MARC B. MIHALY*

Recovery of a Lost Decade (or Is It Three?): Developing the Capacity in Government Necessary to Reduce Carbon Emissions and Administer Energy Markets

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* Associate Dean for the Environmental Law Program and Associate Professor of Law; Vermont Law School. The author, through the law firm he cofounded in San Francisco, Shute, Mihaly & Weinberger LLP, represented community groups, environmental organizations, local governments, and regional governmental entities in energy, environmental, and land use matters. The author offers special thanks to the following: Professors Michael Dworkin and Janet Milne at Vermont Law School; Richard Cowart, Richard Sedano, and Richard Weston at the Regulatory Assistance Project; and Professor Steven Weissman at the University of California, Berkeley School of Law (Boalt Hall) for their invaluable assistance in developing and responding to the ideas in this Article, although the author takes full responsibility for its content. The author also thanks Professor Dworkin, Professor Don Kries, Jessica Reiss, Zhen Zhang, and Matthew Stern at Vermont Law School's Institute for Energy and the Environment and Richard Cowart for their editorial assistance.

INTRODUCTION

Two distinct experiences shape America's nearly four decades of environmental endeavor: a steady awakening to the urgency of the environmental agenda[1] and a vacillating governmental response.[2] As many early predictions of environmental damage have turned into present realities,[3] ecological "facts on the ground" teach that the nation will need to alter significant aspects of modern civilization to avoid a twenty-first century dominated by regional conflict over water, food, and fuel. By contrast, government initiatives to address environmental concerns have waxed and waned at the federal level[4]

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1 *See* News Release, The Pew Research Ctr. for the People & the Press, Environment, Immigration, Health Care Slip Down the List: Economy, Jobs Trump All Other Policy Priorities in 2009, at 3 (Jan. 22, 2009) [hereinafter Pew Policy Priorities], *available at* http://people-press.org/reports/pdf/485.pdf (tracking top domestic priorities for President Obama and Congress and showing the percentage of people who consider "protecting the environment" a "top priority" to be 44% in 2002, while trending up to 57% in 2006 and 2007). In the 2008 presidential election, candidates John McCain and Barack Obama did not debate whether or not climate change was a reality. Instead, both candidates advanced plans to cap and trade emissions. They differed only on the amount and time frame for reductions. President Obama called for "reducing greenhouse gas emissions to 80[%] below 1990 levels by 2050," while McCain called for "a 60[%] reduction below 1990 levels in greenhouse gas emissions by 2050." Bina Venkataraman, *Campaigns Push Energy Issues to the Forefront*, BOSTON GLOBE, Oct. 30, 2008, at A14; *see also* Matthew C. Nisbet & Teresa Myers, *The Polls—Trends: Twenty Years of Public Opinion About Global Warming*, 71 PUB. OPINION Q. 444, 446 tbl.1 (2007) (showing an increase in awareness of the "greenhouse effect" from 39% in 1986 to 91% in 2006).

2 *Compare* Regulating Greenhouse Gas Emissions Under the Clean Air Act, 73 Fed. Reg. 44,354 (proposed July 30, 2008) (to be codified at 40 C.F.R. ch. 1) (stating the Environmental Protection Agency (EPA) Administrator under the Bush administration proposes *not to* regulate greenhouse gas emissions under the Clean Air Act), *with* Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 18,886 (proposed Apr. 24, 2009) (to be codified at 40 C.F.R. ch. 1) [hereinafter EPA Endangerment Finding] (stating the EPA Administrator under the Obama administration proposes *to* regulate greenhouse gas emissions under the Clean Air Act).

3 *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 30 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf (summarizing observed environmental changes including increases in global surface temperature, increases in tropical storm intensity and precipitation, decreases in snow and ice, and rises in sea level).

4 The major media-based regulatory statutes were created during the administrations of Presidents Nixon and Ford, but neither they nor their administrations were serious about implementation. Republicans and many Democrats in Congress counted on underfunding to ensure that the early laws would remain largely aspirational. The Carter administration made serious advances, especially in the new fields of energy and hazardous waste, but the effort was cut short by a single-term presidency hobbled in its final year by the Iran hostage crisis. The Reagan presidency not only slowed or stopped progress, but also consolidated control over the nation's political vocabulary, both rendering it difficult or

and have shown great variability in the states, where some, largely the coastal states, have embraced environmental policy experimentation. Many other states, reflecting the sustained success of the conservative drive to reduce government as a tool for the implementation of social policy,[5] regulate air and water pollution at, or below, the minimum requirements of federal law and do not seriously address energy efficiency or the use of alternative energy.[6]

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impossible to contemplate, or undertake, serious use of government to address environmental issues and creating an atmosphere where market-based solutions were presumed to be superior to governmental solutions. Some progress was made under George H.W. Bush, but the basic neglect of governmental capabilities and the resulting, programmatic atrophy continued. The Clinton administration readdressed environmental concerns in an era during which the steady rise of understanding and crisis made the issue more urgent than during the Carter years. Although the effort made significant strides, its success was both cabined by the need to proceed within the confines of a continuing antigovernment tenor in the political discussion and, subsequently, slowed by the Clinton impeachment and the conservative Republican victory in the 1994 congressional elections. During the presidency of George W. Bush, the nation lost ground as Europe moved to tackle global warming. *See* RICHARD J. LAZARUS, THE MAKING OF ENVIRONMENTAL LAW, at xi–xiii (2004) (providing an account and analysis of the past three decades of environmental law); *see also* Joseph P. Tomain, *The Past and Future of Electricity Regulation*, 32 ENVTL. L. 435, 437, 466–67 (2002) (discussing President George H.W. Bush's National Energy Policy).

The effect of vacillation at the congressional level is illustrated by the timing of changes in policy regarding levels of installation of wind power capacity in the United States. The American Wind Energy Association tracks annual installed capacity, which shows conspicuously large drops in installed wind power capacity in 2000, 2002, and 2004, aligning with the expiration of federal production tax credits. AM. WIND ENERGY ASS'N, WINDPOWER OUTLOOK 2009 (2009), http://www.awea.org/pubs/documents/Outlook_2009.pdf. According to the report, "[e]xpirations of the federal production tax credit (in 1999, 2001, 2003) wreak havoc on industry planning and cause drops in new installations (2000, 2002, 2004)." *Id.*

5 *See* Bob Davis et al., *Unraveling Reagan: Amid Turmoil, U.S. Turns Away from Decades of Deregulation*, WALL ST. J., July 25, 2008, at A1 ("The housing and financial crisis convulsing the U.S. is powering a new wave of government regulation of business and the economy.").

6 In 2007, *Forbes* ranked all fifty states on a scale of environmental orientation. Brian Wingfield & Miriam Marcus, *America's Greenest States*, FORBES.COM, Oct. 17, 2007, http://www.forbes.com/2007/10/16/environment-energy-vermont-biz-beltway-cx_bw_mm_1017greenstates.html. The "Greenest" states were Vermont, Oregon, Washington, Hawaii, and Maryland. *Id.* The least green states were Kentucky, Mississippi, Louisiana, Alabama, Indiana, and West Virginia. *Id.* *Forbes* "ranked each state in six equally weighted categories: carbon footprint, air quality, water quality, hazardous waste management, policy initiatives and energy consumption." *Id.* *Forbes* used the American Lung Association's 2007 State of the Air Report to assess air quality, a 2007 water assessment by the Public Interest Research Group to assess water quality, 2005 data generated by the EPA to assess hazardous waste management, and the American Council for an Energy-Efficient Economy's 2007 scorecard to assess energy efficiency. *Id.* *Forbes* reviewed several factors—such as vehicle miles traveled—to assess energy consumption. *Id.* *Forbes* also assessed various miscellaneous criteria such as LEED

Now, the climate-driven rise of environmental understanding combines with a new political context to create a qualitatively distinct situation for the environmental endeavor in this country. No presidency prior to the Obama administration has enjoyed such receptivity both to the environment as an issue and to the use of government to address it. Although the population of the United States as a whole continues to rank the environment and global warming lower than other concerns such as the economy,[7] awareness of ever more apparent environmental degradation and climate change continues to grow, notably among an increasing range of social and economic leaders, entering significant elements of the business and financial community,[8] the labor movement,[9] and some conservative religious groups.[10] Understanding of the need to accelerate the development of renewable energy and energy efficiency and to reduce oil consumption has become more widespread. While economic downturns in the past have put the environmental movement on the

certifications and alternative fuel requirements. *Id.*; *see also infra* notes 210–14 and accompanying text (discussing the American Council for an Energy-Efficient Economy (ACEEE) ranking of states by investment in energy efficiency).

7 *See* Pew Policy Priorities, *supra* note 1, at 2 (ranking the public's "top priority" concerns; showing energy at sixth after the economy, jobs, terrorism, social security, and education; and further displaying that the environment is sixteenth and global warming is twentieth). Relative ranking aside, the levels of concern for the environment shown in the poll are quite high, with 60% of the respondents ranking energy as a top priority and 41% ranking the environment as a top priority. *Id.* Environmental issues are apparently well established in the minds of the larger public. Even more, it appears the public recognizes the issues as immediately pressing.

8 *See* Clifford Krauss & Kate Galbraith, *Climate Bill Splits Exelon and Chamber of Commerce*, N.Y. TIMES, Sept. 29, 2009, at B1 (reporting both the plan of Exelon, the country's largest operator of nuclear power plants, to leave the U.S. Chamber of Commerce because of the Chamber's stance against climate change legislation and the plan of Pacific Gas & Electric and PNM Resources to withdraw); Kate Galbraith, *Nike Quits Board of U.S. Chamber*, N.Y. TIMES, Oct. 1, 2009, at B2 (reporting the same for Nike); *see also* WORLD BUS. COUNCIL ON SUSTAINABLE DEV. & WORLD ECON. FORUM, CEO CLIMATE POLICY RECOMMENDATIONS TO G8 LEADERS: JULY 2008, at 4 (2008), *available at* http://www.weforum.org/documents/initiatives/CEOStatement.pdf (stating that "over 80 chief executive officers of leading global companies" urge G8 leaders to take action on climate change).

9 *See* Darren Samuelsohn & Ben Geman, *House Dems Prepare to Gamble on Climate Bill Vote*, N.Y. TIMES, June 26, 2009, http://www.nytimes.com/cwire/2009/06/26/26climatewire-house-dems-prepare-to-gamble-on-climate-bill-36514.html?pagewanted=all ("The AFL-CIO, the nation's largest labor organization, urged lawmakers to vote 'yes' on the [Waxman-Markey] bill in its own letter yesterday . . . .").

10 *See generally* ELIZABETH ALLISON, GARRISON INST., RELIGIOUS ORGANIZATIONS TAKING ACTION ON CLIMATE CHANGE (2007), *available at* http://research.yale.edu/environment/climate/wp-content/uploads/2007/04/religioncc0107.pdf (listing religious organizations with programs addressing climate change).

defensive,[11] the recession of 2008–2010 has created a political climate somewhat more receptive to the use of government as a solution to environmental problems.[12]

This Article addresses opportunities and obstacles facing the environmental community in its attempt to use this historic confluence to address the carbon emissions issue. In fact, the nation has a unique opportunity for necessary policy formulation, especially at the federal level,[13] but this Article proposes that implementation will pose more daunting problems rooted in decades of neglect toward the capacity of government, especially at the state level.

Before addressing the obstacles, it is essential to understand that much can be done to reduce the nation's carbon footprint by addressing sources that are susceptible to easy identification and abatement through processes that involve relatively familiar and centralized administrative effort. Slightly less than one-third of our carbon emissions originates from cars, trucks, and other mobile sources.[14] Without minimizing the political obstacles and economic impacts, nationwide adoption of both CO_2 standards similar to those

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[11] *See infra* notes 123–32 (discussing physical and social realities leading to the postponement of attainment deadlines for the Clean Air Act).

[12] *See* Davis et al., *supra* note 5.

[13] In the first six months of the Obama administration:

> (1) the EPA approved the California CO_2 standards for mobile sources, *see* Notice of Decision Granting a Waiver of Clean Air Act Preemption for California's 2009 and Subsequent Model Year Greenhouse Gas Emission Standards, 74 Fed. Reg. 32,744, 32,744 (proposed July 8, 2009), *available at* http://edocket.access.gpo.gov/2009/pdf/E9-15943.pdf;
>
> (2) the EPA proposed to regulate greenhouse gases under the Clean Water Act, EPA Endangerment Finding, *supra* note 2;
>
> (3) the House of Representatives passed a cautious, if complex, approach to reducing carbon emissions from the electricity sector, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009); and
>
> (4) the EPA proposed rules to regulate greenhouse gas emissions. Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule, 74 Fed. Reg. 57,126, 57,126 (proposed Nov. 4, 2009), *available at* http://www.epa.gov/nsr/documents/GHGTailoringProposal.pdf; *see also* John M. Broder, *E.P.A. Proposes New Regulations on Industry Gas*, N.Y. TIMES, Oct. 1, 2009, at A1 (citing the reason for the EPA's proposed action as an "unwilling[ness] to wait for Congress to act").

[14] U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2007, at ES-16 tbl.ES-7 (2009) [hereinafter EPA EMISSIONS INVENTORY] (charting U.S. greenhouse gas emissions in 2007 allocated by economic sector and further showing 28% of emissions resulted from the transportation sector, 34% from the electricity sector, and 19% from the industry sector).

of California[15] and stricter fleet mileage requirements similar to the Corporate Average Fuel Economy (CAFE) standards, enacted by Congress in 1975,[16] will substantially reduce carbon emissions through relatively straightforward legislative and agency action. Additionally, though somewhat less centralized, the power sector, which contributes another third of our carbon footprint, features similarly "low hanging fruit."[17] Some fifty power plants in the United States—mostly older, inefficient coal plants—contribute 30% of all the carbon emissions from the power sector.[18] The act of closing those plants and replacing them with low-carbon or no-carbon options, such as combinations of natural gas plants and efficiency services, would constitute a major step forward.

Such results, however admirable, would constitute only the beginning of a serious climate effort. A frequently stated climate goal calls for limiting the rise of average global temperature by two degrees Celsius, a target increase considered to be near or at the limit society can absorb without severe socioeconomic dislocations.[19] Attainment of this 2% target would require overall carbon emission reductions estimated to be 80% or less than emissions in various historic base years.[20] The above-described efforts would reduce the

15 *See* Assem. B. 1493, 2001–2002 Leg., Reg. Sess. (Ca. 2002) (directing the California Air Resources Board to adopt regulations beginning in 2009). The EPA has now taken action to adopt CAFE standards. Proposed Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards, 74 Fed. Reg. 49,454, 49,454 (Sept. 28, 2009).

16 The Energy Policy and Conservation Act, Pub. L. No. 94-163, 89 Stat. 871 (1975) (codified as amended in scattered sections of 42 and 49 U.S.C.), added Title V, "Improving Automotive Efficiency," to the Motor Vehicle Information and Cost Savings Act, Pub. L. No. 92-513, 86 Stat. 947 (1972), and established CAFE standards, 49 U.S.C. §§ 32902–32919 (2006).

17 *See* EPA EMISSIONS INVENTORY, *supra* note 14, at 2–17 (charting electricity as the cause of 34% of U.S. greenhouse gas emissions).

18 U.S. Envtl. Prot. Agency, eGRID, *available at* http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2007_Version1-1_xls_only.zip (last visited Jan. 29, 2010) (reporting the 2005 fuel consumption, emissions, emission rates, and resource mix for all 4998 electric generators in the United States).

19 *See* Malte Meinshausen et al., *Greenhouse-Gas Emission Targets for Limiting Global Warming to 2° C*, 458 NATURE 1158 (2009); *cf.* Peter Baker, *Poorer Nations Reject a Target on Emission Cut,* N.Y. TIMES, July 9, 2009, at A1 (stating that G8 "negotiators embraced a goal of preventing temperatures from rising more than 3.6 degrees Fahrenheit, and developing nations agreed to make 'meaningful' if unspecified reductions in emissions").

20 *See* NICHOLAS STERN, THE ECONOMICS OF CLIMATE CHANGE: THE STERN REVIEW 218 (2007) (defining and quantifying "stabilisation" as requiring an emissions reduction of

nation's carbon emissions by an estimated 15% to 20%.[21] The rest is the harder work and involves substantial governmental efforts, which are the subject of this Article.

Sooner rather than later, efforts to address climate and energy issues must involve altering patterns of energy supply and use, which in turn means implementing a set of policies and programs that will exceed our current governmental capacity. An ambitious administration and an unlikely cooperative Congress could enact new legislation, issue new regulations, and mandate the creation of new markets. While at least some regulators possess the know-how to implement these new imperatives, the effort will generally require a range of capabilities and expertise in government that does not currently exist. Some of these capacity deficits exist in the federal government, but the most dramatic gaps will occur at the state and local level where programs will have to be implemented to substantially expand the delivery of energy efficiency services,[22] the most immediately available and economically viable carbon reduction strategy.

Government can pass a stimulus bill, for example, that dedicates billions of dollars for green energy efforts at the state and local level,[23] but most states do not possess the people and expertise to design the necessary programs, much less spend the money. This mismatch between mandate and capacity for implementation will

over 80% in order to balance "the Earth's natural capacity to remove greenhouse gases from the atmosphere").

21 The uncertainties in such a calculation tend to ensure any algorithm will suffer from false precision. This Article uses the following assumptions to produce an order of magnitude calculation: power plants generate approximately one-third of the nation's carbon emissions; the fifty coal plants with the most emissions produce half of that amount; and retrofitting those plants could save one-third to one-half of the amount they emit depending on the nature of the substitution—but assuming the substitution is not by efficiency or renewables. These generalities yield 1/3 x 1/2 x (1/3 or 1/2) = 5% to 8%. Transportation is responsible for about a third of the nation's carbon emissions as well. *See supra* note 14 and accompanying text. Assume that CAFE increases yield a one-third reduction in that amount; thus, an additional 11% reduction occurs for a total reduction of 16% to 19% from these changes, which is rounded to the 15% to 20% mentioned in the Article.

22 For a discussion of state programs with substantial experience and success in efficiently using funds generated by voluntary cap-and-trade programs, see *infra* note 195 and accompanying text. For a discussion of state programs with substantial experience and success in efficiently using funds generated by charges applied to all users, see *infra* note 202 and accompanying text.

23 *See* American Recovery and Reinvestment Act of 2009, H.R. 1, 111th Cong. (enacted).

increase manyfold as funds from either carbon cap-and-trade legislation or a carbon tax search for a productive home.[24] As discussed throughout this Article, the levels of carbon price adder (through a cap-and-trade regime) or a carbon tax (at any tax levels under discussion) will not create market effects sufficient to reduce carbon emissions without implementation of efficiency and demand-response policies and programs at the state level, which would require expertise to implement—an expertise currently nonexistent, or in short supply, in most states and in much of the federal regime as well. The source of this lack of capacity lies in both the historic, national ambivalence toward using government as a tool for addressing social concerns and the success of the conservative movement's efforts to limit governmental authority and capability.[25] The result is a government without the tools, people, or budget to address the national climate and energy agenda, unless a generation of neglect of the public sector is reversed.

This Article examines the need for increased capacity in government in two related arenas: the use of a carbon tax or cap-and-trade regime to control carbon emissions and the need to administer energy markets in a way that fulfills their function and operates without abuse. This Article first examines the effort to control carbon emissions, discussing the governmental efforts that will be necessary to administer either a carbon tax or cap-and-trade regime.[26] It then advances the thesis that the political and structural realities associated with our dependence on fossil fuel-based transportation and electricity generation make it unlikely that either approach can reduce carbon emissions solely through the market effect of increased carbon prices. Rather, this Article proposes that, for the next decade and likely the two after that, a carbon tax or cap-and-trade system can achieve carbon reductions largely through a combination of regulatory policies embedded in the legislation and the investment of the revenues resulting from the tax or carbon allowance sales in new government-directed programs to deliver energy efficiency and demand-response services on a nationwide basis.[27] In theory, either a

[24] *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong.; *see also, e.g.*, Save Our Climate Act of 2009, H.R. 594, 111th Cong.; America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong.; Raise Wages, Cut Carbon Act of 2009, H.R. 2380, 111th Cong.

[25] *See* Davis et al., *supra* note 5.

[26] *See infra* Part I.A.

[27] *See infra* Parts I.B., I.C.

tax or a cap-and-trade system could generate the financial resources necessary. However, while some states have developed the bureaucracies and skills necessary to run such programs,[28] most have not and need to be incentivized to change course.

This Article then examines the need for government regulation in the electricity sector as a whole, focusing on both the nation's experimentation with markets, specifically the wholesale electricity market, and the move toward restructuring in many states.[29] This Article contends that, while wholesale electricity markets are a necessary part of any modern system, such markets work only if carefully imbedded in a governmental regulatory regime.[30] The move to restructure traditional command-and-control regulation and the move toward reliance on retail electricity markets in some states have failed to deliver financial benefits to consumers, have changed the cast of characters in the electricity system in ways that do not improve it, and have placed burdens on the American transmission grid.[31] In general, markets have failed to produce the anticipated benefits, and government as regulator has emerged as the necessary paradigm.

I
CARBON TAX OR CAP AND TRADE, IT ALL COMES BACK TO GOVERNMENT

As of this writing, the U.S. House of Representatives has passed and the Senate is considering complex cap-and-trade approaches to reduce carbon emissions from the power sector.[32] Carbon tax

28 *See infra* Part I.A.

29 *See infra* Part II.

30 *See infra* Part II.D.

31 *See* SETH A. BLUMSACK ET AL., CARNEGIE MELLON ELEC. INDUS. CTR., COMMENTS ON WHOLESALE AND RETAIL ELECTRICITY COMPETITION 2 (2005), http://wpweb2.tepper.cmu.edu/ceic/pdfs_other/FERC_Comments_11_18_05.pdf ("Our research shows that there is no evidence that restructuring has produced any measurable benefit to consumers or to the systems which have restructured."); *see also* Timothy P. Duane, *Regulation's Rationale: Learning from the California Energy Crisis*, 19 YALE J. ON REG. 471, 489–90 (2002) (differentiating electricity from other industries in which deregulation was successful).

32 *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong.; GovTrack.us, H.R. 2454: American Clean Energy and Security Act of 2009, http://www.govtrack.us/congress/bill.xpd?bill=h111-2454 (last visited Jan. 29, 2010).

proposals are under consideration as well.[33] For reasons explained below, neither approach works in the absence of increased governmental capacity. Both systems need substantial regulatory effort just to function, although a tax is much simpler to administer. In addition, neither the carbon "cap" nor any politically realistic level of carbon tax or carbon allowance cost will, operating alone, reduce carbon emissions.[34] The advantage of both systems lies in the related policies that may be enacted and the funds the carbon price adder or tax will generate. In the short and medium term, these funds and policies must support energy efficiency and demand response (together referred to as demand-side management or DSM), by far the cheapest and most readily available means to reduce carbon emissions.[35] The bulk of that investment must occur through government policies, programs, and structures that do not yet exist in most states. Thus, regardless of the legislative approach selected at the federal level, a successful carbon strategy will require substantial investment in new governmental capacity, especially at the state level.

A. Both Cap-and-Trade and Tax Regimes Require Substantial Governmental Presence for Basic Operation

When considering a carbon tax or cap-and-trade program, most public observers and advocates tend to focus on the operation of the market rather than government to achieve the intended effect. As discussed later, neither will achieve its ends primarily through market effect, but at the outset, it is important to note that the basic operation

33 *See, e.g.*, Save Our Climate Act of 2009, H.R. 594, 111th Cong.; America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong.; Raise Wages, Cut Carbon Act of 2009, H.R. 2380, 111th Cong.

34 *See* Richard Cowart, *Carbon Caps and Efficiency Resources: How Climate Legislation Can Mobilize Efficiency and Lower the Cost of Greenhouse Gas Emission Reduction*, 33 VT. L. REV. 201, 208–09, 211–12 (2008) [hereinafter Cowart, *Carbon Caps*] (discussing the incorrect assumption that a carbon tax or cap-and-trade program will reduce greenhouse gas emissions significantly without reinvestment into efficiency programs); *see also The Consumer Allocation for Efficiency: How Allowance Allocations Can Protect Consumers, Mobilize Efficiency, and Contain the Costs of GHG Reduction: Hearing on H.R. 2454 Before the Subcomm. on Energy and Environment of the H. Comm. on Energy and Commerce*, 111th Cong. 1 (2009) (statement of Richard Cowart, Dir., Regulatory Assistance Project) [hereinafter Cowart, *Testimony*] (stating "[p]rice is not enough. While one of the essential purposes of cap-and-trade systems and carbon tax proposals is to deliver a price signal to producers and consumers of energy, a climate program that attempts to reduce emissions through price alone will be much more costly than a comprehensive program that includes proven techniques to deliver low-carbon resources, especially cost-effective efficiency resources" (emphasis omitted)).

35 *See infra* notes 150–52 and accompanying text.

of either approach would be a substantial, new governmental presence.

It is axiomatic, of course, that a tax requires a taxing authority, and, in the United States, such an effort would be carried out by the federal government through the Internal Revenue Service.[36] The tax itself would involve substantial implementation issues, although much less so than the complexities of a cap-and-trade regime. Any congressional system will merely set forth the basic policies for the tax—whether the tax is narrowly focused on electricity or extends to the manufacturing, building, or transportation sectors. Similarly, Congress will determine whether the tax is imposed at one of the following points: far "upstream," where oil and gas are imported into the United States; more downstream, at some intermediate point such as the manufacture of cars and trucks and the generation of electricity; or even further downstream, to the point of actual energy consumption.[37] The legislation will also set out exemptions and exclusions, the point at which political pressures assert themselves in a taxation scheme, rendering potentially simple legislation complex. Once these policies are set, agencies of the federal government will need to create regulations and guidelines to apply these principles to a relatively small number of upstream users (possibly built on top of existing taxes) or, if further downstream, to hundreds of thousands of business taxpayers.

The tax would likely be levied in terms of a certain dollar amount per ton of carbon dioxide equivalent, that is the tax rate multiplied by the number of tons, or fraction of tons, of carbon emitted by combustion of a unit of the taxed material.[38] A simple, if unrealistically high, tax example would operate as follows: if the carbon tax were $100 per ton of CO_2 equivalent and combustion of a

36 Janet E. Milne, *Carbon Taxes in the United States: The Context for the Future*, 10 VT. J. ENVTL. L. 1, 29–30 (2008) (summarizing the similarities and differences between carbon taxes and cap-and-trade programs).

37 *See* H.R. 594 § 3; H.R. 1337 § 2; H.R. 2380 § 2; *see also* Janet E. Milne, *Carbon Taxes Versus Cap-and-Trade: The Relative Burdens and Risks of Market-Based Administration*, *in* 7 CRITICAL ISSUES IN ENVIRONMENTAL TAXATION: INTERNATIONAL AND COMPARATIVE PERSPECTIVES 445 (Lin-Heng Lye et al. eds., 2009) (discussing the comparative structure of carbon taxes and cap and trade, while pointing to the relative simplicity of the former).

38 Stephan Speck, *The Design of Carbon and Broad-Based Energy Taxes in European Countries*, 10 VT. J. ENVTL. L. 31, 44 (2008) (describing the schemes by which CO_2 taxes are levied in Denmark, Germany, Sweden, and the United Kingdom and showing Denmark's tax of EUR 12 per ton of CO_2).

barrel of oil was deemed to produce 0.43 metric tons of CO_2 emissions,[39] then the tax would be $43 per barrel. Some entity needs to quantify these equivalents and, if appropriate in light of how far downstream the tax is imposed, disaggregate the carbon equivalents and allocate them to the sources taxed, an exercise quite complex and laden with value judgments.[40] Thus, implementation of a carbon tax will require substantial effort at the federal level.

The basic operation of a cap-and-trade system presents complexity of a different order of magnitude and at all levels of government. Many proposals would create new bureaucracies to implement and watchdog the system at the national level.[41] Existing cap-and-trade systems in the United States and in Europe and the proposals currently before Congress all share a common feature: a proposed cap of total carbon emissions that declines over time.[42] The cap is expressed in terms of tons of CO_2 or an equivalent for other substances that contribute more to the greenhouse effect.[43] The legislation will likely set the cap, its rate of decline, and target year

39 *See* U.S. Envtl. Prot. Agency, Clean Energy: Calculations and References, http://www.epa.gov/cleanrgy/energy-resources/refs.html#oil (last visited Jan. 29, 2010).

40 *See* Gilbert E. Metcalf & David Weisbach, *The Design of a Carbon Tax*, 33 HARV. ENVTL. L. REV. 499, 523 (2007) (discussing where to impose the carbon tax and the benefits of imposing the tax upstream).

41 *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 113(a)(1) (establishing a carbon capture and sequestration task force); *id.* § 171(a) (establishing eight Energy Innovation Hubs); *id.* § 182 (establishing the Clean Energy Deployment Administration); *id.* § 198 (establishing the Office of Consumer Advocacy and the Consumer Advocacy Advisory Committee); *id.* § 215 (establishing the WaterSense program within the EPA); *id.* § 223 (establishing the SmartWay Transport Program within the EPA); *id.* § 331 (proposing addition of § 731 to the Clean Air Act) (establishing the Offsets Integrity Advisory Board); *id.* § 452 (establishing the National Climate Service); *id.* § 475 (establishing the Natural Resources Climate Change Adaptation Panel); *id.* § 493(a) (establishing the International Climate Change Adaptation Program).

42 *See, e.g.*, *id.* § 311 (proposing addition of § 721(e) to the Clean Air Act); *see also* Council Directive 2003/87/EC, 2003 O.J. (L 275) 32 (EU) (creating the European Union Greenhouse Gas Emission Trading System (EU ETS)); Reg'l Greenhouse Gas Initiative, Participating States: State Regulations, http://www.rggi.org/states/state_regulations (last visited Jan. 29, 2010) (listing each state statute or regulation implementing the Regional Greenhouse Gas Initiative (RGGI)).

43 For example, in terms of greenhouse effect, which is the atmosphere's containment of heat, methane is estimated to have twenty-one times the effect of CO_2, and, thus, a ton of methane emissions would be considered the equivalent of twenty-one carbon allowances. Metcalf & Weisbach, *supra* note 40, at 504 (stating methane has a hundred-year global warming potential of twenty-one, which means that one ton of methane emissions has the same climate change impact as twenty-one tons of CO_2).

for achieving a stated percentage reduction,[44] but some federal entity must define the cap in more specific terms.[45] The science behind equivalencies is fairly well advanced; however, the issue is not without its controversy, and the definitions will need to be the subject of an administrative process.

The system begins with a base year, for example, 1990, 1995, or 2005.[46] Again, some entity will have to calculate the total tons of carbon emissions within the United States as of that year. This involves assembling an inventory of all sources of carbon emissions and constructing a quantification of the base year emissions[47] through recorded throughputs or modeling, a considerable challenge, likely subject to controversy. In addition to the base year, existing and proposed cap-and-trade systems feature a stated target percentage reduction from the base year in a target year, for example, a 50% or 80% reduction in carbon emissions from the base year by 2050.[48] The system will then mandate successive reductions in the cap. Some proposals require steady reductions over the effective period of the legislation, while others rely on less frequent and steeper declines.[49] In either case, a governmental entity will need to track carbon

44 *See* H.R. 2454 § 311 (proposing addition of § 721(e) to the Clean Air Act) (defining declining emission allowances for every year from 2012 to 2050).

45 *See id.* § 311 (proposing addition of § 712(b)(1) to the Clean Air Act) (defining carbon dioxide equivalencies for purposes of the Clean Air Act). Proposed section 712(c)(1) of the Clean Air Act states that the EPA Administrator shall conduct the tasks associated with setting the CO_2 cap, including reviewing the carbon dioxide-equivalent values of greenhouse gases every five years. *Id.*

46 *See id.* § 335 (proposing addition of § 861 to the Clean Air Act); *infra* note 194 (describing the voluntary cap-and-trade programs). In negotiations with the G8 in July 2009, the United States insisted on language that leaves uncertain "the starting year against which emissions reductions will be measured." John M. Broder & James Kanter, *Despite Shift on Climate by U.S., Europe Is Wary*, N.Y. TIMES, July 8, 2009, at A9. The Europeans prefer 1990, "which would require much steeper near-term emission cuts, while the United States, Australia and Japan [prefer] a 2005 benchmark." *Id.*

47 *See, e.g.*, H.R. 2454 § 311 (proposing addition of § 721(e) to the Clean Air Act) (setting the base at 4627 million emission allowances in 2012).

48 *See, e.g.*, *id.* (calling for a 77.6% reduction from 2012 to 2050); *see also infra* note 195 (elaborating on state programs with substantial experience and success in efficiently using funds generated by voluntary cap-and-trade programs). As of this writing, the Obama administration agrees with the Europeans on an aspirational goal of a 50% reduction by 2050. Broder & Kanter, *supra* note 46.

49 *Compare, e.g.*, H.R. 2454 § 311 (proposing addition of § 721(e)(1) to the Clean Air Act) (defining specific emissions reductions for every year between 2012 to 2050), *with, e.g.*, Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 3, para. 1, Dec. 10, 1997, 37 I.L.M. 22 (defining one emissions reduction of 5% below 1990 levels by 2012).

emissions over time through inventories, modeling, or a combination thereof in order both to determine whether covered emitters are in compliance with the downward steps and to determine the progress of regions, states, and the nation as a whole toward reducing carbon.

In order to make the scheme functional, entities actually responsible for the carbon emissions in the aggregate have to reduce their emissions from the levels of the base year to the levels necessary to achieve the progressive reductions in the cap. Cap-and-trade schemes accomplish this reduction in the electricity sector through a system of distribution, by auction (preferred by proponents of carbon reduction) or the no-cost allocation (preferred by emitters) of rights to emit carbon, called carbon credits or allowances. The scheme mandates that each of these carbon sources only continue to emit carbon dioxide if the source possesses and then uses or retires the number of carbon allowances that reflect the tons of carbon it emits or consumes.[50] Such carbon allowances will thus have a high value and importance, either (1) as the "currency" under the cap-and-trade scheme required to generate electricity or to purchase electricity generated by sources that produce carbon emissions, or (2) as a commodity that can be sold, if the possessing entity has excess allowances to sell on carbon allowance markets, to other entities that, in turn, need the carbon allowances for power generation or want to resell or option the allowances.

For example, a system that power companies prefer could, upon the start date, allocate a number of carbon allowances equal to its current carbon emissions at no cost to each power-generating entity. Those carbon allowances would have a life equal to the applicable period. If, for example, the legislation required a downward step each three years, the allowance could have a three-year life or less, as it could be three successive one-year allowances. At the end of the three-year period, a fewer number of carbon allowances would be issued to the generating entity reflecting the required reduction in emissions; a downward step of 10%, for example, would result in the

50 *See generally* H.R. 2454. In any cap-and-trade system, allowances are issued and tracked by a governmental authority. When allowances are "used," that is, "retired," the user notifies the administering agency, which then records that those allowances have been consumed and may not be used again. The American Clean Energy and Security Act of 2009 defines "retire" within the cap-and-trade program as "to disqualify such allowance or offset credit for any subsequent use under this title." *Id.* § 312 (proposing addition of § 700(42) to the Clean Air Act).

issuance of 10% fewer allowances for the period.[51] The supervising governmental entity would need to devise a system to allocate the cap among a group of sources it defines and inventories by determining the amount of current carbon emissions and, subsequently, administering the reduction in the allocation to the entities as the national cap declines. Such a task is not dissimilar (though with fewer sources) to the effort required at the state and local level to apply the ambient air standards and timetables in the Clean Air Act to every source of emissions in the United States, a federal, state, and regional effort in collaborative government that required nearly five decades to develop.[52]

Note that the example above involving the allocation of allowances to generators, while preferred by the generators themselves, is most problematic. When the time comes to reduce the needed number of carbon allowances, the generator has few real options. Carbon cap and trade presents very different realities to a power producer than the control of other pollution types such as sulfur dioxide, where the emitters can elect to install pollution control devices to reduce emissions.[53] There exists no "scrubber" for carbon, no simple way to abate it through an add-on pollution control device.[54] Thus, the generator has only a few, unpalatable choices: it can downsize its production, likely by shutting down some generating units; it can replace older, inefficient generating units with new generators that produce more megawatts per ton of CO_2 emitted; or, as described below, it could purchase carbon allowances on a market for allowances created by the legislation. None of these approaches

51 *See id.* § 311 (proposing addition of § 721(e)(1) to the Clean Air Act). Section 5.2 of the 2008 edition of RGGI's model rule provides for the issuance of allowances every three years. REG'L GREENHOUSE GAS INITIATIVE, REGIONAL GREENHOUSE GAS INITIATIVE MODEL RULE § 5.2 (2008), *available at* http://www.rggi.org/docs/Model%20Rule%20Revised%2012.31.08.pdf.

52 *See* Regan J.R. Smith, *Playing the Acid Rain Game: A State's Remedies*, 16 ENVTL. L. 255, 265 (1986) (presenting an overview of the administration of the Clean Air Act "utilizing state devised implementation plans to meet federally promulgated air quality standards").

53 U.S. Envtl. Prot. Agency, Reducing Acid Rain, http://www.epa.gov/acidrain/reducing/index.html (last visited Jan. 29, 2010) (listing options for reducing sulfur dioxide emissions, including the installation of relatively inexpensive scrubbers).

54 Carbon sequestration is, at best, in the demonstration stage. Implementation presents daunting physical, economic, and legal obstacles. *See* CCSREG PROJECT, CARBON CAPTURE AND SEQUESTRATION: FRAMING THE ISSUES FOR REGULATION 1–4 (2009) [hereinafter CCSREG INTERIM REPORT], *available at* http://www.ccsreg.org/pdf/CCSReg_3_9.pdf.

works well for a given generator over time. Downsizing means going out of business. Installing new units works only for older plants, and once that effort is complete, the option is no longer available. Purchasing carbon allowances will become increasingly expensive and difficult over time as the cap declines.

Better systems would distribute the carbon allowances to consumers via a local electric service provider, such as an investor-owned utility, a municipal utility, an electric cooperative, frequently referred to as a local distribution company (LDC), or some other consumer trustee. The distribution amount would be set by a formula reflecting the electricity sold within the service area in the base year. The LDC would then be incentivized to utilize its allowances in the most efficient way by shopping for the least carbon-consuming electricity supply options, potentially using less than the allotted allowances and selling the remainders on the carbon allowance market. In one iteration of this approach, these LDCs would be the ones charged with retiring one carbon allowance for each ton of CO_2 emissions caused by the generation of the electricity they distribute. The entity would, in essence, "use up" the allowances as it shopped for and purchased power, including from itself in the case of a utility that both purchases power and owns its own generation.[55] This local service entity or consumer trustee would spend one allowance for each ton of carbon emitted by the sources from which it obtained power.

This approach would present the owner of the carbon allowances (e.g., the local service provider) with choices that are more meaningful than those facing the generator in the above example, and this scheme would facilitate the policy goals of the cap-and-trade system. While the generator has few options for reducing carbon, the local provider would start with a given number of allowances that it would be incentivized to use in the most carbon-efficient manner, buying the most power it could for the least number of allowances because, if it saved allowances, it could sell them on a carbon allowance market or possibly bank them for a future period depending on the banking provisions of the applicable legislation. In any case, the local provider would not want to exceed its supply of allowances since it would then have to purchase allowances in the market, an

[55] *See* RICHARD COWART, THE REGULATORY ASSISTANCE PROJECT, EFFICIENT RELIABILITY: THE CRITICAL ROLE OF DEMAND-SIDE RESOURCES IN POWER SYSTEMS AND MARKETS 63–64 (2001).

expense it would have to pass on to unhappy consumers. Thus motivated to seek an efficient use of its carbon allowances, the local electricity provider or consumer trustee would likely prefer wind as a source of power over natural gas and natural gas over coal. Most significantly, the local entity would likely invest in efficiency to reduce its demand so it could sell excess credits.[56]

The formula for distribution of this initial national carbon cap among local distribution companies would likely be determined through national legislation and could be based either on current carbon emissions, on population, on current electricity sales, or on some form of combination, a determination fraught with economic and political consequences that cannot be overstated. The formula determines, in significant part, which geographic regions and which industrial, commercial, and residential consumers will bear the economic costs of the transition to a low-carbon economy. The terms of the formula will either reward or not reward the carbon efficiency of the current energy regime within each of the electric service areas. A distribution by current emissions would benefit geographic areas of the country with the highest carbon emissions per kilowatt-hour (kWh) sold. These regions generally rely on coal-fired plants to produce electricity and include the oldest plants, which contribute the greatest part of CO_2 emissions from the electricity sector.[57] Such a distribution formula would disadvantage areas of the country that have historically relied on hydroelectric or natural gas generation

56 *Id.* Note that the American Clean Energy and Security Act of 2009 employs a hybrid approach. H.R. 2454 § 312 (proposing addition of § 700(13), which defines covered entities, to the Clean Air Act). In the industrial sector, the Act provides that the EPA would allocate emission allowances directly to certain large industrial sources. *Id.* § 115 (proposing addition of § 786(f) to the Clean Air Act). In the electricity sector, LDCs receive an allocation of carbon allowances as described in the text of this Article, but it is the generators that are the "covered entities," which means the generators must obtain carbon allowances in order to operate in an amount reflecting their emissions. *See id.* § 321 (proposing addition of § 782 to the Clean Air Act). The Act is silent on how the allowances will flow from the LDCs to the generators. Some LDCs that do not own generation—"wirescos" that simply provide distribution and customer services—will shop around for carbon-efficient sources and, if they can, will both prefer efficiency or low-carbon generation (such as wind) over natural gas and prefer natural gas over coal. In those cases, the system may operate to reduce carbon. However, LDCs that own both their own generation and distribution may simply transfer the allowances at no cost to themselves or to their generator affiliates. In that situation, the system operates much like one that distributes allowances to generators, unless customers are able to pressure commissions to enact procurement policies that force the integrated LDCs to either search elsewhere for power or implement efficiency services.

57 *See* U.S. Envtl. Prot. Agency, *supra* note 18.

plants or have invested substantially in energy efficiency and alternative energy to reduce emissions. Conversely, distribution based on the number of electricity customers, the amount of kilowatt-hour sales, or population will benefit those regions that serve each customer with the lowest CO_2 emissions per capita or per unit of electricity sold. Not surprisingly, both the Regional Greenhouse Gas Initiative (RGGI) and the American Clean Energy and Security Act of 2009 address this difficult issue with compromise.[58]

Regardless of which entity the carbon allowances are distributed to, the burden of administration will be high. The allowances will be distributed either freely (preferred by generators and utilities), through auction (preferred by economists and other policy advocates for carbon reduction), or through a combination. In either case, whether carbon allowances are assigned to generators, to consumers via a trustee or local provider, or some combination thereof, the requisite emission levels and resulting number of allowances needed to operate must be determined for individual sources or service areas.

If the allowances are distributed without an auction, the distribution must be carried out and monitored. An auction would not relieve the administrative burden; even if sources or service areas must purchase their allowances at auction, a governmental entity must determine the number of allowances they require under the cap-and-trade system in order to emit or cause the emission of CO_2. In the event the initial allowance distribution is by auction, the auction must be run. Whichever approach is chosen in the legislation, the stakes will be so high that implementation will inevitably invite controversy. In addition, some governmental entity will need to administer the declining cap, a complex task that involves repeating the aforementioned burden of calculation, monitoring, and enforcement at each downward step of the distribution of total carbon allowances.

In any cap-and-trade regime, government will also need the capacity to address the "trade" part of the cap and trade, a feature designed to build flexibility into the system and to promote efficient use of the economic resources necessary to reduce carbon emissions.[59] Whether the distribution is to consumer entities or to

[58] *See infra* note 195 (discussing the RGGI in detail); *see also* H.R. 2454 § 321 (proposing addition of § 782(a)(2), (b) to the Clean Air Act) (providing for the allocation of allowances for renewable electricity, energy efficiency, and low-income ratepayer assistance and for the allocation of allowances to "avoid disincentives to the continued use of existing energy-efficient cogeneration facilities").

[59] *See id.* § 311 (proposing addition of § 724 to the Clean Air Act).

generators, those unable to reduce carbon emissions as the cap declines will have the option of purchasing carbon allowances on a carbon market, and those entities that have excess allowances can sell into the market and retain the resulting income for their consumers or shareholders.[60] Those entities that find it most economically efficient to make investments that reduce carbon emissions, whether through changes to the generating process or through investment in demand-side management, will do so and sell into the market, and entities that find investing to reduce emissions less economically efficient will purchase allowances on the market, at least in theory.

As discussed above, generators do not possess the same range of choices for carbon reduction as they do for other sources of pollution. Thus, if allocation is made to them, this benefit of the market may not materialize. In any case, all systems will feature a market, and someone has to administer it.[61] This function will require expansion of governmental capabilities because no such national market exists at this time. The Clean Air Act created a cap-and-trade system to control sulfur dioxide (SO_2), but the SO_2 markets present fewer complexities and are much smaller in scale than CO_2 markets.[62] In terms of the gross value of anticipated trades, a national carbon market would constitute the largest formal trading regime in the world. Government will need to set rules and monitor the results of the market. Government will need to create a system of market monitoring that will discourage the exercise of market power by actors manipulating the market, a substantial problem requiring solutions beyond those traditionally employed.[63]

60 *Id.*

61 *See id.* § 311 (proposing addition of § 721 to the Clean Air Act); *see also* Clean Air Act, 42 U.S.C. §§ 7651–7651o (2006) (establishing the SO_2 cap-and-trade program). For a discussion of the lack of a "scrubber" for CO_2 comparable to the inexpensive and readily available "scrubber" for SO_2, see *supra* note 53 and accompanying text.

62 *See* U.S. Envtl. Prot. Agency, *supra* note 53; *see also* Holly Doremus & W. Michael Hanemann, *Of Babies and Bathwater: Why the Clean Air Act's Cooperative Federalism Framework Is Useful for Addressing Global Warming*, 50 ARIZ. L. REV. 799, 812 (2008) (discussing how, although sulfur dioxide regulation effectively targeted power plants—a narrow group, such a system would not work for the regulation of greenhouse gases because reducing these gases requires regulation of a much larger portion of the economy).

63 *See infra* Part II.D (discussing special monitoring concerns of energy markets). RGGI, for example, is monitored by Potomac Economics, an independent market monitor. RGGI, CO_2 Auctions: Market Monitor Reports, http://www.rggi.org/co2-auctions/market_monitor (last visited Jan. 29, 2010). Potomac Economics releases a Market Monitor Report after each auction. *See id.* The Market Monitor Report assesses both compliance with auction rules and procedures and attempts to manipulate auction prices. Potomac Economics, Practice Areas: Emissions Allowance Market Monitoring,

In addition to the administration of caps, base and target years, and initial and subsequent distributions of carbon allowances, any system that applies to a geographically delimited area must also address the issue of "leakage"—the sale of electricity generated from outside the area to consumers inside the area. The location of a carbon source makes no difference for the underlying policy purpose of reducing greenhouse gases; carbon emissions from any location are eventually distributed throughout the atmosphere. The cap-and-trade system must therefore operate in a manner that does not simply move carbon-emitting activities from within the subject jurisdiction to other regions. In RGGI, for example, "leakage" would refer to sales of electricity generated outside the area to customers inside the ten-state RGGI area, say by plants in Pennsylvania or Ohio, which are not RGGI member states.[64] In any national scheme, "leakage" would refer to generation located outside of the United States but serving its citizens.[65] For example, a substantial and increasing portion of the electricity consumed in the Southern California region is generated by plants located in northern Mexico or in neighboring states.[66] In the

http://www.potomaceconomics.com/practice_areas/emissions_allowance_market_monitoring (last visited Jan. 29, 2010).

64 The states participating in RGGI are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. RGGI, Participating States, http://www.rggi.org/states (last visited Jan. 29, 2010).

65 *See* H.R. 2454 § 312 (proposing addition of § 700(33) to the Clean Air Act) (defining "leakage" as a "significant increase in greenhouse gas emissions, or significant decrease in sequestration, which is caused by an offset project or activities under part E and occurs outside the boundaries of the offset project or the relevant program or project under part E").

66 In 2003, California generated 78% of its energy in state and received 14% from southwestern imports. ADAM PAN & RON WETHERALL, CAL. ENERGY COMM'N, 2003 NET SYSTEM POWER CALCULATION 3 tbl.2 (2004), *available at* http://www.energy.ca.gov/reports/2004-05-05_300-04-001R.PDF. Comparatively, California generated 68% of its energy in state and received 24% from southwestern imports five years later. MICHAEL NYBERG, CAL. ENERGY COMM'N, 2008 NET SYSTEM POWER REPORT 5 tbl.2 (2009), *available at* http://www.energy.ca.gov/2009publications/CEC-200-2009-010/CEC-200-2009-010-CMF.PDF. In five years, 10% of California's consumed power moved from California to plants located in the southwestern region. *See id.*; *see also* MIGNON MARKS & AL ALVARADO, CAL. ENERGY COMM'N, NET SYSTEM POWER: A SMALL SHARE OF CALIFORNIA'S POWER MIX IN 2005, at 5 tbl.2 (2006), *available at* http://www.energy.ca.gov/2005publications/CEC-300-2006-009/CEC-300-2006-009-D.PDF; DARYL METZ & MICHAEL NYBERG, CAL. ENERGY COMM'N, 2007 NET SYSTEM POWER REPORT 5 tbl.2 (2008), *available at* http://www.energy.ca.gov/2008publications/CEC-200-2008-002/CEC-200-2008-002-CMF.PDF; ADAM PAN, CAL. ENERGY COMM'N, 2006 NET SYSTEM POWER REPORT 4 tbl.2 (2007), *available at* http://www.energy.ca.gov/2007publications/CEC-300-2007-007/CEC-300-2007-007.PDF; ADAM PAN & TERRY EWING, CAL. ENERGY COMM'N, 2004 NET SYSTEM POWER CALCULATION 2 tbl.1 (2005),

absence of such leakage provisions, those external carbon emissions would not count toward the cap, and carbon sources would be incentivized to locate either outside the United States or in states that have more "headroom" for carbon consumption.

This would replicate the unfortunate history of "export" of sources of criteria pollutant under the Clean Air Act. Southern California utilities, for example, have sought to avoid the offset and other substantial barriers to the location of new sources of emissions within the San Diego and Southern California Air Quality Management Districts by utilizing energy from power plants in New Mexico, Arizona, and, as noted above, Mexico.[67] Similarly, the cap-and-trade system could encourage such outsourcing of carbon emissions unless the regime contained leakage provisions that cover external emissions from sources serving the covered area.[68] International accords may address this issue, but, until they do, any national scheme must include leakage provisions.

The administration of leakage provisions creates extraordinarily complex definitional, permitting, monitoring, and enforcement activities by the applicable agencies.[69] This administration poses complex accounting burdens and verification issues involved in obtaining accurate data about sources outside the affected jurisdiction. Even more difficult administrative issues are posed by another sort of leakage via "trade affected emitters." These emitters are industries that have increased costs of business due to the cost of carbon allowances, rendering them less competitive than similar facilities located outside the covered region, thus encouraging the "leakage" or out-migration of these exposed industries. Advocates for these industries propose a free allocation of allowances, again posing

available at http://www.energy.ca.gov/2005publications/CEC-300-2005-004/CEC-300-2005-004.PDF.

67 *See* sources cited *supra* note 66.

68 OFFICE OF ATMOSPHERIC PROGRAMS, U.S. ENVTL. PROT. AGENCY, EPA ANALYSIS OF THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009 H.R. 2454 IN THE 111TH CONGRESS, app. 5, at 67–77 (2009), *available at* http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis_Appendix.pdf (discussing the need to regulate leakage in an appendix entitled "Global Results: Trade Impacts, Emissions Leakage, and Output-Based Allocation Scenario").

69 *Id.* The issue is sufficiently daunting that as of April 2008, despite widespread recognition of the question and substantial effort toward a solution, the only action RGGI had taken to address leakage was to issue a report recommending that RGGI states monitor for leakage and implement leakage mitigation measures. *See* REG'L GREENHOUSE GAS INITIATIVE, POTENTIAL EMISSIONS LEAKAGE AND THE REGIONAL GREENHOUSE GAS INITIATIVE (RGGI) 41–42 (2008), *available at* http://rggi.org/docs/ 20080331leakage.pdf.

difficult distributional and equity considerations for administrative agencies.[70]

In addition to these challenges, most existing and proposed systems contain offset provisions, which allow the applicable private or governmental entity responsible for retiring carbon allowances to offset existing or new sources of CO_2 emissions with reductions in emissions achieved through various means, such as planting forests, which create carbon "sinks" and absorb carbon, or closing down other sources of emissions.[71] Experience with similar provisions in the European market regime implemented pursuant to the Kyoto Protocol indicates the potential for substantial abuse. Some offsets, for example, involve regimes that can lose their carbon-absorbing capabilities, such as forests planted but not maintained.[72] Some offsets may even involve the "closing" of carbon-emitting plants that would never have been operated in any case or that were built simply

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70 An alternative to the slippery slope resulting from free distribution to some industries but not others would be the imposition of carbon-based tariffs on products imported from nonparticipating regions. Opinions differ on whether such tariffs should be used. *Compare* John M. Broder, *Climate Bill Is Threatened by Senators*, N.Y. TIMES, Aug. 7, 2009, at A12 (reporting that ten senators "seen as crucial undecided votes in the Senate debate on climate legislation" called for "'border adjustments,' tariffs, on goods from countries that do not agree to an international program for carbon dioxide reductions"), *with* Greg Hitt & Naftali Bendavid, *Obama Wary of Tariff Provision*, WALL ST. J., June 29, 2009, at A3 (reporting that President Obama found objectionable provisions of climate change legislation imposing "tariffs on goods from countries that don't match U.S. efforts to combat global warming").

71 *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 502(a) (establishing offset allowances for greenhouse gas emission reductions or avoidance); *id.* § 503 (listing eligible practices).

72 Mike Shanahan, *Chinese Tree Scheme to Help Climate, Wildlife and Locals*, SCIDEV.NET, May 24, 2005, http://www.scidev.net/en/news/chinese-tree-scheme-to-help-climate-wildlife-and.html (last visited Jan. 30, 2010) (discussing China's plans to design tree planting programs with the Kyoto Protocol's Clean Development Mechanism in mind, and, unlike large plantings of non-native trees in the 1990s, China plans on planting native species); Barbara Stark, *Sustainable Development and Postmodern International Law: Greener Globalization?*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 137, 163–64 (2002) (discussing the economic incentives of the Kyoto Protocol and the unintended result of unsustainable monoculture tree plantations (citing FRIENDS OF THE EARTH INT'L ET AL., TREE TROUBLE: A COMPILATION OF TESTIMONIES ON THE NEGATIVE IMPACT OF LARGE-SCALE TREE PLANTATIONS PREPARED FOR THE FRAMEWORK CONVENTIONS ON CLIMATE CHANGE (2001) (describing the negative effects of monoculture tree plantations in Central and South America, Europe, and Africa)); Jonathan Watts, *China Steps Up Reforestation Drive Amid Fears for Ecosystems*, GUARDIAN (London), Mar. 12, 2009, *available at* http://www.guardian.co.uk/environment/2009/mar/11/china-forests-deforestation (discussing China's monoculture forests that deplete water supplies and lack biodiversity despite claims of their ability to capture carbon).

to close.[73] Some governmental entity needs to perform the permitting, accounting, and monitoring of this system to ensure that the offsets constitute real net reductions in carbon, remain real, and do not create other ecological harms deemed unacceptable. In sum, the successful administration of carbon tax proposals and cap-and-trade systems will require complex new governmental regimes.

B. Neither Carbon Emission Caps, nor the Price of Carbon Allowances, nor a Carbon Tax Will Operate to Reduce Emissions

For systemic and practical reasons, the market effect of the tax itself in a carbon tax scheme or the price of a carbon allowance and the cap itself in a cap-and-trade system will not make a significant contribution to the reduction of carbon emissions. The levy of a tax on carbon will not likely operate to reduce emissions due to a lack of the political will necessary to impose a tax that would be high enough to reduce demand through market forces.[74] The likely price of a carbon allowance in a cap-and-trade regime similarly will not reach a price sufficient to reduce electricity demand or cause a shift from either coal to natural gas or natural gas to renewables. Many market barriers to efficiency services cannot be overcome by price increases in carbon-based generation, but rather require policy-based solutions. Finally, even if legislation mandates a reduction in carbon emissions through declining caps aimed at certain percentage reductions by a target year, political and economic realities will force Congress to raise the cap or extend the deadlines unless adequate alternatives to fossil fuel-based generation are in place to make timely compliance feasible.[75]

73 *See* Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1783–89 (2008) (discussing how manufacturers in developing countries purposely overproduce certain greenhouse gases simply to capture and destroy them, thereby generating Certified Emissions Reduction allowances).

74 Brian C. Murray & Heather Hosterman, *Climate Change, Cap-and-Trade and the Outlook for U.S. Policy*, 34 N.C. J. INT'L L. & COM. REG. 699, 706 (2009) (stating that, when comparing a cap-and-trade program to a carbon tax, there is a concern with the carbon tax that the government will not have "the political capacity to set the price at a level that would stabilize emissions").

75 *See id.* at 717 (stating that cap stringency is an issue that must be determined before a cap-and-trade program is adopted); *see also infra* notes 123–32 and accompanying text (discussing the physical and social realities leading to postponement of attainment deadlines for the Clean Air Act).

1. The Price Effect of a Carbon Tax or Carbon Allowance

Much of the debate over approaches to regulating carbon emissions, both in the United States and abroad, focuses on the relative merits of carbon taxes versus a cap-and-trade system. Proponents of a carbon tax point to its simplicity in comparison with the cap-and-trade approach, a contention discussed above. Less clear, however, is the relationship between the central features of each system—the tax itself or the carbon price adder—and the goal of actually reducing carbon emissions. In theory, a carbon tax would raise the price of activities subject to the tax that generate carbon emissions or consume oil and gas. Similarly, the market price of carbon allowances necessary to generate electricity or sell gasoline under a cap-and-trade scheme would raise applicable prices. The higher price of these activities would be passed on to consumers who would, in theory, be motivated to either consume less or switch to alternative activities that consume less.[76]

Problems with the theory begin with the nature of the target activity. Substantially more than half of the nation's carbon emissions derive from the transportation sector and the electricity sector.[77] In each case, the price effect of a carbon tax or carbon allowance will not raise the price of the underlying activity sufficiently to achieve the desired change in behavior and carbon emissions.

In the transportation sector, most of the carbon is emitted through the combustion of gasoline.[78] A carbon tax, whether levied at the pump, at the refinery, further upstream, or at import or production, would serve to raise the price of gasoline. This would, in theory, reduce consumption. Similarly, in a cap-and-trade scheme covering petroleum, upstream sources such as refineries would have to retire carbon allowances to operate, and the cost of the allowance would be reflected in the price of the product and, ultimately, the price of gasoline at the pump. Unfortunately, the consumption of gasoline has

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76 Murray & Hosterman, *supra* note 74, at 706.

77 EPA EMISSIONS INVENTORY, *supra* note 14, at ES-14 tbl.ES-7 (charting U.S. greenhouse gas emissions in 2007 allocated by economic sector and showing 28% of emissions resulted from the transportation sector and 34% from the electricity sector).

78 STACY C. DAVIS ET AL., OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY, U.S. DEP'T OF ENERGY, ORNL-6984, TRANSPORTATION ENERGY DATA BOOK 11.7 tbl.11.6 (28th ed. 2009), *available at* http://cta.ornl.gov/data/tedb28/Edition28_Full_Doc.pdf (stating that, in 2007, 58.6% of carbon dioxide emissions resulted from motor gasoline in the transportation sector).

proven relatively unresponsive to price. In 2007 through 2008, the retail price of gas jumped approximately 60% from about $2.80 to about $4.10, depending on the region.[79] This increase produced a drop in consumption of about 4%.[80] The small consumer response to such a large price increase, or the relative "inelasticity" of gasoline, reflects the low substitutability of the good, which for the purposes of this example is gasoline- or diesel-based transportation.[81] Our historically low investment in public transportation[82] leaves consumers in most situations with no choice but to drive, which means fewer options to substitute the higher-priced good (consuming more carbon, and thus more highly taxed or burdened with less carbon allowance costs) with a lower-priced good (consuming less or no carbon, and thus taxed or burdened less, if at all).

79 U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Retail Gasoline Prices, http://eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_home_page.html (last visited Jan. 30, 2010). On the East Coast, the price for retail gas (regular grade) increased from $2.78 in mid-August 2007 to $4.08 in mid-June 2008. U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Retail Gasoline Historical Prices: East Coast Weekly Retail, http://eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html (follow "East Coast" hyperlink) (last visited Jan. 30, 2010). In the New England area, the price for retail gas increased from $2.57 in March 2007 to $4.09 in June 2008. U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Retail Gasoline Historical Prices: New England Weekly Retail, http://eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html (follow "New England" hyperlink) (last visited Jan. 30, 2010). In the Midwest, the price for retail gas increased from $2.86 at the end of October 2007 to $4.01 at the end of June 2008. U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Retail Gasoline Historical Prices: Mid West Weekly Retail, http://eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html (follow "Mid West" hyperlink) (last visited Jan. 30, 2010). For the entire United States, retail gas prices increased from $2.51 in mid-March 2007 to $4.00 in mid-June 2008. U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Retail Gasoline Historical Prices: U.S. Weekly Retail, http://eia.doe.gov/oil_gas/petroleum/data_publications/wrgp/mogas_history.html (follow "United States" hyperlink) (last visited Jan. 30, 2010) [hereinafter U.S. Energy Info. Admin., U.S. Retail].

80 *As Gas Goes Up, Driving Goes Down*, CNN, May 27, 2008, http://www.cnn.com/2008/US/05/26/gas.driving/index.html (reporting that the Department of Transportation's Federal Highway Administration estimated Americans drove 4.3% less in March 2008 as compared to March 2007).

81 Jonathan E. Hughes et al., *Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand*, 29 ENERGY J. 113, 115 (discussing how gas prices between 1975 and 1980 had a price elasticity between -0.21 to -0.34, but, between 2001 and 2006, the price elasticity was only -0.034 to -0.077).

82 Trip Pollard, *Follow the Money: Transportation Investments for Smarter Growth*, 22 TEMP. ENVTL. L. & TECH. J. 155, 157 (2004) (stating that transit funds allocate substantially more to roads than public transportation). For example, for the 2003–2004 fiscal year budget in Virginia, only $177 million was allocated for alternative transit while $3.1 billion was allocated for roads. *Id.* Unsurprisingly, state and federal funds pay most of the road building and maintenance costs in Virginia but only 55% of the public transit capital expenses. *Id.*

No carbon tax level or carbon allowance price under discussion approaches the levels required to duplicate the price increase discussed above and its modest effect on consumption. Recent tax proposals would commence at approximately $10 per ton of carbon dioxide-equivalent emissions,[83] which, for example, would impose a $1.16 tax on a barrel of oil for the carbon emitted through the combustion of that amount of oil.[84] Such a tax would produce a rise in gasoline prices of about $0.028 per gallon.[85] Recent experience indicates such a tax would have no measurable effect on consumption.[86] Nor will phased increases over time likely reach the levels necessary to materially affect consumption if the current transportation system remains in place. Duplication of the recent 60% rise in gasoline price would require a carbon tax of approximately $535 per ton of carbon-equivalent emissions.[87] This amount exceeds proposals currently in Congress and is an amount this Article asserts is far beyond the tolerance of the current, or any anticipated, political environment in the next two decades without major changes to our transportation system, even in the event of

83 *E.g.*, Save Our Climate Act of 2009, H.R. 594, 111th Cong. § 3 (proposing a tax of $10 per ton of CO_2); America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong. § 2 (proposing a tax of $15 per ton of CO_2).

84 At a carbon tax of $5 per ton of CO_2 equivalent, William D. Nordhaus at the Yale Department of Economics calculated the tax to be the equivalent of a $0.014 tax on one gallon of gasoline and a $0.58 tax on a barrel of oil. William D. Nordhaus, Economic Approaches to Greenhouse Warming, *in* GLOBAL WARMING: ECONOMIC POLICY RESPONSES 33 tbl.2.6 (Rudiger Dornbusch & James M Poterba eds., 1991), *available at* http://www.ciesin.org/docs/003-311/003-311.html. For a $10 carbon tax, I doubled Mr. Nordhaus's calculations and determined that the tax would be the equivalent of a $0.028 tax on one gallon of gas and a $1.16 tax on a barrel of oil.

85 *See supra* note 84. Representative Pete Stark of California testified regarding the Save Our Climate Act of 2009 that the $10 carbon tax will equal an estimated increase of $0.02 per gallon. Congressman Pete Stark, Introducing the Save Our Climate Act, Address Before the U.S. House of Representatives (Jan. 15, 2009) (transcript available at http://www.stark.house.gov/index2.php?option=com_content&do_pdf=1&id =62).

86 *See* U.S. Energy Info. Admin., U.S. Retail, *supra* note 79; *see also* Hughes et al., *supra* note 81.

87 This assertion assumes that gasoline prices increased 60% from $2.50 to $4.00, which is a $1.50 increase per gallon of gasoline. The carbon tax would equal a tax of $535.71 (($1.50/$0.028) x $10 = $535.71) per metric ton of CO_2. *See* STERN, *supra* note 20, at 421 (estimating deployment of low-carbon technologies based on an assumed carbon price of $25 per ton of CO_2); *cf.* U.N. Dep't of Econ. & Soc. Affairs, *World Economic and Social Survey 2009: Promoting Development, Saving the Planet*, 151, 166, U.N. Doc. E/2009/50/Rev.1, ST/ESA/319 (2009), *available at* http://www.un.org/esa/policy/wess/wess2009files/wess09/wess2009.pdf (suggesting that only a carbon price as high as $50 per ton of CO_2 would "induce the required shifts in production and consumption patterns [that could] mobilize the large-scale investments" in clean energy).

sudden and significant manifestations of climate change.[88] Estimates of the likely price of a carbon allowance in a cap-and-trade scheme similarly fall far short of the amount necessary to generate the effect of the rise in price in 2008,[89] and most cap-and-trade schemes contain interrupters that suspend deadlines if the price of carbon allowances rises beyond a set limit.

The substantial rise in the price of gasoline and diesel in 2008 and 2009 contributed to socioeconomic trends that in turn led to a substantial positive effect on consumption, but this Article asserts that this effect is due to a onetime interaction between price and the sociopolitical environment, not the price rise itself. For many opinion makers in both the political and business sector, the sharp rise in price gave credence to the concept of "peak oil."[90] The confluence of scientific information, international opinion, and political shifts within the United States created an atmosphere in which these leaders found themselves more susceptible to a fundamental change in viewpoint upon the occurrence of a triggering event, such as the abrupt rise in the price of oil.[91] Despite the view, repeated in respected, popular press articles at the time, that the high price reflected transient oil market factors rather than the fundamentals of oil supply and demand, many leaders believed that the high price would reflect likely future prices, even if prices dropped in the short

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88 *See supra* note 83 (stating that pending carbon tax bills propose only an initial tax of \$10 to \$15 per ton of CO_2).

89 *See* CONG. BUDGET OFFICE, COST ESTIMATE: H.R. 2454 AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009, at 12–13 (2009) [hereinafter CONG. BUDGET OFFICE, COST ESTIMATE], *available at* http://www.cbo.gov/ftpdocs/102xx/doc10262/hr2454.pdf (tracking the estimated allowance price from \$15 in 2011 to \$26 in 2019).

90 Hon. Richard D. Cudahy, *The Bell Tolls for Hydrocarbons: What's Next?*, 29 ENERGY L.J. 381, 394–95 (2008) (discussing both the depletion of oil and global warming as two threats to the world and how these threats may affect the economy and society); *see also* ROBERT L. HIRSCH ET AL., PEAKING OF WORLD OIL PRODUCTION: IMPACTS, MITIGATION, & RISK MANAGEMENT (2005), *available at* http://www.hilltoplancers.org/stories/hirsch0502.pdf; ROBERT L. HIRSCH, NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, PEAKING OF WORLD OIL PRODUCTION: RECENT FORECASTS, DOE/NETL-2007/1263 (2007), *available at* http://www.netl.doe.gov/energy-analyses/pubs/Peaking%20of%20World%20Oil%20Production%20-%20Recent%20Forecasts%20-%20NETL%20Re.pdf; Peter Maass, *The Breaking Point*, N.Y. TIMES, Aug. 21, 2005, § 6 (Magazine), at 30.

91 Justin Stolte, Note, *The Energy Policy Act of 2005: The Path to Energy Autonomy?*, 33 J. LEGIS. 119, 119–20 (2006) (quoting Matthew Simmons, an energy advisor to George W. Bush, who stated in an interview that "[i]t is past time [to consider peak oil]. As I have said, the experts and politicians have no Plan B to fall back on.").

term.[92] Car companies announced and undertook changes in their production lines to implement modest, if highly visible, increases in fleet fuel efficiency,[93] and those plans did not change when prices subsequently dropped due to the recession that began in late 2008.[94]

92 *See* Peter Huber & Mark Mills, *Oil, Oil, Everywhere . . .* , WALL ST. J., Jan. 27, 2005, at A13 (stating that the price of oil is influenced more by the political instability in Middle Eastern oil-producing countries than the lack of oil in the earth); Pelin Berkmen et al., Int'l Monetary Fund, The Structure of the Oil Market and Causes of High Prices (Sept. 21, 2005), http://www.imf.org/external/np/pp/eng/2005/092105o.htm (explaining that a strong global demand for oil, speculation in the futures market, and fears of potential supply disruptions all play a part in high oil prices); *see also* Stolte, *supra* note 91, at 128–29 (discussing the Energy Policy Act of 2005 as a response to peak oil and addressing the dwindling oil supply); *cf.* Posting of Keith Johnson, *Peak Oil: Global Oil Production's Peaked, Analyst Says*, to Wall Street Journal Environmental Capital Blog (May 4, 2009), http://blogs.wsj.com/environmentalcapital/2009/05/04/peak-oil-global-oil-productions-peaked-analyst-says/. *Compare* Press Release, Cambridge Energy Research Assocs. (CERA), Peak Oil Theory—"World Running Out of Oil Soon"—Is Faulty; Could Destroy Policy & Energy Debate (Nov. 14, 2006), http://www.cera.com/aspx/cda/public1/news/pressReleases/pressReleaseDetails.aspx?CID=8444 (stating that there is three times the amount of remaining oil resources than what the peak-oil theory proponents estimate and arguing that emphasis should not be placed on supply constraints, but rather on factors such as politics, economics, and technology), *with* Roscoe Bartlett & Tom Udall, *Congressional Peak Oil Caucus Responds to CERA Study*, ENERGY BULL., Nov. 14, 2006, http://www.energybulletin.net/node/22396 (stating that, despite the overly optimistic prediction of the amount of oil remaining, CERA's report does support urgency in dealing with oil shortages, global warming, and alternative energy); Samuel Bodman, Energy Sec'y, U.S. Dep't of Energy, Remarks at the Middle East Institute's 60th Anniversary Conference (Nov. 13, 2006) (transcript available at http://www.mei.edu/Events/Conferences/2006AnnualConference/2006ConferenceTranscriptBodman.aspx) (stating that, due to the increase of energy demand and the inability of oil to meet this demand, use of alternative fuels must be expanded).

93 Janet L. Fix, *GM, Ford in PR Battle Over Truck Fuel Mileage War of Words Leaves Skeptics Unconvinced*, DETROIT FREE PRESS, Aug. 3, 2000, at 1A, *available at* http://www.accessmylibrary.com/article-1G1-122012702/general-motors-takes-form.html (reporting that, after Ford announced it was committed to improving SUV gas mileage by 25% within five years, GM asserted it would improve the gas efficiency of minivans and light trucks in addition to SUVs—relatively modest changes given currently available technologies and vehicles).

94 *See* Justin Hyde, *Color This Show Green and Brawn*, DETROIT FREE PRESS, Jan. 14, 2008, at A1 (reporting that, although U.S. car companies have invested in manufacturing more efficient parts, the advanced technologies needed to meet environmental goals have to be borne partially by customers, and automakers are worried that these cars will not sell); Tom Krisher, *Chrysler Plans New SUV; It Says Vehicle Will Be More Fuel-Efficient than Cherokee*, HOUSTON CHRON., Aug. 14, 2008, at B4 (reporting that Chrysler Vice Chairman Tom LaSorda announced that Chrysler will invest in a new car-based SUV, which will be more fuel efficient than the truck-based Cherokee); Jayne O'Donnell, *Higher Fuel Standards Proposed by Feds; Proposal Accelerates Timetable for Efficiency*, USA TODAY, Apr. 23, 2008, at 1B (stating that a proposed Transportation Department rule announces cars and light trucks would have to be 25% more fuel efficient by 2015).

Political consensus on the issue accelerated the efforts to raise CAFE standards, successfully accomplished in 2009.[95]

While these attitudinal and political shifts may continue to mature, and price pressure will assist in this process, this Article asserts that a fundamental shift has occurred. The price effects of the relatively small tax rates proposed by a carbon tax would be overshadowed by even modest improvements in fleet efficiency produced by the CAFE legislation. Political considerations will keep the tax or the price of carbon allowances at levels insufficient to produce a substantial change in activities that generate carbon emissions.

The current structure of the electricity sector also makes it unlikely that the price effect of a carbon tax or carbon allowance regime would operate to reduce carbon emissions from electricity generation used in the commercial, industrial, or residential sectors. Electricity consumption shares the inelasticity of the transportation sector discussed above. In modern industrial society, electricity is deemed a mandatory service.[96] Residential customers will not tolerate interruptions, brownouts, or shortages. For most of the components of residential consumption, which include refrigeration, lighting, and air conditioning, no socially acceptable substitutes are available.[97] Commercial and industrial customers rely fundamentally on electricity to produce goods and services. Modern industrial processes (e.g., computer chip fabrication) and increasing dependency

[95] The Energy Policy and Conservation Act, Pub. L. No. 94-163, 89 Stat. 871 (1975) (codified as amended in scattered sections of 42 and 49 U.S.C.); Henry J. Pulizzi et al., *Car Makers Expect to Hit Fuel Goals*, WALL ST. J., May 20, 2009 (reporting President Obama's announcement of a new CAFE standard, raising the national, fleetwide mileage average to 35.5 miles per gallon—23 for trucks and 27.5 for cars—by 2016).

[96] U.S.-CANADA POWER SYS. OUTAGE TASK FORCE, U.S. DEP'T OF ENERGY, FINAL REPORT ON THE AUGUST 14, 2003 BLACKOUT IN THE UNITED STATES AND CANADA: CAUSES AND RECOMMENDATIONS 5 (2004), *available at* https://reports.energy.gov/BlackoutFinal-Web.pdf ("Modern society has come to depend on reliable electricity . . . .").

[97] Matthew J. Libby, *Deregulating the Electricity Market: What Can Be Learned from California's Mistakes*, 22 ME. B. J. 236, 243 (2007) (explaining that demand for electricity is "essential," a "necessity," "inelastic," and unlikely to decrease due to price increases).

> Goods that exhibit inelastic demand are those where the percentage of change in demand is less than the percentage in change of price. When consumers are dependent on goods with inelastic demand, they are very susceptible to rapid price increases. Furthermore, there is no ready substitutable good for electricity. That is, if the price of electricity skyrockets, consumers cannot easily shift to gas power without a substantial investment that may take several months to complete.

Id. (footnote call numbers omitted).

on electronic data systems and the internet render our society dependent on a highly stable grid of generation and transmission.[98]

Electricity must be provided instantly upon demand and, unlike most other goods, it cannot be stored in meaningful amounts. This economic reality and social consensus is reflected in our electricity regulatory and market systems. Regulators require monopoly service providers to create and maintain systems that meet 100% of demand in each of the 8760 hours of the year.[99] While we tolerate short, infrequent, and geographically contained power interruptions resulting from storms or other events that interrupt local distribution systems, the reliability standards that guide the design of our regional transmission system require levels of redundancy to ensure that service is maintained even if power plants and large transmission lines go down.[100] Our wholesale electricity markets have historically treated demand as totally inelastic.[101] Market operators project total demand for a given hour on the basis of prior experience, weather conditions, and similar factors and then accept bids to provide the necessary power to meet that demand, regardless of price.[102]

98 *See id.*; Steven Ferrey, *Power Future*, 15 DUKE ENVTL. L. & POL'Y F. 261, 266 (2005) (explaining that electricity is a complementary technology to computer technology, space exploration, military applications, and electric motors).

99 *See* Jacqueline Lang Weaver, *Can Energy Markets be Trusted? The Effect of the Rise and Fall of Enron on Energy Markets*, 4 HOUS. BUS. & TAX L.J. 1, 12 (2004) (discussing "regulatory compacts" between states and privately owned utilities in which "[t]he utility was granted a monopoly and in exchange had a duty to serve all customers in its territory").

100 The North American Electric Reliability Corporation (NERC) is required by the Federal Power Act to establish standards that will provide an adequate level of reliability to generation and transmission systems. N. AM. ELEC. RELIABILITY CORP., DEFINITION OF "ADEQUATE LEVEL OF RELIABILITY" 3 (2007), *available at* http://www.nerc.com/docs/pc/Definition-of-ALR-approved-at-Dec-07-OC-PC-mtgs.pdf. "Adequate level of reliability" is achieved if six characteristics are present, including the following: (1) the system limits impact, (2) the scope of instability, and (3) the ability of the system to supply aggregate power and energy despite reasonably expected unscheduled outages. *Id.* at 6.

101 Erin T. Mansur, *Upstream Competition and Vertical Integration in Electricity Markets*, 50 J.L. & ECON. 125, 130 (2007) (explaining that the demand for wholesale electricity is inelastic because (1) "consumers have no incentive to reduce quantity demanded at higher prices because the regulatory structure of electricity retail markets has kept consumers' rates constant" and (2) wholesale purchasers must provide power "at any cost").

102 In economic terms, a free market operates to set a market price at the confluence of an upward-sloping supply curve and a downward-sloping demand curve. However, in electricity markets the demand indicator is neither a curve nor set by market factors, but rather a vertical line set by market operators at a point on the quantity "Q" (or "X") axis at the point of anticipated demand. The price reflects the point where that vertical demand line, which is set by regulators to meet all anticipated demand, intersects the supply curve.

2. Structural Barriers to the Price Signal in the Electricity Sector

This underlying inelasticity is compounded by the structure of energy rate systems, which insulate most customers from the impact of short-term or even medium-term changes in the price of electricity. Putting aside the quantitative inadequacies of any likely signal from either a carbon tax or a price increase due to the need to purchase carbon allowances, a price on carbon emissions is intended to differentiate the price of high-carbon electricity sources from low-carbon sources, which should cost less. Unfortunately, in most situations, prices are not set in a manner that allows the price signal to get through to the consumer. In most states, residential consumers pay a single rate that reflects a long-term average of the prices paid by the utility or other local distribution company. Such an LDC may purchase electricity from a coal plant, a nuclear plant, and a natural gas plant pursuant to long-term contracts with different prices. It may purchase power on the wholesale regional market where most electricity generation, and the price, is derived from natural gas plants. Finally, an LDC may purchase some power from wind facilities. Yet, the retail price to the residential consumer will reflect the blended average—or an ex ante estimate of the blended average—of all of these sources over the period of time between rate proceedings.[103] Rates for commercial and industrial customers similarly reflect the blend of sources of power purchased.

The structure of wholesale markets also operates to insulate the retail customer from price differentiation due to any carbon price adder. In day-ahead wholesale markets, for example, different potential suppliers bid to offer a stated amount of power into the market at a given price for each hour of the next day. The system operator or other market manager adds up the quantity of kilowatt-hours of the bids starting with the lowest price per kilowatt-hour and,

[103] Rate proceedings are initiated by the LDC, and typically set rates prevail several years until the next proceeding. The public utilities commission proceeding determines an estimated revenue requirement necessary for the LDC to pay its expenses and earn a rate of return necessary to attract capital. The revenue requirement is then divided by estimated demand to create rates per kilowatt-hour for the residential class of customer. Some states allow expenses incurred by the utility to pass through to consumers each year to account for fluctuations in prices paid on the wholesale market, but even those adjustments are typically annual, reflecting a blended rate that sends weak, if any, price signal to the customer. JAMES C. BONBRIGHT ET AL., PRINCIPLES OF PUBLIC UTILITY RATES 263 (2d ed. 1988). Commercial and industrial customers frequently have more complex rates that pass through to them, but those prices, whether daily or hourly, still reflect the blended cost of all electricity sources during that time. *See id.* at 485.

when the quantity in the stack of bids reaches the system operator's best estimate of what demand will be for the hour, the operator accepts those bids, rejects the higher ones, and the market price is set at the amount of the highest accepted bid—the "clearing price." All those accepted are "dispatched" for that hour, meaning the winning bidder and all bidders below in the bid stack must provide the power, and those not needed are not dispatched.

The clearing price then becomes the price paid to *all* bidders, regardless of what they originally bid; therefore, participants are not paid what they bid, but rather the amount of the highest bid that "cleared," or was dispatched to meet demand.[104] Typically in the Northeast, for example, the lowest bids are from nuclear and large hydro facilities. These facilities have low marginal costs despite their high original cost of construction. They will almost always sell into the market regardless of the price because any price is better than nothing. In addition, nuclear plants cannot easily or rapidly be turned off and on. For these reasons, such plants will bid low amounts, or frequently zero, because they intend to run regardless of the ensuing clearing price. Plants with higher marginal costs and the ability to turn on and off daily, based on a decision whether to run, will bid their actual marginal costs, and may or may not be dispatched. For example, a nuclear plant may bid $0.00 per kWh, a coal plant may bid $0.03 per kWh, a wind facility may bid $0.06 per kWh, a combined-cycle natural gas plant may bid $0.08 per kWh, and another similar natural gas plant may bid $0.09 per kWh, each for the amount of power stated in the bid. If the highest bid to achieve the quantity necessary to meet demand, or the "last" plant in the stack is the first of the two natural gas plants in this example, then the clearing price would be $0.08 per kWh. All bidders below that bid in the stack would be dispatched and receive that same price. The last natural gas plant would not be dispatched, would not sell into the market, and may not run at all if it does not have alternative customers.

If a carbon tax or a price adder for a carbon allowance increases the price of the last plant dispatched, then it increases the clearing price for *all* sources, including the low-carbon sources at the bottom of the stack. In many markets, the low-carbon sources are, in fact, at the bottom of the stack. These sources bid lower than the highest bid dispatched or accepted by the market operator, frequently made by

[104] *See id.* at 136, 421 (defining the market-clearing price as the price required to bring demand into equality with available supply based on a comparison of supply and demand).

plants using natural gas or coal. Nuclear, hydro, and wind sources may thus get a windfall, but the purchasing LDC and its customers see no differentiation among sources, just a higher wholesale price for all of the power purchased that hour due to the carbon price adder.

For related reasons, the carbon price adder will not cause the market operator to change the pattern of dispatch to favor low-carbon sources over high-carbon sources. First, most of the low-carbon sources, as discussed above, bid low and run anyway. But, it could be asked, will the price increase caused by a carbon tax or the requirement that the generator retire carbon allowances cause the price of coal to rise to the point where it is more expensive than lower carbon natural gas? This issue has been carefully studied. The carbon content of gas and coal is well understood. One megawatt-hour (mWh) of coal produces approximately a ton of carbon, and one megawatt-hour of natural gas produces approximately half that amount. One can calculate the amount of a carbon-based price adder that would cause natural gas to displace coal. Calculations made by a variety of interests indicate a consensus that a carbon tax or a carbon allowance price well in excess of $50 per ton of CO_2 emissions would be required to cause natural gas to displace coal given current, relatively low prices for natural gas.[105] Higher prices for natural gas would require an even higher carbon tax or allowance price.[106] These prices are neither in the politically feasible range of a carbon tax nor in the range of the estimated price of a carbon allowance in a cap-and-trade regime.[107]

105 *See* Cowart, *Testimony*, *supra* note 34, at 5–6 (stating that "in the upper Midwest, which is highly dependent on coal . . . '[e]ven a CO_2 value of $50/ton would produce only a 4 percent reduction in regional emissions given the current generation mix' . . . [i]n Texas, [which relies heavily on gas] . . . 'even a CO_2 value of $40/ton produces little emissions reduction' from the existing mix" (quoting Victor Niemeyer, *The Change in Profit Climate: How Will Carbon-Emissions Policies Affect the Generation Fleet?*, PUB. UTIL. FORT., May 2007, at 20, 24)).

106 In 2002, the natural gas electric power price was $3.10 per thousand cubic feet. U.S. Energy Info. Admin., U.S. Dep't of Energy, U.S. Natural Gas Electric Power Price (Dollars per Thousand Cubic Feet) (Oct. 30, 2009), http://tonto.eia.doe.gov/dnav/ng/hist/n3045us3m.htm. The price increased steadily and consistently until September 2005 when it jumped above $10 for the first time since 2002. *Id.* The 2005 spike leveled out around $6 in mid-2006 and remained steady until the end of 2007, and then the price consistently increased until April 2008. *Id.* From April 2008 until August 2008, the price remained high, peaking at $12.50. *Id.* However, March and April 2009 saw prices drop to the $4 range, a price not seen since November 2003. *Id.*

107 *See supra* p. 415. Pending carbon tax bills propose only a tax of $10 to $15 per ton of CO_2, which would not create demand-side behavioral changes.

The same logic applies to the price point at which the price of carbon emissions might cause the market to deliver new clean sources that displace the next coal plant that would have been built, or to pay for the cost of carbon capture and storage. The consensus of studies of these questions indicates that the price of the carbon adder would have to exceed $90 per ton,[108] again far in excess of either a likely tax or carbon allowance.[109] A recent study by the Electric Power Research Institute concluded that, in a scenario favorable to low-carbon or carbon-neutral substitutes, carbon prices would need to reach $50 per ton to stimulate the replacement of coal power with nuclear.[110] In a scenario where high capital costs and other factors render nuclear energy development more sluggish,[111] a more realistic future in the view of many, equivalent carbon allowance prices of $125 to $150 per ton would have to prevail to affect emissions, a price many times that of the likely or possible.[112]

3. Nonprice Barriers to Efficiency

For the electricity and heating needs of the residential, commercial, and industrial sectors, energy efficiency is the cheapest source of energy—as cheap, and often cheaper, than generating electricity with coal or heating with oil or gas. A kilowatt saved is the same as a kilowatt generated and consumed. One can estimate with some precision the cost of efficiency, that is the cost of saving a kilowatt,

108 In a study on a carbon cap-and-trade program in California, Energy and Environmental Economics, Inc. (E3) found that the carbon allowance price must be at least $90/ton to create sufficient incentives for market investments in renewables. Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies, Rulemaking No. 06-04-009 Docket No. 07-OIIP-01, at 8–9, 13 (June 2, 2008) (Cal. Pub. Utils. Comm'n) (AB 32 Implementation: Greenhouse Gases, Opening Comments of the Los Angeles Department of Water and Power), *available at* https://www.pge.com/regulation/GreenhouseIncentivesOIR/Pleadings/LA-DWP/2008/GreenhouseIncentivesOIR_Plea_LA-DWP_20080602-01.pdf; *see also* E3: Energy & Envtl. Econ., Inc., CPUC Avoided Cost Proceedings (July 31, 2006), http://www.ethree.com/avoidedcosts.html.

109 *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 321.

110 Victor Niemeyer, Lew Rubin & Kyle Davis, *CO_2 Prices and Their Potential Impact on the Western U.S. Power Market*, 24 NAT. RESOURCES & ENV'T 3, 3–5 (summarizing an Electric Power Research Institute study titled, "An Analysis of CO_2 Policy Impacts on Western Power Markets").

111 *See infra* notes 146–47 and accompanying text (discussing nuclear energy's increasing expenses and substantial long-term carbon footprint).

112 Niemeyer, *supra* note 110, at 3–5.

and compare that cost to the cost of generating the electricity instead. Managing demand through efficiency yields in the range of $0.02 to $0.04 per kilowatt saved.[113] This compares to a national average retail electricity price of $0.11 per kilowatt for residential customers and $0.09 across all sectors.[114] Despite this price advantage, efficiency has not nearly reached its potential because of both market and nonmarket barriers that do not relate to price and, thus, would not be addressed through the increased price advantage that might be conferred by a carbon tax or carbon allowance imposed on high-carbon generation alternatives.

These barriers have been well documented elsewhere, and consequently, this section of this Article provides only a brief overview. The monopoly regulatory scheme prevalent in the United States incorporates the cost of capital into rates.[115] The certainty of such a system combines with the tax-free bonding capacity[116] of utilities to ensure inexpensive and plentiful (some would say too plentiful)[117] capital for the construction of power plants. With few exceptions, such cheap capital is not available for the installation of efficiency services on the customer side of the meter. An LDC can use tax-free bonds to build a power plant, but a customer who wants to purchase a more efficient refrigerator must pay the added cost with cash or borrow at far less advantageous rates. The same holds true for

113 Efficiency Vermont, one of the national leaders in energy efficiency services, continues to provide low-cost energy savings. A recent annual report estimates the cost of saving electricity between $0.025 and $0.029 per kWh. EFFICIENCY VT., 2008 HIGHLIGHTS: HELPING VERMONT FAMILIES AND BUSINESSES SAVE MONEY AND SAVE ENERGY, http://www.efficiencyvermont.com/stella/filelib/Highlights2008_Final.pdf (last visited Jan. 31, 2010).

114 U.S. Energy Info. Admin., U.S. Dep't of Energy, Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector, http://www.eia.doe.gov/cneaf/electricity/epm/table5_3.html (last visited Jan. 31, 2010). Efficiency remains far more cost effective than fossil fuel-generated electricity, regardless of the fuel source. Consider prices in Pennsylvania, a predominately coal state, with a price average across all sectors of $0.0964 per kWh compared to California, which relies on mostly natural gas and little coal, with an average price across all sectors of $0.1376 per kWh. U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, FORM EIA-826 SALES AND REVENUE SPREADSHEETS (2009), http://www.eia.doe.gov/cneaf/electricity/page/sales_revenue.xls [hereinafter U.S. ENERGY INFO. ADMIN. DATABASE].

115 BONBRIGHT ET AL., *supra* note 103, at 198.

116 *Id.* at 19.

117 PAUL PETERSON ET AL., SYNAPSE ENERGY ECON., THE NEW ENGLAND EXPERIMENT: AN EVALUATION OF THE WHOLESALE ELECTRICITY MARKETS 21 (2003), *available at* http://www.synapse-energy.com/Downloads/SynapsePaper.2003-06.0.Wholesale-Electricity-Markets-Evaluation.A0008.pdf (referring to the incorporation of the cost of capital as resulting in "redundant compensation for a single service").

the typical industrial customer that wants to purchase more expensive, but more energy-efficient, boilers, fans, ovens, or other industrial processes. Furthermore, the initiative for construction of generation lies with a specialized institution (the LDC or merchant generator), while it is the individual customer, busy with the other aspects of life, who must purchase the energy-efficient appliance.

Many efficiency opportunities relate to building improvements in the residential or commercial setting, where better insulation and more efficient heating, cooling, and lighting can produce electricity savings at rates substantially below the avoided cost of generating the electricity. Yet these efficiency elements are not constructed because the benefits accrue to a different entity than the entity making the construction decisions. These "split incentives" plague multifamily residential construction where developers would have to front the additional costs of efficiency, but the eventual tenants reap the benefit.[118] Due to other structural aspects of the real estate market and the simple lack of information, the value to the tenant does not carry upstream to rents for the landlord and thus to sales prices for the developer. Similarly, commercial structures can incorporate energy-saving features, but neither builders nor landlords (sometimes the same entity) experience the benefit since the price of many leases is net of energy costs, which are borne by the tenant. As discussed later, policy and program solutions can address these split incentives and lack of access to capital, but a simple carbon price adder will not.[119]

This disconnect between those burdened by the cost and those receiving the benefit can be especially acute for systems that do not reduce electricity consumption or manage demand, but rather change the time of day consumption occurs, shifting consumption from peak to off-peak periods.[120] Such processes can save the LDC enormous amounts, but rate structures frequently do not pass on the savings to

118 CHERYL HARRINGTON, THE REGULATORY ASSISTANCE PROJECT, WHO SHOULD DELIVER RATEPAYER FUNDED ENERGY EFFICIENCY? 8 (2003) (providing an example of "split incentives such as that between landlord and tenant where a tenant who pays the electric bill might see savings from an efficiency program but the landlord who would need to make the capital improvement does would not realize any savings").

119 *See infra* Part I.D.

120 *See* ELEC. ADVISORY COMM., U.S. DEP'T OF ENERGY, SMART GRID: ENABLER OF THE NEW ENERGY ECONOMY 9 (2008), *available at* http://www.oe.energy.gov/DocumentsandMedia/final-smart-grid-report.pdf (discussing the benefits of the smart grid to consumers in terms of the consumers' "ab[ility] to better plan and manage their energy consumption," which in turn leads to cost savings by reducing consumption rather than by reducing rates).

the residential or commercial customer who undertakes the process to shift demand. The LDC will likely pay much more for electricity at times of peak demand than at periods when demand is low. Wholesale prices on an August afternoon paid in a region that experiences air conditioner-driven summer peaks of energy use, especially in a region with insufficient supply, might exceed nighttime prices by one or, in situations with inadequate supply, two orders of magnitude.[121] In the New England region, for example, utilities may pay more than 10% of the total amount paid for power in order to provide power during 2% of the hours, when prices are highest.[122] If demand can be shifted off of such peaks, the savings are great. Such demand response may involve an industrial facility changing hours of operation on a day with particularly heavy energy demand. Utilities could remotely cycle residential air conditioners on and off in the homes of participating customers while not allowing temperatures to fluctuate more than acceptable amounts. The cost of such strategies is small compared to the financial savings, but, in the traditional utility model, the cost is born by the customer implementing the strategy. The benefit, however, accrues to the LDC, which, under prevailing rate structures that charge average rates, cannot pass the savings on to the customer bearing the cost. Carbon price adders do not affect that calculus.

4. The Cap in Cap and Trade

Sociopolitical considerations similar to those that limit the possible price of a carbon adder will likely operate such that the "cap" in cap and trade will not force a reduction in carbon emissions from the electric sector. Absent other mechanisms that offer noncarbon alternatives or reduce demand, society will simply exceed the caps as they decline. When that occurs, this Article asserts that the caps will be raised or the compliance dates will be extended, either by

121 U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-04-844, ELECTRICITY MARKETS: CONSUMERS COULD BENEFIT FROM DEMAND PROGRAMS, BUT CHALLENGES REMAIN 8 (2004); *see also* COWART, *supra* note 55, at 8 ("System loads vary substantially from hour to hour (e.g., by a factor of two to three during a single day) . . . .").

122 COWART, *supra* note 55, at 9 & fig.1 (showing that, in reference to "annualized price-duration curves," the "[t]op 1% of [p]rices equal 15.8% [of] [w]holesale [c]osts (weighted by load)"); *cf.* U.S. DEP'T OF ENERGY, THE SMART GRID: AN INTRODUCTION 19, http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf (last visited Jan. 31, 2010) ("[Ten percent] of all generation assets and [twenty-five percent] of distribution infrastructure are required less than 400 hours per year, roughly [five percent] of the time.").

administrative action or by an act of Congress. Experience with the attainment deadlines in the Clean Air Act illustrates such repeated adjustments of target dates to address political realities.[123] Just as cap-and-trade legislation would set permissible levels of carbon emissions as deemed necessary to prevent unacceptable global warming, the Clean Air Act sets necessary standards for certain pollutants in the ambient air to protect the public health and welfare.[124] Just as cap and trade would set time deadlines for the reduction of carbon emissions by stated amounts, the Clean Air Act sets deadlines for attainment of the national ambient air standards in all air basins.[125] The Clean Air Act Amendments of 1970 set the attainment date at 1977 at the latest.[126] Most major metropolitan areas found that technically feasible and socially acceptable means of reducing pollution to the levels set by the ambient air standards were unavailable, and these areas simply failed to meet the deadlines, limiting their plans and their behavior to the implementation of options they deemed realistic.[127]

In the face of those realities, the "letter" of the law did not prevail. The Act provided, and still provides, that when a state fails to submit a State Implementation Plan (SIP) that complied with the Act to the EPA, the Agency itself must establish a Federal Implementation Plan (FIP) for the state or metropolitan area containing sufficient mechanisms to meet the standards.[128] Given the political

[123] Carolyn McNiven, *Using Severability Clauses to Solve the Attainment Deadline Dilemma in Environmental Statutes*, 80 CAL. L. REV. 1255, 1263–65 (1992) (discussing both the 1977 Clean Air Act before it was amended in 1990 and the difficulty the courts experience in fashioning an appropriate remedy after attainment deadlines have passed).

[124] *Id.* at 1265.

[125] *See id.* at 1266–67.

[126] *Id.* (noting that "state governments were to achieve national air quality standards for regulated pollutants within three years" of the 1970 Clean Air Act or within five years with federally approved extensions); *see also* U.S. Steel Corp. v. EPA, 605 F.2d 283, 285 n.1 (7th Cir. 1979) (quoting 42 U.S.C. § 7407(d)(1) as amended in 1977, which required states to submit a list of areas that do not meet ambient air quality standards to the EPA Administrator within 120 days of August 7, 1977).

[127] McNiven, *supra* note 123, at 1266–67, 1269 (stating that the 1977 amendments to the 1970 Clean Air Act extended attainment deadlines once it was clear some regions could not meet the deadlines).

[128] Coalition for Clean Air v. S. Cal. Edison Co., 971 F.2d 219, 228–29 (9th Cir. 1992) (ordering the EPA to meet its statutory duty and promulgate an FIP for the South Coast Air Basin after the EPA failed to establish a federal plan and the Coalition for Clean Air filed suit); Abramowitz v. EPA, 832 F.2d 1071 (9th Cir. 1988) (ordering the EPA to disapprove California's State Implementation Plan for the South Coast Air Basin because

consequences, the EPA initially balked[129] and then complied with a judicial mandate by issuing plans containing physically available, but socially and politically unacceptable, mechanisms.[130] For example, for the city of Los Angeles, the EPA required that gasoline be rationed such that the amount sold would be limited to the amount that, when combusted, would allow attainment of the standard.[131] Naturally, Congress responded by extending the deadline and has repeatedly extended the deadline as necessary to conform the law to the social and political realities reflecting the availability of actual and acceptable means to reduce emissions.[132]

Such political stasis occurs even where technologically and economically viable solutions are readily available. CAFE itself provides a discouraging example. Since the CAFE standards were enacted in 1975, automakers have developed smaller, more fuel-efficient cars. Yet, due in substantial part to the political efforts lead by congressmen representing Detroit, CAFE standards were frozen

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the plan did not show ozone and carbon monoxide would be reduced to the attainment levels by 1987).

129 *Coalition for Clean Air*, 971 F.2d at 228; McNiven, *supra* note 123, at 1274–75 (discussing the EPA's actions after the court orders in *Abramowitz* and *Coalition for Clean Air* and how the EPA subsequently published the proposed FIP in 1988, but the Agency did not take final action on the proposal because it hoped Congress would pass amendments that would end the need for an FIP).

130 McNiven, *supra* note 123, at 1279–80 (citing 38 Fed. Reg. 31,232, 31,233 (1973)); 38 Fed. Reg. 2194, 2195 (1973) (discussing the EPA's 1972 plan for air quality attainment for the city of Los Angeles, after the EPA was ordered to promulgate a plan for the metropolitan area by January 15, 1973, in *City of Riverside v. Ruckelshaus*, 4 Env't Rep. Cas. (BNA) 1728, 1731 (C.D. Cal. 1972)).

131 McNiven, *supra* note 123, at 1279–80.

132 *Id.* at 1269–71 (discussing the attainment deadline being extended to 1982 and Congress's attempts to extend the deadline afterwards as well). After 1981, Congress repeatedly attempted to amend the Clean Air Act to replace overdue deadlines with new ones, but, because of deadlock over acid rain provisions, the legislation did not pass until 1990. *Id.* As such, between 1983 and 1990, nonattainment areas were stuck between deadlines they could not meet with no statutory provisions for a postdeadline plan. *Id.*; *see also* Trs. for Alaska v. Fink, 17 F.3d 1209, 1210 n.1 (9th Cir. 1994) (citing 42 U.S.C. § 7502(a)(2)) (stating that the 1977 amendments extended the deadline for nonattainment areas for carbon monoxide to 1982, or until 1987 if the EPA approved a SIP); Joseph M. Feller, *Non-Threshold Pollutants and Air Quality Standards,* 24 ENVTL. L. 821, 826 & n.24 (1994) (citing 42 U.S.C. § 7511(a)(1) (Supp. 1992) (extending deadlines for ozone), § 7512(a)(1) (extending deadlines for carbon monoxide), and § 7513(c) (extending deadlines for particulate matter)). For example, ozone was given a five classification scheme. *Id.* at 830–31. In the areas where ozone was marginally in excess of the standard, attainment was to be completed in three years. *Id.* at 831. "Moderate" areas were given six years. *Id.* "Serious" areas were given nine years. *Id.* "Severe" areas were given fifteen years. *Id.* The worst or "extreme" areas were given twenty years. *Id.*

for more than five years while fleet mileage standards and performance in Europe, Japan, and China surpassed those in the United States.[133] Similarly for carbon, until means are developed for continuing the activities that currently create electricity demand with less carbon, neither the cap nor the deadlines will have the desired effect.

In sum, at tax or carbon allowance prices proposed or currently anticipated, neither the tax in carbon tax legislation, nor the cap, targets, or price of carbon allowances in cap-and-trade legislation will operate to reduce carbon emissions to target levels. Political realities will make the tax or price of the carbon allowance too low to affect an inelastic demand, and neither the cap nor the targets will remain in place unless socially and economically acceptable strategies are available and implemented to meet them.

C. Both Systems Can Have an Effect by Directing Revenue to Efficiency and Demand Management

We are led then to the question of how to develop other means for reducing the demand for fossil fuel-based transportation and electric power. Since neither the carbon tax itself, nor the price of carbon allowances, nor the cap itself will reduce demand, what in the proposed legislation will? The answer is funding and policies. Both a tax or cap-and-trade system can generate new funds, but the success of the legislative effort will depend for the most part on how those funds are spent and what policies, enacted at both the federal and state level, accompany the effort.[134]

133 For an example of congressional actions freezing CAFE standards, compare S. 1506, 104th Cong. (1995), with H.R. 2200, 104th Cong. (1995). Congress also terminated funding for the National Highway Traffic Safety Administration such that the Agency was unable to engage in CAFE standards rulemaking. *See* Department of Transportation and Related Agencies Appropriations Act, Pub. L. No. 104-50, 109 Stat. 436 (1995). Congress lifted its freeze on CAFE standards in 2001. *See* Department of Transportation and Related Agencies Appropriations Act of 2002, Pub. L. No. 107-87, 115 Stat. 833.

134 *See* Cowart, *Testimony*, *supra* note 34. The American Clean Energy and Security Act of 2009, in fact, contains policies and programs that approach reducing demand or development of alternative energy directly rather than through a cap or carbon trading. *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 131(a), (c) (establishing State Energy and Environment Development (SEED) Accounts to serve as repositories for state emissions allowances designated for renewable energy and energy efficiency); *see also id.* § 184 (establishing the Clean Energy Investment Fund); *id.* § 246 (establishing the Clean Energy Manufacturing Revolving Loan Fund Program to increase manufacturing of clean energy and energy-efficient technologies); America's Energy Security Trust Fund Act of 2009, H.R. 1337, 111th Cong. § 2 (establishing Trust

In the transportation sector, some progress has been made outside of either scheme. As discussed above, the CAFE standards have been raised, and further regulatory efforts at the national level can include progressive tightening of these standards.[135] Funds from a carbon tax or cap-and-trade system could assist efforts by the federal government to expand both public transit directly and efforts by the states to coordinate transit and land use at the regional and local level to reduce carbon output.[136] A major advance, however, will lie in the eventual, complete electrification of the ground fleet, a development that leads back to the nation's electricity system, which is the subject of this discussion.[137]

1. Generation Options, Including Renewables

In the longer term, rising demand for electricity will require dramatic increases in the portion of our power mix supplied by noncarbon generation. A brief review of the generation options, however, is not encouraging, at least in the next decade and possibly in the next two decades. Coal plants, of course, are the problem, not the solution. Newer plants produce more megawatt-hours per million British thermal unit[138] than older plants and, thus, have a smaller carbon footprint per unit of power, but that footprint is still very large.[139] Carbon capture and storage (CCS) technology has yet to be demonstrated at the relevant scale, and substantial institutional, legal, and environmental issues need to be resolved before CCS would be

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Fund for investments in clean energy technology); *cf.* Raise Wages, Cut Carbon Act of 2009, H.R. 2380, 111th Cong. § 2 (offsetting Social Security Tax with carbon tax revenue).

135 *E.g.*, Josh Voorhees, *Obama Finalizes 8% CAFE Hike for 2011 Models*, GREENWIRE, Mar. 27, 2009, http://www.eenews.net/public/Greenwire/print/2009/03/27/2 (suggesting minimum standards may increase or become mandatory prior to 2020).

136 *See* H.R. 2454 § 222(c)(3) (amending 23 U.S.C. § 135(f)) (requiring that state emissions reduction processes address transportation-related greenhouse gases).

137 *See generally* H.R. 2454 §§ 121, 122, 123 (establishing an electric vehicle infrastructure, a large-scale vehicle certification program, and plug-in electric-drive vehicle manufacturing).

138 Milne, *supra* note 36, at 3 n.9 (defining the British thermal unit (Btu) as the "quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit" (quoting WEBSTER'S NEW WORLD DICTIONARY 178 (3d college ed. 1991))).

139 *See generally* SYNAPSE ENERGY ECON., INC., DON'T GET BURNED: THE RISKS OF INVESTING IN NEW COAL-FIRED GENERATING FACILITIES (2008), *available at* http://www.synapse-energy.com/Downloads/SynapseReport.2008-02.ICCR.Don't-Get -Burned-Risks-of-New-Coal.07-014.pdf.

practical.[140] Natural gas is better, but, while replacing coal with natural gas is a possible short-term approach,[141] even highly efficient, combined-cycle natural gas plants produce substantial carbon footprints. If the natural gas must be imported as liquefied natural gas (LNG), the total life cycle carbon output approaches the output of efficient coal plants.[142]

As much attention as is given to renewable generation, its share of the U.S. total electric generation mix remains at about 9% and declines as the country's total increases.[143] Most of that amount consists of generation from large hydro facilities, which usually take the form of major dams built in the early- to mid-twentieth century.[144] Due to environmental, financial, and siting constraints, meeting additional demand through the construction of additional large hydroelectric facilities is not a realistic option in this country.[145] Nuclear energy comprises about 20% of the mix, but, for price, environmental, and regulatory reasons, that share is unlikely to

140 *See* CCSREG INTERIM REPORT, *supra* note 54, at 1–2.

141 *See* Paulina Jaramillo et al., *Comparative Life-Cycle Air Emissions of Coal, Domestic Natural Gas, LNG, and SNG for Electricity Generation*, 41 ENVTL. SCI. & TECH. 6290, 6294 (2007) ("[I]ntegrated coal gasification combined cycle (IGCC) and natural gas combined cycle (NGCC) power plants could be installed. [These] plants are generally more efficient . . . than the current fleet of power plants.").

142 The carbon footprint of LNG must include power consumed and emissions from processes related to liquefaction at the source, pumping to port, ship transportation, and regasification. *Id.* at 6291–92. Until recently, projected domestic consumption was estimated to outpace supplies, requiring a rapid substitution of LNG for native natural gas. However, note that recent gas discoveries have made native gas more available and a more attractive substitution for coal, at least in the short term. Ben Casselman, *U.S. Gas Fields Go from Bust to Boom*, WALL ST. J., Apr. 30, 2009, at A1 ("A massive natural-gas discovery here in northern Louisiana heralds a big shift in the nation's energy landscape. After an era of declining production, the U.S. is now swimming in natural gas."). Nevertheless, natural gas futures markets still anticipate large price increases in the coming years. U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, SHORT-TERM ENERGY OUTLOOK 6 (2010), *available at* http://www.eia.doe.gov/emeu/steo/pub/jan10.pdf ("[S]pot price averaged $4.06 per Mcf in 2009, and the forecast price averages $5.36 per Mcf in 2010 and $6.12 per Mcf in 2011.").

143 *See* U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, ELECTRIC POWER ANNUAL 2008, at 2 fig.ES1 (2010), *available at* http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf.

144 *See id.* (showing hydroelectric power accounting for 6%).

145 DOUGLAS G. HALL ET AL., IDAHO NAT'L LAB., FEASIBILITY ASSESSMENT OF THE WATER ENERGY RESOURCES OF THE UNITED STATES FOR NEW LOW POWER AND SMALL HYDRO CLASSES OF HYDROELECTRIC PLANTS 9 fig.3 (2006), *available at* http://www1.eere.energy.gov/windandhydro/pdfs/doewater-11263.pdf (showing large hydro sites account for less than 1% of all feasible hydroelectric sites in the United States, yet have the potential for 26% of the total estimated 300,000 MWa gross power potential).

increase significantly.[146] Also, although the production of nuclear energy emits less carbon than fossil fuel-based generation, if viewed on a life cycle basis, its carbon footprint is actually substantial.[147]

All remaining renewables comprise slightly more than 3% of the energy mix.[148] We have seen dramatic percentage increases in solar production, but these increases occurred on an almost insignificant base of existing generation. No matter how rapidly solar energy builds market penetration, it will be at least a decade before solar displaces a significant portion of our current fossil fuel-based generation. Biofuel is problematic as a low-carbon substitute because it involves either feedstocks, such as corn, that have high-carbon production processes or other feedstocks that require converting large land areas that may now be forested or otherwise currently operate as large carbon sinks.[149] Development of algae- or bacteria-based systems will take years to research, demonstrate, and

146 *See* U.S. ENERGY INFO. ADMIN. DATABASE, *supra* note 114. The "nuclear renaissance" proposed by advocates has not materialized. Most of the thirty applications filed during the last administration were generated by a deadline in subsidy legislation and are not active. Mary Anne Sullivan, *The Many Challenges of the "Full Portfolio" Approach: Utilities Prepare for Climate Change Regulation*, ROCKY MTN. MIN. L. FOUND., Apr. 10–11, 2008, at 12–14. "Next generation" plants in Finland and France are suffering cost and time overruns similar to the prior generation of plants. *See* MARK COOPER, VT. LAW SCH., THE ECONOMICS OF NUCLEAR REACTORS: RENAISSANCE OR RELAPSE? 41 (2009), *available at* http://www.vermontlaw.edu/Documents/Cooper%20Report%20on%20Nuclear%20Economics%20FINAL%5B1%5D.pdf. Thus far, the United States has been unable to find an area for a waste disposal site. Reprocessing plants, proposed as a solution by nuclear advocates, actually leave most of the high-level waste in place and in need of long-term sequestration. Nuclear power plants remain a prohibitively expensive source of power. *See id.* at 33. One author recently estimated that doubling our nuclear capacity through the addition of one hundred new plants would cost over a trillion dollars. *Id.* at 1 (estimating lifetime costs of one hundred new reactors between $1.9 and $4.4 trillon). No private entity has pursued a plant without some sort of government subsidy. *Id.*

147 COOPER, *supra* note 146, at 57–58 (noting that construction, decommissioning, and early fuel cycle of nuclear reactors are all energy intensive with CO_2 emissions increasing over the life of a reactor).

148 *See* U.S. ENERGY INFO. ADMIN., *supra* note 143, at 2 fig.ES1 (showing "other renewables" accounted for 3.1% of electricity generation in 2008).

149 THE RUSH TO ETHANOL: NOT ALL BIOFUELS ARE CREATED EQUAL 22–23 (2007) (explaining that an increase in feedstock cultivation leads to higher pesticide use, soil depletion, and deforestation, depleting natural CO_2 absorption and increasing emissions); *see* Sindya N. Bhanoo, *Calculating Emissions Is Problematic*, N.Y. TIMES, Oct. 23, 2009, http://www.nytimes.com/2009/10/23/science/earth/23biofuel.html?emc=eta1. *See generally* Mark Z. Jacobson, *The Short-Term Cooling but Long-Term Global Warming Due to Biomass Burning*, 17 J. CLIMATE 2909 (2004) (providing a detailed analysis on emissions and climate change for biofuels and deforestation).

commercialize.[150] Wind energy can now be priced competitively with fossil fuel generation, even without tax subsidies, in many parts of the country. Yet, again, its dramatic growth is on a small base.[151]

For both wind and solar energy, transmission constitutes a constraint. The current configuration of the nation's power transmission grid is not optimized to bring power to users from locations where wind and solar energy will most likely develop. While wind energy now and solar energy in a decade may be competitive in the market,[152] neither can afford to internalize the cost of transmission necessary to transport power to the urban centers that are the locus of demand.[153] The variable or intermittent nature of these sources also limits their share of total use. Even a "smart grid" possesses physical attributes that limit the amount of such variable or intermittent energy it can absorb.[154] The remainder must either be an uninterruptible supply, or at least dispatchable or deliverable on demand, or consist of a "base load" currently provided both by large

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150 *See* Jad Mouawad, *A Biofuel Drop in the Bucket?*, N.Y. TIMES, July 14, 2009, at B1 (indicating commercialization of such systems is five to ten years away).

151 *See, e.g.*, U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, RENEWABLE ENERGY TRENDS IN CONSUMPTION AND ELECTRICITY 2007, at 23 tbl.1.11 (2009), *available at* http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/trends.pdf (showing increase in total wind generation by a factor of more than two from 2003 to 2007); *cf.* U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, RENEWABLE ENERGY CONSUMPTION AND ELECTRICITY PRELIMINARY STATISTICS 2008, at 4 tbl.1 (2009), *available at* http://www.eia.doe.gov/cneaf/alternate/page/renew_energy_consump/pretrends08.pdf (reporting wind energy consumption in 2007 at 0.3% of total energy consumption and 4.67% of renewable energy consumption).

152 RON PERNICK & CLINT WILDER, CLEAN EDGE, UTILITY SOLAR ASSESSMENT (USA) STUDY: REACHING TEN PERCENT SOLAR BY 2025, at 7 (2008) (projecting solar photovoltaics will reach cost parity on a kilowatt-hour basis with conventional electricity by 2015); *Global Energy Technology Strategy Essential to Addressing Climate Change*, 17 AIR POLLUTION CONSULTANT 1.7, 1.10 (2007) (noting wind generation costs are competitive but solar is not because of large capital costs); *see also* David R. Hodas, *Ecosystem Subsidies of Fossil Fuels*, 22 J. LAND USE & ENVTL. L. 599, 612–13 (2007) (suggesting solar energy is not cost competitive with fossil fuels because solar reflects the true cost of capturing energy and, thus, needs market adjustments to justify capital costs).

153 Government action to support such transmission has been tied up in financial and regional conflict. *See* Matthew L. Wald, *Debate on Clean Energy Leads to a Regional Battle over Jobs*, N.Y. TIMES, July 14, 2009, at A13.

154 The North American Electric Reliability Corporation (NERC) notes that, to date, the smart grid has only experienced variable generation less than 5% of total annual generation. N. AM. ELEC. RELIABILITY CORP., ACCOMMODATING HIGH LEVELS OF VARIABLE GENERATION 4 (2009). However, increased generation from sources such as wind, solar, and some hydro is expected to increase variability. *Id.* at i. Increased variability in the bulk power system could present a threat to reliability and, therefore, must be managed through NERC standards and advances in technology. *See id.* at 4–5.

coal and natural gas plants, which must somehow be replaced, and by the existing fleet of nuclear and hydro plants, which is unlikely to experience a significant increase. This continued need to rely on base load poses a difficult problem because, even where alternative generation technologies are or become available, the effort to replace high-carbon base generation with low-carbon alternatives faces the heavy impediment of slow amortization of the existing fleet. Annual depreciation rates for base-load plants are sufficiently small enough that, even assuming an optimistic low carbon for high carbon swap rate, between one and two decades would pass before the fleet showed any substantial change in mix.

Other approaches to the intermittent and variable nature of renewables include the development of devices to store large amounts of electric energy (such as compressed air, flywheels, and advanced batteries), but commercialization of these technologies, while growing, has not yet been reached.[155] Wave energy is a significant possibility and may have low environmental impact and low variability, but again, it will be at least a decade before this source of energy generates any significant share of our electricity.[156]

2. Demand-Side Management: Efficiency, Demand Response, and Grid Improvements

The United States needs a source of carbon-efficient power to meet increases in demand and hopefully allow reductions during the next decade or so before renewables can make major inroads into the current coal- and natural gas-based electric generation. That "source" is demand-side management (DSM), an effort to meet demand by reducing and managing power needs. DSM includes increases in the efficiency of the power system. With appropriate policies and organizational efforts, DSM can provide the same substantive electricity services provided now with substantially less electricity. A watt of energy saved is the same as a watt generated, or, as Amory

155 *Id.* at 49–50 (discussing the possibility for storage technologies such as battery energy storage, flywheel energy storage, and compressed air energy storage to assist integration of large-scale variable generation).

156 *See generally* Minerals Mgmt. Serv., U.S. Dep't of the Interior, Alternative Energy and Alternate Use Guide: Wave Energy, http://www.ocsenergy.anl.gov/guide/wave/index.cfm (last visited Feb. 2, 2010) (indicating that wave power has significant potential to offset growing energy demand but is not yet commercialized).

Lovins terms it, a "negawatt" is the same as a kilowatt.[157] Such enhancements are referred to as "energy efficiency." In addition, shifting the time at which the demand for power occurs can reduce peak demand. This shift is referred to as "demand response." The power grid can also be improved to create substantial savings, adopting a package of improvements loosely referred to as the "smart grid." These options are discussed briefly below.

Just as ratepayer funds have routinely been invested in the construction of new power plants, ratepayer funds can be invested in energy efficiency.[158] Traditionally, a utility or other local provider, which determined the need to meet new demand, received regulatory approval to construct or participate in the development of a new generating plant. The applicable public utility commissions (PUCs) typically approved rates that incorporated the cost of the capital for the plant—frequently in the form of tax-exempt bonds—into the applicable rates. The same utilities, state agencies, or hybrid "efficiency utilities," such as Efficiency Vermont, can similarly invest ratepayer funds in ways that reduce demand.[159] For example, Efficiency Vermont can pay hardware stores to subsidize the price of compact fluorescent lightbulbs (CFLs) to $0.99 instead of the market price of $3.00.[160] The utility can contract with an industrial facility to

157 *See* Amory B. Lovins, *Saving Gigabucks with Negawatts*, PUB. UTIL. FORT., Mar. 21, 1985, at 19. "Negawatt" is roughly defined as a unit of power that is not consumed and was coined in 1985 by Amory B. Lovins. *See id.*

158 COWART, *supra* note 55, at 66–70 (proposing mechanisms to encourage energy efficiency from utilities including system benefits charges).

159 *See generally* MAGGIE ELDRIDGE ET AL., AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., ACEEE REPORT NO. E086, THE 2008 STATE ENERGY EFFICIENCY SCORECARD 6–8 (2008) [hereinafter 2008 ACEEE SCORECARD] (benchmarking state energy efficiency efforts). Most states allow utilities to undertake this effort under supervision with varying degrees of rigor. In some states, state agencies deliver efficiency services directly. Efficiency Vermont is the nation's first efficiency utility. Efficiency Vt., About Us, http://www.efficiencyvermont.com/pages/common/AboutUs/ (last visited Feb. 2, 2010). It is funded by an energy efficiency charge applied statewide to all ratepayers. *Id.* The funds pay for energy efficiency improvements in residential and commercial applications. *Id.* For a great case study review of fourteen state ratepayer-funded efficiency utility programs, see HARRINGTON, *supra* note 118; *infra* note 195, which elaborates on state programs with substantial experience and success with the efficient use of funds generated by voluntary cap-and-trade programs; and *infra* note 202, which elaborates on state programs with substantial experience and success with the efficient use of funds generated by charges applied to all users. This hybrid approach may be the most effective.

160 *See* Efficiency Vt., RebateCenter, http://www.efficiencyvermont.com/pages/Residential/RebateCenter/ (last visited Feb. 2, 2010). Currently, Efficiency Vermont's statewide CFL rebate program offers in-store coupons for various amounts off Energy Star light bulbs. *Id.* CFLs use "75 percent less energy and [last] about 10 times longer than an

pay outright for the replacement of all of its inefficient electric motors with new efficient models, or Efficiency Vermont can subsidize the conversion with low- or no-interest loans. Utilities or state agencies can invest ratepayer funds to either change out incandescent lighting for florescent or replace older industrial heating or cooling processes, including heating, ventilating, and air conditioning units, with high-efficiency models that perform the same function but with less electricity consumption. Outside of the electric sector, building retrofit and the construction of new buildings incorporating highly insulating walls, roofs, and windows serve the same function as poorly insulated structures but save fuel for heating and cooling.[161]

Such efficiency services require the finance or subsidy of the applicable appliance or industrial/residential feature or process and substantial organizational development to locate opportunities, enter into relevant agreements, deliver the service, and conduct verification. While the cost of this effort is considerable, it is substantially lower than the cost of construction and operation of energy generation. States such as California, Oregon, Washington, and New York, as well as the New England states, have substantial experience with these efficiency programs in the electricity sector and have developed sophisticated systems for pricing the cost of saved electricity to the ratepayer per watt, the cost of the "production" of "negawatts" that can be compared to the production of megawatts.[162] As stated earlier, this process would manage demand through efficiency costs in the range of $0.02 to $0.04 per kilowatt saved.[163] This compares to a national average retail electricity price of $0.11 per kilowatt for residential customers and $0.09 across all sectors.[164]

Note that a comparison of the efficiency costs to retail rather than wholesale electric prices is appropriate here. The retail price of

incandescent bulb." Energy Star, U.S. Envtl. Prot. Agency, Light Bulbs (CFLs), http://www.energystar.gov/index.cfm?c=cfls.pr_cfls (last visited Feb. 2, 2010).

161 *See* JENNIFER THORNE AMANN & ERIC MENDELSOHN, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., REPORT NO. A052, COMPREHENSIVE COMMERCIAL RETROFIT PROGRAMS: A REVIEW OF ACTIVITY AND OPPORTUNITIES 7 (2005) (estimating potential building energy savings from a comprehensive commercial retrofit program as 11% to 26% of consumption).

162 *See* 2008 ACEEE SCORECARD, *supra* note 159, at 5 tbl.2 (ranking the overall utility and public benefits programs in all fifty states and concluding the top states in order were Vermont, Connecticut, California, Minnesota, Oregon, New York, Massachusetts, and Washington).

163 *Id.*; *see also supra* note 113 and accompanying text.

164 *See supra* note 114 and accompanying text.

generated electricity is higher than the wholesale price because of the cost of transmission, meter reading, billing, and other customer services that are normally factored into retail rates. Efficiency gains generally occur on the customer side of the meter, are not in need of transmission, relieve transmission congestion, and reduce the demand for new transmission and distribution facilities—a cost savings not included in the above calculations. Efficiency improvements also do not generally increase the metering and service costs reflected in retail rates. The more appropriate price comparison is between the $0.02 to $0.04 cost per kilowatt-hour saved by efficiency services, which includes customer costs, to substantially higher retail rates that include transmission and service.

Americans are far from exhausting opportunities for reducing demand by increasing efficiency. As discussed below, most states have yet to begin serious efficiency efforts. In those states that have undertaken substantial efforts, the resulting gains in efficiency flatlined per capita growth in electricity demand,[165] despite increases in economic activity, and, together with some adoption of renewable sources, total generation needs in such states frequently remain stable or decline.

The examples above focused on "end use" efficiency. Improvement of the physical and technological nature of the electric transmission and distribution[166] system has promise as well. The current grid is a patchwork of poorly integrated systems, in many cases utilizing lines, switches, capacitors, and other elements whose design dates from the early-twentieth century and whose component equipment may not be much newer. Grid operators frequently have only a general sense of grid performance and power flows. They sustain performance by ensuring that substantial excess generation

165 ANANT SUDARSHAN & JAMES SWEENEY, U.S. ASS'N FOR ENERGY ECON., DECONSTRUCTING THE ROSENFELD CURVE: UNDERSTANDING CALIFORNIA'S LOW PER CAPITA ELECTRICITY CONSUMPTION 16–19 (2008), *available at* http://www.usaee.org/usaee2008/submissions/OnlineProceedings/Sudarshan_Sweeney.pdf (discussing California's low electricity consumption per capita despite the rising rate of U.S. consumption as a whole and the reasons for the difference); *see also* LEE SCHIPPER & JAMES MCMAHON, AM. COUNCIL FOR AN ENERGY EFFICIENT ECON., REPORT NO. E951, ENERGY EFFICIENCY IN CALIFORNIA: A HISTORICAL ANALYSIS (1995).

166 Transmission refers to "the transportation of electricity over long distances at high voltages, typically from generators to local utility companies." TIMOTHY J. BRENNAN ET AL., ALTERNATING CURRENTS: ELECTRICITY MARKETS AND PUBLIC POLICY 13 (2002). Distribution refers to "the transformation of high-voltage electricity to lower voltages and the delivery of that power to users for lighting, heating, air conditioning, appliances, and other personal and commercial uses." *Id.*

capacity is online. Current grid reliability standards require that plants that are not needed at the time operate just to provide backup power in the event a mechanical malfunction takes a plant or transmission line off-line.[167] These plants consume fuel for reserve purposes alone; their turbines are literally running just as a precaution called "spinning reserve." Extra generation is also required to make up for line losses due to the old design and age of equipment.[168] Development of a modern, computerized system of generation and distribution can reduce the ways in which the grid itself consumes power or requires excess generation.[169] Depending on the nature and scope of these improvements, such grid upgrades are estimated to reduce annual carbon emissions by between 5% and 16% by 2030, a substantial contribution.[170]

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167 Eric Hirst & Brendan Kirby, *Technical and Market Issues for Operating Reserves*, ELECTRICITY J., Mar. 1999, at 36 (discussing the required balance between production and consumption to maintain the grid and operating reserves necessary when a major generator or transmission line fails).

168 Line loss is defined as "[e]lectric energy lost because of the transmission of electricity. Much of the loss is thermal in nature." U.S. Energy Info. Admin., U.S. Dep't of Energy, Energy Glossary: L, http://www.eia.doe.gov/glossary/glossary_l.htm (last visited Feb. 2, 2010); *see also* Nathanael Greene & Roel Hammerschlag, *Small and Clean Is Beautiful: Exploring the Emissions of Distributed Generation and Pollution Prevention Policies*, ELECTRICITY J., June 2000, at 50, 57 (discussing the benefits of distributed generation, including the decrease in line losses) ("Depending on the size, grid, loading and distance between load and generator, line losses can vary from just a few percent to 20% to 30%. Average line losses vary from 5% to 10%.").

169 *See* ELEC. ADVISORY COMM., *supra* note 120, at 10 (stating that smart meters can "reduce . . . electricity consumption by up to 25% during peak periods"); *see also id.* at 8 (discussing reduction in distribution losses). The U.S. Energy Information Administration believes that a smart grid will "enable more efficient use of the transmission and distribution grid, lower line losses, facilitate greater use of renewables, and provide information to utilities and their customers that will lead to greater investment in energy efficiency and reduced peak load demands." U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, AN UPDATED ANNUAL ENERGY OUTLOOK 2009 REFERENCE CASE REFLECTING PROVISIONS OF THE AMERICAN RECOVERY AND REINVESTMENT ACT AND RECENT CHANGES IN THE ECONOMIC OUTLOOK 10 (2009), *available at* http://www.eia.doe.gov/oiaf/servicerpt/stimulus/arra.html.

170 *Smart Grid or Smart Policies: Which Comes First?*, ISSUESLETTER (Reg. Assistance Project, Montpelier, Vt.), July 2009, at 7 n.16 [hereinafter *Smart Grid*], *available at* http://www.raponline.org/showpdf.asp?PDF_URL=Pubs/Issuesletter_July09.pdf. Note that the "smart grid" concept is defined in various ways depending on the interests of the proponent. Some studies limit the improvements to remotely read meters, which may financially benefit utilities that can replace meter readers with automated systems but would not operate to improve carbon emissions per se. Others may take the opposite tack, including arguably extraneous elements in the smart grid to enhance the claimed benefits. *See generally id.* at 1–4. Some estimates, for example, include as part of the smart grid coordinated off-peak charging by pervasive, plug-in hybrid-electric vehicles that then discharge at peak periods if not in use. *See id.* at 4. The

A shift of demand away from the peak is also a means to produce substantial financial savings for consumers and may, but not necessarily will, reduce carbon emissions. Utilities and private efficiency enterprises are now installing and operating systems that allow remote coordination of industrial, commercial consumers to reduce power demand at peak periods and pass the savings along to those entities participating.[171] This process, known as demand response, promises substantial cost savings.[172] Factories can shut down certain processes at peak periods and share in the resulting and frequently very large savings.[173] If the "smart grid" upgrades include remotely accessible, price-sensitive meters that can be linked to smart appliances, the grid would enable remote control of household devices. Local service providers could cycle air conditioners or other electric appliances off in thousands of participating households to reduce the peak demand usually met through fossil fuel-based generation.[174] These processes are commercially available now. However, such demand-response efforts will not necessarily operate to reduce carbon emissions since, while demand is redistributed away from the peak hours and ratepayer expenditures are reduced, the total power demand remains unchanged. Funds can be liberated and invested in efficiency, but carbon savings occur only if inefficient peaking units with high-carbon footprints are replaced with lower carbon emission sources to serve as a base load.

Estimates of the electricity consumption savings from these efficiency and demand-response efforts vary, but the Electricity Advisory Committee estimates that efficiency and demand services could reduce total electricity consumption between 10% and 15% by

low range of savings cited in the text assumes only grid elements available today. The higher number cited (16%) includes high-potential technologies available in the longer term, such as large-scale storage devices, but not this use of electric vehicles. *Id.* at 7 n.16.

171 EnerNOC, Inc., for example, deployed PowerTalk in Boston, Massachusetts, in April 2009. Press Release, EnerNOC, Inc., EnerNOC Deploys Industry's First Presence-Enabled Smart Grid Technology (Apr. 30, 2009), *available at* http://www.enernoc.com/press/press-releases.php (follow "2009" hyperlink; then follow "EnerNOC Deploys Industry's First Presence-Enabled Smart Grid Technology" hyperlink). PowerTalk is the first smart-grid technology that enables real-time communication between smart meters and EnerNOC's Network Operations Center, which can send information more efficiently to customers. *Id.*

172 *See* ELEC. ADVISORY COMM., *supra* note 120, at 9 (discussing the smart grid's benefits as a "demand response [and] load management [program]").

173 *Id.* at 5–6 (discussing the economic and environmental benefits of smart grids).

174 *See id.* at 4 (describing smart meter installations in Texas and California).

2025.[175] Shifting demand away from peak periods through demand reponse could reduce demand at peak periods by 25%, although carbon emission reductions would be lower and would depend on the nature of the substituted nonpeak generation.[176] A substantial but realistic effort comparable to that already undertaken in a number of states could eliminate the need for new fossil fuel-based generation, and pilot smart-meter programs show decreases in consumption as high as 37%.[177] As discussed above, grid improvements could affect additional savings.

Thus, regardless of the choice of tax or cap and trade, legislative efforts to control carbon for the electricity sector and for residential, commercial, and industrial uses must include funding and policies that enhance the delivery of efficiency services, grid improvements, and possibly demand response on a nationwide basis. In the absence of necessary funds and policies, the tax will not reduce demand in the absence of a lower carbon alternative, the cap itself will not reduce demand, and legislators will lift the cap or delay the dates for its attainment. This Article first discusses the funding below and then, in Part D below, the policies necessary to produce the desired reductions in carbon emissions.

3. Funding for Efficiency, Demand Response, and Grid Improvements

States with successful efficiency and demand-response systems use some sort of surcharge on rates to fund the programs that deliver efficiency services.[178] Without duplicating the successful state programs on a national scale, both cap-and-trade and tax legislation will fail to have the desired effect.[179] Fortunately, however, either one of these legislative approaches can generate sufficient funds, when coupled with appropriate policies at the national and state level, to deliver carbon reduction through efficiency, grid reform, and demand management. The tax itself can be partly devoted to this

175 *Id.* at 6 tbl.2-1.

176 *Id.*

177 *See Baltimore Gas and Electric Company Unveils Plans for One of the Most Advanced Smart Grid Initiatives in the Nation*, BUSINESS WIRE, July 13, 2009 (reporting that Baltimore Gas and Electric Company's advanced metering and consumer rebate program showed that customers reduced their consumption during peak periods by 26% to 37%).

178 *See infra* Part I.D.

179 *See infra* notes 195, 202.

purpose as well as a portion of the revenues from the sale of carbon allowances.

The amount of revenue generated in the case of a tax simply depends on the tax itself, but current tax proposals are estimated to produce approximately $60 billion per year.[180] Analysis of revenues from a cap-and-trade system depends on the structure of the legislation.[181] Revenues derive from the sale of carbon allowances. In a pure auction system, all carbon allowances are created by the government and either sold in an open market to generators that need the allowances to continue to operate, or distributed to local electricity providers or consumer trustees that, in turn, can sell them.[182] The market sets the price. The RGGI market auctions 100% of the carbon allowances.[183] Revenues from the operation of an auction, or multiple auctions in a nationwide system, would dwarf any prior experience with such markets and are currently estimated in the range of $130 billion to $366 billion.[184]

In the case of cap and trade, actual revenues will likely be much lower because not all allowances will be auctioned. Although many experts and advocates of efficiency and renewables favor a system where all carbon allowances are auctioned, most proposals under

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[180] For example, the Save Our Climate Act of 2009, H.R. 594, 111th Cong. § 2, proposes an initial carbon tax of $10 per ton of carbon emitted. According to the U.S. Energy Information Association, total U.S. carbon dioxide emissions in 2007 were 6022 million metric tons. U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES 2007, at 13 (2008), *available at* http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/0573(2007).pdf. Multiplying $10 per ton by 6022 million tons of carbon, House Bill 594 will generate over $60 billion in revenue per year if carbon emission rates remain stagnant. However, from 2006 to 2007, carbon emission rates increased 1.6%.

[181] In 2007, the Massachusetts Institute of Technology (MIT) Joint Program on the Science and Policy of Global Change analyzed various bills proposing cap-and-trade systems, including the Lieberman-McCain Bill of 2007. SERGEY PALTSEV ET AL., MIT JOINT PROGRAM ON THE SCIENCE & POLICY OF GLOBAL CHANGE, REPORT NO. 146, ASSESSMENT OF U.S. CAP-AND-TRADE PROPOSALS 2 (2007), *available at* http://web.mit.edu/globalchange/www/MITJPSPGC_Rpt146.pdf. The report analyzed the bills using the MIT Integrated Global System Model and the MIT Emissions Prediction and Policy Analysis Model. *Id.* Though revenue depends on a number of factors, including allocation, MIT estimated that the potential revenue streams from proposed cap-and-trade programs would be "substantial, ranging in just the first period of the policy from $130 billion in the 287 bmt case to $366 billion in the 167 bmt case." *Id.* at 24.

[182] *Id.* (discussing the differences between allowances given away as opposed to auctioned for purposes of the study).

[183] *See infra* note 195.

[184] PALTSEV ET AL., *supra* note 181, at 24.

consideration contain either partial auctions or no auctions.[185] Power companies prefer that the government allocate carbon allowances to current emitters at no cost.[186] In that case, revenues would be nil. Bills in Congress compromise through an auction of some of the allowances.[187]

Potential funding for efficiency services could be reduced by diversion to stakeholders that want a portion of such revenue to mitigate their real and perceived costs of a cap-and-trade system or a carbon tax.[188] Low-income ratepayers want to be compensated to neutralize rate increases due to the impacts of the tax or cost of the carbon allowances.[189] Energy-consuming economic industries want assistance for the same reason.[190] The congressional cap-and-trade legislative effort has provoked a feeding frenzy of interests that have

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185 *See* Obama for Am., Barack Obama and Joe Biden: Promoting a Healthy Environment, *available at* http://www.barackobama.com/pdf/issues/EnvironmentFactSheet.pdf (last visited Feb. 2, 2010) (stating that a "100 percent auction ensures that all large corporate polluters pay for every ton of emissions they release, rather than giving these emission rights away for free to coal and oil companies"); *see also* CAL. ENERGY COMM'N, RECOMMENDATIONS FOR DESIGNING A GREENHOUSE GAS CAP-AND-TRADE SYSTEM FOR CALIFORNIA 58 (2007), *available at* http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (discussing the pros and cons of both the free distribution of allowances and the auction of all allowances, concluding that a mixed approach is superior).

186 CAL. ENERGY COMM'N, *supra* note 185, at 58 (reporting that free distribution advocates argue companies already have the right to pollute; therefore, the free allowances are the equivalent of traditional regulation in which companies are "allowed to emit for free up to a certain level").

187 The American Clean Energy and Security Act of 2009, provides for an initial auction of 5% of the power sector allowances. H.R. 2454, 111th Cong. § 311 (proposing addition of § 726 to the Clean Air Act). Most of the remaining allowances are distributed to LDCs at no charge. *See id.* Those LDCs may sell them to generators, which need to retire them to operate. *See id.* Those sales would create a subsequent market generating revenues which the LDC could invest in efficiency services. H.R. 2454 § 321 (proposing addition of § 783(b)(1) to the Clean Air Act, which provides for the distribution of allowances for electricity LDCs, and proposing addition of § 783(e)(1) to the Clean Air Act, which provides for distribution of allowances for small LDCs).

188 *See* CAL. ENERGY COMM'N, *supra* note 185, at 55 (stating that the advantages of auctioning the allowances include the ability to use revenues to advance program goals, use revenues to advance the same treatment of new entrants and existing emitters, and avoid windfall profits and perverse incentives).

189 For a discussion of industries affected by or exposed to cap-and-trade programs, see *supra* note 70 and accompanying text. *See generally* U.S. ENVTL. PROT. AGENCY, EPA ANALYSIS OF THE WAXMAN-MARKEY DISCUSSION DRAFT: THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009: EXECUTIVE SUMMARY 30 (2009), *available at* http://www.epa.gov/climatechange/economics/pdfs/WaxmanMarkeyExecutiveSummary.pdf.

190 *See* U.S. ENVTL. PROT. AGENCY, *supra* note 189, at 4–6.

identified potential impacts on their constituencies. The same constituencies would also push for the diversion of funds from any carbon tax. Dedication of some of the revenue for these purposes may be necessary and socially important,[191] but, to the extent that these interests operate to produce legislation that reduces income available to successfully fund nationwide demand-side management, the success of the entire effort, be it tax or cap and trade, is placed at risk.

The most extreme of these diversion scenarios would divert all of the funds away from efficiency or demand response by simply providing for a return of all the proceeds from an auction directly to citizens for use as they see fit.[192] Such "cap-and-dividend" legislation[193] would constitute the worst form of legislation: society would go through the administrative and financial effort of cap and trade in a manner that might compensate impacted social and industrial sectors, but not much real-world reduction in carbon would occur. The stakeholders or citizens in receipt of the funds would possess new financial resources that may compensate for the perceived or actual added costs of the cap-and-trade system, but society itself will have developed no realistic short-term solutions to reduce electricity demand. The effort would create an illusion of progress without the substance.

Even a system that auctions a minority of the allowances, however, has the potential to generate substantial levels of funding for the delivery of nationwide demand-side management on a scale much larger than any prior effort. Recent estimates of the amount of funding available for demand-side management from the Waxman-Markey Bill range from $56.7 billion to $95 billion, depending on

191 Milne, *supra* note 36, at 5 (stating "[i]f all of the revenue from the tax is used to provide tax relief of some form, the tax is 'revenue neutral.' The new revenue offsets the revenue loss from the tax cuts, rendering the tax package as a whole revenue neutral."); *id.* at 16 (discussing placement of the carbon tax revenue into a deficit-reduction package, which would, in turn, benefit a broad range of constituents).

192 JOHN BAILEY, NEW RULES PROJECT, CARBON CAPS WITH UNIVERSAL DIVIDENDS: EQUITABLE, ETHICAL & POLITICALLY EFFECTIVE CLIMATE POLICY 1 (2008) (advocating for dividing dividends from carbon allowance auctions equally on a per capita basis). The rationale is based on the theory that clean air (lower emissions) is a public commons, and therefore the revenue should be returned to the public. *Id.* at 2. Bailey also considers the prospects of spending revenue on efficiency and renewable energy. *Id.* at 6.

193 Such legislation was introduced by Representative Christopher Van Hollen on April 1, 2009. *See generally* Cap and Dividend Act of 2009, H.R. 1862, 111th Cong.

how local service providers use the allowances distributed to them.[194] It is through the application of a portion of this funding to efficiency and demand response that these bills will have effect, not through the cap nor through the tax.

D. A Successful Demand-Side Management Program Will Require Substantial Additions to Governmental Policies and to Governmental Capacity in the States

The story does not end, however, with availability of funds. The funds have to be spent, and the necessary services have to be delivered effectively. The effort requires an array of policies at the national and state level and a complex of public and private capacities at the state and local level. While some states have the systems and the people in place to absorb funding of this magnitude, the great majority does not.[195] A substantially increased governmental

194 *Compare* CONG. BUDGET OFFICE, COST ESTIMATE, *supra* note 89, at 33–39, *with* AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., HR. 2454 ADDRESSES CLIMATE CHANGE THROUGH A WIDE VARIETY OF ENERGY EFFICIENCY MEASURES (2009), http://www.aceee.org/energy/national/HR2454_Estimate06-01.pdf.

195 In general, states with experience effectively spending funds to reduce emissions have acquired that experience through either charges applied to all users or the administration of funding derived from cap-and-trade programs. Currently, only one voluntary cap-and-trade program is fully operational in the United States: the RGGI. Reg'l Greenhouse Gas Initiative, Welcome, http://www.rggi.org/home (last visited Feb. 2, 2010). Two other programs—the Midwestern Greenhouse Gas Reduction Accord (MGGRA) and the Western Climate Initiative (WCI)—are currently under development. *See* Midwestern Greenhouse Gas Reduction Accord, Home, http://www.midwesternaccord.org/index.html (last visited Feb. 2, 2010); W. Climate Initiative, History, http://www.westernclimateinitiative.org/history (last visited Feb. 2, 2010).

RGGI includes the following ten Northeastern and Mid-Atlantic states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Reg'l Greenhouse Gas Initiative, Participating States, http://www.rggi.org/states (last visited Feb. 2, 2010). Collaboratively, the ten states wrote a CO_2 Budget Trading Program Model Rule, which each state then implemented through state regulations. Reg'l Greenhouse Gas Initiative, Model Rule, http://www.rggi.org/about/history/model_rule (last visited Feb. 2, 2010). RGGI specifically caps emissions from power plants and auctions allowances from plants under their allotted cap. Reg'l Greenhouse Gas Initiative, RGGI Benefits, http://www.rggi.org/about/benefits (last visited Feb. 2, 2010). The intent of the program is for the states to invest the proceeds from the auctions in programs that benefit consumers, such as efficiency and renewable energy. *Id.*

Thus far, RGGI has conducted six auctions. Reg'l Greenhouse Gas Initiative, Auction Results, http://www.rggi.org/co2-auctions/results (last visited Feb. 2, 2010). The net revenues were: $38,575,738.09 on September 25, 2008; $106,489,935.24 on December 17, 2008; $117,248,629.80 on March 18, 2009; $104,242,445.00 on June 17, 2009; $66,278,239.35 on September 9, 2009; and $61,587,120.90 on December 2, 2009. *Id.* Each state allocates its share of the revenue individually. Reg'l Greenhouse Gas Initiative, Investment Programs, http://www.rggi.org/states/program_investments (last visited Feb. 2, presence in the demand-side management arena will have to be developed in order to bring the promise of either a tax or a cap-and-trade system to fruition.

For reasons discussed above, markets alone do not cause the delivery of efficiency services. A successful effort involves both standards and government involvement in delivery. Some part of this effort should take the form of legislated standards and must occur at the federal level. Increases in our automobile fleet efficiency require higher CAFE standards, an effort recently undertaken but still needing further upward modification in mileage standards, investment in transit at the federal and state levels, and changes to local land use.[196] But to address energy demand from the industrial, commercial, and residential sectors, solutions lie in changes in state approaches to energy efficiency and demand response. Some states have appliance efficiency standards, but most do not. National standards for heating, air condition, lighting, and refrigeration would provide the backbone of a national DSM effort. While the public discussion of the American Clean Energy and Security Act of 2009 has focused on its cap-and-trade provisions, the legislation actually contains ground-breaking national appliance standards[197] and national building standards,[198] as well as national renewable portfolio standards,[199] which will assist in the eventual development and deployment of renewable energy sources. For the reasons discussed herein, these standards constitute an essential companion to the cap; without more efficient appliances and buildings, achieving the cap will prove

2010). For example, New Hampshire, Maine, and Vermont allocate 100% of their RGGI revenue to either energy efficiency or demand-side management. *See* N.H. DEP'T OF ENVTL. SERVS., RGGI ANNUAL REPORT OF THE NH DEPARTMENT OF ENVIRONMENTAL SERVICES AND PUBLIC UTILITIES COMMISSION 9, 11, 12–13 (2009), *available at* http://www.puc.nh.gov/SustainableEnergy/GHGERF/10-9-09 RGGI Annual Report to NH Legislature.pdf. Maryland allocates the least to energy efficiency or demand-side management with only 46%. S.B. 268, 2008 Leg., 425th Sess. (Md. 1999). The other five states fall in a range of 65% to 88%. *See* N.H. DEP'T OF ENVTL. SERVS., *supra*, at 8–12.

It is likely too early to know if the investments in energy efficiency or demand-side management from RGGI have been effective, considering that those allocations only began after the first auction in September 2008. But, encouragingly, nine of the ten RGGI states realized a reduction in megawatt-hours sold from 2007 to 2008—Maine was the exception. U.S. ENERGY INFO. ADMIN. DATABASE, *supra* note 114.

196 *See supra* note 133 and accompanying text (tracking the freeze and unfreeze of CAFE standards).

197 *See* American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 212–14, 218.

198 *Id.* §§ 201–209.

199 *Id.* §§ 101–103.

problematic and Congress will find it difficult to resist extensions of time.

Some grid improvements should be planned at the national level by the Federal Energy Regulatory Commission (FERC) and the U.S. Department of Energy. Some must occur regionally, planned and carried out by regional transmission operators or regional transmission associations.[200] However, the nature of the delivery of efficiency and demand response makes the implementation of these efforts largely a matter of state utility regulation and other efforts at the state, local, and service-area level.[201] It is here that the nation's carbon reduction effort will meet its test. Some states have been examples of innovation and delivery of demand-side management, but most have not. That situation will have to change if the current carbon reduction effort is to succeed.

Delivery of efficiency and demand-response services uses organizational approaches that a number of states have mastered.[202]

200 FERC sets rates ("tariffs") for interstate transmission. Fed. Energy Regulatory Comm'n, About FERC: What FERC Does, http://www.ferc.gov/about/ferc-does.asp (last visited Feb. 2, 2010). There are currently seven regional transmission organizations in the United States—generally nonprofit organizations with varied experience and success in modernizing their grids. *See* Fed. Energy Regulatory Comm'n, FERC Industries: Regional Transmission Organizations (RTO)/Independent System Operators (ISO), http://www.ferc.gov/industries/electric/indus-act/rto.asp (last visited Feb. 2, 2010) (mapping the RTOs and ISOs in the United States and Canada). One difficulty in creating a voluntary, multistate RTO/ISO is the differing preferences for a for-profit transmission company as opposed to a nonprofit RTO/ISO. *See* 18 C.F.R. § 35.34 (2009).

201 Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities, 61 Fed. Reg. 21,540, 21,626 n.544 (May 10, 1996) (codified at 18 C.F.R. pts. 35, 385) ("This Final Rule will not affect or encroach upon state authority in such traditional areas as the authority over . . . administration of integrated resource planning and utility buy-side and demand-side decisions, including DSM . . . .").

202 The states with experience spending funds effectively to reduce carbon emissions have acquired that experience through either voluntary cap-and-trade programs or charges applied to all users. *See supra* note 195. Such programs are funded by charges included in customer utility bills. The revenue generated is then invested in energy efficiency and demand-side management by either the utility itself or a separate entity. 2008 ACEEE SCORECARD, *supra* note 159, at 6.

The ACEEE found Vermont, California, and Connecticut have the leading ratepayer-funded efficiency programs. *Id.* at 18 fig.1. Vermont's program, for example, is funded by a "non-bypassable charge" affixed to every customer's monthly bill. Efficiency Vt., About Us, http://www.efficiencyvermont.com/pages/common/AboutUs/ (last visited Feb. 2, 2010). The revenue generated goes straight to Efficiency Vermont, a separate entity that administers the funds for energy efficiency and demand-side management projects. Blair Hamilton & Michael Dworkin, *Four Years Experience of the Nation's First Energy Efficiency Utility: Balancing Resource Acquisition & Market Transformation Under a Performance Contract*, *in* PROC.-2004 ACEEE SUMMER STUDY ON ENERGY EFFICIENCY

The funds are typically raised as part of rates, a charge that applies to all users—sometimes called a "non-bypassable charge" or a "wires" charge if collected by additions to the component of rates attributable to transmission and distribution.[203] The funds are spent in a myriad of ways to facilitate the installation of the most efficient motors, appliances, and heating, cooling, and other processes for commercial, industrial, and residential customers. Some states use regulatory regimes to require utilities to perform almost all functions of efficiency, including installation, although evidence that utilities perform the function vigorously is mixed.[204] Other states provide efficiency services as part of the state bureaucratic function,[205] although funds allocated for that purpose are then sometimes subject to legislative diversion to meet other budget priorities.[206] Vermont has experimented with an efficiency utility that provides efficiency services with ratepayer funds through a performance-based contract with the state regulator.[207] This approach has the advantage of both an organizational culture dedicated to the efficiency effort[208] and a funding stream insulated contractually from potential diversion for other state budget priorities.[209]

However structured, a successful demand-side management program requires development of policies and dedication of resources at the state level. The unevenness of the states' commitment to efficiency lies at the heart of the problem that must be addressed in order to succeed in reducing the nation's carbon footprint. In 2008, the American Council for an Energy-Efficient Economy ranked all

IN BUILDINGS 5-129, 5-129 (2004). Because of their ratepayer-funded energy efficiency program, Vermont realized 1% savings in utility needs from 2006 to 2007 and 1.7% from 2007 to 2008. 2008 ACEEE SCORECARD, *supra* note 159, at 18 fig.1.

Efficiency Vermont has experienced such success for a number of reasons. First, it operates under a competitively awarded, performance-based contract, which means it must achieve results in order to continue to exist. *See* Hamilton & Dworkin, *supra*, at 3. Second, revenue goes directly to Efficiency Vermont instead of the state treasury, minimizing temptation for diversion. *Id.* at 2. Finally, as an entity separate from the state government, Efficiency Vermont can adapt quickly to efficiency innovations, which has fostered "an attitude and culture of ongoing flexibility and innovation." *Id.* at 10.

203 *See supra* note 202 and accompanying text.

204 *See supra* note 202 and accompanying text.

205 *See supra* note 202 and accompanying text.

206 *See supra* note 202 and accompanying text.

207 *See supra* note 202 and accompanying text.

208 *See supra* note 202 and accompanying text.

209 *See supra* note 202 and accompanying text.

fifty states based on their overall energy efficiency performance.[210] The report also separately ranked states for their ratepayer-funded energy efficiency programs.[211] Forty-one states have at least some form of a ratepayer-funded energy efficiency program in place.[212] However, at least nine states have no program at all.[213] Also, eleven states can be said to barely have a program at all.[214] South Carolina, Georgia, Virginia, Pennsylvania, Tennessee, Kansas, Arkansas, Nebraska, Michigan, South Dakota, and North Dakota received less than two points out of a possible twenty.[215] In fact, only thirteen states scored higher than ten points for their ratepayer-funded energy efficiency programs, six of which were RGGI states.[216] In many of the states leading the effort, dollars spent for energy efficiency in the electricity sector constitute about 2% of system revenues, and, in many states, the amount is less than 0.5%.[217] A robust program would require the investment of approximately 5% of system revenues and, as discussed above, would return cost savings and carbon reductions in the most cost-efficient manner.

Devotion of resources at the state level is necessary for a successful DSM effort, but resources alone are insufficient: the effort requires thoughtful revision of long-standing regulatory policies and market structures. A key example involves the delivery of efficiency services, especially by utilities, and demonstrates the sophistication of the necessary policies that need revision. While FERC plays an increasingly important role due to the importance of transmission, multistate and regional wholesale markets, and experiments with deregulation,[218] the great bulk of regulation lies with the states through their public utility commissions. PUCs set rates that determine utility compensation for key activities, including the return of capital invested in generation, in-state transmission and distribution, and the operation of their system. If the utilities perform

[210] 2008 ACEEE SCORECARD, *supra* note 159, at iv–v tbl.ES-1.

[211] *Id.* at 5–6 tbl.2.

[212] *Id.*

[213] *Id.* (scoring Alaska, Alabama, Mississippi, Missouri, Delaware, West Virginia, Louisiana, Oklahoma, and Wyoming at 0 points out of a maximum possible score of 20).

[214] *See id.*

[215] *Id.*

[216] *Id.*

[217] *Id*. at 7–8 tbl.4.

[218] For a discussion of restructuring and wholesale markets, see *infra* Part II.B.2.

demand-side mangement services, those services are regulated at the state level as well.[219]

The traditional rate-setting process, as it exists in almost all states, operates in a manner that discourages utilities from undertaking the delivery of efficiency services. Some states have altered their rate-setting processes to hold utility revenue harmless from the effects of reduced consumption, but most have not. In the absence of changes, the typical regulatory system produces a situation in which efficiency reduces utility revenue and profits. The rate-setting process begins with an estimate of the total revenue required to operate a utility, including a reasonable rate of return necessary to reward investors in amounts consistent with the risk they undertook and to attract necessary additional capital. That total revenue requirement is then divided by the anticipated demand for kilowatt-hours to produce a rate—for example, $0.12/kWh for residential customers. That rate, and not the total estimated dollar revenue requirement, is typically the legal and operative output of the rate-setting process that simply authorizes the utility to charge the adjudicated rate per kilowatt-hour.[220] If sales are higher than estimated, profits are higher. If sales are lower than estimated in the rate-setting process, profits are lower or nonexistent. Efficiency programs pose a problem for utilities because, if successful, the programs reduce sales to levels lower than anticipated in the algorithms used to derive the rate. If the installation of efficiency measures reduces total kilowatt-hour sales by even a small amount, the resulting drop in revenue can produce a large percentage reduction in profit, as profits come from the last dollars earned.[221] Some forward-looking states have now put revised rate-making processes in place that "decouple" revenue from sales in a manner that holds utilities harmless from sales declines due to efficiency measures. Some states have enacted a form of performance-based ratemaking that operates to incentivize efficiency services rather than penalize utilities for reduced sales due to efficiency.[222]

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219 *See infra* Part II.B.2.

220 *See* BONBRIGHT ET AL., *supra* note 103, at 201–02.

221 For example, if the total revenue required were $100, of which profits were $10, then a 5% drop in revenue to $95 is a 50% drop in profits to $5. Efficiency measures that reduce revenue frequently reduce costs, so the literal math of this example would not hold to the stated extent. Nonetheless, profits would likely decline substantially more than revenues. *Id.* at 201.

222 *See* WAYNE SHIRLEY ET AL., THE REGULATORY ASSISTANCE PROJECT, REVENUE DECOUPLING STANDARDS AND CRITERIA: A REPORT TO THE MINNESOTA PUBLIC

States need to consider a myriad of other changes to their regulatory policies and rate structures to enhance efficiency and to realize the potential benefits of physical smart-grid improvements. Some states still have rate structures that encourage consumption rather than efficiency. During the 1940s through the 1960s, states viewed electrification as a social good and took on the role of advocating for increased consumption. Many enacted declining block rates that set lower per kilowatt-hour rates for increased levels of consumption, a sort of quantity discount.[223] Some states have now reversed course, approving "inclining block" rates that charge more per kilowatt-hour for increased usage levels.[224] Some states are encouraging the installation of smart meters, which allow customers to view electricity rates in real time. Some systems could allow customers to install (or have the local service provider install and remotely operate) devices that periodically cycle off appliances such as air conditioners to reduce demand when prices are high. However, these physical improvements will have no effect unless state PUCs offer dynamic rate options that allow them to pay market rates at the time of the demand reduction, or some variation, rather than rates reflecting annual system averages. Improvements to the grid, such as line upgrades, smart controls, and system monitoring, require similar policy initiatives to deliver system benefits and reduce carbon

UTILITIES COMMISSION 36–37 (2008), *available at* http://www.raponline.org/docs/RAP_Shirley_DecouplingRevenueRpt_2008_06_30.pdf; *see also* NAT'L ACTION PLAN FOR ENERGY EFFICIENCY, ALIGNING UTILITY INCENTIVES WITH INVESTMENT IN ENERGY EFFICIENCY 5-3 (2007), *available at* http://www.epa.gov/RDEE/documents/incentives.pdf. Such systems typically set the rate as described in the text above but they also guarantee the utility the total revenue required regardless of the actual sales. *See* SHIRLEY ET AL., *supra*, at 6. If sales, and thus revenue, are less than the authorized amount, then the utility receives the difference through rate increases in the next year—effectively a "true up." *See* NAT'L ACTION PLAN FOR ENERGY EFFICIENCY, *supra*, at 5-3 to 5-5. Similarly, if revenues are higher than the set amount, rates the next year are reduced. *See* SHIRLEY ET AL., *supra*, at 12. The allowed revenue in the next year also factors in growth in population or industrial/commercial activity. *See id.* at 32. After a few years, the guaranteed revenue is reset to take into account the effects of efficiency, which may either offset growth and cancel the need for new plants or reduce demand—allowing for the closing of older units or reductions in purchases on the wholesale power markets. *See generally id.*

223 *See* Ren Orans et al., *Inclining for the Climate GHG Reduction via Residential Electricity Ratemaking*, PUB. UTIL. FORT., May 1, 2009, at 40 (advocating for GHG reductions via changes to inclining block rates for residential consumption).

224 *Id.*

emissions. Commissions will need to clarify reliability objectives and policies.[225]

Development of energy-saving and energy-generating options on the customer side of the meter will similarly require policy innovation at the state level. In many cases, the difference between poor or no policies and excellent policies will be the dispositive factor in determining whether strategies reduce or increase carbon emissions. For example, in a very few years, many car manufacturers will offer plug-in hybrid electric vehicles (PHEVs). This means that much of our energy use for transportation will switch from consumption of oil to electricity. While this development could reduce greenhouse gas emissions if the source of electricity is renewable, the increased consumption of electricity in areas that rely primarily on coal generation would more than offset gains from reduced combustion of gasoline, thus causing a net increase in greenhouse gas emissions.[226] Regulatory policies, however, could encourage PHEV charging during off-peak times and discharging back into the grid during on-peak periods, effectively creating a distributed storage network. State policies that incentivize the local service provider to equip customers with the necessary devices could ensure that the pervasive use of PHEVs produces benefits to our carbon reduction program.[227]

These efforts to enhance efficiency and demand management in the power sector must be undertaken on a state-by-state basis. No shortcut exists. These strategies derive from each state's regulatory regime, rate-setting methodologies, and efficiency delivery systems. Some states such as California, New York, Vermont, Connecticut, and Massachusetts have several decades of experience with efficiency, and some states, though fewer, have experience with demand management.[228] Most states, however, have small, utility-run programs that deliver a limited suite of efficiency services, such as insulation retrofit for low-income homeowners, and not much

[225] For an excellent summary of policies necessary to realize the potential of the smart grid, see *Smart Grid*, *supra* note 170, at 5–6.

[226] U.S. GOV'T ACCOUNTABILITY OFFICE, FEDERAL ENERGY AND FLEET MANAGEMENT: PLUG-IN VEHICLES OFFER POTENTIAL BENEFITS, BUT HIGH COSTS AND LIMITED INFORMATION COULD HINDER INTEGRATION INTO THE FEDERAL FLEET 11–12 (2009), *available at* http://www.gao.gov/new.items/d09493.pdf.

[227] *Smart Grid*, *supra* note 170, at 4.

[228] *See supra* note 195; *supra* note 202.

more.[229] Many states effectively have no program at all.[230] No program means a lack of experienced staff.

These efforts, especially the direct delivery of efficiency, are financially more efficient than the construction of new power plants but the enterprise requires substantial human capital and the investment of ratepayer funds. The current extent and efficacy of these programs depend on the value individual states place on efficiency. Some states, as mentioned above, have devoted substantial funds to the efficiency effort.[231] The majority of states, however, have devoted little or no funding or regulatory resources to the effort. They lack experience in program design and evaluation, marketing, and training personnel and, as a result, have low consumer awareness. Federal funding or presence in the delivery of efficiency services has been minimal in prior administrations and is still largely inchoate under President Obama.[232]

For these inexperienced states, expending a major allocation of federal funding for demand-side management would currently be a simple impossibility. Congress can pass the legislation and deliver the funds to the states, but, in the absence of capacity to implement, the funds cannot be spent productively. It is an uncomfortable truth that human and bureaucratic capacity takes time to develop, and those states that have never made the effort, or made the effort in the Carter era and subsequently dismantled during restructuring, will require substantial time to construct the governmental presence necessary to

[229] *See supra* note 195; *supra* note 202.

[230] *See supra* note 195; *supra* note 202.

[231] *See supra* note 195; *supra* note 202.

[232] The [former] President's overall FY 2008 budget request for energy-efficiency [sic] programs within DOE's Office of Energy Efficiency and Renewable Energy is $515 million, down nearly $117 million (18%) from the FY 2006 appropriated level. This large cut follows a gradual slide from the $695 million that was appropriated for these programs in FY 2002. Funding for these programs has decreased by one-third (37%) since 2002, after adjusting for inflation. In addition, the request for electricity R&D programs, many of which focus on efficiency, is $86 million, a decrease of $50.3 million (37%) from the FY 2006 appropriated level. Several deployment programs, along with industrial R&D, have experienced some of the biggest funding cuts.

Fiscal Year 2008 Appropriations for Energy-Efficiency Programs of the U.S. Department of Energy Before the Subcomm. on Energy & Water Development of the H. Comm. on Appropriations, 110th Cong. (2007) (statement of Kateri Callahan, President, Alliance to Save Energy), *available at* http://ase.org/content/article/detail/3699.

dispense the funds in ways that achieve the goals of the cap-and-trade or carbon tax legislation.[233]

How can the states be incentivized to undertake this effort as swiftly as feasible? If funds are allocated to states without oversight, or even with oversight, then the revenue will be spent but not effectively. No state will likely return the funds,[234] but, in those states without the necessary governmental capacity, carbon emissions per capita will not be reduced. The only way to create a real capacity for the nationwide delivery of demand-side management services will be through elements of the applicable legislation that incentivizes states to develop the capability—and possibly penalizes those states that do not. An initial distribution of allowances on the basis of sales or bases other than current carbon consumption[235] is a mild motivator since a rational consumer trustee or local provider will search out efficiency as the most immediately available and least expensive carbon-efficient strategy. However, stronger measures are needed, especially after the initial period.[236] The funding formula could change such that those states that achieve or sustain previously achieved low-carbon emissions per capita would receive a greater share of the funds. Absent concerted efforts by the states, the nation will not be successful in meeting national carbon reduction targets.

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233 Michael Dworkin et al., *A Driving Need, a Vital Tool: The Rebirth of Efficiency Programs for Electric Customers*, 209, 211, 228–29, *in* CAPTURING THE POWER OF ELECTRIC RESTRUCTURING (Joey Lee Miranda ed., 2009).

234 Republican Governor Mark Sanford of South Carolina tried to reject stimulus dollars but, even in one of the most conservative states, he found the position impossible to maintain over time. Posting of Kate Phillips, *South Carolina Governor Rejects Stimulus Money*, to The Caucus Blog (Mar. 20, 2009), http://thecaucus.blogs.nytimes.com/2009/03/20/round-2-omb-rejects-sc-governors-stimulus-plan/; *see also* Shaila Dewan, *6 Governors May Reject Portions of Stimulus*, N.Y. TIMES, Feb. 21, 2009, at A12. *But see* Posting of Kate Phillips, *South Carolina Will Apply for Most of Its Stimulus Money*, to The Caucus Blog (Apr. 3, 2009), http://thecaucus.blogs.nytimes.com/2009/04/03/south-carolina-will-apply-for-most-of-its-stimulus-money/.

235 American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 401 (proposing addition of § 761 to the Clean Air Act) (describing a distribution of emission allowance rebates).

236 *See* Cowart, *Testimony*, *supra* note 34, at 18. Intrinsically, the mere allocation on the basis of electricity sales rather than carbon consumption has some motivational effect.

II
THE MIXED SUCCESS OF THE MOVE TO MARKETS REVEALS THE NEED FOR GOVERNMENT REGULATION

The state search for more efficient energy regimes is not new. By the 1990s, states leading the effort had sophisticated energy regulatory schemes in place that had adapted traditional monopoly regulation to mandate or incentivize energy efficiency and the development of renewable energy sources.[237] Some of those states abandoned those nascent systems for free market schemes that have both failed to deliver the anticipated economic advantages and decimated renewable energy and efficiency programs.[238] Markets have proven as expensive—and perhaps more expensive—to administer than traditional monopoly regulation. FERC and the states should cabin the use of markets to distinct purposes and build regulatory expertise to manage the remaining power markets.

A. The Traditional Cost of the Service Model

In response to concerns over the implacable tendency of railroads to produce monopolies, American legislators, economists, and other public intellectuals initiated a system of monopoly regulation.[239] In

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[237] Duane, *supra* note 31, at 487–88.

[238] Nancy A. Rader & Richard B. Norgaard, *Efficiency and Sustainability in Restructured Electric Markets: The Renewables Portfolio Standard*, ELECTRICITY J., July 1996, at 39–41; *see also* RYAN WISER & GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., RENEWABLE PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007, at 4 fig.2 (2008), *available at* http://eetd.lbl.gov/ea/ems/reports/lbnl-154e-revised.pdf (reporting a timeline of the enactment of state renewable portfolio standards).

[239] Railroads presented the first case of a phenomenon now called "natural monopolies," although earlier cases indicate the nation had begun to grapple with the issue. Munn v. Illinois, 94 U.S. 113, 135 (1876) (holding that a statute regulating rates charged by grain elevators at a railroad terminal point was valid because the grain elevator both had a natural monopoly at the terminal and was serving the public interest); Charles River Bridge v. Warren Bridge, 36 U.S. 420, 500 (1837) (holding state legislation that charters a corporation providing public benefits, such as a bridge or ferry, must be construed against the corporation in order to protect the public interest); *see also* Herbert Hovenkamp, *Technology, Politics, and Regulated Monopoly: An American Historical Perspective*, 62 TEX. L. REV. 1263, 1266 n.24 (1984) (discussing *United States v. Trans-Missouri Freight Ass'n*, 166 U.S. 290 (1897), as an example of the Supreme Court forcing competition even though railroads are natural monopolies). As for turnpike regulation, see Peter Karsten, *Supervising the "Spoiled Children of Legislation": Judicial Judgments Involving Quasi-Public Corporations in the Nineteenth Century U.S.*, 41 AM. J. LEGAL HIST. 315, 365 n.191 (1997), which discusses cases where turnpike and bridge companies were dissolved due to failure to build or maintain the structures as stipulated.

the century and a half since the electrification of America began, Congress, state legislatures, administrative agencies, and the courts have labored to produce a monopoly regulatory approach to the power sector that provides the nation with reliable, reasonably priced electricity.[240] State commissions developed staffs with deep familiarity with the financial, structural, and physical nature of both the power industry as a whole and the utilities under their control.[241] Though with great variation among the states and distinct cycles of regulatory focus and neglect, the resulting system provided reliable, inexpensive electric service, assisted in substantial part by sustained low levels of inflation, inexpensive oil and gas, and technological advances in generation that produced ever-increasing economies of scale.[242] This socioeconomic situation and regulatory certainty provided vertically integrated utilities with a business environment featuring monopoly rights and guaranteed levels of return, which encouraged adequate—and some said excessive—capital investment in the power sector.[243]

B. The Rise of the Markets in the Energy Arena

The factors that supported a historic downward trend in rates changed in the 1970s and 1980s.[244] Inflation spiked, technologies reached a plateau, and oil producers formed and maintained an oligopoly that successfully increased prices.[245] Environmental

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240 *See* EDWARD KAHN, ELECTRIC UTILITY PLANNING AND REGULATION 7 (1988); CHARLES F. PHILLIPS, JR., THE REGULATION OF PUBLIC UTILITIES: THEORY AND PRACTICE 3 (3d ed. 1993).

241 Paul R. Joskow & Richard Schmalensee, *Incentive Regulation for Electric Utilities*, 4 YALE J. ON REG. 1, 5 (1986) (discussing, in general, state regulatory structures for rate setting).

242 Duane, *supra* note 31, at 478 (noting that "ever-larger generating units lowered per-unit costs just as expanding markets allowed greater efficiencies"); Stefan H. Krieger, *An Advocacy Model for Representation of Low-Income Intervenors in State Public Utility Proceedings*, 22 ARIZ. ST. L.J. 639, 639–41 (1990) (citing DOUGLAS D. ANDERSON, REGULATORY POLITICS AND ELECTRIC UTILITIES: A CASE STUDY IN POLITICAL ECONOMY 70 (1981); Paul R. Joskow, *Inflation and Environmental Concern: Structural Change in the Process of Public Utility Price Regulation*, 17 J.L. & ECON. 291, 312–13 (1974)) (discussing both the decrease in energy costs between 1951 and 1971 and the economies of scale and technological advances achieved after World War II).

243 *See* Tomain, *supra* note 4, at 446–47 (stating that monopoly regulation supported the expansion of the industry, including more capital investments in infrastructure).

244 Duane, *supra* note 31, at 481.

245 *Id.*; Tomain, *supra* note 4, at 450 (noting that factors such as inflation, increase in environmental regulatory costs, and OPEC restrictions on oil production caused increases in energy prices).

regulations increased costs, and, in the late 1970s, recession reduced growth in consumption.[246] Investment in nuclear plants produced large losses, rate increases, and, in some cases, utility bankruptcies.[247] During the Carter presidency, the federal government began experimenting with fundamental reforms to the monopoly regulatory regime to address these trends, encourage efficiency, and engage environmental issues, while maintaining reasonable rates of return for utilities,[248] but the Reagan administration had little interest in pursuing such regulatory innovation.[249]

The reform effort moved to the states, a generally suitable forum because the state PUCs regulated the electricity providers.[250] By the 1990s, the most active commissions in the more environmentally conscious states had sophisticated, modified regulatory regimes in place that had adapted traditional monopoly regulation to mandate or incentivize energy efficiency and the development of renewable energy sources.[251] Commissions in these states required that utilities develop integrated resource plans that both encouraged efficiency and demand response and gave priority to power from renewable sources.[252] Customers in these states paid small nonbypassable transmission charges to subsidize efficiency, renewables, and

[246] Tomain, *supra* note 4, at 450.

[247] John F. Lomax, Jr., *Future Electric Utility Bankruptcies: Are They on the Horizon and What Can We Learn from* Public Service Co. of New Hampshire*'s Experience?*, 12 BANKR. DEV. J. 535, 554 (1996) (discussing the cost overruns of nuclear plant construction during the mid-1980s).

[248] Tomain, *supra* note 4, at 451 (stating that the Carter administration passed the Public Utility Regulatory Policies Act of 1978 (PURPA) to encourage energy conservation, alternative energy sources, and market-based rates).

[249] *Id.* at 437 (reporting that the Reagan administration stressed deregulation).

[250] Scott F. Bertschi, Comment, *Integrated Resource Planning and Demand-Side Management in Electric Utility Regulation: Public Utility Panacea or a Waste of Energy?*, 43 EMORY L.J. 815, 816–17 (1994) (stating that, under the U.S. Constitution, states regulate utilities pursuant to their police power).

[251] DAVID MOSKOVITZ, THE WORLD RES. INST., RENEWABLE ENERGY: BARRIERS AND OPPORTUNITIES, WALLS AND BRIDGES 14 (1993), *available at* http://www.raponline.org/Pubs/General/RenewEnergyBarriersOpportunities.pdf (offering that state commissions such as those in Arizona, Texas, and Vermont initiated efforts to incorporate photovoltaics in their planning, rules, and practice).

[252] Michael Dworkin et al., *Revisiting the Environmental Duties of Public Utility Commissions (2006)*, 7 VT. J. ENVTL. L. 1, 2–3 (2006) (describing the duties of fifteen states' public utility commissions to consider environmental policies, including resource planning and conservation programs); *see also* Bertschi, *supra* note 250, at 830–35 (discussing the characteristics of integrated resource planning); Duane, *supra* note 31, at 487–90.

developers of solar, wind, biomass, and cogeneration energy facilities.[253] In such states, federal law giving preferences to renewable sources[254] was implemented aggressively to provide these sources with the high returns and long-term contracts necessary to attract risk capital.[255] In some states, such as California, and in the Northeast, resulting gains in efficiency flatlined per capita growth in electricity demand,[256] despite increases in economic activity, and, together with some adoption of renewable sources, eliminated most of the need for new power plant construction.[257]

A countervailing trend emerged, however, in the form of the use of markets, in lieu of traditional rate setting (which market proponents gave the pejorative label "command-and-control").[258] The Reagan administration nurtured the concept; the idea grew in the first Bush years, aided by the collapse of the Soviet Union and the following market triumphalism, which embraced markets as a cheaper, more efficient, and allegedly more just approach to social policies than regulation.[259] Deregulation and competition in the natural gas industry had led to substantial investments in new capacity and much lower gas prices. Partial deregulation in telephony led to lower toll prices and product innovation. This led many observers, including those who favored some public oversight, to push for increased competition in the supply of electricity. The market movement manifested itself in two distinct, if related, ways in the power sector: wholesale regional markets and the replacement of monopoly

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253 CHERYL HARRINGTON ET AL., THE REGULATORY ASSISTANCE PROJECT, ENERGY EFFICIENCY POLICY TOOLKIT 70–88 (2006), http://www.raponline.org/Pubs/General/EfficiencyPolicyToolkit.pdf (discussing energy efficiency planning and investments of different states).

254 The Federal Power Act encourages the increased use of alternative energy sources by requiring local utilities to buy power from small power production facilities with a production capacity of eighty megawatts or less and that are cogenerators. Federal Power Act, 16 U.S.C. §§ 796(17)(c), 824a-3 (2006).

255 *See* Tomain, *supra* note 4, at 452.

256 *See generally supra* note 165 and accompanying text.

257 *See* Duane, *supra* note 31, at 476–93 (elaborating on the evolution of regulation from the "Utility Consensus" paradigm of the 1920s to "Integrated Resource Planning" of the 1980s and 1990s).

258 President Ronald Reagan issued Executive Order 12,291, which stated that "[r]egulatory action shall not be undertaken unless the potential benefits to society for the regulation outweigh the potential costs to society." Exec. Order No. 12,291, 46 Fed. Reg. 13,193, 13,193 (Feb. 17, 1981). President Bill Clinton rescinded Executive Order 12,291 with Executive Order 12,866 and modified several particulars without altering the basic idea of the order. Exec. Order No. 12,866, 58 Fed. Reg. 51,735 (Sept. 30, 1993).

259 Duane, *supra* note 31, at 491.

regulation with retail, market-based systems in many states, a process generally labeled "restructuring."[260]

1. Wholesale Markets

With the encouragement of FERC, regional wholesale electricity markets emerged as an important element of electricity management in substantial portions of the United States. Traditionally, utilities and other entities serving local markets produced some or most of the power they sold to their customers, and their state commissions determined the price of that power.[261] Increasingly, however, utilities and other local service entities wanted a market to purchase extra power when needed and to sell excess power.[262] Also, a new type of entity emerged, one that simply owned generation and had no retail customers. Such independent power producers or "merchant generators" relied on long-term, bilateral power sale and purchase contracts with utilities serving retail customers, but these independents also wanted an open market to sell their power.[263] Loose associations of utilities began the buying and selling, and soon, in key regions of the country, tightly integrated power pools emerged—nonprofits controlled by member utilities.[264] Some of these, under the leadership of FERC, have morphed into quasi-public independent system operators (ISOs), controlling the grid within their broad regional jurisdiction and operating day-ahead, short-term markets and "day-of" (e.g., same day), spot markets.[265] In other areas of the country, regional markets of a sort emerged but these were coordinated by the largest utility in the area.

FERC desired to make such regional markets mandatory throughout the United States but was unsuccessful. Today, regional markets operate in California, New York, the Midwest, the mid-Atlantic states, and New England.[266] Utilities and other local entities

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260 *See id.* at 490–92.

261 *See* Federal Power Act, 16 U.S.C. §§ 824, 824a–824j, 824j-1, 824k–824w (2006).

262 *See* Tomain, *supra* note 4, at 451–52.

263 *See id.*

264 *Id.* at 457.

265 *See* Seth Blumsack, *Measuring the Benefits and Costs of Regional Electric Grid Integration*, 28 ENERGY L.J. 147, 147, 153–54 (2007) (discussing the FERC's role in encouraging independent management of the grid and a centralized spot market).

266 *See id.*; Cal. Indep. Sys. Operator (ISO), Mission and Vision, http://www.caiso.com/docs/2005/09/28/200509281333048821.html (last visited Jan. 30, 2010); Midwest Indep. Sys. Operator (MISO), Overview, http://www.midwestiso.org/

serving retail customers use these markets to supplement their "native" generation and their long-term contracts to purchase power from outside sources.[267] In some areas, as much as half of the total power comes from these regional markets, while, in others, it is a small fraction of a total derived mostly from locally based generation.[268]

2. Restructuring

A more sweeping redesign of the monopoly regulatory system emerged from a combination of political and economic forces that created buyers and sellers with strong incentives to bypass traditional monopoly utilities in order to deal with each other directly.[269] In the depressed years of the early 1990s, industries sought to control rising power costs.[270] Their historic suppliers, the vertically integrated, regulated utilities, ran a mixture of older, more expensive plants and newer, cheaper ones.[271] Their energy supply mix also included mandatory and expensive contracts to purchase power from alternative energy suppliers, as well as write-offs for expensive and sometimes nonoperational nuclear plants.[272] Their rates, set by

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home (last visited Jan. 30, 2010); New England Indep. Sys. Operator (ISO-NE), Overview, http://www.iso-ne.com/aboutiso/co_profile/overview/index.html (last visited Jan. 30, 2010); N.Y. Indep. Sys. Operator (NYISO), Our Purpose and Responsibility, http://www.nyiso.com/public/about_nyiso/nyisoataglance/purpose/index.jsp (last visited Jan. 30, 2010); PJM Interconnection (PJM), Company Overview, http://www.pjm.com/about-pjm/who-we-are/company-overview.aspx (last visited Jan. 30, 2010); Sw. Power Pool (SPP), About SPP, http://www.spp.org/section.asp?pageID=1 (last visited Jan. 30, 2010); Elec. Reliability Council of Tex. (ERCOT), About ERCOT, http://www.ercot.com/about/ (last visited Jan. 30, 2010). The remaining areas are divided into the following regions: the Northwest, Fed. Energy Regulatory Comm'n, Electric Power Markets: Northwest, http://www.ferc.gov/market-oversight/mkt-electric/northwest.asp#rto (last visited Jan. 30, 2010); the Southwest, Fed. Energy Regulatory Comm'n, Electric Power Markets: Southwest, http://www.ferc.gov/market-oversight/mkt-electric/southwest.asp (last visited Jan. 30, 2010); and the Southeast, Fed. Energy Regulatory Comm'n, Electric Power Markets: Southeast, http://www.ferc.gov/market-oversight/mkt-electric/southeast.asp (last visited Jan. 30, 2010).

[267] Stephen L. Teichler & Ilia Levitine, *Long-Term Power Purchase Agreements in a Restructured Electricity Industry*, 40 WAKE FOREST L. REV. 677, 691–99 (2005) (discussing the importance of long-term contracts despite open access and spot markets).

[268] *See supra* note 66 (describing California's locally based generation).

[269] *See* Tomain, *supra* note 4, at 450.

[270] Duane, *supra* note 31, at 489.

[271] *See* Tomain, *supra* note 4, at 444, 452–53.

[272] Federal Power Act, 16 U.S.C. §§ 796(17)(c), 824a-3 (2006).

regulators to reflect these blended costs, were frequently high.[273] By contrast, emerging independent power producers or merchant generators could offer power from new, inexpensive natural gas plants at lower marginal costs, rather than the higher average cost of the system offered by the utilities.[274] Cost-conscious industrial buyers sought bargains from equally motivated merchant generators, but the two groups could not transact with each other because the monopoly utility stood in between.[275] In monopoly regulation, the local service provider, usually a utility, provides power to all consumers.[276] Cheap merchant generation could be sold to utilities, but the savings were simply blended into other higher costs. Industrial buyers and merchant generators pushed politically to bypass the utility altogether by entering into bilateral power purchase agreements with each other directly.[277] These forces combined with the free market ideology described above to produce a rush for restructuring in many states.[278]

States that chose to address these forces through what proponents called restructuring (as opposed to the more politically charged "deregulation")[279] implemented open access to allow any type of entity—merchant generators, wholesale power producers, or sellers of any sort (including utilities)—to enter into agreements to sell directly to retail customers, which, depending on the state, could include combinations of industrial, commercial, or residential consumers.[280] Utilities were required to transmit the power in these contracts, or "wheel" the power, at the same price as power transmitted from the utilities' native generation to their own customers.[281] In order to reduce the perceived likelihood that utilities might manipulate

[273] Tomain, *supra* note 4, at 451–52.

[274] *See id.*

[275] *See id.* at 453.

[276] Duane, *supra* note 31, at 476–78.

[277] Tomain, *supra* note 4, at 453.

[278] Duane, *supra* note 31, at 491–94; Peter Navarro, *A Guidebook and Research Agenda for Restructuring the Electricity Industry*, 16 ENERGY L.J. 347, 353 (1995).

[279] Duane, *supra* note 31, at 490–91. To some extent, this process occurred at the federal level. *See* Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (codified in 15, 16, 38, and 42 U.S.C.); 18 C.F.R. § 35.28 (2009); 18 C.F.R. § 37 (2009).

[280] Navarro, *supra* note 278, at 347–48. In most states, local service providers were obliged to continue to offer some classes of customers that did not choose to select alternative sources of power the option to continue with the current service provider, which offered default or basic service under various labels.

[281] *Id.* at 348.

transmission rate structures to discriminate in favor of their own power transmission and against other entities using their lines, some states required utilities to "unbundle," or separate their generation from their transmission assets, and many utilities sold off generation assets to either newly created, unregulated affiliates or other generators—leaving themselves as primarily transmission, distribution, and service companies.[282] Many states did not restructure.[283] These states operate with traditional, local power service providers, frequently vertically integrated utilities, with prices set by the states on a traditional cost-of-service basis.[284] Even in these nonrestructured states, however, the wholesale market is an increasingly important source of power purchase and sale.

Restructuring also tilted power away from the states and toward FERC. As the public utility shrank or moved assets to unregulated affiliates, state regulators lost authority over much of the electric sector.[285] Instead of local generation selling through state-regulated transactions with local consumers, a greater percentage of the power bought and sold flows on interstate transmission systems where rates are set by FERC, not the states.[286] FERC's embrace of the market concept during the administrations of Presidents Clinton and George W. Bush enhanced the promarket tilt.[287] While state regulators in nonrestructured states set rates to reflect the projected cost of providing service, including a rate of return calculated to leave the utility in good economic health, FERC allowed rates for these increasingly important interstate transactions to be set simply by operation of the market.[288]

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[282] *See generally id.* at 361–62 (identifying disadvantages of forced divestiture of utility assets).

[283] U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, STATUS OF STATE ELECTRIC INDUSTRY RESTRUCTURING ACTIVITY (2003), http://www.eia.doe.gov/cneaf/electricity/chg_str/restructure.pdf.

[284] *See* Navarro, *supra* note 278, at 405.

[285] *See* Federal Power Act, 16 U.S.C. §§ 792–832 (2006); *see also* Tomain, *supra* note 4, at 452.

[286] *See* 16 U.S.C. § 824(b)(1) (2006).

[287] *See generally* Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594. George W. Bush signed the Energy Policy Act, which set forth three energy policy goals, one of which was to promote competition in the wholesale power market. *See id.*

[288] *See* Midcoast Ventures I, 61 F.E.R.C. ¶ 61,029 (1992). The FERC's 1992 Policy Statement on Incentive Ratemaking for Interstate Natural Gas Pipelines, Oil Pipelines, and Electric Utilities made clear that the Agency does not require the traditional cost-of-service price setting, but rather approves market-based rates and allows incentive ratemaking in the appropriate situation. 61 F.E.R.C. ¶ 61,168 (1992).

There now exists more than a decade of experience and analysis available regarding these two major structural changes—creation of regional wholesale markets and restructuring in many states. The former has advantages and disadvantages; wholesale markets are here to stay and have valuable functions, although they clearly require extensive governmental and protective apparatus and attentive market monitoring. Proponents of restructuring believed the switch to open access and market-based retail rates would reduce prices for all customers, expand private investment, reduce regulatory costs, and increase the efficiency of the system.[289] That is not the way it has turned out.

C. Retail Markets for Residential and Commercial Customers in Restructured States Fail

Although open access worked for large industrial clients in some states, it did not work for many commercial or residential customers. Few wanted or found alternatives to their local utility, which became providers of last resort.[290] Potential alternative providers found the price of entry into the market too high.[291] The marketing costs of attracting customers exceeded potential profits.[292] Nonprice barriers to entry were high: utilities understood their customers and had billing, repair, and other mechanisms in place that new entrants found expensive to duplicate.[293] The only remnant of open access in most restructured states is found in the industrial sector, where large

289 Tomain, *supra* note 4, at 436 (discussing the benefits of competitive electricity markets).

290 Duane, *supra* note 31, at 505 ("Industrial customers had the sophistication and incentive to sign on with new providers, but residential customers had little reason to switch.").

291 *Id.* ("New competitors had to charge their own customers to pay the CTC toward the utilities' stranded costs, which made it extremely difficult to compete with the utilities on the basis of price. New providers also faced sign-up costs of up to $600 per customer, as well as the inertia of customers' familiarity with their existing utilities. Most potential entrants to the retail market, therefore, made a decision to wait until the transition period ended in 2002 before competing aggressively.").

292 *Id.* In many restructured states, utilities were required to be the supplier of last resort (under a "standard offer") at rates set low on a transitional basis to protect residential customers from initial market fluctuations. These rates were lower than the market prices in most cases.

293 *See id.*

consumers have found price benefits from the ability to contract with merchant providers.[294]

D. The Wholesale Markets Require Careful Governing Efforts and Careful Market Monitoring to Avoid Manipulation

Although many of those states that experimented with restructuring have partially reregulated, wholesale markets have provided a valuable source of power to local service providers, can be structured to encourage efficiency and demand management,[295] and will remain a factor in much of the country.[296] There is a significant body of opinion and some factual evidence that regional wholesale markets will deliver both reliability and cost savings to power systems.[297] The nation will retain a hybrid system. However, hybrid systems work only when embedded within a regulatory system that requires extensive and careful control and monitoring.

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294 The U.S. Energy Information Administration labels the electric entities resulting from restructured (or deregulated) markets as "Energy-Only Providers." U.S. ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, ELECTRIC POWER ANNUAL 2008, at 63 tbl.7.3 (2010), *available at* http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf. The 2008 report charts revenue from retail electricity sales by provider and sector. *Id.* In 2007, Energy-Only Providers received 22.9 billion dollars in revenue, compared to the 343.7 billion dollars received by the total electric industry. *Id.* That is 6.63% of electricity revenue going to restructured markets. *See id.* Within the Energy-Only Providers, the industrial sector received 31.5% of the revenue—compared to 7.2% for residential and 59.3% for commercial. *See id.* (charting all providers and all sectors from 1997 through 2008).

295 Regional markets and related grid enhancements may be needed to integrate intermittent renewable energy sources into the grid. *See* text accompanying notes 152–56 (discussing issues related to the integration of renewable intermittent energy sources, such as wind and solar, into the grid).

296 California, for example, has returned largely to the regulatory model. The state terminated open access except for certain grandfathered purchasers. Utilities have "re-bundled" by acquiring generation, and rates are regulated. *See* 18 C.F.R. § 35.34 (2009) (establishing RTOs, which are meant to prevent discriminatory access to transmission). However, the state determined this reregulation did not eliminate the need for a wholesale market; the California ISO opened day-ahead and day-of markets on April 1, 2009. Press Release, Cal. Indep. Sys. Operator Corp., California ISO Launches New & Improved Markets (Apr. 1, 2009), http://www.caiso.com/2383/23837b9467860.pdf.

297 *See* MOSKOVITZ, *supra* note 251, at 13–14 (discussing studies examining the benefits of restructuring and regional market integration). While consultant studies found that consumers benefited from lower rates, academic studies found no evidence of lower prices. *Id.* at 19–20. Although one academic study did indicate a benefit, the benefit was much smaller than that determined by consultants. *Id.*; *see also* David B. Spence, *Can Law Manage Competitive Energy Markets?*, 93 CORNELL L. REV. 765, 776–77 (2008) (stating studies have found that the restructuring of the PJM electricity market resulted in lower prices, but other studies of restructuring in general found price increases).

Each of the wholesale markets requires substantial governing capability. Governance varies by market. The ISOs are nonprofit entities with stakeholder boards and substantial staff. These entities perform governmental functions, and issues arise as to the delegation of such vital functions to nongovernmental entities.[298] Concerns have also been voiced by state regulators that may have only advisory or informal relationships with these important regional entities, which have so much influence over the delivery of power to the customers within a given state.[299] The effort to oversee these complex regional markets requires large, well-paid staffs; the cost of these staffs is borne by customers through surcharges on power sold. Recent estimates indicate that the cost of running these markets is comparable to the cost of traditional cost-of-service regulation, and, although there is overlap, consumers will pay for both systems.[300] It should be noted, however, that the cost is not great in relation to the benefit of the regulatory supervision.

The regional wholesale markets have proven susceptible to manipulation in ways that the traditional tools designed to address anticompetitive behavior were ill-suited to address.[301] The results were especially devastating in restructured states such as California where vulnerabilities of the wholesale market were compounded by

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298 *See* Michael H. Dworkin & Rachel Aslin Goldwasser, *Ensuring Consideration of the Public Interest in the Governance and Accountability of Regional Transmission Organizations*, 28 ENERGY L.J. 543, 572 & n.158 (2007) (discussing the constitutional dilemma of a federal agency delegating "to a private body the authority to make decisions about the substantive provisions of federal law or regulatory obligations").

299 *Id.* at 586 ("At the same time, the states, as yet, have not played a day-to-day role in RTO decision-making. Since these organizations were established, state regulatory bodies have struggled to determine what their role is in this new system regarding the markets, reliability determinations, and future planning.").

300 The FERC has estimated annual labor costs associated with the operation of RTOs to be $22 million, with an average cost per employee of $117,167. FED. ENERGY REGULATORY COMM'N, U.S. DEP'T OF ENERGY, DOCKET NO. PL04-16-000, STAFF REPORT ON COST RANGES FOR THE DEVELOPMENT AND OPERATION OF A DAY ONE REGIONAL TRANSMISSION ORGANIZATION 16 (2004), *available at* http://www.ferc.gov/EventCalendar/Files/20041006145934-rto-cost-report.pdf (comparing cost information submitted by various existing RTOs). The FERC also estimated the average RTO requires 187 full-time equivalent employees for minimum functionality. *Id.* The FERC concluded that costs associated with the operation of RTOs likely cost the typical retail customer $2.31 per year. *Id.* at ii.

301 *See* Duane, *supra* note 31, at 535–36 ("Both history and a sophisticated technical understanding of electricity markets demonstrate that this is an industry that is too susceptible to abuse to be left free of regulatory oversight. That was regulation's original rationale, and it remains valid today despite the many benefits that some deregulation in other sectors has brought.").

new state policies.[302] Wholesale power markets typically involve a small number of players that make repeated transactions. The electric grid, historically designed to connect regulated generators to their retail customers, presents limited options for moving power, and the number of power sources available to serve given customers in certain locations is also limited.[303] Customer demand, by contrast, is relatively inelastic and, in most cases, treated by market administrators as totally inflexible.[304] Market demand for a given hour on a given day is estimated using weather and consumption models, and then administrators take bids until that amount of power is made available.[305] Administrators simply assume that customer demand is inflexible and unrelated to cost; they will buy the power no matter what the cost. In the absence of corrective market reforms to enhance the intrinsic hedging functions of efficiency and demand management, and given that there are no substitutes for electricity in most situations, the administrators are correct.[306] Also, there is a coincidence of power demand among most customers, creating high peaks in demand at certain points during the day. The power facilities that can quickly meet this peak demand are expensive, and their

302 *Id.* at 481 (enumerating the results of the California energy crisis as: "rolling blackouts, skyrocketing rates, utility bankruptcies, stonewalled investigations, document destruction, and the effective insolvency of California itself"). In California, restructuring provisions required investor-owned utilities to buy power through the day-ahead market, meaning electricity transactions had to move through the market and investor-owned utilities could not enter into bilateral contracts with sellers. *Id.* at 498–99. This eliminated the hedge of long-term contracts and increased vulnerability of the short-term market to manipulation. *Id.* at 499.

303 *See* U.S. ENERGY INFO. ADMIN., *supra* note 294, at 28 tbl.2.1 (showing 89% of net generation in 2007 came from only coal, natural gas, and nuclear).

304 *See* JOSEPH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW IN A NUTSHELL 42–43 (2004 ed.) (citing the high value of electricity as a reason to consider customer demand inelastic, but also citing excessive price escalations as capable of reducing consumption).

305 *See* ISO New England, Inc., Morning Report, http://www.iso-ne.com/sys_ops/mornrpt/index.html (last visited Jan. 30, 2010) (providing daily information used to determine generation needs and price, including the weekly weather forecast, weather forecast for peak hour, peak load from the previous day, capacity, maintenance, etc.).

306 For an excellent discussion of possible market reforms to stimulate DSM as a hedge, see COWART, *supra* note 55. In the absence of such DSM measures, the disconnect between price and consumer demand is prevalent because residential customers and some commercial customers pay a rate that is derived from an average of all prices paid during the month or year. Such consumers are not even aware of hourly or daily price spikes. *See supra* note 304 and accompanying text (referring to the disconnect between price and consumer demand as inelasticity).

ownership or control can be concentrated in the hands of a few market players.[307]

This inflexible demand, spatially and quantitatively limited supply, and unique market structure combine to make the wholesale electric market highly susceptible to manipulation by market participants.[308] These participants quickly learn the characteristics of the other players and the behavior of the market and can manipulate prices in ways that escape traditional regulatory and judicial approaches to protecting markets from the exercise of market power.[309] The administration of antitrust statutes relies on complex algorithms applied to make a static determination of whether a given market player has market share and other characteristics necessary to exercise market power, that is the ability to change prices through its actions alone.[310] These calculations are made assuming such market power evolves slowly and sustains itself for long periods of time. Antitrust administration also relies on lengthy, slow *post hoc* regulatory analysis and judicial enforcement.[311] By contrast, manipulation of wholesale markets, especially in restructured states, can cause precipitous changes in price not typical of the usual retail markets that antitrust statutes address.[312] Prices can spike by factors of a hundred

[307] For example, there are currently 980 power plants in California and only 40 are "peakers." Cal. Energy Comm'n, http://energyalmanac.ca.gov/powerplants/POWER_PLANTS.XLS (last visited Jan. 30, 2010).

[308] *See* TOMAIN & CUDAHY, *supra* note 304, at 289–94 (detailing the various manipulations accomplished by Enron, including "wash trades," "fat boy," "get shorty," and others).

[309] *See generally* KONG-WEI LYE, LEARNING AGENTS IN POWER MARKETS (2004) (reporting a simulation of power markets involving ten computerized decision makers, or "agents," that were able to raise prices very quickly without complex knowledge of strategies or the ability to communicate with one another).

[310] Antitrust is controlled by the following statutes: the Sherman Act, 15 U.S.C. §§ 1–7 (2006); the Clayton Act, 15 U.S.C. §§ 12–27 (2006); and the Federal Trade Commission Act, 15 U.S.C. §§ 41–51 (2006). *See also* BRENNAN ET AL., *supra* note 166, at 26–32 (describing the regulation of competition in the electricity industry).

[311] *See* BRENNAN ET AL., *supra* note 166, at 93–94 (describing the responsibilities for enforcing antitrust laws, which rest with the Federal Trade Commission and the Department of Justice's Antitrust Division).

[312] Duane, *supra* note 31, at 505 ("Existing participants in the wholesale market were also behaving inconsistently with the economic theory upon which the move to deregulation and restructuring had been based. The ISO's Market Surveillance Committee ('MSC'), composed of three independent economists, issued several reports noting evidence of market power in 1998 and 1999." (citing FRANK A. WOLAK ET AL., AN ANALYSIS OF THE JUNE 2000 PRICE SPIKES IN THE CALIFORNIA ISO'S ENERGY AND ANCILLARY SERVICES MARKETS (2000), *available at* http://www.caiso.com/docs/2000/09/26/200009261407245692.pdf)).

or more. Enron's power traders discovered various strategies that both were difficult to detect and could concentrate high levels of market power in one market player for brief periods of time, resulting in price spikes of two orders of magnitude.[313] The economic and social costs of such manipulation cannot await years of analysis and litigation for correction.

The emergent solution appears to be the installation of market monitors within both regulating entities and the administration of wholesale markets.[314] These market monitors, now installed to various degrees in the PJM Interconnection, the New York ISO, and the New England regional transmission organization,[315] would consist of cadres of highly trained individuals, armed with computing capability that matches any of the market participants. They would use computer programs to evaluate each transaction against projected, normal market behavior to detect unusual events that might reflect market manipulation. They can flag suspected transactions. Market participants balance their accounts on a periodic basis, typically monthly. At the end of a month, participants will pay balances owed for the power supplied. A flagged transaction indicates to market participants that the affected market transaction will be analyzed during the current period, and the price may be reduced. The bidder of a flagged transaction still must provide the power if dispatched but it may receive a much lower price than originally indicated when the transaction cleared.[316] Also, repeated evidence of manipulation

313 Duane, *supra* note 31, at 477–78.

314 Such an approach has been advocated by Richard Cowart of The Regulatory Assistance Project since the Enron crisis. *See generally* RICHARD COWART, THE REGULATORY ASSISTANCE PROJECT, MARKET POWER AND MARKET MONITORING–CRITICAL ISSUES FOR SERC AND COMPETITIVE WHOLESALE MARKETS (2003), *available at* http://www.raponline.org/Pubs/China/SERCMarketPower.pdf.

315 PJM, Overview of Market Monitoring Unit, http://www.pjm.com/sitecore/content/Globals/Training/Courses/ol-mmu.aspx?sc_lang=en (last visited Jan. 30, 2010); N.Y. INDEP. SYS. OPERATOR, FERC ELECTRIC TARIFF: ATTACHMENT O (2009), *available at* http://www.nyiso.com/public/webdocs/documents/tariffs/market_services/ms_attachments/att_o.pdf; ISO New England, Inc., Market Monitoring Reports, http://www.iso-ne.com/markets/mktmonmit/rpts/index.html (last visited Jan. 30, 2010) (providing monitoring reports for both internal and external market monitors). For the rule adopting an independent market monitor, see 16 TEX. ADMIN. CODE § 25.365 (2007), *available at* http://www.puc.state.tx.us/rules/subrules/electric/25.365/25.365.pdf.

316 COWART, *supra* note 314 (describing a 2002 incident in which the PJM Market Monitor successfully detected and corrected an irregularity) ("[A] power marketer actually purchased power *from PJM* at one interface, and then scheduled its return *into PJM* at another, higher-priced location . . . [and] pocketed the difference between the two prices.").

would constitute grounds for either expulsion from the market or other legal action. The operation and regulation of these market monitors constitute a substantial portion of the expense and regulatory effort of running a wholesale market.

E. Wholesale Markets Require Secondary Markets in Order to Provide Adequate Investment in New Capital Facilities

It also appears that wholesale markets fail to produce the desired investment in new plants necessary to meet growing demand.[317] As described above, society considers the value of reliable and continuous electrical service too high to tolerate any risk of inadequate supply.[318] It turns out that the financial interests that drive investors in new plants do not naturally align with a regulator's need to produce adequate investment in new generation (or in new energy efficiency) to assure reliable service in the future. A solution, at least within the New England wholesale market, has been the creation of a *second* wholesale market where the market administrators ask for bids on the creation of new sources of supply, or capacity.[319]

The traditional cost-of-service regulatory approach provided regulators with the means to assure that monopoly utilities provided adequate supply. Of equal or greater significance, the regulatory system provided utilities with electricity rates expressly calculated to both run the existing system and attract capital for the creation of new

317 Richard J. Pierce, Jr., *Completing the Process of Restructuring the Electricity Market*, 40 WAKE FOREST L. REV. 451, 490 (2005) ("[A] restructured market that relies entirely on a competitive wholesale market to produce revenues for generators is insufficient to induce the socially necessary level of investment in generating capacity.").

318 U.S.-CANADA POWER SYS. OUTAGE TASK FORCE, *supra* note 96, at 140–70 (describing changes needed to ensure reliability, and therefore to avoid the high costs of chronic large-scale blackouts, and estimating the cost of the August 14 blackout between $4 and $10 billion in the United States).

319 In order to correct the market tendency to underinvest in capital projects, New England created the Forward Capacity Market (FCM). ISO New England, Inc., Forward Capacity Market, http://www.iso-ne.com/markets/othrmkts_data/fcm/index.html (last visited Jan. 30, 2010). The FCM facilitates auctions to purchase sufficient capacity to meet forecasted demand. *Id.* Capacity is purchased at the auction three years before the delivery date. CARISSA SEDLACEK, ISO NEW ENGLAND, INC., WELCOME TO THE FORWARD CAPACITY MARKET (FCM) NEW RESOURCE QUALIFICATION FORUM FOR CAPACITY COMMITMENT PERIOD 2013–2014, at 11 (2009), *available at* http://www.iso-ne.com/support/training/courses/fcm/fcm_forum_may_5.pdf. This allows new companies to bid into the power generation system. *Id.* The secured future purchase agreement allows the new companies to solicit capital investment, borrowing against that agreement.

facilities necessary for growth.[320] The wholesale market does not expressly address this issue; other bidders set the price. As discussed earlier, in such wholesale markets the "clearing price" is the price of the last unit dispatched by the market manager to meet demand for the applicable period.[321]

This may initially appear counterintuitive, but it represents the way most markets function. Some manufacturers can make a given type of shirt, for example, for a higher cost and some for less. Each may "bid" into the market by offering the shirt for sale. Some potential shirt buyers will pay more and some less for this given shirt. In classic economics, the clearing price, the market price for the shirt, will be where these demand and supply curves meet. That market price is the end of the matter. Those producers that want or need a higher sale price will not get it and will not participate in the market. Those that would have produced the shirt for less will not charge less; they will charge the market price and pocket the difference. The same is true in the power market as each bidder dispatching power gets the clearing price. Those above this price do not play in that transaction, and those below it reap higher profits due to their lower costs and resulting "producer surplus."[322]

In economic terms, the cost-of-service approach sets rates to reflect the subject utilities' *average* cost of producing electricity, while the free market trends toward the *marginal* cost of the power.[323] Marginal cost does not compensate players for the sunk, or needed, costs of new capital expansion; the players have to rely on the periods when the clearing price is over their marginal cost or bid.[324] This works in markets where prices and bidders are multiple and vary. In power markets, some participants always bid what they know will be

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[320] *See* BONBRIGHT ET AL., *supra* note 103, at 92–93. The traditional rate-setting formula calculates the "Revenue Requirement" of the subject utility as equal to its total expenses plus a rate of return on capital sufficient to attract the investment necessary to raise the capital (through a combination of sale of stock, sale of bonds, and borrowing) to construct generation necessary to meet demand.

[321] *See supra* note 104 and accompanying text; *see also* BONBRIGHT ET AL., *supra* note 103, at 485.

[322] BONBRIGHT ET AL., *supra* note 103, at 421 ("Let the current rate of output be even slightly below the maximum output permitted by plant capacity . . . and marginal cost of service may be a mere fraction of average cost.").

[323] *Id.* at 412–13 (comparing the competitive price structure, which relies on average costs, with the marginal-cost principle).

[324] *Id.* at 410 (explaining that marginal costs include not only the additional cash required for additional output, but also enhancements to increase the rate of output).

below the clearing price because they know they must run their plants regardless of the clearing price. Nuclear power plants, for example, cannot turn on and off depending on these transactions, so if they have excess power, they face the choice of either selling it or not. In those cases, they will always prefer to sell, regardless of price. Other producers may bid low for similar reasons: they know they need to be one of those picked to sell or be dispatched.[325]

It turns out that such a market-based marginal price does not encourage investment in new, inevitably expensive plants.[326] In the current environment, future power sources, especially given higher construction costs and the costs of environmental regulation, are estimated to produce power at substantially higher wholesale prices than existing plants.[327] If the new plants were built, their bids into the wholesale market or their price requirements in longer-term bilateral contracts would be higher to meet their marginal cost of operation. They might not "clear," or be dispatched, enough to pay back investors, unless demand was reliably high over the thirty or more years necessary to pay back the investment in the plant. This problematic market operation aggravates other problems with raising capital. In a regulated system, the government sets prices that are not only calculated to attract capital, but public utilities can raise funds through tax-free bond offerings. Private merchant generators can sell bonds as well, but they are taxable. Also, risks for merchant generation are higher than in a monopoly regulatory environment, so investors want a higher return. Thus, the cost of capital is higher for private power developers than regulated utilities.[328]

One solution is reregulation. For example, California has taken steps since its disastrous encounter with restructuring to reregulate the system.[329] The state no longer relies exclusively on a spot market and

325 *Id.* at 136.

326 Libby, *supra* note 97, at 241.

327 *See* Christine Real de Azua, *The Future of Wind Energy*, 14 TUL. ENVTL. L.J. 485, 498 (2001) ("The main reason for the continued high use and low price of electricity produced from coal in the United States is that the older power plants remain exempt from the performance standards applied to the new power generators regarding regulated pollutants.").

328 *See generally* BONBRIGHT ET AL., *supra* note 103, at 13 (differentiating a private business from a public utility, which is subject to both governmental price control and additional limits (i.e., taxations) on the ability to earn an excessive rate of return).

329 For a full discussion of California restructuring, see *supra* Part II.B. *See also* Libby, *supra* note 97, at 242 ("In an effort to alleviate the problems apparently causing electricity

encourages other contractual options.[330] But wholesale markets have proven useful, and in some states, local service providers purchase a substantial portion of their total power on the spot market.[331] Thus, a solution needed to be devised that corrected for the market's tendency to produce underinvestment in new capital facilities. In New England, that need became a second, independent "forward capacity market" run by the same market authority that manages the wholesale power market, the New England ISO.[332]

Early proposals for this capacity market provde contentious. Many stakeholders believed that early proposals, while aiming at new capacity, overcompensated market participants for existing capacity.[333] A recent settlement among stakeholders, approved by FERC, sets the terms for this secondary market, and the first round of bidding occurred successfully in 2006.[334] The design of this complex market, at least in New England, does allow demand response to bid into the market.[335] This market successfully commenced operation in 2008, and the first auction has been held. This approach, however, will mean the operation and supervision of two separate, complex markets. Each will require monitoring and regulation. The administrative and regulatory efforts will be substantial and ongoing.

prices to soar, the regulators re-imposed price caps on retail sales and then imposed price caps on wholesale transactions.").

330 Libby, *supra* note 97, at 242. ("Finally, in December 2000, FERC dismantled the CalPX and allowed utilities to make long-term contracts.").

331 *Id.* at 246 ("Despite the problems with the deregulation process, the market approach has shown enough promise that many states are willing to move forward with deregulation.").

332 *See supra* note 318 and accompanying text.

333 PETERSON ET AL., *supra* note 117, at 21 ("Regional stakeholders have questioned whether some of these changes may be over lapping [sic], that is, provide redundant compensation for a single service.").

334 *See* Clinton A. Vince et al., *What Is Happening and Where in the World of RTOs and ISOs?*, 27 ENERGY L.J. 65, 91 (2006) (citing Explanatory Statement of the Settling Parties in Support of Settlement Agreement and Request for Expedited Consideration, Devon Power LLC et al., Docket Nos. ER03-563-000, ER03-563-030, ER03-563-055 (FERC Mar. 6, 2006)) (describing ISO New England's Forward Capacity Market and Settlement Agreement).

335 *See id.* at 90–92. Companies bid in the market to reduce power demand through contracts formed with industrial sources allowing the companies to turn off processes upon request. *See supra* note 171 (discussing EnerNOC).

F. The Wholesale Market Will Require Design and Investment in an Expanded Grid

Restructuring and FERC's free market approach placed a substantial additional burden on the grid. In the traditional environment, the transmission system operated largely to transmit power from native generation to native load via lines of vertically integrated utilities, which owned the generation and served the local customer. In the restructured environment, a national set of economic actors use transmission to wheel power to destinations determined by factors related to contractual, strategic, corporate, and economic considerations unrelated to transmission system design or efficiency, increasing the volume of transactions.[336]

The competition induced by the increasing number of supply options available to any given site was supposed to reduce prices.[337] That did not develop; restructuring failed to deliver the expected reductions in the price of power.[338] Recent studies confirm the anecdotal experience of ratepayers. Overall, power proved more expensive in restructured states than power in states that continued to employ traditional cost-of-service ratemaking.[339] In sum, to operate

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336 *See* Libby, *supra* note 97, at 238–39 (providing a history of public utilities including how they came to provide the generation and the transmission of electricity); *id.* at 242 (describing the factors determining transmission including, for example, the "stagger[ing] basis" of choice of supplier given to customers).

337 *Id.* at 242 ("When consumers were given a choice of suppliers, they would presumably choose the supplier that had the lowest rates. This power that the California legislature sought to shift onto the consumer would create competition in the market, causing firms to drive down their costs to compete to provide the lowest priced electricity. The end result of the process was supposed to save consumers money.").

338 *Id.* ("Before long, a heat wave settled on California, and demand for electricity increased as air conditioning units were turned on across the state. However, unlike the previous month, electricity rates were not capped at a maximum price. Now that the price cap had been lifted, the rates that customers were paying were being determined by the bids offered on the CalPX spot market. In July 1999, California electricity customers saw their bills increase by as much as 200 percent from June, with the average residential bill rising from $50.59 to $101.58 per month. By the time the summer of 2000 rolled around, the problems with AB 1890 were becoming more apparent. California electricity customers paid more than $1.2 billion for power during the week of June 14, 2000—three times more than they had paid a year earlier." (footnote call numbers omitted)).

339 *See* BLUMSACK ET AL., *supra* note 31, at 2 ("Our research shows that there is no evidence that restructuring has produced any measurable benefit to consumers or to the systems which have restructured."); *see also* U.S. ENERGY INFO. ADMIN., *supra* note 294, at 66 tbl.7.4 (charting the average cost of electricity in 2007 for all sectors from unregulated retail service providers as $11.03 per kilowatt-hour—compared to $9.13 in all sectors for the total electricity industry). Note that a price differential between states existed before restructuring, and this differential derived primarily from differences in the

wholesale markets and to manage the hybrid remainders of restructuring, strong regulatory efforts will be needed at the state and regional levels.

CONCLUSION

As much as some have desired to reduce the role of government, to make government more efficient, to substitute free markets for "command and control," the United States needs government to act collectively in the coordinated and national effort necessary both to modernize our electricity system and to control carbon emissions. The effort to control carbon emissions must be defined and led by the President and Congress, but this mission cannot be carried out without increases in capacity at the state and local levels. The provisions of proposed federal legislation, such as a carbon tax or a cap on emissions, will not operate in the real world to reduce carbon emissions without viable alternatives to fossil fuel-based systems. In the short term, our best option is efficiency services and demand-response systems implemented primarily at the state and local level. Any national carbon legislation therefore needs to fund and to set standards and policies that encourage the development of state and local governmental capacity to address energy efficiency and other demand-side management activities. The national effort must be designed to motivate those states that have failed to develop this capacity to change their course for ideological, fiscal, or historical reasons. Reliance on markets in the electricity sector, it turns out, increases rather than decreases the need for a sophisticated governmental presence at the national and state level and attentive nonprofit governance at the regional level.

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price of fuel. States relying primarily on inexpensive coal generation—inexpensive given the lack of charge for environmental externalities—experience relatively less costly power and states relying on expensive natural gas, higher costs. That differential has survived restructuring.