respond to more immediate shareholder pressures.[326] And recent analysis suggests that, absent governmental support and direction, private sector innovation tends to build incrementally upon itself rather than risking the more transformative steps necessary to achieve decarbonization.[327]

All this assumes a sufficient carbon price. But what is the likelihood of achieving the price levels considered necessary to induce transformative change in the electricity sector? An international economic analysis of the carbon prices required to achieve the objectives of the Paris Agreement on Climate Change suggests that, worldwide, a price of at least $40 to $80 per ton of carbon dioxide is necessary by 2020, and $50 to $100 per ton of carbon dioxide is necessary by 2030.[328] Given the immediate political and economic

---

323 *See* WILLIAMS ET AL., *supra* note 2, at 81.

324 *See supra* notes 78–82 and accompanying text (describing a variety of factors affecting investment decisions); WILLIAMS ET AL., *supra* note 2, at 81 (observing that "[p]rice signals are very imperfectly refracted through fragmented energy markets, many segments of which are highly inelastic with regard to price").

325 *See* DALLAS BURTRAW ET AL., GREENHOUSE GAS REGULATION UNDER THE CLEAN AIR ACT: A GUIDE FOR ECONOMISTS 13 (2011) (noting that utilities' ability to pass costs through to consumers could render them less sensitive to price signals).

326 *See* TOMAIN, *supra* note 107, at 105.

327 *See generally* Liscow & Karpilow, *supra* note 135.

328 CARBON PRICING LEADERSHIP COAL., REPORT OF THE HIGH-LEVEL COMMISSION ON CARBON PRICES 5 (2017), https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/5949402936e5d3af64b94bab/1497972781902/ENGLISH+EX+SUM+CarbonPricing.pdf.

consequences of a high carbon price, analysts are skeptical that policymakers would establish market mechanisms that generate carbon prices high enough to induce needed change.[329] Utilities and power companies are well-organized and likely to be influential in political and administrative settings,[330] and policymakers could fear consumer backlash if they impose a hefty price on carbon. Without a sufficient carbon price, power companies and utilities will be tempted to purchase inexpensive allowances or make only modest, but not transformative, investments, slowing if not blocking the path to decarbonization.[331]

Recently proposed and operating carbon pricing programs provide a case in point. Although the Clean Power Plan is currently in limbo, analysts assessing its projected impact concluded that, if states chose to fulfill the requirements through cap-and-trade programs, actual emissions would be less than the interim caps in the

---

They note that existing carbon pricing programs in North America and Europe feature carbon prices below $10/ton of carbon dioxide, far short of the necessary levels. *Id.* at 6. The authors emphasize the need to not only have a strong current price signal, but "a credible commitment to maintain prices high enough in the future to deliver the required changes." *Id.* at 4.

[329] *See* Burtraw & Palmer, *supra* note 144, at 194–96; Christoph Bertram et al., *Complementing Carbon Prices with Technology to Keep Climate Targets Within Reach*, 5 NATURE CLIMATE CHANGE 235, 235 (2015); Denniss et al., *supra* note 161, at 33; Görlach, *supra* note 161, at 738, 742–43 (describing political impediments to setting sufficiently high price); Jenkins, *supra* note 144, 469–72 (describing multiple "political economy" constraints, on both the energy producer and consumer sides, that reduce the likelihood that policymakers will develop climate policies that establish an adequate carbon price); Mormann, *supra* note 211, at 1624; Driesen, *supra* note 22 (manuscript at 38–40); *see also* Mark Jaccard, *Want an Effective Climate Policy? Heed the Evidence*, POL'Y OPTIONS (Feb. 2, 2016) http://policyoptions.irpp.org/magazines/february-2016/want-an-effective-climatepolicy-heed-the-evidence/ (describing Canadian governments' unwillingness to impose a carbon tax high enough to motivate needed change).

[330] *See* Jonas Meckling et al., *Winning Coalitions for Climate Policy*, 349 SCIENCE 1170, 1170 (2015).

[331] *See* WILLIAMS ET AL., *supra* note 2, at 14 (stating that "[c]arbon prices have a role to play in the policy toolkit, but by themselves are unlikely to provide a sufficiently stable or large signal to drive the long-term investments required for deep decarbonization"); Richard Toshiyuki Drury et al., *Pollution Trading and Environmental Injustice: Los Angeles' Failed Experiment in Air Quality Policy*, 9 DUKE ENVTL. L. & POL'Y F. 231, 276–78 (1999) (suggesting that, under cap-and-trade programs, companies avoid innovation by purchasing credits).

early years of the program,[332] and by its end-date, 2030, allowance prices would range from low to negligible.[333] That outcome is not surprising given the CPP's modest objectives.[334]

And so far, all of the existing carbon trading programs have had low allowance prices and modest price-induced innovation.[335] The European Union's Emissions Trading System (ETS) has featured low to negligible allowance prices,[336] and the European Union is still struggling to improve the ETS' effectiveness. In the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade program covering the electricity sector in several northeastern and mid-Atlantic states, actual emissions have often been below the emissions cap[337] and the "reserve price" to maintain a price despite weak demand has generated only a very low price signal of around $2 per ton.[338] Although electricity generation during the RGGI program shifted significantly from coal and toward natural gas, it is not clear whether

---

332 Jennifer Macedonia et al., *Modeling the Evolving Power Sector and Impacts of the Final Clean Power Plan*, BIPARTISAN POL'Y CTR. (June 2016), http://cdn.bipartisanpolicy.org/wp-content/uploads/2016/06/BPC-Energy-Clean-Power-Plan-Modeling.pdf.

333 *See id.* at 33–34. Prices are lowest in the Eastern Interconnect and in Texas, representing a substantial majority of the nation's emissions. *See id.*

334 Low allowance prices are unsurprising because, in developing the Clean Power Plan, EPA did not incorporate many of the available and achievable reductions it had identified in developing its performance standards. *See* ALICE KASWAN & KIRSTEN ENGEL, CTR. FOR PROGRESSIVE REFORM, UNTAPPED POTENTIAL: THE CARBON REDUCTIONS LEFT OUT OF EPA'S CLEAN POWER PLAN 4–10 (2016), http://progressivereform.org/articles/Untapped_Potential_CPP_1607.pdf.

335 *See* Driesen, *supra* note 22 (manuscript at 38).

336 Boyd, *supra* note 2, at 1691–92. The ETS emissions targets in the early years were higher than existing emissions, a consequence of inaccurate target-setting and economic recession. *See* Lesley K. McAllister, *The Overallocation Problem in Cap-and-Trade: Moving Toward Stringency*, 34 COLUM. J. ENVTL. L. 395, 411–12 (2009) (describing overallocation in EU ETS' early years); Kaswan, *Industrial Pollution*, *supra* note 273, at 102–03 (describing overly lax caps in the EU ETS and RGGS trading programs).

337 *See* JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41836, THE REGIONAL GREENHOUSE GAS INITIATIVE: LESSONS LEARNED AND ISSUES FOR CONGRESS 8–9 (2017) (describing and depicting relationship between the emissions cap and actual emissions). Although the cap has been adjusted, prices remain low. *Id.*

338 *See* RAMSEUR, *supra* note 337, at 11 (describing reserve price of approximately $2 per ton).

the low carbon price played a significant role in that shift.[339] Carbon prices in California's carbon trading program, in allowance auctions and on the secondary market, have been at or close to the state's price floor in the low teens, even after a recent extension of the program.[340] The ETS, RGGI, and California have all taken legislative and administrative steps to tighten emissions caps,[341] but allowance prices in all three jurisdictions remain low.[342] It is unclear whether

---

339 Tyler Hodge, *Natural Gas Expected to Surpass Coal in Mix of Fuel Used for U.S. Power Generation in 2016*, U.S. ENERGY INFO. ADMIN.: TODAY ENERGY (Mar. 16, 2016), https://www.eia.gov/todayinenergy/detail.php?id=25392. RGGI states' reliance on coal-fired power decreased from 33% in 2005 to 7% in 2016. *See* RAMSEUR, *supra* note 337, at 6. To replace coal-fired power, RGGI states turned primarily to natural gas, which increased from 25% in 2005 to 43% in 2016. *See id.* at 7 fig.3 (showing relative shifts in energy sources from 2005 to 2016). However, the degree to which that shift is attributable to the allowance prices is unclear. Some argue that the RGGI program's low allowance price played an important role in utilities' shifts away from coal-fired power and overall emission reductions. *See id.* at 7 (citing studies analyzing RGGI's role in electricity generation shifts). However, other forces, including economic recession, decreasing natural gas prices, and increased regulatory costs for coal-fired power likely played an important role. *See id.* The same shift away from coal might well have occurred without the RGGI program's low allowance prices.

340 *See* Busch, *Carbon Prices Rise*, *supra* note 159. In May 2017, current allowances sold for $13.80 per allowance. *California Cap-and-Trade Program, Summary of Joint Action Settlement Prices and Results*, CAL. AIR RES. BOARD, https://www.arb.ca.gov/cc/capandtrade/auction/results_summary.pdf (last updated Nov. 2017).

341 *See* RAMSEUR, *supra* note 337, at 8 (describing RGGI's revised and tightened emissions cap commencing in 2014). The EU is working on its latest efforts to tighten the emissions gap and increase allowance prices. *See* Daniel Boffey, *Reform of EU Carbon Trading Scheme Agreed*, GUARDIAN (Feb. 28, 2017, 3:08 PM), https://www.theguardian.com/environment/2017/feb/28/reform-of-eu-carbon-trading-scheme-agreed. California has established a more demanding long-term emissions target (40% below 1990 emissions). *See* Jennifer Medina & Matt Richtel, *California's Emissions Goal Is a 'Milestone' on Climate Efforts*, N.Y. TIMES (Aug. 25, 2016), https://www.nytimes.com/2016/08/26/us/californias-emissions-goal-is-a-milestone-on-climate-efforts.html (describing 2016 legislation). A year later, the state explicitly extended its cap-and-trade program to 2030. *See* Chris Megerian, *Gov. Jerry Brown Signs Law to Extend Cap and Trade, Securing the Future of California's Key Climate Program*, L.A. TIMES (July 25, 2017, 3:00 PM), http://www.latimes.com/politics/la-pol-ca-jerry-brown-climate-change-law-20170725-story.html.

342 Notwithstanding a significantly tighter emissions cap, in spring 2017, RGGI allowance prices dropped to $3, just above the reserve price of around $2

these or other jurisdictions will have the political will to increase carbon prices to a level that would induce the innovation necessary to achieve decarbonization.[343]

In sum, although, as discussed below, carbon prices could play a helpful role in inducing planning and investments, they cannot provide sufficient planning, and the invisible hand of the market is unlikely to be strong or coordinated enough to achieve the level of decarbonization that is necessary.[344] While there is no guarantee that government institutions developing climate and decarbonization plans will be immune to the political forces that have dampened carbon prices, they can establish clearer goals and roadmaps than can be accomplished through the vagaries of price signals.

C. *Governance and Overcoming Utility Resistance*

If state governments take a hands-off approach to energy source choices and rely largely on a carbon price, utilities and existing power companies are likely to be the primary players. But that control could impede some desirable energy transition paths that are unlikely to be initiated willingly by utilities, and so require a government push. For example, in some jurisdictions, utilities have little incentive to adopt energy efficiency programs because they reduce revenue from electricity sales and face regulatory hurdles that make

---

per allowance. *See* O. Nilay Manzagol, *Regional Greenhouse Gas Initiative Auction Prices are the Lowest Since 2014*, U.S. ENERGY INFO. ADMIN. (May 31, 2017), https://www.eia.gov/todayinenergy/detail.php?id=31432. Although Chris Busch sees the market improving over previous levels (when many allowances remained unsold and those that were sold were sold at the reserve price), the recent allowance price of $13.80 per allowance was only 23 cents over the price floor. Busch, *Carbon Prices Rise*, *supra* note 159.

343 *See generally* Burtraw & Palmer, *supra* note 144, at 194–96 (expressing skepticism that policymakers will set carbon prices high enough to induce needed change); Görlach, *supra* note 161, at 743 (same). British Columbia, which adopted a modest carbon tax in 2008, decided against increasing the tax beyond its initial levels. *See* Jaccard, *supra* note 329.

344 *See* Boyd, *supra* note 2, at 1618 (stating that "markets alone will have difficulty providing" the planning and financing needed to build low-carbon generation and "modernize the electric power grid," and observing that coordinating renewable and distributed generation sources "will require a degree of administration and oversight that exceeds current systems operation capabilities").

implementation challenging and uncertain.[345] And some utilities have perceived increasing distributed generation as a threat to their viability and may be unwilling to facilitate integration of distributed resources into the grids they manage.[346] In contrast, affirmative governance could better coordinate the range of appropriate initiatives and facilitate transitions in utility regulation that accommodate and rationalize these new opportunities.

D. *Governance and Democratic Virtues*

The private sector undoubtedly values the autonomy of market-based measures, which give them the freedom to make investment and emissions choices so long as they present sufficient allowances or pay a required tax. But that advantage to industry is a disadvantage for public engagement and democratic accountability.[347]

---

345 *See* Inara Scott, *"Dancing Backward in High Heels": Examining and Addressing the Disparate Regulatory Treatment of Energy Efficiency and Renewable Resources*, 43 ENVTL. L. 255, 276–78 (2013) (explaining industry reluctance to embrace energy efficiency given difficulties in recovering costs, measuring demand reductions, and meeting regulatory requirements to demonstrate cost-effectiveness); Michael P. Vandenbergh & Jim Rossi, *Good for You, Bad for Us: The Financial Disincentive for Net Demand Reduction*, 65 VAND. L. REV. 1527, 1545–48 (2012) (describing utility disincentives to promote energy efficiency); Dick Munson, *As Utilities Embrace Change, FirstEnergy's Strategy Is Resistance and Protectionism*, GREENTECH MEDIA (Aug. 21, 2015), https://www.greentechmedia.com/articles/read/as-utilities-embrace-change-firstenergys-strategy-is-resistance-and-protect.

346 *See, e.g.*, Boyd, *supra* note 2, at 1677–79 (describing utilities' perception of distributed generation as a threat and their efforts to limit distributed generation); Rule, *supra* note 291, at 117–26 (same). Utilities are not only unlikely to facilitate energy efficiency and renewables, they are attempting to erect barriers to distributed generation in a number of states. *See id.* at 118–19; Welton, *supra* note 56 (manuscript at 26–28) (observing that utilities are likely to resist consumer-generated power); Welton, *supra* note 97, at 592–95 (describing utilities' challenges to net metering programs around the country). While some of these efforts may reflect legitimate concerns about energy reliability and the utilities' ability to maintain necessary infrastructure, some of these initiatives could also reflect the desire to suppress competition.

347 Environmental justice advocates have gone so far as to state that: "Trading is undemocratic, secretive, and excludes the public from decision-making about whether and how to address greenhouse gas emissions." *The Cap-and-Trade Charade for Climate Change*, EJ MATTERS, www.ejmatters.org/docs/Reasons.pdf (last visited Mar. 24, 2017); *see also The California Environmental Justice Movement's Declaration in Support of Carbon Pricing Reform in California*, CAL. AIR

Although government decisions about emissions caps and the overarching structure of market-based mechanisms present participatory opportunities, market-based mechanisms offer limited opportunities for participation in choices about specific energy sources. The development of climate action plans, decisions about RPSs, energy efficiency goals, and implementation measures all generate opportunities for public participation and create at least some measure of public accountability. From a governance perspective, that public role—whether by legislators, government officials, or the public itself in public hearings—is a central advantage of planning and regulatory approaches.[348]

To be sure, even under a market-based approach, many utility and private energy generation siting decisions are subject to governmental approvals that are likely to include opportunities for public

RES. BOARD (Feb. 15, 2017), https://www.arb.ca.gov/cc/ejac/meetings/02142017/20170215ca-ej-declaration-on-carbon-pricing-reform-approved.pdf (stating that "carbon trading is undemocratic because it allows entrenched polluters, market designers, and commodity traders to determine whether and where to reduce greenhouse gases and co-pollutant emissions without allowing impacted communities or governments to participate in those decisions"). To the extent that greenhouse gas trading or taxes could allow some plants to increase pollution, the planned increases could potentially trigger standard permitting processes, processes that would include some measure of public participation. However, increases due to additional hours of operation (like more frequent use of existing natural gas plants) do not usually trigger permitting requirements, which are based on the rate of emissions, not absolute emissions. Moreover, the critical question is often about where reductions, and associated pollution benefits, will occur, not simply where increases occur. Decisions to maintain rather than reduce emissions would not trigger permitting processes and associated public engagement. *See generally* Kaswan, *Environmental Justice*, *supra* note 276, at 10299–303 (discussing intersection between co-pollutant regulation and carbon trading programs, the distribution of benefits, and participation).

[348] *See Forum on Climate Change*, *supra* note 273 ("[Principle] 10: Ensure that people-of-color, Indigenous Peoples and low-income communities . . . have the inalienable right to have our voices shape what is the most significant policy debate of the 21st Century"); Görlach, *supra* note 161, at 736 (noting that "transparency, public acceptance, and stakeholder participation" are important attributes to consider in choice of policy instruments); Kaswan, *Environmental Justice*, *supra* note 276, at 10302–03 (describing cap-and-trade programs' participatory justice limits).

comment.[349] However, if a state's dominant approach is to evaluate the decisions that power companies and utilities have already made in response to carbon prices, then the PUC, and public participants in the PUC's approval process, will be much more passive than they would be if they had a more robust role in determining the state's energy future.

Public engagement in governmental energy planning and decision-making could take multiple forms that vary significantly in the degree of public participation and accountability. Where a state legislature enacts a renewable portfolio standard, representative democracy is at work. Although the public is not directly engaged, lawmakers have some degree of accountability to their electorate.[350] When state PUCs or energy commissions make decisions or issue rulings, then agency officials are accountable to the state's elected officials, offering at least a tenuous degree of public accountability. With some variations, state requirements for utility integrated resource planning or long-term procurement plans often include opportunities for public participation during the utility planning process and again during the PUC review process.[351] FERC requires RTOs to engage in planning exercises that include multiple stakeholders, including utilities, state officials, and other interested parties.[352] Although such highly technical proceedings are not for the

---

349 For example, new generators must obtain relevant land use and environmental permits. *See generally* Nancy Perkins Spyke, *Public Participation in Environmental Decisionmaking at the New Millennium: Structuring New Spheres of Public Influence*, 26 B.C. ENVTL. AFF. L. REV. 263, 276–83, 286 (discussing environmental review and permitting programs incorporating public participation). In addition, utilities must obtain approval from PUCs for generation investments, rates, and other matters, some of which create at least some opportunity for public participation. *See* Welton, *supra* note 56 (manuscript 38–48) (discussing "access to process" in electricity sector decision-making).

350 In California, environmental justice organizations have worked closely with legislative allies to influence the shape of the state's greenhouse gas policies. *See, e.g.*, Alice Kaswan, *Climate Change and Environmental Justice: Lessons from the California Lawsuits*, 5 SAN DIEGO J. CLIMATE & ENERGY L. 1, 3–4 (2014) [hereinafter Kaswan, *California Lawsuits*]; Julie Sze et al., *Best in Show? Climate and Environmental Justice Policy in California*, 2 ENVTL. JUST. 179, 179–81 (2009).

351 *See* WILSON & BIEWALD, *supra* note 213, at 26–27.

352 *See* Michael H. Dworkin & Rachel Aslin Goldwasser, *Ensuring Consideration of the Public Interest in the Governance and Accountability of Regional*

faint of heart, and public engagement is primarily channeled through interest groups,[353] citizens nonetheless have the opportunity to channel their views. At the other extreme, recent efforts to establish local control over decentralized energy resources maximize citizen control.[354]

The nature and quality of public participation and public accountability differs markedly in each of these settings, and assessing the value and drawbacks to participation in each is an important area for further research.[355] For the purposes of this Article, however, the central argument is that, compared with market mechanisms' privatized decision-making, these various governmental fora all offer greater opportunities to experience the virtues of democratic governance: public participation, public accountability, and deliberation.

E. *Governance and Political Viability*

To some degree, the political viability of the decarbonization objective itself remains highly uncertain, whether we pursue market-based mechanisms or more direct planning and prescriptive measures. Nonetheless, it is worth considering the relative political viability of market versus prescriptive measures.

Cap-and-trade programs have been assumed to present the political sweet spot to date, providing environmentalists with an emissions cap and industry with a cost-effective approach and malleable design features.[356] More recently, at the federal level, limited bipartisan support for a carbon tax is emerging.[357] In addition to their assumed cost-effectiveness attributes, cap-and-trade and tax programs

---

Transmission Organizations, 28 ENERGY L.J. 543, 568–70 (2007) (describing stakeholder participation in RTO decision-making).

353 *See* Welton, *supra* note 56 (manuscript at 46–47).

354 *See id.* (manuscript at 34–45) (noting citizen-control element of the energy democracy movement); Tomain, *supra* note 57, at 1134–45.

355 *See, e.g.*, Dworkin & Goldwasser, *supra* note 352, at 583–86 (describing concerns about public representation in RTO decision-making).

356 *See* J.R. DeShazo & Jody Freeman, *Timing and Form of Federal Regulation: The Case of Climate Change*, 155 U. PA. L. REV. 1499, 1550–55 (2007).

357 *See* Arianna Skibell, *Will Graham Support for Carbon Tax Spur Senate Action?*, GREENWIRE (Sept. 20, 2017), https://www.eenews.net/greenwire/2017/09/20/stories/1060061227.

provide a sense of neutrality; they do not single out particular industries for phase-out or appear to pick favorites. The "carbon price" provides a neutral government signal and carbon content, not politics, will determine the policy's impact. However, except for a few states' ambitious targets, existing caps and proposed caps have been light, and Congress' one serious effort to enact a federal cap-and-trade program ultimately failed.[358] As noted above, policy analysts remain pessimistic that carbon prices will be set at levels that will achieve decarbonization.[359]

This is not to say that most governance approaches to date have embraced decarbonization, although a few states have set relatively ambitious renewable portfolio standards.[360] But, as we consider future decarbonization policy options, prescriptive measures could have certain political advantages. Market-based controls start with a price tag; power companies, utilities, and consumers all perceive the "cost" of carbon.[361] A low carbon price might pose relatively little threat, but attempts to impose a high cost would send a jarring and politically toxic message that is likely to spark strong resistance, particularly from well-organized vested interests.[362] And, because market-based measures provide implementation flexibility, the proposed carbon price would not be accompanied by an explicit vision of a low-carbon future or specify identifiable benefits, other than general promises that the air will be cleaner and climate change consequences lessened.[363] This political challenge is likely to plague efforts to impose a sufficient carbon price.

In contrast, planning and developing prescriptive measures to achieve a clean energy transition allows policymakers and stakeholders to develop and conceptualize a vision for the future.[364] Conceptualizing pathways to a clean energy future would allow people

---

358 *See* John C. Dernbach & Robert Altenburg, *Evolution of U.S. Climate Policy*, *in* GLOBAL CLIMATE CHANGE AND U.S. LAW 83, 103–05 (Michael B. Gerrard & Jody Freeman eds., 2d ed. 2014).

359 *See supra* note 331 and accompanying text.

360 *See supra* note 220 and accompanying text (discussing RPSs); Medina & Richtel, *supra* note 341.

361 *See* WILLIAMS ET AL., *supra* note 2, at 81.

362 *See* Roberts, *supra* note 75.

363 *See id.*

364 *See id.*

to connect climate policy to tangible quality of life issues, like employment opportunities, improved air quality, more efficient buildings and transportation, and the like.[365] Although a clean energy vision could be threatening to the industries that appear destined to fade and their workers, other constituencies, including the public at large and fledgling energy companies already beginning a clean energy transition, could galvanize political support for a deep transition.[366]

F. *Acknowledging Governance Deficits*

None of this is to say that governments necessarily get things right. Government institutions have deliberative capacities and the ability to engage in comprehensive and public-serving policies, but that does not guarantee results that serve the public interest. In fact, some market advocates might suggest that market measures to control carbon emissions would have more, not less, success in serving long-term public welfare because leaving decisions to the market would avoid inevitably distorted public decision-making.[367] This view was reflected in the movement to deregulate the electricity sector, a movement that stemmed from a fundamental distrust of government agencies and the belief that free markets would better serve the public interest than "captured" agencies serving the industries they were assigned to regulate.[368]

Both legislative and agency processes risk control by vested interests.[369] Utilities and fossil fuel companies already have considerable political influence and are likely to attempt to perpetuate their

---

365 *See* Meckling et al., *supra* note 330, at 1171.

366 Meckling and colleagues stress the critical role that green industries could play in mobilizing political support for a clean energy transition. *See* Meckling et al., *supra* note 330, at 1171; *see also* Roberts, *supra* note 75 (describing the need to develop coalitions of climate-friendly interests and the greater success this strategy would have over pure carbon pricing mechanisms).

367 *See* Black & Pierce, *supra* note 110, at 1341–42.

368 *See generally id.* at 1341. Boyd cogently describes the ideological underpinnings that prompted deregulation in a wide array of economic sectors, including the electricity sector. *See* Boyd, *supra* note 2, at 1651–58.

369 *See* David E. Adelman & David B. Spence, *Ideology vs. Interest Group Politics in U.S. Energy Policy*, 95 N.C. L. REV. 339, 403–04 (2017).

control over energy resources.[370] As noted above, certain measures, like energy efficiency and distributed generation, pose a particularly direct threat to utility control and are thus especially likely to be resisted by powerful utilities.[371]

Whether already vested interests or not, public legislatures and agencies will face pressure from "rent-seeking" industries, from old-school fossil fuel companies and utilities, to new-school biomass,[372] solar, or wind energy companies.[373] These industry pressures could have an outsized degree of influence relative to the more diffuse public interest in sustainable and affordable energy.[374] Although public interest groups seek to channel the wider public interest in particular outcomes, they do not always have the same resources or clout as directly affected industries.[375]

Furthermore, although recent public opinion suggests increasing public support for transitioning to clean energy,[376] the transition will cause disruptions to some regions and industries, and public support is likely to vary in relation to the benefits and costs of transition in

---

370 *See* Boyd, *supra* note 2, at 1624 (noting a "constellation of deeply entrenched political and economic interests, makes the system very resistant to change"); Adelman & Spence, *supra* note 369, at 403–04 (describing potential resistance to clean energy due to pressures from coal-associated interest groups).

371 *See supra* notes 345–46 and accompanying text.

372 For example, federal renewable fuel requirements are hotly contested, with some alleging that Midwestern corn growers' political pressures, rather than clean air objectives, explain current ethanol requirements. *See* Robert W. Hahn, *Ethanol: Law, Economics, and Politics*, 19 STAN. L. & POL'Y REV. 434, 461–63 (2008) (describing the role of the corn lobby and ethanol producers in successfully promoting ethanol requirements).

373 *Cf.* Eric Biber, *Cultivating a Green Political Landscape: Lessons for Climate Change Policy from the Defeat of California's Proposition 23*, 66 VAND. L. REV. 399, 420–25 (2013) (observing that well-established renewable energy and energy efficiency programs created business support for retaining California's climate program).

374 *See* Adelman & Spence, *supra* note 369, at 403–04.

375 *See* Welton, *supra* note 56 (manuscript at 52–56).

376 *See* Cary Funk & Brian Kennedy, *2. Public Opinion on Renewables and Other Energy Sources*, PEW RES. CTR. (Oct. 4, 2016), http://www.pewinternet.org/2016/10/04/public-opinion-on-renewables-and-other-energy-sources/ (stating that 89% that surveyed favor more solar power and 83% favor more wind power).

particular regions and to particular groups.[377] Uncertainty about the location and scale of climate consequences render the benefits of climate change policies speculative and remote, in comparison with the more direct and immediate consequences of climate mitigation strategies, like loss of jobs in the fossil fuel sector.[378] Moreover, current citizens will inevitably reflect their own interests, not those of the future generations who will be most heavily impacted by climate change.[379]

Notwithstanding the messiness and potential risks associated with the political process, however, engaging governance institutions is preferable to relying solely on the individual decisions of private energy sector players responding to price signals. As Spence states, determining the public interest will always be "hotly contested."[380] He adds, though, that "that does not negate the worthiness of pursuing that goal."[381]

Given the risk of outsized influence by industry interest groups, public engagement is essential. Campaigns to increase public awareness could help build widespread support for transformative action. And greater engagement in decision-making institutions, whether legislative or administrative, will decrease the likelihood of capture and reduce the influence of vested interests.[382] Public engagement

---

377 *See* Welton, *supra* note 56 (manuscript at 20) (considering the lack of public consensus on climate change, "it is not clear that democratization of the [energy] field will lead to greater action" on climate change).

378 *See* Nadja Popovich et al., *How Americans Think About Climate Change, in Six Maps*, N.Y. TIMES (Mar. 21, 2017), https://www.nytimes.com/interactive/2017/03/21/climate/how-americans-think-about-climate-change-in-six-maps.html (observing that climate change is the type of long-term threat with remote and speculative consequences, for which it is difficult to generate political action).

379 *Cf.* Dale W. Jamieson & Marcello Di Paola, *Political Theory for the Anthropocene, in* GLOBAL POLITICAL THEORY 254 (David Held & Pietro Maffetone eds., 2016) (observing, among many democratic challenges, that the need to protect future generations from climate change challenges the theory that democratic institutions should serve their constituents).

380 *See* Spence, *Naïve Markets*, *supra* note 59, at 1028.

381 *See id.*

382 *Cf.* James Gray Pope, *Republican Moments: The Role of Direct Popular Power in the American Constitutional Order*, 139 U. PA. L. REV. 287, 290–93 (1990) (arguing that U.S. history reveals periods in which popular protest has successfully overcome control by vested interest groups).

through political organizing, interest group pressure, and direct citizen engagement will help hold governmental decision-makers accountable to the public.[383]

In addition, notwithstanding the risk of rent-seeking, emerging clean energy industries could play a constructive role in mobilizing political will for decarbonization.[384] Prescriptive policies, like renewable portfolio standards, will benefit the clean energy sector in ways that could be clearer and more direct than abstract carbon pricing policies.[385] As such, the clean energy companies who stand to benefit from such policies could help build political will for decarbonization and provide a counter-weight to the power of vested fossil fuel interests.[386]

---

383 Frequent calls for energy "democracy" are valuable, but do not necessarily reflect this form of public engagement. As Welton has observed, the term energy democracy has embraced "pro-sumers" installing their own distributed energy or energy efficiency resources or choosing their own energy supply. *See* Welton, *supra* note 56 (manuscript at 24–34) (describing consumer choice version of "energy democracy"). *See generally* Sharon B. Jacobs, *The Energy Prosumer*, 43 ECOLOGY L.Q. 519, 523–25 (2016); *see also* Tomain, *supra* note 57, at 1138–39 (describing consumer control). The term energy democracy has also been used to describe localized efforts by municipalities to shift supply to renewables and adopt green building codes. *See* Welton, *supra* note 56 (manuscript at 34–45) (describing local control variant of energy democracy claims); Tomain, *supra* note 57, at 1140–45 (describing benefits of local control over local energy). These citizen efforts are important and will contribute to a clean energy transition. But individual and localized action will not be sufficient; state and federal decision-makers will—and should—continue to develop policies that will have broad impacts on the electricity system. As Welton observes, individual and local action does not substitute for steady public engagement in the institutions that will have the largest impact on the overall structure of the U.S. electricity system. *See* Welton, *supra* note 56 (manuscript at 57–65) (suggesting that "consumer control" and "local control" variants of energy democracy will be insufficient to achieve a clean energy transition, and that participation in large-scale state and federal policymaking will also be necessary).

384 *See* Meckling et al., *supra* note 330, at 1170–71.

385 *See id.*

386 *See id.*

IV. THE ROLE OF COMPLEMENTARY MARKET MECHANISMS IN A CLEAN ELECTRICITY TRANSITION

Given the complexity and scale of the challenges ahead, little is gained by exclusive reliance on either markets or regulation.[387] As Boyd stated in the context of conceptualizing public utility law, we need a "normative and conceptual frame for moving beyond the false separation of markets and regulation . . . to guide the common, collective enterprise of building and elaborating the institutions, regulatory structures, and business models that will be necessary to realize a low-carbon future."[388]

A. *Markets: Complementary Gap-Fillers and Backstops*

Although I argue that government institutions are essential to envisioning an effective and equitable transition to a low-carbon future, market measures could complement more direct government initiatives. Complementary market mechanisms could lessen risks arising from governance deficits, provide ongoing incentives to reduce emissions (especially emissions that are not directly addressed by prescriptive measures), and, in the case of cap-and-trade, could provide a backstop in case prescriptive measures fail to achieve expected reductions.

As noted above, even government institutions ready to act on climate change can be subject to pressure from vested interests that might oppose measures directly aimed at them.[389] At least for some sectors, it might be politically easier to promulgate a general market mechanism like cap-and-trade or a carbon tax, rather than more utility- or industry-specific requirements or expectations.

In addition, if political jockeying leads to piecemeal and incomplete governance efforts, with initiatives in some areas but not in others, then a carbon price could exert a sector-wide pressure that

---

[387] *Cf.* Spence, *Naïve Energy Markets*, *supra* note 59, at 1023–24, 1028–30 (observing that, in energy law, we have accepted a mix of markets and regulation in order to capture the benefits and avoid the drawbacks of each).

[388] Boyd, *supra* note 2, at 1620. He states further "that the transition to a low carbon electricity system over the coming decades can only be realized if it is seen as a collective, political choice that aligns technologies, business models, and regulatory frameworks . . . ." *Id.* at 1622.

[389] *See supra* Section III.F.

could fill potential gaps.[390] For example, renewable portfolio standards could direct a transition toward certain forms of energy.[391] But if certain types of renewables, like distributed generation, are not included in the RPS, then a carbon price could continue to incentivize these additional carbon-reducing initiatives.[392]

Both an emissions cap and a carbon tax can "backstop" regulatory measures, though in different ways. The cap in a complementary cap-and-trade program would provide greater certainty in achieving a particular level of emissions reductions than planning and regulatory measures alone.[393] Planning and regulatory measures do not usually guarantee a particular emissions reduction, since electricity sector emissions vary with population, the state of the economy, and weather patterns.[394] If the population of a state increases, then emissions could go up even if per capita energy use went down.[395] And, notwithstanding some progress in decoupling emissions growth and carbon emissions, a robust economy, with more commerce and more driving, is still likely to generate higher emissions per capita than a depressed economy.[396] An emissions cap

---

390 *See* WILLIAMS ET AL., *supra* note 2, at 75–76.

391 *See* Boyd, *supra* note 2, at 1669.

392 For example, homeowners or businesses can consider the economics of installing solar or combined heat and power systems a carbon price factored into the price of electricity could affect the decision-making calculus. *See* Boyd, *supra* note 2, at 1700–01.

393 *See* Görlach, *supra* note 161, at 743 (noting that the cap in the European Trading System provides a "safety net in the policy mix, which ensures that emissions stay within the cap, no matter how well or poorly other policy instruments perform"); Alice Kaswan, *Controlling Power Plants: The Co-Pollutant Implications of EPA's Clean Air Act § 111(d) Options for Greenhouse Gases*, 32 VA. ENVTL. L.J. 173, 211 (2014) [hereinafter Kaswan, *Controlling Power Plants*] (observing that cap-and-trade provides more certainty about reducing emissions levels than performance-rate standards).

394 *See* Swift, *supra* note 160, at 5 (observing that emissions caps achieve better results than prescriptive regulations because they do not allow emissions to grow with increased production).

395 Kuishuang Feng et al., *Drivers of the US CO_2 Emissions 1997–2013*, NATURE COMM. 1, 3 (2015), https://www.nature.com/articles/ncomms8714.

396 According to a recent analysis, between 1997 and 2007, 71% of U.S. carbon emissions increases were attributable to economic activity; 29% was attributable to population growth. *See id.* at 2. From 2007 to 2009, 83% of the decrease in US emissions was attributable to the recession; only 17% was attributable from

would provide an emissions backstop to contain emissions regardless of these factors. Although trading programs to date have established relatively weak caps relative to existing trends, the backstop function could nonetheless be valuable if external forces would otherwise result in increasing emissions.

A carbon tax would not provide an emissions backstop, but it would provide a continuous incentive for carbon reductions regardless of other factors.[397] So, for example, if economic growth and associated emissions decreased, an emissions cap could suddenly become quite lax, leading to low allowance prices and little incentive to invest in emissions reductions.[398] A carbon tax, in contrast, would generate a consistent price signal over time, regardless of fluctuations in economic activity or other factors affecting emission levels.

Another critical attribute of market-based mechanisms is their revenue, revenue that can help finance a transition to clean energy and the inevitable cost of adapting to climate change.[399] Funds generated through cap-and-trade programs or a carbon tax could be returned to consumers as a dividend.[400] Revenue could also be used to

---

shifts from coal to natural gas. *Id.* To achieve long-term decarbonization, economic growth and emissions will need to be substantially decoupled.

397 *See* Kaswan, *California Lawsuits*, *supra* note 350, at 36–37.

398 *See* Kaswan, *Controlling Power Plants*, *supra* note 393, at 210–11 (observing that decreases in demand could result—and have resulted—in lax emissions caps that fail to drive the adoption and development of pollution controls). Low-allowance prices could result from multiple causes, not limited to economic recession; a detailed study of low-allowance prices in the EU ETS could identify causation for only 10% of the price drop, with 90% unexplained. *See* Nicolas Koch et al., *Causes of the EU ETS Price Drop: Recession, CDM, Renewable Policies, or a Bit of Everything?–New Evidence*, 73 ENERGY POL'Y 676, 684 (2014). Of the 10% deemed explainable, economic recession was the most important driver. *See id.*

399 While the effect of the RGGI cap-and-trade program on emissions is unclear, the program has generated 2.7 billion dollars in auction revenue, some of which was devoted to energy efficiency and renewable energy investments, provided important indirect greenhouse gas mitigation benefits. *See* JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41836, THE REGIONAL GREENHOUSE GAS INITIATIVE: LESSONS LEARNED AND ISSUES FOR CONGRESS 10 (2017) (discussing auction revenue) and 12 (noting allocation of auction revenue).

400 *See* Amy Sinden, *Revenue-Neutral Cap and Trade*, 39 ENVTL. L. REP. 10944, 10945 (2009).

finance investments in clean energy.[401] And revenue could be used to address the equity implications of the transition, by providing dividends to help poor households pay increasing energy costs, or by improving energy efficiency in low-income households, or by extending the benefits of clean energy to disadvantaged communities.[402] In addition, carbon revenue could help finance adaptation measures, like preparing or relocating vulnerable communities.[403]

And, although this Article does not attempt to address federalism issues generally, it is worth noting that a *federal* carbon price could stimulate prescriptive measures at the state level.[404] Instead of depressing state action, a federal carbon price could motivate states to develop strategies that shape how their generators, utilities, and consumers will be affected by that price. States that might not have taken climate action on their own might respond to a federal carbon price by initiating a range of measures designed to ensure that state actors benefit from rather than being disadvantaged by the federal carbon price. In other words, they might have a new incentive to encourage and facilitate low-carbon generation, so as to maximize economic benefits and avoid the costs of continued reliance on high-carbon sources.

---

401 *See* RAMSEUR, *supra* note 399, at 12 (noting that 8% of revenue generated through the RGGI program has been used to develop clean and renewable energy).

402 Allowance auctions in the RGGI program have generated 2.7 billion dollars, much of which has been invested n energy efficiency and renewable energy. *See* RAMSEUR, *supra* note 399, at 10 (revenue generated) and 12 (allocation of revenue). Although a smaller proportion of allowances are auctioned in California's cap-and-trade program in comparison with RGGI, as of September 2017, California's auctions have generated over five billion dollars in auction revenue for the state. *Table: California Cap-and-Trade Program, Summary of Proceeds to California and Consigning Entities*, CAL. AIR RES. BOARD, https://www.arb.ca.gov/cc/capandtrade/auction/proceeds_summary.pdf (last updated Sept. 2017). 35% of the revenue is designated to benefit disadvantaged communities, and remaining revenue includes support for high-cost mitigation measures, like high-speed rail to reduce transportation emissions. *See infra* note 479 and accompanying text (describing California's use of auction revenue).

403 *See* Heather McGray, *Fact Sheet: The Role of Adaptation*, WORLD RES. INST.: INSIGHTS (May 18, 2009), http://www.wri.org/blog/2009/05/fact-sheet-role-adaptation (observing the importance of establishing cap-and-trade to create a source of revenue for adaptation).

404 *See generally* Boyd & Carlson, *supra* note 58, at 891 (observing that federal "nudges" could help encourage states to take steps that serve national goals).

So, notwithstanding the importance of government engagement, a carbon price, whether through a cap-and-trade program or a carbon tax, can help motivate change (especially if more direct government efforts are lackluster), fill gaps in direct governance approaches, and provide a backstop to ensure continued reductions.

B. *The Incompatibility of Markets and Prescriptive Regulations Revisited*

As noted above, market advocates not only tout the benefits of market mechanisms, they suggest that, except under limited circumstances, coupling prescriptive measures with market measures would be redundant and could undermine market measures' asserted cost-effectiveness and innovation benefits.[405] Because concerns about the potential negative effects of prescriptive measures on market measures could chill willingness to take prescriptive initiatives,[406] it is critical to unpack the arguments to determine the degree to which prescriptive and market measures can work together, instead of at cross-purposes, to prompt fundamental decarbonization.[407]

1. MARKETS, PRESCRIPTIVE REGULATIONS, AND REDUNDANCY

Although a combination of market and prescriptive measures may result in some redundancy, that redundancy could help avoid the inevitable risk that a single policy instrument could fail to achieve its intended objective.[408] As explored above, at least at present, policymakers appear reluctant to establish carbon prices high

---

405 *See supra* Section II.A.3.

406 *See* Driesen, *supra* note 22 (manuscript at 27–28) (discussing degree to which prescriptive measures in Europe and Australia may be chilled by concerns about the relationship between such measures and market mechanisms).

407 Driesen argues that carbon taxes are more compatible with prescriptive measures than cap-and-trade. *See id.* (manuscript at 45–46). In this Article, I note potential interactions without taking a position on the relative desirability of differing market mechanisms.

408 *See, e.g.*, Görlach, *supra* note 161, at 737–39. Scholars have long debated the benefits and drawbacks of redundancy in the federalism context, where potentially overlapping federal and state controls are at issue. The "safety net" argument has featured prominently as a justification for allowing states to continue to regulate notwithstanding the emergence of parallel federal authority. *See, e.g.*, Kirsten H. Engel, *Harnessing the Benefits of Dynamic Federalism in Environmental Law*,

enough to induce decarbonization.[409] If so, prescriptive measures that map out the pathway are not merely "redundant," they are likely to be necessary.[410] At the same time, however, prescriptive measures could fail to be sufficiently comprehensive or could simply remain unfulfilled, as has occurred under many environmental statutes.[411] With the potential risks of unfulfilled prescriptive measures in mind, a market mechanism, even if weak, could provide at least a partial safety net.[412] As discussed in Section II.A.1, the cap in a cap-and-trade program would constrain emissions, while a carbon tax would provide at least some level of ongoing financial incentive for emissions reductions.[413] When there is no perfect solution, in theory or in practice, some measure of redundancy is desirable.

2. MARKETS, PRESCRIPTIVE REGULATIONS, AND COST-EFFECTIVENESS

Market advocates suggest that, unless there are market failures, market signals alone should drive investment decisions because they provide the most cost-effective path to achieving a given goal.[414] In this view, if market mechanisms are unnecessarily combined with prescriptive requirements, the prescriptive requirements will push regulated entities to take more expensive paths to achieving the same goal, increasing the cost of achieving the goal and undermining the cost-effectiveness benefits of the contemporaneous market-based program.[415]

In principle, lowering the costs of carbon reduction is a valuable objective. Lower costs not only help industry; they reduce the impact on the poor, and could also lead policymakers to accept more

---

56 EMORY L.J. 159, 161, 178–81 (2006) (describing the safety net benefits of retaining state regulatory authority alongside federal authority).

409 *See supra* notes 328–31 and accompanying text.

410 *See* Jenkins, *supra* note 144, at 468; *see also* Alice Kaswan, *Why a Cap-and-Trade System Needs a Regulatory Backstop*, CPRBLOG (Aug. 26, 2009), http://www.progressivereform.org/CPRBlog.cfm?idBlog=56F58E4B-D5FD-4FDB-7CFE8D1838C2AADA [hereinafter Kaswan, *Regulatory Backstop*].

411 *See* Kaswan, *Regulatory Backstop*, *supra* note 410.

412 *See* Görlach, *supra* note 161, at 743–44.

413 *See supra* Section II.A.1.

414 *See supra* notes 127–30 and accompanying text.

415 *See id.*

demanding carbon reduction efforts.[416] Nor should prescriptive approaches ignore cost-effectiveness. For example, requiring costly carbon capture-and-storage for existing coal-fired power plants would be an expensive path that could further entrench coal, impeding rather than serving a long-term transition.

But, as scholars have observed, a narrow focus on cost-effectiveness could undermine other policy goals. First, a focus on cost-effectiveness does not consider the full societal costs and benefits of energy choices—in economic-speak, it does not consider their broader allocative efficiency. Second, incentivizing short-term cost-effective mechanisms could delay investments in necessary but higher-cost long-term investments, ultimately undermining or increasing the cost of decarbonization.

Market mechanisms are cost-effective because they encourage regulated entities to take the measures that cost them the least, but that "cost-effectiveness" does not necessarily maximize allocative efficiency because a carbon-based price signal does not account for the broader environmental and economic costs and benefits of energy choices.[417] A carbon price based solely on greenhouse gas reduction goals does not reflect or build in benefits like reductions in co-pollutants, enhanced energy security, an effective pathway to long-term reductions, employment opportunities in new industries, or other benefits.[418] Görlach concludes "that a single-dimensional understanding of optimality, which focuses only on the cost-effectiveness of policy instruments, is inadequate."[419]

---

[416] *See supra* notes 99, 127–30 and accompanying text.

[417] *See* Driesen, *supra* note 22 (manuscript at 11–13).

[418] *See id.* (manuscript at 12–13); Görlach, *supra* note 161, at 735–36; Kaswan, *Industrial Pollution*, *supra* note 273, at 57–58 (citing economist James Boyce's assertion that the goal of "efficiency" should not focus solely on cost minimization, it "should seek to maximize net social benefits from reducing greenhouse gas emissions"); *see also* SOVACOOL ET AL., *supra* note 75, at 21–22 (observing that energy choice require critical tradeoffs and suggesting that justice principles should guide such choices). Economists often focus on optimizing a single variable as a matter of principle, arguing that it is not possible to find an "optimal" solution where multiple goals are at stake. *See* Görlach, *supra* note 161, at 736–37. However, in the real world, decision-makers are juggling the multiple variables and implications of prescriptive or incentive-based mechanisms.

[419] *See* Görlach, *supra* note 161, at 736.

In addition, a narrow "cost-effectiveness" inquiry generally considers only the short-term cost to regulated entities, like the costs of closing down existing fossil fuel plants and investing in new renewables. In the long-term, transitioning to clean energy could lead to a wide range of long-term economic benefits to new energy-generating companies as well as to other economic sectors that contribute to green technology, operations, and implementation.[420] These benefits may not all accrue to the regulated entity, but they are systemic economic benefits that could justify prescriptive approaches that appear, when focusing only on short-term impacts to the regulated entity, to be less cost-effective than the actions taken in response to a price signal.

Privileging cost-effectiveness not only unduly narrows the policy inquiry, it could impede efforts to achieve a deep transformation. As Driesen's work has made clear, market mechanisms are considered cost-effective because they incentivize regulated entities to pursue low-cost solutions and spare them from high-cost investments.[421] However, if these cost-savings features do not provide sufficient incentives for deep transformation, market measures could be ineffective—and in some cases more costly—at achieving long-term and multifaceted goals like deep decarbonization.[422]

---

420 *See* TOMAIN, *supra* note 107, at 90–91; WILLIAMS ET AL., *supra* note 2, at 8. Williams's study notes that the benefits of a clean energy economy are likely to be spread more broadly than the benefits of a fossil-fuel based economy, which concentrated benefits in a few industries. *Id.*

421 David M. Driesen, *Does Emissions Trading Encourage Innovation?*, 33 ENVTL. L. REP. 10094, 10094 (2003).

422 *See* WILLIAMS ET AL., *supra* note 2, at 11; David Driesen, *Is Emissions Trading an Economic Incentive Program?: Replacing the Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289, 334–35 (1998) [hereinafter Driesen, *Replacing the Command and Control*]; Driesen, *supra* note 22 (manuscript at 39) (noting that "trading can reduce pressures on high cost sources to innovate to escape high abatement costs"); *see also id.* (manuscript at 40) (noting that "[h]igh cost innovation may prove very important to addressing long-term environmental problems like climate disruption"); Roberts, *supra* note 75. Williams and his co-authors observe that decarbonization often requires multiple coordinated steps, some of which may be low-cost but others of which may be high-cost; initiating only the low-cost steps would fail to achieve a well-integrated and efficient transformation. WILLIAMS ET AL., *supra* note 2, at 81; *see also* Meckling et al., *supra* note 330, at 1171 (observing the prescriptive measures "may avoid future costs[] by speeding up progress toward more ambitious emission cuts").

For example, recent greenhouse gas cap-and-trade programs have allowed the use of carbon offsets, which let regulated entities cover their emissions with offsets from reductions occurring in unregulated sectors.[423] Instead of reducing emissions or investing in energy alternatives, a power company could save money by purchasing offsets from, say, a forest preservation project.[424] While such an opportunity would, at least theoretically, achieve the same emissions reductions at a cheaper cost, it would fail to prompt the more transformative actions necessary to achieve decarbonization.[425] Similarly, if a carbon price led utilities or power companies to convert coal plants to natural gas combustion or to invest in new natural gas plants, that might be more cost-effective than investing in new renewables and the transmission necessary to access them, but such actions could delay—if not prevent—decarbonization by 2050.[426] If short-term cost-effective measures lead to long-lived investments that lock in reliance on fossil fuels or other problematic technologies, then policies that privilege short-term cost-effectiveness could significantly hamper long-term objectives and impose higher long-term costs.[427] Again, this is not to say that prescriptive

---

[423] *See generally* JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., RL34436, THE ROLE OF OFFSETS IN A GREENHOUSE GAS EMISSIONS CAP-AND-TRADE PROGRAM: POTENTIAL BENEFITS AND CONCERNS 1–2 (2008); *see* JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R41836, THE REGIONAL GREENHOUSE GAS INITIATIVE: LESSONS LEARNED AND ISSUES FOR CONGRESS 14–15 (2017) (describing the RGGI offset program and noting that an earlier federal cap-and-trade proposal would have allowed a very high percentage of offsets); *see Compliance Offset Program*, CAL. AIR RES. BOARD, https://www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm (last visited Oct. 11, 2017); *Use of International Credits | Climate Action*, EURO. COMM'N, https://ec.europa.eu/clima/policies/ets/credits_en (last visited Oct. 17, 2017).

[424] *See* CAL. AIR RESEARCH BD., COMPLIANCE OFFSET PROTOCOL: U.S. FOREST PROJECTS 1 (2015), https://www.arb.ca.gov/cc/capandtrade/protocols/usforest/forestprotocol2015.pdf.

[425] In considering the possibility of global offsets, one commentator has stated: "Cap-and-trade will not get us into a different world; it'll get us planting more eucalyptus trees in Brazil." Matthew Yi, *Dems, Governor Spar Over Road to Clean Air / Resources Board's Beefed-Up Staff at Center of Tug-of-War*, S.F. CHRON. (July 17, 2007, 4:00 AM), http://www.sfgate.com/politics/article/Dems-governor-spar-over-road-to-clean-air-2581201.php.

[426] *See* DEYETTE ET AL., *supra* note 69, at 15–16.

[427] *See supra* note 422 and accompanying text.

measures will necessarily avoid these pitfalls; instead, it is to recognize that undirected price signals create a risk of short-sighted investments.

Higher short-term investment costs may be a necessary attribute of decarbonization, even if they are not the cheapest way to reduce emissions at a given point in time.[428] Thus, although studies indicate that prescriptive measures like RPS may cost more per ton than anticipated carbon prices under cap-and-trade,[429] an RPS could better facilitate a transition to clean energy than sole reliance on a carbon price designed to induce the lowest cost measures, measures which might not lead to transformative changes in electricity supply.[430]

3. MARKETS, PRESCRIPTIVE MEASURES, AND INNOVATION

One of the key attributes of market mechanisms is their "innovation incentive," which, in this context, means that a carbon price gives electricity sector players the incentive to take transformative steps toward decarbonization.[431] If prescriptive measures are coupled with cap-and-trade programs, however, it is possible that the prescriptive measures will drive emission reductions that reduce the demand for allowances, which would reduce allowance prices, and

---

[428] *See id.* (manuscript at 40) (noting that "a tension exists between maximizing near-term cost effectiveness and long-term technological development"); Görlach, *supra* note 161, at 735, 743.

[429] *See supra* notes 154 to 156 and accompanying text (describing studies comparing carbon reduction costs under RPSs versus cap-and-trade).

[430] Boyd suggests that policymakers understood that renewable energy might not be competitive with other sources and initially designed RPSs to address the fear that higher-cost renewables might otherwise not be competitive in the power markets that emerged from the 1990s deregulatory efforts. *See* Boyd, *supra* note 2, at 1669. In practice, renewables, once built, are competitive with fossil fuels on the power markets. Because renewables have low operating costs and the sources with the lowest marginal costs are dispatched first, renewable supplies are, in fact, frequently relied upon before fossil fuel sources. However, as discussed above, basing payments on marginal operating costs makes it difficult for generators to recover their much larger capital costs, so success in power markets does not guarantee adequate investment. *See supra* note 230 and accompanying text (discussing new generators' financing challenges given the wholesale market price structure). Of course, a carbon price would improve the viability of renewables, but, as discussed above, the "push" is unlikely to be sufficient. *See supra* note 329 and accompanying text.

[431] *See supra* note 131 and accompanying text.

which would ultimately weaken the innovation incentive.[432] For example, prescriptive regulations in California have led to significant emissions reductions, leading to little demand for allowances and contributing to the state's low allowance prices.[433]

This risk is, however, remediable. A price floor, as adopted in some trading programs, could facilitate the compatibility of prescriptive regulations and cap-and-trade by maintaining a minimum price to encourage market-driven innovation.[434] And this risk to innovation incentives exists only with cap-and-trade; because a carbon tax persists unchanged regardless of the role of prescriptive measures, it would continue to provide innovation incentives.

Moreover, market mechanisms are not the only way to induce innovation. Market advocates often compare market mechanisms to one type of prescriptive mechanism: technology-based performance standards that set specific emission rate limitations based on the agency's assessment of available control technologies in a particular industry,[435] a mechanism that, at least in practice, tends not to encourage technological innovation.[436]

But, as the foregoing discussion of potential governance mechanisms suggests, prescriptive regulations come in many forms and often provide substantial innovation incentives.[437] An outright ban

---

432 *See supra* notes 157 to 158 and accompanying text.

433 *See* Chris Busch, *Comment: California's Cap-and-Trade Program – the Crisis That Wasn't*, CARBON PULSE (Aug. 2, 2016, 4:56 AM), http://carbon-pulse.com/22969/ [hereinafter Busch, *The Crisis That Wasn't*].

434 *See* Adam Whitmore, *On Climate Change Policy, section 3: Price floors and ceilings*, https://onclimatechangepolicydotorg.wordpress.com/carbon-pricing/price-floors-and-ceilings/ (last updated Feb. 10, 2017) (listing price floors in existing greenhouse gas cap-and-trade programs).

435 *See, e.g.*, Ackerman & Stewart, *supra* note 111, at 1335–37 (noting drawbacks to technology-based "command and control" regulations). Recognizing the multiplicity of types of prescriptive requirements also generates a response to the argument that market-based control mechanisms reduce the government's information burden relative to command-and-control regulations. While technology-based standards unquestionably place a high informational burden on agencies, general performance standards, bans, and phase-outs do not; they leave the burden of reaching the goal to the regulated sector.

436 *See id.* at 1336.

437 *See* Driesen, *Replacing the Command and Control*, *supra* note 422, at 297–99; Driesen, *supra* note 22 (manuscript at 38). Tomain describes the complex web that fosters innovation, including incentives like market mechanisms, prescriptive requirements like standards, in addition to government-supported research, tax

or phase-out of unsustainable sources, such as coal-fired power, would create a direct and strong incentive to develop alternative generation sources and reduce electricity demand.[438] Overarching performance standards, like an RPS requiring 25% renewables by a certain year, are likely to promote, not stifle, innovation as the regulated sectors innovate to meet the percentage requirement. Generators will be incentivized because they know there will be a market if they develop renewables to satisfy the relevant RPSs. Similarly, a requirement to achieve a certain level of energy efficiency creates an incentive to develop new and more effective mechanisms to achieve energy efficiency.[439] This is not to say that such efforts would be easy to enact or that they would even succeed; environmental law is rife with unfulfilled statutory mandates.[440] The point is that prescriptive measures, as well as market signals, have the capacity to incentivize innovation. The ability of prescriptive regulations to drive transformation is evident in the role they have played in states and countries that combine trading programs with market mechanisms. One analyst suggests that reductions in Canada's projected emissions have been driven primarily by Ontario's ban on coal-fired power and by a "clean electricity" regulation that led British Columbia to cancel two coal-fired power plants and a gas plant,

---

incentives, and other programs. TOMAIN, *supra* note 107, at 103–04. Similarly, Liscow and Karpilow explain that private-sector innovation tends to build incrementally on itself and that the private sector is likely to require direct measures—including support—to invest in more transformative measures. Liscow & Karpilow, *supra* note 135, at 387, 404–22.

[438] As noted above, regulators in Washington state negotiated a phase-out of the state's coal-fired power plant. *See* MACBETH ET AL., *supra* note 66, at 43. And California banned generation and imports from sources with emissions above those from natural gas plants, effectively banning future coal-fired power. *See infra* note 462 and accompanying text.

[439] More rigid "command and control" requirements, like building codes or appliance standards, might emerge from the general prescriptive goal, but the presence of an overarching and increasing energy efficiency target creates an incentive to develop new mechanisms that could be embodied in regulations over time.

[440] *See* Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 300–05 (1999).

not by some Canadian states' market-based approaches.[441] In California, one observer has stated that "California's suite of performance standards – such as efficiency standards for buildings and appliances, the renewable electricity standard for utilities, and the low carbon fuel standard for transportation fuels – are principally responsible for falling emissions."[442]

Thus, innovation incentives are an important attribute for climate policy, and to the degree prescriptive measures risk dampening contemporaneous market mechanisms, a price floor can forestall that risk. Furthermore, market measures do not hold a monopoly on innovation; while prescriptive measures would presumably represent certain key policy decisions, they can nonetheless retain ample space for innovation.

4. THE RISK THAT TRADING COULD DAMPEN PRESCRIPTIVE MEASURES' ENVIRONMENTAL BENEFITS

The compatibility question concerns not only the impact of prescriptive measures on market mechanisms, but the impact of market mechanisms on prescriptive measures. The benefits of a prescriptive program could potentially be diluted by participation in a multi-sector or multijurisdictional trading program.[443] The emissions reductions achieved by the prescriptive regulations could be translated into emissions allowances that could then lead to an increase in emissions in other sectors or jurisdictions.[444] This risk has been aptly named the "waterbed effect": If you press down in one spot, the water (emissions) could simply shift to another spot, leaving overall

---

441 *See* Jaccard, *supra* note 329.

442 Busch, *The Crisis That Wasn't*, *supra* note 433.

443 Driesen, *supra* note 22 (manuscript at 24–25).

444 *See id.* In the context of the European Union's climate policy, which includes a renewables goal, an energy efficiency goal, and a trading program, Stavins argues that the reductions achieved in the energy sector by the renewables and efficiency requirements will drive down emissions in those sectors, leaving more low-cost allowances available for sources in other sectors, who are then likely to forego reductions and purchase allowances. As a result, the renewables and efficiency mandates would not lead to any additional reductions beyond the cap. *See* Stavins, *Will Europe Scrap Its Renewables Target?*, *supra* note 22.

emissions the same and discouraging innovation in the allowance-purchasing sector or jurisdiction.[445]

Driesen provides a compelling example in a multijurisdictional program. Holland put its plans to close down its coal-fired power plants on hold when it recognized that such closures would generate a large quantity of emissions allowances that might then be sold and result in continued carbon emissions elsewhere in the European Union.[446] The sale of allowances from Holland's facility closures would not jeopardize Europe's overarching cap, but Holland's prescriptive approach would have less of an impact than they might have intended.[447] Although Holland would be pursuing a clean energy future, the sale of the resulting allowances could dampen the incentive for other European participants to do likewise.[448]

Conversely, however, the ability to sell allowances could increase a jurisdiction's incentive to shut down its coal-fired facilities. In the Holland example, if the prescriptive requirements were imposed within the context of a trading program, then the Dutch could sell the extra allowances generated by shutting down coal plants, which would help finance the transition and create an incentive for other countries to do likewise.[449]

In addition, if a regulating jurisdiction did not want their reductions to be diluted through sale of extra allowances, it is possible to design a trading program that lets participating jurisdictions retire some or all of the "extra" allowances: those allowances representing reductions beyond the reductions expected of that jurisdiction.[450]

---

[445] *See* Machiel Mulder, Univ. of Groningen, *The Waterbed Effect*, FUTURE LEARN, https://www.futurelearn.com/courses/energy-transition/4/steps/240990 (last visited Feb. 12, 2018).

[446] *See* Driesen, *supra* note 22 (manuscript at 1–3, 24–25).

[447] *See id.* (manuscript at 24–25).

[448] *See id.* (manuscript at 3).

[449] *See id.* (manuscript at 25). Driesen implies that the ability of Dutch industries to profit from allowance sales might have facilitated the initial plan to shut-down coal-fired power plants. *Id.*

[450] The European Union is addressing allowance surpluses by establishing a "market stability reserve" to take surplus allowances out of circulation. *Market Stability Reserve |Climate Action*, EUR. COMMISSION, https://ec.europa.eu/clima/policies/ets/reform_en (last visited Oct. 17, 2017) [hereinafter *Market Stability Reserve*]; *see also* Driesen, *supra* note 22 (manuscript at 28) (noting that a jurisdiction could withhold extra allowances to dampen the waterbed effect); Alice Kaswan, *Decentralizing Cap-and-Trade? The Question of State Stringency*, 1

Other strategies to maintain emission reduction incentives include allowance price floors that maintain a price signal to encourage reductions even if there is a large supply of allowances.[451]

The waterbed effect could also occur where a single jurisdiction adopts a multi-sector trading program.[452] If prescriptive regulations cover only some sectors (like electricity or fuels), then those sectors could generate extra allowances that become available to unregulated sectors, dampening incentives to reduce emissions in sectors that are not covered by prescriptive regulations. For example, California has adopted numerous prescriptive measures to reduce energy and transportation sector measures, measures that are largely responsible for reductions to date.[453] Reductions in the energy and transportation sectors could make allowances easily available to industrial sources, sources which have faced fewer prescriptive carbon reduction requirements.[454] As a result, the success of measures in the energy and transport sectors could lead to relatively few reductions in the industrial sector.[455]

SAN DIEGO J. CLIMATE & ENERGY L. 103, 125 (2009) (noting that, if a sub-jurisdiction seeks to reduce emissions by more than expected by a larger jurisdiction's program, it must retire extra allowances).

451 *See* Whitmore, *supra* note 434 and accompanying text (describing price floors and allowance reserves designed to maintain allowance prices and avoid surplus allowances).

452 *See* Görlach, *supra* note 161, at 741–42.

453 *See id.*

454 *See* Kaswan, *California Lawsuits*, *supra* note 350, at 7–9 (observing that the state has adopted more prescriptive measures for the electricity and transportation sectors than for industry). In recent years, the state has adopted some limited measures controlling methane releases from oil and gas operations. *Update Informative Digest: Regulation for Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities*, CAL. AIR RES. BOARD, https://www.arb.ca.gov/regact/2016/oilandgas2016/oguid.pdf (last visited Aug. 12, 2017).

455 Although a multiplicity of factors can affect a given sector's emission levels, it is worth noting that, between 2007 and 2015, emissions in California's more regulated sectors, transportation and electricity, dropped substantially, while less-regulated industrial emissions remained flat. CAL. AIR RESEARCH BD., 2017 EDITION: CALIFORNIA GREENHOUSE GAS EMISSIONS INVENTORY 2 (2017), https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2015/ghg_inventory_trends_00-15.pdf (chart indicating relative shifts in sectoral emissions). Economic growth during the period suggests that industrial emissions per unit of output did go down, *see id.* at 9, but the difference in trends raises the possibility that

Awareness of the waterbed effect could and should shape government measures to control emissions. Policymakers will need to take the "waterbed effect" into account when determining how to address all significant sectors moving toward decarbonization. And, if prescriptive measures do not appear appropriate for all of these sectors, then other means for maintaining a carbon price sufficient to incentivize reductions, like price floors, will likely be necessary.

C. *Energy Planning and Regulation Coupled with Complementary Market Mechanisms: The California Example*

The viability of combined prescriptive and market-based approaches is not purely theoretical. Europe, Canada, and several states have taken combined approaches.[456] Here, I focus on California's multifaceted approach, which combines a wide range of planning and prescriptive approaches with a complementary cap-and-trade program. The California legislature has passed numerous bills affirmatively shaping the state's energy strategy and designed to achieve a wide range of environmental, social, and economic objectives. Although the state has developed a greenhouse gas cap-and-trade program, legislative and agency requirements remain the primary drivers in the energy sector. In the energy sector, the cap-and-trade program serves as a complementary measure that provides an emission "backstop" as well as revenue to fund a number of the

---

the additional reductions achieved in the electricity and transportation sectors supported on-going emissions in the industrial sector.

[456] *See* Elisa Morgera et al., *The EU's Climate and Energy Package: Environmental Integration and International Dimensions* 2 (Edinburgh Europa Paper Series, Working Paper No. 07, 2010), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1711395 (discussing the European Union's combination of mechanisms to achieve emission reduction targets); Jaccard, *supra* note 329 (describing numerous countries or states that combine prescriptive and pricing mechanisms); Roberts, *supra* note 75 (describing Ontario's multi-faceted climate policy); MACBETH ET AL., *supra* note 66, at 4, 9, 12, 15, 17, 27, 28, 35, 39 (indicating that the states with carbon trading policies, including the states participating in the Regional Greenhouse Gas Initiative and California, also have a range of other energy sector climate policies); *see generally* Lori Snyder Bennear & Robert N. Stavins, *Second-Best Theory and the Use of Multiple Policy Instruments*, 37 ENVTL. & RES. ECON. 111 (2007) (observing that many environmental pricing schemes also include supplementary measures).

state's ambitious energy transition goals.[457] Although other states could make different choices, and California still has a long way to go to achieve decarbonization, the California experience provides at least a snapshot of an integrated prescriptive and market-based approach.

1. SHAPING CALIFORNIA'S ENERGY MIX

California's clean energy programs pre-date the recent proliferation of climate-driven measures. The California Energy Commission established a Renewable Energy Program in 1998, and by 2002 the state's energy agencies established an initial goal of increasing renewables to 20% of the state's supply by 2017.[458] Through administrative and legislative goal-setting, the state intensified its renewable energy goals, culminating in 2015, when the state adopted the goal of achieving 50% renewables by 2030.[459] In addition to promoting renewable energy, the state has promoted consumer energy efficiency since the 1970s and features a multitude of programs for improving efficiency, including building and appliance standards.[460] Going beyond already-high energy efficiency standards, in 2015, the state established a goal of doubling energy efficiency by 2030.[461] In

---

[457] It is worth noting that ARB has stated that the "cap-and-trade program will complement other measures for entities within covered sectors." *See* CAL. AIR RESEARCH BD., CLIMATE CHANGE SCOPING PLAN 31, 35 (2008), https://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf [hereinafter 2008 SCOPING PLAN]. In other words, ARB has treated the other measures as the central programs, to be complemented by cap-and-trade, rather than the other way around.

[458] *See* CAL. ENERGY COMM'N, *History of California's Renewable Energy Programs*, http://www.energy.ca.gov/renewables/history.html (last visited Apr. 2, 2017).

[459] *See* CAL. ENERGY COMM'N, *Renewables Portfolio Standard*, http://www.energy.ca.gov/portfolio/ (last visited Aug. 11, 2017) [hereinafter *Renewables Portfolio Standard*]. The 50% renewables by 2030 goal was established by S.B. 350 in 2015. *See* S.B. 350 § 20(b)(2)(B), 2015–2016, Reg. Sess. (Cal. 2016); CAL. PUB. UTIL. CODE § 399.15(b)(2)(B) (2016).

[460] *See* CAL. PUB. UTIL. COMM'N, REGULATING ENERGY EFFICIENCY: A PRIMER ON THE CPUC'S ENERGY EFFICIENCY PROGRAMS (Feb. 2016), http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/News_Room/Fact_Sheets/English/Regulating%20Energy%20Efficiency%200216.pdf.

[461] Cal. S.B. 350 § 6(c)(1).

2006, California effectively precluded reliance on new heavily-polluting coal-fired power by adopting an electricity-sector emissions performance standard that prohibits new commitments to energy from sources that emit more than a combined-cycle natural gas power plant.[462]

California adopted its landmark comprehensive climate change statute, AB 32, the Global Warming Solutions Act, in 2006.[463] The statute directed the state's Air Resources Board (ARB) to develop a comprehensive scoping plan to reduce the state's "emissions to 1990 levels by 2020."[464] Working with agencies throughout California's government and with public engagement throughout the state, ARB developed a multifaceted scoping plan that explored reduction opportunities and strategies in every sector of the state's economy.[465]

The initial scoping plan called for, and the state ultimately adopted, a cap-and-trade program to cover 85% of the state's emissions, including electricity-sector emissions.[466] However, in the electricity sector, the cap-and-trade program is complementary to the plethora of measures designed to reduce electricity-sector emissions. The scoping plan included agency-initiated measures as well as numerous electricity-sector specific laws California has passed to reshape the state's energy sector.[467] Since the adoption of AB 32 and the implementation of the state's cap-and-trade program, the California legislature has continued to guide electricity-sector emissions rather than relying on the cap-and-trade program to induce reductions. As noted above, the state legislature increased the RPS renewables goal to 50% by 2030 and established a goal of doubling the

---

[462] CAL. PUB. UTIL. CODE § 8341(a) (2008); § 8341(d)(1); CAL. ENERGY COMM'N, *SB 1368 Emission Performance Standards*, http://www.energy.ca.gov/emission_standards/ (last visited Aug. 12, 2017) (describing SB 1368 limits on high-carbon generation).

[463] CAL. HEALTH & SAFETY CODE § 38500 et seq. (2006).

[464] CAL. HEALTH & SAFETY CODE § 38550 (establishing 1990 target) and § 38561(a) (requiring scoping plan).

[465] *See* 2008 SCOPING PLAN, *supra* note 458, at ES-1–ES-3.

[466] *See Overview of ARB Emissions Trading Program*, CAL. AIR RES. BOARD (Feb. 9, 2015), https://www.arb.ca.gov/cc/capandtrade/guidance/cap_trade_overview.pdf.

[467] *See* 2008 SCOPING PLAN, *supra* note 458, at 41–45 (describing efficiency and renewables measures) and 53 (describing Million Solar Roofs Program).

state's already high energy-efficiency levels by 2030.[468] In addition, the state requires publicly owned electric utilities to invest in energy storage to increase reliability as more intermittent sources, like wind and solar, are integrated into the grid.[469]

At this stage, most of the energy sector reductions appear to be driven by prescriptive requirements rather than by the cap-and-trade program's price signal.[470] In 2016, however, the California legislature adopted a new target: 40% reduction below 1990 levels by 2030,[471] a level much more stringent than the 2020 target, which called for reducing to 1990 levels.[472] Although prescriptive measures, like the ambitious RPS and energy-efficiency goals, will continue to be important, the cap-and-trade program is expected to drive more of the reductions as the emissions cap tightens.[473] Increasing electrification of transportation and potential increases in air-conditioning to respond to warmer temperatures could increase per capita electricity emissions, amplifying the importance of a firm cap to constrain emissions growth.[474] Despite the trading program's

---

468 *See Renewable Portfolio Standards*, *supra* note 459 and accompanying text.

469 CAL. PUB. UTIL. CODE § 2836(a)(1) (2011); CAL. PUB. UTIL. CODE § 9506(a) (2011); CAL. ENERGY COMM'N, *AB 2514 – Energy Storage System Procurement Targets from Publicly Owned Utilities*, http://www.energy.ca.gov/assessments/ab2514_energy_storage.html (last visited Aug. 1, 2017).

470 *See* Busch, *The Crisis That Wasn't*, *supra* note 433.

471 S.B. 32, 2015–16, Reg. Sess. (Cal. 2016); CAL. HEALTH & SAFETY CODE § 38566 (2016).

472 *See* CAL. HEALTH & SAFETY CODE § 38550 (2007) (setting 2020 GHG reduction target).

473 CAL. AIR RESEARCH BD., CALIFORNIA'S 2017 CLIMATE CHANGE SCOPING PLAN: THE STRATEGY FOR ACHIEVING CALIFORNIA'S 2030 GREENHOUSE GAS TARGET 109 (Nov. 2017), https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf [hereinafter NOVEMBER 2017 SCOPING PLAN]. Busch, *Carbon Prices Rise*, *supra* note 159. California explicitly re-authorized the use of the cap-and-trade program to meet the new 2030 target. *See* Melanie Mason & Chris Megerian, *California Legislature Extends State's Cap-and-Trade Program in Rare Bipartisan Effort to Address Climate Change*, L.A. TIMES (July 17, 2017, 9:15 PM), http://beta.latimes.com/politics/la-pol-ca-california-climate-change-vote-republicans-20170717-story.html.

474 *See, e.g.*, Sara Goudarzi, *Increased Use of Air Conditioners to Produce More Greenhouse Gas*, LIVE SCI. (Aug. 1, 2006, 10:48 AM), https://www.livescience.com/919-increased-air-conditioners-produce-greenhouse-gas.html (men-

increasing significance, however, it is clear that the California legislature and California agencies are playing a significant role in steering the state's clean energy transition.

2. SOCIOECONOMIC GOALS IN CALIFORNIA'S CLIMATE POLICY

California's greenhouse gas legislation has focused not only on the narrow and important task of reducing greenhouse gases, but numerous bills have also explicitly addressed many of the environmental and socioeconomic implications of the transition to clean energy. As discussed below, some of these provisions were embodied in general climate legislation, while others focused directly on the electricity sector.

a. Multi-faceted Provisions in Economy-Wide Bills

AB 32, California's landmark comprehensive climate change law, explicitly required the agencies to consider a wide range of environmental and socioeconomic considerations in deciding the best mechanism for reaching its initial 2020 target. The law directs CARB, the implementing agency, to ensure that its approach: "minimizes costs and maximizes benefits for California's economy, improves and modernizes California's energy infrastructure and maintains electric system reliability, maximizes additional environmental and economic cobenefits for California, and complements the state's efforts to improve air quality."[475]

The law further directs CARB to "[e]nsure that activities undertaken to comply with [its] regulations do not disproportionately impact low-income communities,"[476] and requires CARB to "[c]onsider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health."[477] Recognizing that climate change regulation generates economic opportunities, not just

---

tioning how temperature changes will require more air conditioning for buildings); *supra* note 312 and accompanying text (discussing increased electricity demands resulting from electrification of transportation and buildings).

475 CAL. HEALTH & SAFETY CODE § 38501(h) (2017).

476 CAL. HEALTH & SAFETY CODE § 38562(b)(2) (2017).

477 CAL. HEALTH & SAFETY CODE § 38562(b)(6).

costs, the law requires CARB to "direct public and private investment toward the most disadvantaged communities in California."[478]

Once CARB decided to adopt a cap-and-trade program as part of its greenhouse gas reduction strategy, the California legislature again mobilized to steer revenue from emissions allowance auctions directly to disadvantaged communities. In 2012, the state legislature required that 25% of auction revenue be devoted to climate projects that benefit disadvantaged communities, a percentage they increased to 35% in 2016.[479] Another bill identified the principles defining eligible projects, including projects to reduce greenhouse gas emissions that, to the extent feasible, "[m]aximize economic, environmental, and public health benefits to the state" through jobs, improved air quality, investments in disadvantaged communities, and engaging "businesses, public agencies . . . nonprofits, and other community institutions . . . ."[480]

When the California legislature adopted its ambitious 2030 emissions reduction commitment, it passed a companion bill, AB 197, designed to facilitate efforts to integrate greenhouse gas and co-pollutant reductions.[481] The law requires consolidated reporting

---

[478] CAL. HEALTH & SAFETY CODE § 38565 (2007).

[479] In 2012, S.B. 535 required that 25% of the available auction revenue be used to benefit disadvantaged communities, and that 10% of the available money must support projects physically "located within disadvantaged communities." *Id.* In 2016, the legislature increased the proportion of revenue to disadvantaged communities to 35% and required that 25% fund projects within disadvantaged communities. *See* CAL. HEALTH & SAFETY CODE § 39713 (2016). The 2016 legislation required that an additional 10% of revenue be used to benefit low-income residents, due to concern that the definition of "disadvantaged communities" had left out many low-income residents who do not reside in communities classified as "disadvantaged." *See id.*; Emi Wang, *Addressing the Climate Gap: California Legislature Delivers for Frontline Communities*, GREENLINING INST. (Sept. 14, 2016), http://greenlining.org/blog/2016/addressing-climate-gap-california-legislature-delivers-frontline-communities/.

[480] CAL. HEALTH & SAFETY CODE § 39712(b) (2016). The bill further identified potentially eligible projects, including improving energy efficiency and distributed clean energy at universities, public buildings, and industrial sites, funding to reduce transportation-related emissions and emissions associated with natural resources uses, funding for sustainable infrastructure projects and waste reduction, and investments in programs and research. CAL. HEALTH & SAFETY CODE § 39712(c).

[481] Assemb. 197, 2016–2017, Reg. Sess. (Cal. 2016); *see generally* Alice Kaswan, *Landmark California Law Links Emissions Reductions and Environmental*

and publication of greenhouse gases and co-pollutant data.[482] In addition, to address concerns that the emissions trading program could limit greenhouse gas reductions (and associated co-pollutant reduction benefits) in California, the law prioritized "direct emission reductions at large stationary sources of greenhouse gas emissions" and "from mobile sources."[483]

From a participatory standpoint, California's climate laws have included provisions designed to enhance the voice of historically marginalized communities. In 2006, AB 32, the state's comprehensive climate law, created an Environmental Justice Advisory Committee to advise the CARB on its climate policies.[484] In 2015, AB 1288 added two new members to the Air Resources Board and specified that the new members should be people "who work[] directly with communities in the state that are most significantly burdened

---

Justice Goals, CPR BLOG (Sept. 19, 2016), http://progressivereform.org/CPRBlog.cfm?idBlog=0DC5EEF3-9B02-F46A-54D19E4D60A4E837 [hereinafter Kaswan, *Landmark California Law*].

482 CAL. HEALTH & SAFETY CODE § 38531(a)(1) (2017).

483 CAL. HEALTH & SAFETY CODE § 38562.5 (a) (2017). The language prioritizing direct reductions results from pressure from environmental justice advocates who have long held that California's adoption of a cap-and-trade program undermines the state's ability to maximize the pollution co-benefits of greenhouse gas reductions. *See generally* Kaswan, *California Lawsuits*, *supra* note 350. There is considerable uncertainty about how to interpret the prioritization of "direct" emission reductions, and what implications the language has for the state's cap-and-trade program. *See* Ann Carlson, *SB 32 Passage Great News but Legislature Needs to Pass AB 197 Too*, LEGAL PLANET (Aug. 23, 2016), http://legal-planet.org/2016/08/23/sb-32-passage-great-news-but-legislature-needs-to-pass-ab-197-too/. The law does not appear to rule out cap-and-trade, particularly where the trading programs leads to reductions at covered sources; it does, however, appear to suggest that carbon offsets are disfavored. *See* Kaswan, *Landmark California Law*, *supra* note 481. Thus, this addresses environmental justice advocates' concerns that the program's offset provisions, which allow entities reducing or sequestering emissions to sell their reductions to entities subject to the cap-and-trade program, allow the regulated entities to "offset" their emissions rather than directly reducing them. *See* Kaswan, *California Lawsuits*, *supra* note 350, at 28–29.

484 Assemb. 32, 2005–2006, Reg. Sess. (Cal. 2006). While the EJAC has questioned the degree to which CARB heeds and adopts their recommendations, there is little question that the EJAC provides a mechanism for organizing and relaying the views of disadvantaged communities that would be more difficult to achieve without an organized committee. *See* Kaswan, *California Lawsuits*, *supra* note 350, at 5–6.

by, and vulnerable to, high levels of pollution, including, but not limited to, communities with diverse racial and ethnic populations and communities with low-income populations."[485] Although these participatory measures do not guarantee power or control, they reflect the recognition that the state's climate and energy policies will have significant implications for the environmental and economic well-being of marginalized populations, and provide procedural mechanisms for ensuring that these often-neglected views will be heard.

b. Electricity-Sector Bills

The California legislature has actively guided the state's clean energy pathway and, in doing so, has frequently integrated socioeconomic considerations. In 2013, S.B. 43 encouraged utilities to invest in small-scale renewables so that their customers would be able to request renewable energy from the utility.[486] The law stated that, when investing in renewable energy, the utilities should give preference to renewable energy projects that provide environmental and economic benefits to communities afflicted with poverty or high unemployment, or that suffer from high emission levels of toxic air contaminants, criteria air pollutants, and greenhouse gases.[487]

S.B. 350, the 2105 legislation which substantially increased the state's renewable portfolio standard and energy efficiency goals, included provisions addressing access to renewables and efficiency in disadvantaged communities.[488] S.B. 350 also called for a comprehensive study of the barriers to investing in renewable energy and efficiency for low-income customers.[489] The law stated that the Public Utilities Commission and the Energy Commission should consider "distributed generation to the extent that it provides economic and environmental benefits in disadvantaged communities."[490] The law encouraged state agencies, as they work to decrease costs and increase benefits, to consider technologies with "zero or lowest feasible emissions of greenhouse gases, criteria pollutants, and toxic air

---

485 CAL. HEALTH & SAFETY CODE § 39510(e) (2017).
486 CAL. PUB. UTIL. CODE § 399.13(a)(1) (2017).
487 PUB. UTIL. § 399.13(a)(7)(A).
488 S.B. 350, 2015–2016, Reg. Sess. (Cal. 2016).
489 CAL. PUB. RES. CODE § 25327(b)(1) & (2) (2016).
490 CAL. PUB. UTIL. CODE § 400(a) (2017).

contaminants onsite,"[491] thereby encouraging a multi-pollutant approach.

To enhance participation, notoriously difficult in complex PUC administrative proceedings, the law also established an advisory group with representatives from disadvantaged communities.[492] The advisory group is tasked with reviewing clean energy and pollution reduction programs and determining "whether [the] proposed programs will be effective and useful in disadvantaged communities."[493]

In order to enable poor renters to enjoy the benefits of solar energy, AB 693 established the "Multifamily Affordable Housing Solar Roofs Program."[494] The law dedicates up to one hundred million dollars for installing solar power on apartment buildings, with the expectation of lowering utility bills for low-income apartments.[495] The bill stated that "[i]nstalling . . . solar energy systems in disadvantaged communities can provide local economic development benefits while advancing the state's renewable energy policies and policies to reduce emissions of greenhouse gases."[496]

Lastly, the California legislature passed a law that responds to environmental justice concerns that new natural gas power plants will end up in disadvantaged communities already subject to heavy pollution burdens.[497] In 2016, the Legislature adopted AB 1937, which directs utilities, in seeking and considering bids for new natural gas power plants, to avoid bids for gas-fired generating units "in communities that suffer from cumulative pollution burdens."[498]

---

[491] PUB. UTIL. § 400(b).

[492] PUB. UTIL. § 400(g).

[493] *Id.*

[494] CAL. PUB. UTIL. CODE § 2870(a)(2) (2017).

[495] CAL. PUB. UTIL. CODE § 2870(c). Moreover, the law requires that the electricity "be primarily used to offset electricity usage by low-income tenants" and authorizes the agency to require covenants and deed restrictions to ensure that the property continues to be rented to low-income residents. PUB. UTIL. § 2870(f)(2).

[496] Assemb. 693, 2015-2016, Reg. Sess. (Cal. 2015). The law directs the PUC to "establish local hiring requirements . . . to provide economic development benefits to disadvantaged communities . . . ." *Id.*

[497] Assemb. 1937, 2015–2016, Reg. Sess. (Cal. 2016).

[498] *Id.* The law was inspired by a specific siting controversy in California. Environmental justice advocates opposed an effort to build a fourth natural gas power plant in Oxnard, California, and sought to prevent such concentrations in the future. *See* CAL. ENVTL. JUST. ALL., 2016 HIGHLIGHTS AND 2017 OUTLOOK

As the trend away from coal continues and natural gas prices remain low, many anticipate increasing investment in natural gas power plants.[499] Although the environmental impacts of natural gas combustion are much lower than for coal combustion, natural gas plants do contribute to local pollution loads and equitable siting remains a concern.[500]

The California legislature's extensive guidance reflects the state's recognition that energy choices will have a multiplicity of environmental and economic repercussions, and the state's recognition that it can strongly influence the shape of future energy investments.[501] Rather than leaving all decisions to utilities, power companies, and other market players, the state's renewable energy and energy efficiency requirements firmly direct the state toward a long-term transition to clean energy. Provisions allocating money and opportunity to disadvantaged communities help direct the benefits to all, in contrast to more laissez-faire approaches, which would more likely benefit those wealthy enough to take advantage of new clean energy and efficiency technologies.[502] Although most states are unlikely to have the political alignment of green technology and environmental justice interests that paved the way for California's legislative initiatives,[503] other states can learn from California's initiatives and draw upon the California experience in developing legislative or administrative policies.

CONCLUSION

Decarbonization presents a systemic challenge to our infrastructure and the institutions that shape it. Although market advocates

---

3–4 (2016), http://caleja.org/wp-content/uploads/2015/09/2016-Victories-and-2017-Outlook_-FINAL.pdf.

499 Hodge, *supra* note 339.

500 NAT'L RESEARCH COUNCIL, *supra* note 84, at 8.

501 *See* Kaswan, *Landmark California Law*, *supra* note 481.

502 *See supra* note 100–01 and accompanying text.

503 *See* Kaswan, *California Lawsuits*, *supra* note 350, at 3–5 (describing the role of environmental justice groups in incorporating environmental justice provisions into the state's comprehensive climate law, AB 32); Alice Kaswan, *A Cooperative Federalism Proposal for Climate Change Legislation: The Value of State Autonomy in a Federal System*, 85 DENVER L. REV. 791, 796 (2008) (noting degree to which support for California's climate laws has stemmed, in part, from expected economic benefits).

promote market mechanisms and perceive only a limited role for "complementary" prescriptive measures, a carbon price, acting alone, cannot drive the ship. Our governing institutions, both legislative and administrative, centralized and decentralized, can give shape to a new clean energy economy. In envisioning a long-term electricity-sector transition, government decision makers can address difficult tradeoffs, consider multiple environmental and socioeconomic implications, and develop long-term roadmaps and pathways for change, through processes that are democratically accountable and include at least some measure of public participation. Of course, there is no guarantee that government institutions will rise to the challenge, whether through prescriptive or market-based measures. Increasing public awareness and engagement will be essential to achieving positive change.

As government institutions set the course for change, market mechanisms can, however, play an important role. The could help motivate widespread reductions, fill regulatory gaps, provide at least a partial fallback if prescriptive measures prove insufficient, and generate revenue to assist consumers and fund mitigation and adaptation efforts. Though important, these roles serve to complement, not substitute for, public deliberation over the shape of our energy future.