



Bridges not Barriers:  
The Law-STEM Alliance as a Catalyst for Innovation

**BIBLIOGRAPHY OF CLE READING MATERIALS**  
**JUNE 17, 2015**

**Energy and Environment - Session 3**

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

Steven Ferrey, *Solving the Multimillion Dollar Constitutional Puzzle Surrounding State 'Sustainable' Energy Policy*, 49 WAKE FOREST L. REV. 121 (2014).

Jim Tozzi & Bruce Levinson, *Accomplishment Beyond Dollars*, ENVTL. F., Jan.-Feb. 2014, at 30.

David G. Victor, *The Geoengineering Option: A Last Resort Against Global Warming?*, FOREIGN AFF., Mar./Apr. 2009, at 64.

# Accomplishment Beyond Dollars

*Social, policy, and environmental entrepreneurs have enterprise and initiative, taking an improved planet as their main compensation. Entrepreneurs have succeeded because they have developed techniques that move the ball forward with no personal reward*



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**W**e frequently read about the successes of entrepreneurs in the private sector. Their rewards range from sumptuous yachts to palatial homes to, perhaps, a legacy in history books. However, there is another group of entrepreneurs that public administration scholars have been studying for years. We present the results of extensive reviews performed by leading academicians who have identified five individuals whose work fits three entrepreneurial categories in which financial status is not a proxy for success.

Each example illustrates a different application of the entrepreneurial spirit and yet all five cases share some commonalities from which lessons can be drawn. We present a *social entrepreneur* who created networks of social innovators, and another who built the most effective organization for securing patient access to medical marijuana; an international *policy entrepreneur* who established a template for free trade agreements and a domestic policy entrepreneur who overhauled the process and standards for developing federal regulations; and an *environmental entrepreneur*, a former staff member of a congressional committee who created much of America's environmental policy. It is important to note that the recognition of these entrepreneurs is based largely on extensive independent analysis of their accomplishments by National Science Foundation-funded researchers.

An article in the *Washington Post* headlined "The Rise of the Social Entrepreneur," by Melisa Stefan (November 11, 2011), concludes: "An entrepreneur brings

energy, business rigor, intelligence, and resourcefulness to a problem, upsetting the status quo. Social entrepreneurs see a societal issue and apply the same principles."

The article explains:

"The rise of nonprofit collaboration stems from a society-wide sense that social problems need innovative solutions that are not likely to emerge from the government," said Greg Dees, co-founder of the Center for the Advancement of Social Entrepreneurship at Duke University. "We see our government struggling, and that's true around the world," he said. "We need private resources and private resourcefulness." By "private resources," Dees means more than just money. Social entrepreneurship, as a field, focuses more on people and new ideas than traditional philanthropy alone, according to Kriss Deiglmeier, head of Stanford's Center for Social Innovation.

Based on the work of Ashoka Innovators for the Public and on the academic literature, our definition of social entrepreneurship is using innovative activities to create effective responses to social challenges in settings ranging from the neighborhood to the world.

This article defines the term policy entrepreneur consistent with the 1991 Department of Defense-funded research of Nancy Roberts and Paula King, as meaning "the process of introducing innovation — the generation, translation, and implementation of new ideas — into the public sector." Because policy entrepreneurs work to improve government, they often

emerge from the civil service, the backbone of civilization. And no enterprise is stronger than its backbone.

Environmental entrepreneurship we define by the example set by the as yet unparalleled accomplishments of an individual responsible for creating much of our federal environmental policy. The term “environmental entrepreneurship” has been misused by organizations, researchers, and the media to mean everything from green business ventures to the activities of environmental non-profit organizations. By contrast, our example of an environmental entrepreneur is an individual who did not donate large sums of money to the cause nor lead a national or international organization but did single-handedly transform the process by which the environment is regulated.

**S**ocial entrepreneurs, persons who use entrepreneurial techniques to meet human needs, provide a powerful demonstration of the global benefits from entrepreneurship. Bill Drayton, a former assistant administrator at EPA who later founded Ashoka — a global organization that identifies and invests in leading social entrepreneurs — exemplifies the best of social entrepreneurship. Jim Tozzi had the good fortune of having a near-weekly breakfast with Bill Drayton during the latter’s tenure at EPA in the Carter administration. Drayton’s work in founding Ashoka was a landmark event in the history of social entrepreneurship. Ashoka invests in social change similar to the way venture capitalists invest in start-up businesses. Drayton is recognized throughout the world as the leading social entrepreneur; he is in a class all his own.

In carrying out the Biblical precept of helping heal the sick, Steph Sherer recognized the human consequences flowing from flawed federal data, specifically, in this case, a Health and Human Services statement denying that cannabis has recognized medical utility. HHS’s dissemination of inaccurate data continues to encroach on patient access to health care information and treatment. Americans for Safe Access, the organization Ms. Sherer founded, is working at every level of government using administrative, judicial, legislative, and educational tools, including at times the Data Quality Act (discussed below), in an ongoing effort to ensure patients can safely obtain physician-prescribed medication. She too is a social entrepreneur.

Robert Dahl’s 1961 book *Who Governs? Democracy and Power in an American City* is an essential text in understanding policy entrepreneurship. Dahl analyzed the diverse multitude of actors in New Ha-

ven, Connecticut, to determine who actually wields power. A 1963 review of *Who Governs?* in the *Canadian Journal of Economics and Political Science* explained that Dahl attempted “to track down various potential sources of direct and indirect political influence: elected leaders, political sub-leaders, economic notables, social notables, voters, and the like.” What Dahl found was that holders “of high social position and/or great wealth wield little behind-the-scenes influence. Voters, meanwhile, have only an indirect impact on the political process, as their interest and range of choice are slight. The number of highly influential citizens is limited to a small group who deliberately concentrate the resources at their disposal on political matters.” In Dahl’s work we can see early academic recognition of the most basic trait common to all three categories of successful entrepreneurs, having an intense focus on process.

The National Science Foundation has been one of the dominant funders of political science research by academia. Included in the NSF program is research directed at the methods used to affect federal policymaking. Several professors concluded that there is a substantial difference between lobbyists and policy entrepreneurs. Based on their literature, we define a lobbyist as someone who conducts a public pursuit of private interests whereas a policy entrepreneur conducts a private pursuit of public interests. We focus on the latter.

As a result of the aforementioned observations, the NSF provided grants that resulted in a publication by Congressional Quarterly entitled *Lobbying and Policy-making — The Private Pursuit of Private Interests*, by Ken Godwin, Scott Ainsworth, and Erik Godwin. The NSF has supported or otherwise recognized many researchers who have contributed to our understanding of the work of entrepreneurs in government. Godwin conducted eight case studies on policy formulation and concluded that the individuals associated with the passage of the North American Free Trade Agreement and the Data Quality Act were the leading examples of successful policy entrepreneurs.

With respect to NAFTA, former Mexican President Carlos Salinas’s 1990 initiative that achieved a comprehensive free trade pact with the United States and Canada is a stunning example of the power of policy entrepreneurship. In examining Salinas’s accomplishments, Godwin emphasizes a core issue: a deep knowledge of the technical and political facets of the policy process is essential to entrepreneurship. An entrepreneur’s in-depth insider knowledge and years of work are vastly more important than merely having a good idea or a creative approach.

In the case of the Mexican president, his American policy experience included obtaining master's and doctoral degrees from Harvard. Although such education may sound more theoretical than practical for a political career, Wallace Sayre, a political scientist at Columbia, notes that the intensity of academic politics is in inverse proportion to the issues at stake. In addition to process knowledge, Godwin emphasizes that Salinas made the wise decision of choosing a powerful interest group, the Business Roundtable, as an ally.

A Congressional Research Service report, "NAFTA at 20," notes that "NAFTA has brought economic and social benefits to the Mexican economy as a whole," even though the benefits have been uneven. The CRS report also contains an observation, recounted below, that makes evident that one positive externality from successful entrepreneurship is that it leads to additional policy successes well beyond the scope of the original endeavor. CRS explained that one legacy of NAFTA "is that it has served as a template or model for the new generation of [free trade agreements] that the United States later negotiated and it also served as a template for certain provisions in multilateral trade negotiations as part of the Uruguay Round" of the World Trade Organization talks.

**A**lmost all examples of successful policy entrepreneurship involve alliances with various vested interests, except one. Godwin analyzed the entrepreneurial process by which the Data Quality Act was enacted [SEE *The Environmental Forum*, September/October 2004]. The act put the White House Office of Management and Budget in charge of setting quality standards for all data disseminated by federal agencies. The law also granted affected persons the specific right to "seek and obtain" correction of data not meeting standards. Godwin describes the DQA as "a radical change in regulatory policymaking" and "one of the most significant regulatory reforms over the past twenty-five years." The law changed how the government evaluates and manages data throughout the collection-analysis-dissemination process. It was drafted and passed without assistance from potentially affected parties. Godwin states that the DQA was "a policy that was invisible to the political parties, to the legislators who passed it, and to the president who signed it into law."

The DQA breaks with traditional models of policymaking — and demonstrates a critical break with lobbying — because a major change was achieved not only without attention and without allies but also without the provision of resources by other parties. Godwin notes that he determined that the entrepre-

neur, Jim Tozzi, "was not paid by any of his clients to develop the amendment." Godwin's research was in keeping with Dahl's findings about great wealth yielding "little behind-the-scenes influence."

Another example of policy entrepreneurship could emerge from a detailed review of various reference works on the evolution of the centralized regulatory review function in OMB [SEE *The Environmental Forum*, May 1982, May 1983, January/February 2012, and the *Administrative Law Review (Special Edition)* 37 (2011)]. The NSF or a comparably capable organization could sponsor research to assess the contribution of the various individuals who participated in the establishment of centralized regulatory review.

Unfortunately, NSF has discontinued support of its political science programs because of congressionally imposed funding criteria that include a statement on preventing the NSF from "wasting federal resources on political science projects." The doors are open for a major foundation or university to fund additional case studies and for the Congress to eliminate this restriction.

In discussing environmental entrepreneurship, a sharp distinction needs to be drawn between the environmental entrepreneur described herein and the plethora of organization founders, functionaries, politicians, pundits, philanthropists, executives, talking heads, and countless other really famous and important people. The environmental policy community should address several questions: One, is it worth dedicating scarce resources to the identification and promotion of environmental entrepreneurs? Thanks to scholars in political science, public administration, and economics there is a substantial amount of literature which provides researchers with tools for assessing whether the identification of environmental entrepreneurs (including their warts and associated financial costs) is a socially beneficial program to pursue. Two, if one or more organizations proceed with identifying additional environmental entrepreneurs and promoting their entrepreneurial attitude and techniques, how does one develop a repository of successful methods and techniques which can be used by future entrepreneurs?

The hallmark and the legacy of entrepreneurs rest on their having fundamentally changed the processes by which future decisions are made. In short, environmental entrepreneurs are measured not just by their immediate accomplishments but also by the accomplishments of their progeny. By being able to enact viral process changes through detailed process knowledge and a long term effort, but with little funding and less recognition, environmental and policy entrepreneurs are potentially a polity's most powerful and least predictable actors.

**R**ecognition of environmental entrepreneurs requires a careful, serious review of the record. By way of analogy, recognition of environmental entrepreneurs should involve a process more akin to that used by the Vatican for verifying saints rather than their process for electing popes. Thus, it is safe to say that individuals whose achievements have not passed rigorous scholarly review are not likely to be environmental entrepreneurs. It is equally safe to say that persons whose claim to fame is primarily through their record of inspiring others or providing vast sums of money are also excluded from being an environmental entrepreneur.

If an organization did decide to initiate a process for recognizing environmental entrepreneurs so as to derive lessons and practices supporting future entrepreneurship, then there would be the need for a formal identification and recognition process. A process implies that there would be one or more institutions to manage a scholarly evaluation of environmental entrepreneurship. In short, there would be the need for organizations to perform rigorous analysis and also an Ashoka-NSF type function of providing “professional support services and connections to a global network across the business and social sectors” for environmental entrepreneurs.

To reiterate, the identification of environmental entrepreneurs would not be an end in itself. Recognizing such entrepreneurs would be worthless if it became some sort of hall of fame and another opportunity for the one percent to celebrate themselves. Rather, the purpose of the process would be to support future environmental accomplishments, unquantifiable yet valuable beyond dollars.

Our example, the Montana-educated child of journalists Leon Billings, came to Washington as a lobbyist for the American Public Power Association. After several different jobs Leon emerged as staff director for Senator Edmund Muskie (D-Maine), who chaired the committee which had jurisdiction over environmental programs. Jim Tozzi had the opportunity to work with Mr. Billings at the initiation of the Clean Water Act’s development. Mr. Tozzi was the head of environmental programs in the Office of Management and Budget and represented the administration during congressional consideration of the statute. From the onset, Mr. Billings was the sole environmental entrepreneur at the table; he developed innovative ideas and realized them by having accumulated vast amounts of political capital through many hours of hard work with elected officials of both parties. In the Billings’ regime there was not a majority and a minority staff; there was one staff — the Senate Public Works staff. Efforts by Tozzi to have minority members oppose committee actions

were often fruitless because Billings had the support of the “minority” staff.

Billings, a non-lawyer, set broad precedents for the establishment of environmental legislation, including detailed, but not lengthy, requirements for the issuance of regulations by the Executive Branch coupled with stringent deadlines which could be enforced by citizen suits. He also instituted a strong oversight program to monitor the activities of the Executive Branch during the implementation of the Clean Air Act and he instituted a series of actions to hold Executive Branch officials accountable for their actions.

Billings knew how to play hardball — he was frequently referred to as Senator Billings. An often told story is about the time several executives from the automobile industry went to see him regarding tailpipe emissions. The executives handed Billings a sheet of paper with the numbers they wanted enacted into law; Billings took the sheet, folded it into a paper airplane, tossed it, at which time it plummeted to the floor. Billings then remarked: “I guess those numbers do not fly.”

Billings did recognize the importance of public and private participation in congressional deliberations. To this end, he and Tozzi would frequent the Tune Inn bar in D.C., a very inexpensive and, to say the least, non-imposing institution, after congressional markups. Soon thereafter the Tune Inn was frequented by lobbyists awaiting the arrival of Billings, many of whom received their payout in the form of yachts but not the passage of landmark environmental legislation.

Billings is a noteworthy environmental entrepreneur because his work on the Clean Air Act led to the passage of the Clean Water Act and set the stage for the passage of numerous environmental statutes in similar fashion in the 1970s [SEE *The Conflict Over Environmental Regulation*, by Frank Manheim].

We draw three conclusions from this review of the literature and our own personal experience. First, environmental entrepreneurs use a combination of in-depth insider’s knowledge and audacity to change the processes by which decisions are made. Second, strict adherence to the NSF-style vetting process will result in the identification of a small but very select group of environmental entrepreneurs. It takes extensive, independent analysis by third parties to identify environmental entrepreneurs and to educate the public on the techniques they have developed. Third, Leon Billings is an environmental entrepreneur whose work has survived more than four decades of judicial, congressional, and Executive Branch review and has had a lasting impact on the quality of the nation’s environment, all of which sets a high bar for the designation of other environmental entrepreneurs in the future. •

# SOLVING THE MULTIMILLION DOLLAR CONSTITUTIONAL PUZZLE SURROUNDING STATE “SUSTAINABLE” ENERGY POLICY

*Steven Ferrey* \*

## I. CHECK, CHECK, CHECKMATE: NO LEGAL ROOM TO MOVE

Energy, the core of the modern economy, confronts a constitutional impasse: state governments are now being legally constrained by court decisions regarding their abilities to enact sustainable energy legislation, regulation, and policy. Electric power generation is the most capital-intensive industry in the United States,<sup>1</sup> undergirding the modern economy,<sup>2</sup> and the key mechanism to address climate change and global warming.<sup>3</sup> U.S.

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1. Scott DiSavino, *Interview—U.S. Power Industry to Invest \$85 Bln Annually in Electric Grid*, REUTERS (Feb. 6, 2013, 5:24 PM), <http://www.reuters.com/article/2013/02/06/utilities-eei-idUKL1N0B6I7C20130206>

(“Our industry is the most capital-intensive industry in the United States and projects to spend an average of about \$85 billion a year on capital expenditures through 2014,” said Tom Kuhn, president of the Edison Electric Institute.”); *see also Electric Utilities Remain Most Capital-Intensive Industry*, 15 ELECTRIC PERSP., Sept.–Oct. 1991, at 56, 56.

2. *See* STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS 563–64 (6th ed. 2013) (describing the role of electric power in modern high-rise cities—providing the elevators, air conditioning, and electric lights that are essential to the modern high-rise).

3. *See* Steven Ferrey, *Goblets of Fire: Potential Constitutional Impediments to the Regulation of Global Warming*, 35 ECOLOGY L.Q. 835, 837–38 (2008) (“Carbon reduction in the electric power sector is the urgent new policy focus for mitigation of the effects of global warming.”); *see also* discussion *infra* Part V (providing examples of state regulatory schemes offering incentives

sustainable energy policy is principally implemented through state statutes and regulations.<sup>4</sup> Table 1 sets forth the primary pillars of sustainable energy policy in the United States: five regulatory initiatives implemented by the states.

TABLE 1: STATE RENEWABLE ENERGY INCENTIVE REGULATORY MECHANISMS

Regulatory Mechanism	States Adopting
Net Metering	85% of states <sup>5</sup>
Renewable Portfolio Standards	65% of states <sup>6</sup>
Renewable System Benefit Charges	33% of states <sup>7</sup>
Carbon/GHG Regulation	20% of states <sup>8</sup>
Feed in Tariffs	<10% of states <sup>9</sup>

Recent legal challenges, relying on a long history of Supreme Court constitutional jurisprudence, foreshadow that several state programs have overstepped constitutional limits. State sustainable energy policy has endured a host of recent significant legal challenges based on the Supremacy Clause of the Constitution<sup>10</sup>:

- States either settled in favor of challengers or lost in a majority of these lawsuits.
- One was dismissed on procedural grounds without reaching the merits of the claim, with permission for the plaintiff/challenger to refile the complaint.
- One is still pending, with the four judges who have heard the case to date equally split on its basic constitutionality.

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for decreased consumption, as decreasing consumption minimizes the amount of greenhouse gases that give rise to global warming).

4. See discussion *infra* Part III; see also FERREY, *supra* note 2, at 586 (noting that states regulate all intrastate distribution of power).

5. See *Net Metering Map*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/documents/summarymaps/net\\_metering\\_map.pdf](http://www.dsireusa.org/documents/summarymaps/net_metering_map.pdf) (last visited Dec. 3, 2013) (displaying a map that labels the states that have adopted a net metering policy).

6. See *Renewable Portfolio Standard Policies: March 2013*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/documents/summarymaps/RPS\\_map.pdf](http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf) (last visited Dec. 10, 2013).

7. ELIZABETH DORIS ET AL., STATE OF THE STATES 2009: RENEWABLE ENERGY DEVELOPMENT AND THE ROLE OF POLICY 65 (2009), available at <http://www.nrel.gov/docs/fy10osti/46667.pdf>.

8. See *infra* note 166 and accompanying text.

9. See *infra* notes 34, 36–37, 39 and accompanying text.

10. See U.S. CONST. art. VI, cl. 2; see also *infra* notes 32–42, 70, 135.

Separately, state sustainable energy policy recently has undergone thirteen significant legal challenges pursuant to the dormant commerce clause of the Constitution<sup>11</sup>:

- States either settled in favor of challengers or lost at the trial or appellate level in a majority of these matters.
- Some of the lawsuits either were dismissed on procedural grounds without reaching the merits of the claim or are still pending a final decision.

Regardless of the obvious merits of the transition to sustainable energy policies,<sup>12</sup> this is not a sustainable constitutional record for state governments. There is a profound and absolute jurisdictional line between state and federal government power<sup>13</sup>—and nowhere is this line more sharply defined than for electric power in America and sustainable energy policy.<sup>14</sup> Electric power in the United States is moving increasingly in interstate commerce through wholesale power transactions; the former status bars state geographically-based statutory and regulatory discrimination against that interstate commerce, and the latter status bars any state regulation of wholesale transactions.

At Harvard Law School's 2012 conference addressing these state-federal energy issues, attendees were challenged to suggest some solution to the constitutional impasse.<sup>15</sup> This Article is the first to construct a solution, and this solution can operate seamlessly under the applicable law in any state. Part II examines each of the five primary mechanisms in Table 1 that are implemented through state renewable energy statutes and regulations, some of which are now the subject of the litigation summarized above and discussed in more detail herein. Part III constructs the proposed legally viable

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11. See U.S. CONST. art. I, § 8, cl. 3 (reciting the Commerce Clause, which courts have interpreted to implicitly include a dormant commerce clause); see also *infra* notes 129–37, 145, 149, 162–65, 180–82.

12. See STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX: KEY CHOICES FOR CARBON RESTRICTION AND SEQUESTRATION 13–14 (2010) (describing the imminent dangers of global warming should the nations of the world not limit greenhouse gas emissions).

13. See U.S. CONST. art. VI, cl. 2 (“[T]he Laws of the United States . . . shall be the supreme Law of the Land; and the Judges in every State shall be bound thereby, any Thing in the Constitution or Laws of any State to the Contrary notwithstanding.”).

14. See 16 U.S.C. §§ 824d–824e (2012) (discussing public utilities’ rates and charges for the transmission of electric energy and the power of the federal government to fix those rates and charges); *FERC v. Mississippi*, 456 U.S. 742, 756–57 (1982) (finding that Congress’s broad Commerce Clause power reaches even purely intrastate electric utilities).

15. Harvard Law Sch., Conference on Clean Energy and the Constitution (Nov. 30, 2012).

alternative regulatory mechanism for states to successfully advance sustainable energy policy while avoiding the constitutional impasse.

Any viable solution will be tested against legal precedent: I do so in this Article in two different analyses in Parts IV and V. This solution is easy to implement, supported by direct precedent, and legally permissible in every one of the fifty states. This solution satisfies all constitutional requirements pursuant to the doctrines of equal protection, the dormant commerce clause, and the Supremacy Clause. This solution offers a legal breakthrough in the constitutional impasse, charting a critical new route to implement legally bulletproof sustainable energy policy.

## II. HOW WE GOT THERE: THE SUSTAINABLE ROAD TAKEN TO CONSTITUTIONAL IMPASSE

The constitutional limitations on state statutory and regulatory power over energy regulation have always been in plain sight. The Supremacy Clause<sup>16</sup> and the Commerce Clause<sup>17</sup> are two of the most litigated constitutional clauses in American jurisprudence and have been at the epicenter of energy law for more than three-quarters of a century.<sup>18</sup> In each of the five Subparts that follow, I address the constitutional issues surrounding each of the five primary techniques that states have employed to promote sustainable energy policy.

### A. *State Feed-In Tariffs*

A feed-in tariff ("FiT") is a regulatory requirement imposed by some states on their regulated utilities to purchase on a wholesale basis certain designated types of independent power generation, typically from renewable resources or combined heat and power ("CHP") units, at prices well in excess of the market value of wholesale power.<sup>19</sup> The regulated utilities are forced to "buy high" in terms of other electric power available in the market.<sup>20</sup> FiTs administratively torque the operating power market in favor of the sellers of certain state-designated renewable or CHP power, not adhering to accepted rate-making methodology to minimize prudent

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16. U.S. CONST. art. VI, cl. 2.

17. *Id.* at art. I, § 8, cl. 3.

18. See discussion *infra* Part III.

19. 2 STEVEN FERREY, THE LAW OF INDEPENDENT POWER § 10:134 (Clark Boardman Envtl. Law Ser. No. 30, 2013).

20. Electric power in the Northeast has been available at an average price during the past years of \$0.05/kWh or less. See generally *Electricity*, U.S. ENERGY INFO. ADMIN. (Dec. 6, 2013), <http://www.eia.gov/electricity/annual/pdf/epa.pdf> (providing the annual statistics for each state's average cost to the ultimate consumer for electric power). The Vermont FiTs for power of this value were set for wind of < 15 kW at \$0.20/kWh, for wind > 15 kW at \$0.125/kWh, and for solar generation at \$0.30/kWh. *Id.*

utility-incurred costs.<sup>21</sup> Costs of a FiT are passed on to captive consumers by the utilities.<sup>22</sup>

The Federal Power Act, sections 205 and 206,<sup>23</sup> empowers the Federal Energy Regulatory Commission ("FERC" or the "Commission") to exclusively regulate rates for the interstate and wholesale sale and transmission of electricity.<sup>24</sup> The U.S. Supreme Court held that Congress meant to draw a "bright line," easily ascertained and not requiring case-by-case analysis, between state and federal jurisdiction.<sup>25</sup> When a transaction is subject to exclusive FERC jurisdiction and regulation, state regulation is preempted as a matter of both federal law and the U.S. Constitution's Supremacy Clause, according to a long-standing and consistent line of rulings by the U.S. Supreme Court.<sup>26</sup>

The rates, terms, and provisions of any wholesale sale or transmission of electricity in interstate commerce are exclusively within federal jurisdiction and control, not state authority. Under the Federal Power Act, FERC has "exclusive authority to regulate the transmission and sale at wholesale of electric energy in interstate commerce, without regard to the source of production."<sup>27</sup> The filed-rate doctrine preempting state law applies with equal force to federal and state courts.<sup>28</sup> The filed-rate doctrine also applies to efforts by state regulators to modify the terms of a FERC-mandated

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21. 1 FERREY, *supra* note 19, § 5:9.

22. 2 *id.* §10:134.

23. 16 U.S.C. §§ 824d–824e (2012).

24. Pub. Util. Dist. No. 1 v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006), *aff'd in part, rev'd in part sub nom.* Morgan Stanley Capital Grp., Inc. v. Pub. Util. Dist. No. 1, 554 U.S. 527 (2008).

25. Fed. Power Comm'n v. S. Cal. Edison Co., 376 U.S. 205, 215–16 (1964).

26. New Eng. Power Co. v. New Hampshire, 455 U.S. 331, 340–44 (1982) (overturning an order of the New Hampshire Public Utilities Commission that restrained within the state, for the financial advantage of in-state ratepayers, low-cost hydroelectric energy produced within the state). The Supreme Court held this to be an impermissible violation of the dormant commerce clause of the U.S. Constitution, Article I, Section 8, Clause 3, and the Federal Power Act: "Our cases consistently have held that the Commerce Clause of the Constitution, Art. I, § 8, cl. 3, precludes a state from mandating that its residents be given a preferred right of access, over out-of-state consumers, to natural resources located within its borders or to the products derived therefrom." *Id.* at 338; *see also* Entergy La., Inc. v. La. Pub. Serv. Comm'n, 539 U.S. 39, 49–50 (2003) (finding that the state public service commission's order, which mandated that public utilities make certain payments, impermissibly "trapped" costs that FERC had allocated in a tariff); Miss. Power & Light Co. v. Miss. *ex rel.* Moore, 487 U.S. 354, 371–72 (1988) (same); Nantahala Power & Light Co. v. Thornburg, 476 U.S. 953, 966 (1986) (same); Mont.-Dakota Utils. Co. v. Nw. Pub. Serv. Co., 341 U.S. 246, 251–52 (1951) (same).

27. *New Eng. Power Co.*, 455 U.S. at 340.

28. *See* Ark. La. Gas Co. v. Hall, 453 U.S. 571, 581–82 (1981) ("The court below . . . has consequently usurped a function that Congress has assigned to a federal regulatory body. This the Supremacy Clause will not permit.").

rate determination or cost allocation.<sup>29</sup> States, however, retain authority over retail electric sales because “FERC’s jurisdiction over the sale of power has been specifically confined to the wholesale market.”<sup>30</sup> If states impose a rate in excess of avoided cost (the wholesale value of power in the market) by either “law or policy,” the “contracts will be considered to be void *ab initio*.”<sup>31</sup>

The Supreme Court in 1986, and again in 1988, 2003, and 2008, reaffirmed and enforced exclusive federal jurisdiction pursuant to the filed-rate doctrine when states attempted to assert jurisdiction inconsistent with FERC’s exclusive authority over wholesale rate determinations.<sup>32</sup> The precedent applied to FiTs was set forth in articles discussing these issues.<sup>33</sup> California in 2011 lost its case attempting to defend its state FiTs for renewable power.<sup>34</sup> The PJM region is comprised of all or parts of thirteen states and Washington, D.C.,<sup>35</sup> and recently, two separate constitutional challenges—in separate federal courts by regional generators of power in the mid-Atlantic states against New Jersey’s<sup>36</sup> and Maryland’s<sup>37</sup> in-state

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29. See *Entergy La., Inc.*, 539 U.S. at 47–49 (“FERC-mandated cost allocations could not be second-guessed by state regulators.”).

30. *New York v. FERC*, 535 U.S. 1, 20 (2002).

31. *Conn. Light & Power Co.*, 70 F.E.R.C. ¶ 61,012, ¶ 61,029–30 (1995); see also *Indep. Energy Producers Ass’n v. Cal. Pub. Utils. Comm’n*, 36 F.3d 848, 858–59 (9th Cir. 1994) (referring to the full amount of the avoided cost as the “statutory ceiling” for rate setting); *S. Cal. Edison Co.*, 70 F.E.R.C. ¶ 61,215, ¶ 61,675 (1995) (explaining that FERC intended to set a full avoided cost rate as the maximum permissible rate).

32. See *Morgan Stanley Capital Grp. Inc. v. Pub. Util. Dist. No. 1*, 554 U.S. 527, 531 (2008) (providing the statutory framework that stipulates FERC’s authority to review wholesale energy contracts); *Entergy La., Inc.*, 539 U.S. at 41, 49–50 (same); *Miss. Power & Light Co. v. Miss. ex rel. Moore*, 487 U.S. 354, 371–73 (1988) (“FERC has exclusive authority to determine the reasonableness of wholesale rates.”); *Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953, 963 (1986) (stating that the filed-rate doctrine limitations also apply “to decisions of state courts”).

33. See, e.g., Steven Ferrey et al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 DUKE ENVTL. L. & POL’Y F. 125 (2010) [hereinafter Ferrey et al., *Fire and Ice*] (describing the jurisdictional barrier that limits states’ ability to regulate the energy market through FiTs); Steven Ferrey et al., *FIT in the USA: Constitutional Questions About State-Mandated Renewable Tariffs*, PUB. UTIL. FORT., June 2010, at 60 [hereinafter Ferrey et al., *FIT in the USA*] (same); Steven Ferrey, *Follow the Money! Article I and Article VI Constitutional Barriers to Renewable Energy in the U.S. Future*, 17 VA. J.L. & TECH. 89 (2012) [hereinafter Ferrey, *Follow the Money!*] (same); Steven Ferrey, *Shaping American Power: Federal Preemption and Technological Change*, 11 VA. ENVTL. L.J. 47 (1991) (same).

34. *Cal. Pub. Utils. Comm’n*, 132 F.E.R.C. ¶ 61,047, ¶ 61,339 (2010).

35. *About PJM*, PJM, <http://www.pjm.com/about-pjm.aspx> (last visited Dec. 3, 2013).

36. See *PPL Energyplus, L.L.C. v. Hanna*, No. 11-745, 2013 WL 5603896, at \*1 (D.N.J. Oct. 11, 2013) (deciding the issue of whether the New Jersey program violated the Supremacy Clause).

wholesale power subsidies—were lost by each state, which resulted in change in FERC-approved regional PJM Independent System Operator procedures.<sup>38</sup>

In 2012, a federal court ruled that Vermont regulation of its wholesale power preferences and sales violated the U.S. Constitution.<sup>39</sup> Preemption of state jurisdiction to regulate wholesale power transactions, as well as dormant commerce clause violations resulting from state attempts to discriminate in the preference for in-state regulation of power moving in interstate commerce,<sup>40</sup> resulted in the federal court's finding of unconstitutionality<sup>41</sup>:

Under the Federal Power Act: "Congress has drawn a bright line between state and federal authority in the setting of wholesale rates and in the regulation of agreements that affect wholesale rates. States may not regulate in areas where FERC has properly exercised its jurisdiction to determine just and reasonable wholesale rates or to insure that agreements affecting wholesale rates are reasonable." . . . [A] state "must [. . .] give effect to Congress' desire to give FERC plenary authority over interstate wholesale rates, and to ensure that the States do not interfere with this authority." Under the "filed-rate doctrine," state courts and regulatory agencies are preempted by federal law from requiring the payment of rates other than the federal filed rate.<sup>42</sup>

When the Vermont suit was initiated in 2011, the State argued that Entergy, the challenger, should pay the State's, as well as its own, legal expenses of the litigation.<sup>43</sup> The opposite result

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37. See *PPL Energyplus, L.L.C. v. Nazarian*, No. MJG-12-1286, 2013 WL 5432346, at \*2 (D. Md. Sept. 30, 2013) (memorandum of decision) ("[T]he Court holds that Plaintiffs have established their claim that the [Maryland program] violates the Supremacy Clause of the United States Constitution by virtue of field preemption . . .").

38. PJM Interconnection, L.L.C., 135 F.E.R.C. ¶ 61,022, ¶ 61,087 (2011) (order accepting proposed tariff revisions).

39. *Entergy Nuclear Vt. Yankee, L.L.C. v. Shumlin*, 838 F. Supp. 2d 183, 242–43 (D. Vt. 2012), *aff'd in part, rev'd in part*, 733 F.3d 393 (2d Cir. 2013).

40. For treatment of the dormant commerce clause issues, see *infra* Subpart III.C.

41. *Entergy Nuclear Vt. Yankee, L.L.C.*, 838 F. Supp. 2d at 242–43.

42. *Id.* at 233 (second alteration in original) (citations omitted) (quoting *Miss. Power & Light Co. v. Miss. ex rel. Moore*, 487 U.S. 354, 374 (1988); *Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953, 966 (1986)) (citing 16 U.S.C. § 791a et seq.; *Entergy La., Inc. v. La. Pub. Serv. Comm'n*, 539 U.S. 39, 47 (2003) ("The filed rate doctrine requires 'that interstate power rates filed with FERC or fixed by FERC must be given binding effect by state utility commissions determining intrastate rates.'" (quoting *Nantahala*, 476 U.S. at 962))).

43. See Anne Galloway, *Shumlin Wants to "Bill Back" Legal Expenses in Entergy Suit to Entergy*, VTDIGGER (Apr. 30, 2011), <http://vtdigger.org/2011/04>

transpired, however: In implanting an unconstitutional action that the scholarship had cautioned against, and losing when challenged, the state was held responsible for reimbursing the challenger's legal fees, which were \$4.62 million at the trial court level and, with appeal, continued to mount.<sup>44</sup> FITs and state jurisdiction over wholesale power pricing are under legal attack and are unconstitutional when undertaken pursuant to state law or regulation.

### B. State Net Metering

Net metering started from a modest experiment in a Midwest state and grew to be the state renewable incentive used by more states than any other nationwide, actively implemented in more than 85% of the fifty U.S. states.<sup>45</sup> Net metering is more an accounting convention applied to trading power than it is a legal commodity sale according to case decisions, and it typically is applicable by state law and order to renewable sources of distributed power on the customer's side of the retail utility meter.<sup>46</sup> Each of the forty-three state net metering programs is distinct. There are differences as to allowable sizes of units, vintage and longevity of credits, ability to cash out credits, eligible classes of customers, and eligible technologies.<sup>47</sup>

When the customer purchases and uses electricity from the distribution company, the meter runs forward; when more electricity is produced from the facility than is consumed by the customer, the excess is sent to the electricity grid, running the meter in reverse

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/30/shumlin-wants-to-bill-back-legal-expenses-in-entergy-suit-to-entergy/ ("The Shumlin administration wants Entergy Corp. to pay for any legal expenses the state may incur as it defends itself against a lawsuit Entergy initiated against the state last week.").

44. See *Entergy Nuclear Vt. Yankee*, 838 F. Supp. 2d at 242–43 (ordering entry of judgment in favor of Entergy); Motion for Attorney's Fees, Expenses, and Costs, and for Leave to File Supplemental Evidence in Support of Motion at 4, *Entergy Nuclear Vt. Yankee*, 838 F. Supp. 2d 183 (No. 1:11-cv-99) (requesting \$4.62 million in attorney's fees).

45. See *Net Metering Map*, *supra* note 5 (displaying a map that labels the states that have adopted a net metering policy).

46. Steven Ferrey, *Virtual "Nets" and Law: Power Navigates the Supremacy Clause*, 24 GEO. INT'L ENVTL. L. REV. 267, 273 (2012); see also *Glossary, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY*, <http://www.dsireusa.org/glossary/> (last visited Dec. 3, 2013) (providing a definition of "net metering").

47. See *Rules, Regulations & Policies for Renewable Energy, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY*, <http://www.dsireusa.org/summarytables/rpre.cfm> (last visited Dec. 3, 2013) (allowing users to click on each state's net metering policy to view the specific rules and regulations of that policy).

direction and reversing the net accounting of power flow.<sup>48</sup> By turning the meter backwards, and because only a single rate applies to a single meter, net metering effectively compensates the generator at the full retail rate (which includes that approximately two-thirds of the retail bill is attributable to transmission, distribution, and taxes) for transferring just the wholesale energy commodity—the power itself.<sup>49</sup> Accounting for net metered power at the retail rate multiplies by several fold the effective value or revenue earned from the wholesale power transaction of supplying wholesale power to the utility.<sup>50</sup> So, what should the utility pay for power that it neither voluntarily solicits nor always has resalable use for? The majority of the forty-three net metering states compensate the generator for its excess generation at the federal “avoided cost” or the wholesale power sale rate. A few states compensate the wholesale distributed energy net metering customer for the excess power at the much higher, retail rate.<sup>51</sup> And this latter option causes legal issues.

Some of the states that allow net metering put a limit on the percentage of total power that can be net metered, to avoid the problem of net metering power back to the utility when the utility does not need the power.<sup>52</sup> Massachusetts has “virtual net metering” that is more far-reaching than the programs of other states,<sup>53</sup> wherein net metering credits can be transferred to other

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48. See *Glossary*, *supra* note 46 (“When a customer’s generation exceeds the customer’s use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time during the same billing cycle.”).

49. See *id.* (“In effect, the customer uses excess generation to offset electricity that the customer otherwise would have to purchase at the utility’s full retail rate.”). As to whether electricity is a “good” or a “service” and how it should be treated under the law, see STEVEN FERREY, *THE NEW RULES: A GUIDE TO ELECTRIC MARKET REGULATION* 211–31 (2000).

50. See *infra* Part VI & Table 4. The retail rate of NSTAR power was close to \$0.17/kWh in 2013 for retail residential customers, while the ISO-NE wholesale rate for that power was < \$0.05/kWh. See *generally* *Markets*, ISO—NEW ENG., <http://ISO-NE.com/markets/index.html> (last visited Dec. 3, 2013) (providing real-time market data on wholesale prices).

51. Ferrey, *supra* note 46.

52. See, e.g., Mary Powers, *Maryland Regulatory Staff Takes Side of Solar Producers on Net Metering Issues*, *ELECTRIC UTIL. WK.*, Aug. 16, 2010, at 24 (discussing Maryland Public Service Commission’s decision to limit the total power that is net metered, such that each customer may produce up to 125% of the amount of electricity that he or she uses).

53. See 220 MASS. CODE REGS. §§ 18.00–.09 (2013) (setting forth the Massachusetts net metering scheme); Ferrey, *supra* note 46, at 271 (labeling the Massachusetts scheme “virtual” net metering). Massachusetts net metering was originally created by order of the Massachusetts Department of Public Utilities in 1982. *Massachusetts Net-Metering Rules*, U.S. EPA, <http://www.epa.gov/chp/policies/policies/mamassachusettsnetmeteringrules.htm> (last visited Nov. 8, 2013).

unrelated customers in the utility service territory.<sup>54</sup> Net metering subsidizes designated renewable on-site generation by allowing it to utilize the utility distribution system to store electric energy without paying any pro rata per kilowatt-hour cost for this distribution and energy banking or storage service.<sup>55</sup> This power can be reclaimed at any time by the original producer through credits for the amount net metered, again without paying any share of the costs of the distribution system that redelivers the credited quantity of net metered power.<sup>56</sup> This loss of distribution revenue to the utility is recovered through increased rates to other customers to cover the fixed costs of utility system operation and two-way power flows and use.<sup>57</sup>

The literature addresses how to enact net metering without legal controversy.<sup>58</sup> In 2001, FERC held in the *MidAmerican Energy Co.*<sup>59</sup> case that state net metering decisions were not preempted by Federal law and no sale occurs when net metering accounts for less power export from the generator than the amount of power sold to the distributed generator.<sup>60</sup> In the 2009 *Sun Edison L.L.C.*<sup>61</sup> case, FERC determined that the Commission lacked jurisdiction over the generator if there was no net sale of power to the utility over the billing period.<sup>62</sup> There was no net sale unless the customer delivered back to the utility more electricity than the backup power he or she purchased from the utility within an extended billing

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54. 220 MASS. CODE REGS. § 18.05(1); Ferrey, *supra* note 46, at 295.

55. Ferrey, *supra* note 46, at 271, 273.

56. *Id.* at 271 (“Basic net metering . . . [allows the original producer to] restock[] that same gross quantity of power later to the generator at no cost.”).

57. Tom Tiernan, *Attention to Good Standby Rates Seen Key as Distributed Generation Plays Bigger Role*, ELECTRIC UTIL. WK., Dec. 31, 2012, at 10, 10.

58. See, e.g., Steven Ferrey, *Efficiency in the Regulatory Crucible: Navigating 21st Century “Smart” Technology and Power*, 3 GEO. WASH. J. ENERGY & ENVTL. L. 1 (2012) [hereinafter Ferrey, *Efficiency in the Regulatory Crucible*] (discussing the development of renewable power and the appropriate measures to resolve the related policy challenges and legal barriers); Steven Ferrey, *Net Zero: Distributed Generation and FERC’s MidAmerican Decision*, ELECTRICITY J., Oct. 2004, at 33 (analyzing the policy implications of a FERC decision regarding net metering); Ferrey, *supra* note 46 (comparing state net metering policies against the parameters of constitutional law).

59. *MidAmerican Energy Co.*, 94 F.E.R.C. ¶ 61,340 (2001).

60. *Id.* ¶¶ 62,261, 62,263. In March 2001, MidAmerican Energy Company challenged before FERC the state of Iowa’s regulations directing MidAmerican to interconnect with three “[a]lternate [e]nergy facilities and to offer net billing arrangements to those facilities.” *Id.* ¶ 62,261. MidAmerican also requested a declaratory order that federal law preempted these regulations. *Id.* MidAmerican asked the commission to undertake enforcement action against the Iowa Board or to issue a declaratory order that the final orders of the Iowa Board are preempted by PURPA. *Id.*

61. *Sun Edison L.L.C.*, 129 F.E.R.C. ¶ 61,146 (2009).

62. *Id.* ¶ 61,620.

period.<sup>63</sup> While neither the *MidAmerican* nor the *Sun Edison* case presented such facts of a net power flow to the utility from the net metered generator, and FERC did not decide such issues, both decisions meticulously and exhaustively limited the legal finding only to fact situations where there was no net flow of power back to the power grid.

In Rhode Island, there was a challenge to net metering involving the wind generator at the Portsmouth High School, which is directly interconnected to the distribution grid rather than first serving a substantial host load at the high school—thus having virtually 100% of net power produced flow back to the grid.<sup>64</sup> The challenge alleged that as an independent wholesale project, the wholesale generator can be paid no more than the avoided cost afforded to qualifying facilities under the Public Utility Regulatory Policies Act ("PURPA")<sup>65</sup> rather than being paid under the net metered calculation, which is approximately 300% of avoided cost.<sup>66</sup> The Rhode Island Division of Public Utilities and Carriers Advocacy Unit supported this complaint against the utility's policy.<sup>67</sup> After the suit was initiated, the state changed the definitions in its state net metering law to allow the school to allocate its net metering credits to several municipal accounts.<sup>68</sup> This change did not end the legal challenge; relief was sought at FERC by plaintiff Riggs, and FERC declined on procedural grounds to render a decision.<sup>69</sup>

In an ongoing case not involving net metering per se but contesting whether a state can regulate wholesale power transactions from independent generators to utilities, Vermont recently lost its attempted defense of state power to regulate

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63. *Id.*

64. *In re Complaint by Benjamin Riggs Relating to Net Metering at the Town of Portsmouth Wind Generator Facility and National Grid—Electric*, No. D-10-126 (R.I. Div. Pub. Util. & Carriers Oct. 13, 2011) [hereinafter *Portsmouth Net Metering*], available at [http://www.ripuc.org/eventsactions/docket/D-10-126-Riggs-Portsmouth-Ord20510\(10-13-11\).pdf](http://www.ripuc.org/eventsactions/docket/D-10-126-Riggs-Portsmouth-Ord20510(10-13-11).pdf) (report and order).

65. See 16 U.S.C. § 824a-3(e) (2012) (explaining that Qualifying Facilities are exempt from certain costs).

66. Memorandum from Benjamin C. Riggs, Jr. Objecting to and Commenting on National Grid's Tariff Advice Filing to Luly E. Massaro, Comm'n Clerk, R.I. Pub. Util. Comm'n (Aug. 2, 2011) [hereinafter *Riggs Memorandum*], available at [http://www.ripuc.org/eventsactions/docket/4268-PublicComments-Riggs\(8-2-11\).pdf](http://www.ripuc.org/eventsactions/docket/4268-PublicComments-Riggs(8-2-11).pdf).

67. *Portsmouth Net Metering*, *supra* note 64, at 19–20.

68. *Riggs Memorandum*, *supra* note 66, at 1–2.

69. Benjamin Riggs, 138 F.E.R.C. ¶ 61,172, ¶ 61,172 (Mar. 15, 2012) (notice of intent not to act), available at <http://www.ferc.gov/whats-new/comm-meet/2012/031512/E-14.pdf> (stating that FERC declined to initiate an enforcement action under section 210(h)(2)(A) of PURPA).

wholesale power sale transactions or terms,<sup>70</sup> although this particular claim awaits ripeness in order to ground injunctive relief.<sup>71</sup> Subsequently, in Vermont, there was a recent challenge at FERC to Vermont's SPEED net metering program<sup>72</sup> and standard offer program, although the challenger had applied for Qualifying Facility status only one day before the complaint.<sup>73</sup> FERC procedurally chose not to exercise discretion to take jurisdiction over this request for enforcement.<sup>74</sup>

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70. *Entergy Nuclear Vt. Yankee, L.L.C. v. Shumlin*, 838 F. Supp. 2d 183, 239 (D. Vt. 2012), *aff'd in part, rev'd in part on other grounds*, 733 F.3d 393 (2d Cir. 2013). Under the Federal Power Act, 16 U.S.C. § 791a *et seq.*,

Congress has drawn a bright line between state and federal authority in the setting of wholesale rates and in the regulation of agreements that affect wholesale rates. States may not regulate in areas where FERC has properly exercised its jurisdiction to determine just and reasonable wholesale rates or to insure that agreements affecting wholesale rates are reasonable.

*Miss. Power & Light Co. v. Miss. ex rel. Moore*, 487 U.S. 354, 374 (1988). "A State must . . . give effect to Congress' desire to give FERC plenary authority over interstate wholesale rates, and to ensure that the States do not interfere with this authority." *Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953, 966 (1986). Under the filed-rate doctrine, state courts and regulatory agencies are preempted by federal law from requiring the payment of rates other than the federal filed rate. See *Entergy La., Inc. v. La. Pub. Serv. Comm'n*, 539 U.S. 39, 47 (2003) ("The filed rate doctrine requires 'that interstate power rates filed with FERC or fixed by FERC must be given binding effect by state utility commissions determining intrastate rates.'" (quoting *Nantahala*, 476 U.S. at 962)).

71. Under the Supremacy Clause, the filed-rate doctrine, and the Federal Power Act,

[t]he [trial] court then held that even if Entergy were to be forced to enter into a new PPA [power purchase agreement] in violation of the market-based tariff, its recourse would be to have the agreement reviewed by FERC. However, the court concluded that "it is not clear what preemptive effect the [Federal Power Act] has to prevent [Vermont] from refusing to consider continued operation without such an agreement," as there would be no such agreement to review. The court thus declined to enjoin the defendants on the basis of Entergy's Federal Power Act claim,

and both the trial and circuit courts agreed that this issue was not yet ripe for review since FERC review had not yet occurred prior to court action. *Entergy Nuclear Vt. Yankee*, 733 F.3d at 407 (citations omitted).

72. Vermont Energy Act of 2009, 2009 Vt. Acts & Resolves 324–25 (codified at VT. STAT. ANN. tit. 30, § 8005(b) (2008)), *amended by* Vermont Energy Act of 2012, 2012 Vt. Acts & Resolves 727 (codified at VT. STAT. ANN. tit. 30, §§ 8005a, 8006a (Supp. 2013)) (allowing eligible projects of 2.2 MW or less to participate in the FIT).

73. Vermont Department of Public Service Protest and Motion to Dismiss at 9, *Otter Creek Solar L.L.C.*, 143 F.E.R.C. ¶ 61,282 (2013).

74. *Otter Creek Solar*, 143 F.E.R.C. ¶ 61,282 (refusing to exercise jurisdiction to initiate a case to construe the legality of the Vermont Energy Act of 2009, VT. STAT. ANN. tit. 30, § 8005(b)); see also *North Hartland, L.L.C.*, 105 F.E.R.C. ¶ 61,036 (2003) (dismissing without prejudice a request for a

### C. State Renewable Portfolio Standards

Renewable Portfolio Standards ("RPSs") require electric utilities and other retail electric providers to include in their annual retail sales a specified percentage of electricity supply from renewable energy sources in the form of acquired Renewable Energy Credits ("RECs").<sup>75</sup> Twenty-nine states and the District of Columbia have RPSs.<sup>76</sup> The required state percentage of energy delivered to consumers from eligible renewable sources currently varies from 2% to 40% of annual retail sales in different state programs.<sup>77</sup> The RPS programs in the states are very different in terms of what technologies qualify. Most states allow solar, wind, biomass, and landfill gas resources to qualify in RPS programs; states are less consistent regarding the eligibility of other resources, such as biogas, municipal solid waste, geothermal energy, all hydro resources, fuel cells, and ocean-tidal renewable resources.<sup>78</sup> Many RPS programs target only new renewable projects in lieu of older projects.<sup>79</sup> RPS programs have been characterized as a form of backdoor renewable subsidies.<sup>80</sup>

Solar-specific RPS requirements in eleven states and Washington, D.C. include solar or distributed generation set-asides for a percentage of eligible projects.<sup>81</sup> The cost of acquiring the required RECs is passed on to captive retail power consumers.<sup>82</sup>

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declaratory order); *Barnet Hydro Co.*, 95 F.E.R.C. ¶ 61,257 (2001) (dismissing a complaint requesting FERC's interpretation of a previously issued order).

75. *Renewable Portfolio Standards*, U.S. ENVTL. PROTECTION AGENCY, <http://www.epa.gov/agstar/tools/funding/renewable.html> (last updated Sept. 27, 2012); *Most States Have Renewable Portfolio Standards*, U.S. ENERGY INFO. ADMIN. (Feb. 3, 2012), <http://www.eia.gov/todayinenergy/detail.cfm?id=4850>.

76. See *Renewable Portfolio Standard Policies: March 2013*, *supra* note 6.

77. See *Indiana: Incentives/Policies for Renewable Energy*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/incentives/incentive.cfm?Incentive\\_Code=IN12R&re=1&ee=0](http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=IN12R&re=1&ee=0) (last visited Dec. 10, 2013) (showing 4% as Indiana's required state percentage of energy delivered to consumers from eligible renewable sources); *Hawaii Incentives/Policies for Renewable Energy*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/incentives/incentive.cfm?Incentive\\_Code=HI06R&re=1&ee=0](http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=HI06R&re=1&ee=0) (last visited Dec. 10, 2013) (showing 40% as Hawaii's required state percentage of energy delivered to consumers from eligible renewable sources).

78. Ferrey et al., *Fire and Ice*, *supra* note 33, at 146–47.

79. See Steven Ferrey, *Threading the Constitutional Needle with Care: The Commerce Clause Threat to the New Infrastructure of Renewable Power*, 7 TEX. J. OIL GAS & ENERGY L. 59, 64–66 (2012) (noting that resource eligibility in state RPS programs has expanded beyond traditional renewables).

80. Robert Glennon & Andrew M. Reeves, *Solar Energy's Cloudy Future*, 1 ARIZ. J. ENVTL. LAW & POL'Y 91, 106 (2010).

81. RYAN WISER & GALEN BARBOSE, RENEWABLE PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007, at 16–20 (2008), available at <http://eetd.lbl.gov/sites/all/files/publications/report-lbnl-154e-revised.pdf>.

82. See Glennon & Reeves, *supra* note 80, at 108.

The California Public Utility Commission (“PUC”) Division of Ratepayer Advocates criticized the rapid escalation in California ratepayer costs to achieve the RPS mandate.<sup>83</sup> The cost of RPS compliance exceeded the cost of the power itself.<sup>84</sup>

The so-called constitutional dormant commerce clause prohibits actions that are facially discriminatory against interstate commerce.<sup>85</sup> A regulation that “evinces” discriminatory purpose against interstate commerce “or unambiguously discriminates in its effect . . . almost always is ‘invalid per se.’”<sup>86</sup> A facially neutral statute that imposes an incidental “burden on interstate commerce incommensurate with the local benefits secured”<sup>87</sup> would fail the balancing test articulated by the Supreme Court in *Pike v. Bruce Church, Inc.*<sup>88</sup> Discrimination against commerce itself occurs when a statute or regulation

- i. shifts the costs of regulation onto other states, permitting in-state lawmakers to avoid the costs of their political decisions,
- ii. has the practical effect of requiring out-of-state commerce to be conducted at the regulating state’s direction, or
- iii. alters the interstate flow of the goods in question, as distinct from the impact on companies trading in those goods.<sup>89</sup>

The scope of commerce among the states for purposes of a dormant commerce clause analysis is broadly defined,<sup>90</sup> and all objects of interstate trade merit Commerce Clause protection, which

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83. Geoffrey Craig, *Renewable Costs of California’s Three Big Utilities Soared Last Year, CPUC Data Shows*, ELECTRIC UTIL. WK., Feb. 13, 2012, at 18.

84. *Id.*

85. *Dep’t of Revenue v. Davis*, 553 U.S. 328, 338 (2008) (quoting *Or. Waste Sys., Inc. v. Dep’t of Env’tl. Quality*, 511 U.S. 93, 99 (1994)).

86. *Brown & Williamson Tobacco Corp. v. Pataki*, 320 F.3d 200, 209 (2d Cir. 2003) (quoting *Nat’l Elec. Mfrs. Ass’n v. Sorrell*, 272 F.3d 104, 108 (2d Cir. 2001)).

87. *Sorrell*, 272 F.3d at 108 (citing *Pike v. Bruce Church, Inc.*, 397 U.S. 137, 142 (1970)).

88. 397 U.S. at 142.

89. *Entergy Nuclear Vt. Yankee, L.L.C. v. Shumlin*, 733 F.3d 393, 431 n.37 (2d Cir. 2013) (quoting *Am. Booksellers Found. v. Dean*, 342 F.3d 96, 102 (2d Cir. 2003) (internal quotation marks omitted)).

90. *See City of Philadelphia v. New Jersey*, 437 U.S. 617, 626–27 (1978) (holding that a state cannot discriminate against articles of commerce originating in other states unless there is a “reason, apart from their origin, to treat them differently”).

includes the transmission of electric energy in interstate commerce<sup>91</sup>:

[I]t is difficult to conceive of a more basic element of interstate commerce than electric energy, a product used in virtually every home and every commercial or manufacturing facility. No State relies solely on its own resources in this respect.<sup>92</sup>

State statutes found to facially discriminate against out-of-state commerce interests based on geography or favoring local interests are found to be per se invalid.<sup>93</sup> Laws that attempt to regulate the conduct of out-of-state businesses also violate the Commerce Clause.<sup>94</sup> These laws can assume the form of added taxes and charges on out-of-state goods.<sup>95</sup> State and local laws are deemed unconstitutional under the dormant commerce clause when a law differentiates between in-state and out-of-state economic interests in a manner that "benefits the former and burdens the latter."<sup>96</sup> The Supreme Court held that statutes that establish regional barriers (not necessarily just one-state isolation) and discriminate only against some states rather than all states violate the Commerce Clause.<sup>97</sup>

There are a number of the twenty-nine states with RPSs that have incorporated credit multipliers, geographic restrictions, or preferences to promote in-state/in-region generation of power, to the exclusion of external power, in the following percentages:

- Eight of the twenty-nine RPS states, or 27%, have REC multipliers for in-state generation: Arizona,<sup>98</sup>

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91. See *New York v. FERC*, 535 U.S. 1, 16 (2002) ("[T]ransmissions on the interconnected national grids constitute transmissions in interstate commerce.").

92. *FERC v. Mississippi*, 456 U.S. 742, 757 (1982).

93. See *City of Philadelphia*, 437 U.S. at 624 (noting that if a statute is facially discriminatory, it is virtually per se invalid); see also *Gen. Motors Corp. v. Tracy*, 519 U.S. 278, 297–98 (1997); Patrick Jacobi, *Renewable Portfolio Standard Generator Applicability Requirements: How States Can Stop Worrying and Learn to Love the Dormant Commerce Clause*, 30 VT. L. REV. 1079, 1101 (2006) (proposing that a court will likely strike down as unconstitutional any regulation that discriminates geographically or through point of origin); Trevor D. Stiles, *Renewable Resources and the Dormant Commerce Clause*, 4 ENVTL. & ENERGY L. & POL'Y J. 34, 60–61 (2009).

94. See *Healy v. Beer Inst.*, 491 U.S. 324, 335–37 (1989) (striking the requirement that the price of beer not be higher than that charged out of state).

95. See *Chem. Waste Mgmt. Inc. v. Hunt*, 504 U.S. 334, 341–42 (1992) (invalidating an Alabama law imposing an extra fee on imported hazardous waste).

96. *Or. Waste Sys., Inc. v. Dep't of Env'tl. Quality*, 511 U.S. 93, 99 (1994).

97. See *Hunt*, 504 U.S. at 339–40.

98. ARIZ. ADMIN. CODE §§ R14-2-1806(D)–(E) (2009).

Colorado,<sup>99</sup> Delaware,<sup>100</sup> Maine,<sup>101</sup> Michigan,<sup>102</sup> Missouri,<sup>103</sup> Nevada,<sup>104</sup> and Washington.<sup>105</sup>

- Four of the RPS states, or 14%, including two states that also provide for a geographically discriminatory REC multiplier, have either a requirement or preference for in-state generation: California,<sup>106</sup> Colorado,<sup>107</sup> North Carolina,<sup>108</sup> and Ohio.<sup>109</sup>
- Four of the twenty-nine RPS states, or 14%, give program preferences to the use of in-state manufactured products or in-state labor forces: Arizona,<sup>110</sup> Delaware,<sup>111</sup> Michigan,<sup>112</sup> and Montana.<sup>113</sup>
- Eleven of the twenty-nine RPS states, representing 38% of RPS states, have a requirement for in-region, rather than in-state, geographic location of generation to create RECs, including one of the states that also has in-state multipliers and one with an in-state preference: Connecticut,<sup>114</sup> Illinois,<sup>115</sup> Maine,<sup>116</sup> Maryland,<sup>117</sup> Massachusetts,<sup>118</sup> New Hampshire,<sup>119</sup> North Carolina, Ohio,<sup>120</sup> Oregon,<sup>121</sup> Pennsylvania,<sup>122</sup> and Rhode Island.<sup>123</sup>

99. COLO. REV. STAT. §§ 40-2-124(c)(V)(A)–(D), (c)(IX), (d) (2013).

100. DEL. CODE ANN. tit. 26, §§ 356(a)(1), (d)–(e) (2012).

101. ME. REV. STAT. tit. 35-A, § 3605 (2010).

102. MICH. COMP. LAWS SERV. § 460.1039(1) (LexisNexis 2010).

103. MO. ANN. STAT. § 393.1030(1) (West 2013).

104. NEV. REV. STAT. ANN. § 704.7822 (LexisNexis 2011).

105. WASH. ADMIN. CODE §§ 194-37-110(1)(c)(i)–(iii) (2008).

106. *California Incentives/Policies for Renewables Efficiency*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/incentives/incentive.cfm?Incentive\\_Code=CA25R&re=1&ee=1](http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA25R&re=1&ee=1) (last updated Oct. 30, 2013) (explaining that a maximum of 25% of RPS compliance can be achieved through the use of tradable renewable energy credits; therefore, the remainder of the RPS compliance must be attained through in-state power sales).

107. COLO. REV. STAT. §§ 40-2-124(e)(II)–(III) (2013).

108. N.C. GEN. STAT. ANN. § 62-133.8(b)(2)(e) (West 2012).

109. OHIO REV. CODE ANN. § 4928.64(B)(3) (LexisNexis 2012).

110. ARIZ. ADMIN. CODE §§ R14-2-1806(D)–(E) (2007).

111. DEL. CODE ANN. tit. 26, §§ 351(b)–(c) (2009).

112. MICH. COMP. LAWS SERV. §§ 460.1001(2)(a)–(d) (LexisNexis 2010).

113. MONT. CODE ANN. § 69-3-2005(3)(a) (2013).

114. CONN. GEN. STAT. ANN. § 16-245a(b) (West 2013).

115. 20 ILL. COMP. STAT. ANN. 3855/1-56(b) (West 2013).

116. 65-407-311 ME. CODE R. § 6 (LexisNexis 2011).

117. MD. CODE REGS. 20.61.03(D) (2011).

118. MASS. ANN. LAWS ch. 25A, § 11F(a) (LexisNexis 2013).

119. N.H. REV. STAT. ANN. § 362-F:6(I) (LexisNexis 2011).

120. OHIO REV. CODE ANN. § 4928.64(C)(5) (LexisNexis 2012).

121. OR. REV. STAT. § 469A.135(1)(a), (2) (2011).

122. 73 PA. STAT. ANN. § 1648.4 (West 2008).

123. R.I. GEN. LAWS § 39-26-4(d) (2012).

- Eleven of the twenty-nine states, or 38%, have an in-state requirement for certain distributed power.<sup>124</sup>
- Four of the twenty-nine states, or 14%, have a benefit for an in-state capital component or labor.<sup>125</sup>
- Some states have multiple multipliers and preferences.<sup>126</sup>
- Only seven of the twenty-nine states, or 24%, have no geographic preferences in their laws.<sup>127</sup>

Although states were cautioned regarding how to best design compliant RPS programs,<sup>128</sup> states proceeded as they chose. There has been litigation in major states, including New Jersey, Maryland, Colorado, Missouri, Massachusetts, California, Vermont, and elsewhere, contesting dormant commerce clause violations involved with state energy/electric power regulation<sup>129</sup>:

124. Ferrey, *supra* note 79, at 75–77.

125. Steven Ferrey, *Alternative Energy in a Spaghetti Western: Clint Eastwood Confronts State Renewable Energy Policy*, 32 UTAH ENVTL. L. REV. 279, 292 (2012) (listing Arizona, Delaware, Michigan, and Montana as having this in-state benefit).

126. *Id.* at 291–92.

127. *Id.* at 292.

128. See generally Ferrey, *supra* note 79; Steven Ferrey, *Constitutional Barriers Confronting State Renewable Energy Programs*, A.B.A. ENERGY COMM. NEWSL., June 2006, at 3 [hereinafter Ferrey, *Constitutional Barriers*]; Ferrey, *Efficiency in the Regulatory Crucible*, *supra* note 58; Ferrey, *Follow the Money!*, *supra* note 33; Steven Ferrey, *Renewable Orphans: Adopting Legal Renewable Standards at the State Level*, 19 ELECTRICITY J. 52, 52–53 (2006) [hereinafter Ferrey, *Renewable Orphans*]; Steven Ferrey, *Renewable Subsidies in the Age of Deregulation*, PUB. UTIL. FORT., Dec. 1997, at 22; Steven Ferrey, *Sustainable Energy, Environmental Policy, and States' Rights: Discerning the Energy Future Through the Eye of the Dormant Commerce Clause*, 12 N.Y.U. ENVTL. L.J. 507 (2004).

129. For an article concluding that the Maryland RPS program and others that similarly facially discriminate against interstate commerce are likely unconstitutional in violation of the dormant commerce clause, see Anne Havemann, Comment, *Surviving the Commerce Clause: How Maryland Can Square Its Renewable Energy Laws with the Federal Constitution*, 71 MD. L. REV. 848, 851 (2012). Rader and Hempling argued that courts will not apply strict scrutiny to an RPS that bases eligibility on a generator's ability to produce benefits for a state rather than the geographic origin of the electricity. NANCY RADER & SCOTT HEMPLING, *THE RENEWABLES PORTFOLIO STANDARD: A PRACTICAL GUIDE A-3-A-4* (2001). Recent court decisions, however, do not support that argument: stating a basis in the statute other than what a court determines to be the actual purpose or effect of a statute does not allow a state to avoid facial discrimination, strict scrutiny, or a finding of a violation of the dormant commerce clause. See *Gade v. Nat'l Solid Wastes Mgmt. Ass'n*, 505 U.S. 88, 105 (1992) ("In assessing the impact of a state law on the federal scheme, we have refused to rely solely on the legislature's professed purpose and have looked as well to the effects of the law."); *Entergy Nuclear Vermont, L.L.C. v. Shumlin*, 733 F.3d 393, 393 (2d Cir. 2013); *Norris v. Lumbermen's Mut. Cas. Co.*, 881 F.2d 1144, 1150 (1st Cir. 1989).

- A successful constitutional challenge by conventional power generators to New Jersey's in-state energy facility preferences<sup>130</sup>
- A successful constitutional challenge by conventional power generators to Maryland's in-state energy facility preferences<sup>131</sup>
- A suit involving renewable power RPS RECs in Colorado<sup>132</sup>
- A suit on Missouri RPS RECs limited only to in-state projects<sup>133</sup>

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130. See PPL Energyplus, L.L.C. v. Hanna, No. 11-745, 2013 WL 5603896, at \*1 (D.N.J. Oct. 11, 2013) (finding the New Jersey regulation a violation of the Constitution's Supremacy Clause); PJM Interconnection, L.L.C., 135 F.E.R.C. ¶ 61,022, ¶ 61,022 (2011). In 2011, New Jersey enacted legislation to encourage the acquisition by utilities of the output of 2000 MW of new in-state power projects. Mary Powers, *PJM Generators File Complaint with FERC Seeking Relief from NJ In-State Generation Law*, ELECTRIC UTIL. WK., Feb. 7, 2011, at 11. New Jersey faced a pending lawsuit by several existing independent power generators asserting that the state law was in violation of the Constitution's Commerce Clause—because it was predicated on in-state “favoritism” and was a “blatant and explicit effort to promote the construction of new generation facilities in New Jersey”—and alleging discrimination in the statute's ordering utilities to sign long-term contracts only with in-state generation facilities participating in multistate PJM ISO capacity. Hannah Northey, *Utilities Challenge N.J. Law While Preparing to Reap Its Benefits*, ENVTL. & ENERGY PUB. (Mar. 2, 2011), <http://www.eenews.net/public/Greenwire/2011/03/02/4>; Powers, *supra*, at 11, 13. In response, in 2011, FERC amended the PJM ISO rules to prevent New Jersey state law from attempting to encourage construction of in-state power generation by, in part, causing New Jersey to bid power into the PJM system at suppressed prices in order to win capacity right auctions. Mary Powers, *Rebuffed by FERC Ruling, New Jersey BPU Plans to Look Again at How to Attract New Generation*, ELECTRIC UTIL. WK., May 23, 2011, at 4, 6 (noting that FERC, on April 12, 2011, eliminated a PJM rule that allowed a prior exemption for projects to make minimum offer prices when tempered by state energy programs).

131. See PPL Energyplus, L.L.C. v. Nazarian, No. MJG-12-1286, 2013 WL 5432346, at \*2 (D. Md. Sept. 30, 2013) (memorandum of decision) (finding the Maryland regulation a violation of the Constitution's Supremacy Clause).

132. Complaint for Injunctive & Declaratory Relief, Am. Tradition Inst. v. Colorado, 876 F. Supp. 2d 1222 (D. Colo. 2012) (No. 1:11-cv-00859-WJM-BNB), available at <http://www.americantradition.org/wp-content/uploads/2011/04/ATI-RPS-Complaint-ATI-v-Colorado.pdf>. The American Tradition Institute (“ATI”), through its Environmental Law Center, filed a lawsuit in federal court challenging the constitutionality of Colorado's renewable energy standard, based upon evidence that the state's law violates the Commerce Clause. *Id.* at 1–2. ATI's complaint argued that because the state mandate provides economic benefits to Colorado's renewable electricity generators that are not available to out-of-state power generators, the program violates the dormant commerce clause. *Id.* at 2.

133. *State ex rel. Mo. Energy Dev. Ass'n. v. Pub. Serv. Comm'n*, Nos. 10AC-CC00512, 10AC-CC00511, 10AC-CC00513, 10AC-CC00528, 10AC-CC00536 (Cole Cnty. Mo. June 29, 2011), *rev'd*, 386 S.W.3d 165 (Mo. Ct. App. 2012). The

- TransCanada's suit against Massachusetts over discrimination against out-of-state energy projects for RPS RECs and renewable energy contracts, which was partially settled in favor of the challengers<sup>134</sup>
- California's attempt to differentiate regulation of out-of-state energy products based on the distance they must travel and the greater carbon intensity of electricity produced in the Midwest to produce renewable energy fuel<sup>135</sup> (separate from California setting in-state wholesale tariffs)<sup>136</sup>

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state trial court in 2011 ruled that the Missouri RPS program was illegal because it required RECs to be generated by in-state projects or projects that delivered the power to in-state customers. *Id.* at 13–14. The court held that the RPS program “takes the cash property of utilities (and their ratepayers) and transfers it to certain customers” without due process. *Id.* at 14. The decision was reversed on appeal and is now subject to further appeal. See *State ex rel. Mo. Energy Dev. Ass'n*, 386 S.W.3d at 165.

134. Complaint at 1, *TransCanada Power Mktg. Ltd. v. Bowles*, No. 4:10-cv-40070-FDS (D. Mass. Apr. 16, 2010). In April 2010, Massachusetts was sued by TransCanada alleging dormant commerce clause violations regarding requirements that state utilities enter long-term contracts with in-state new renewable energy projects and that solar renewable energy credits be earned only by in-state solar photovoltaic power projects, regardless of where the power generation creating the RECs was sold. *Id.* TransCanada alleged that Massachusetts ratepayers would be negatively impacted because they would be forced to pay higher rates for only in-state renewable energy. *Id.* at 8. Massachusetts quickly settled the suit and fundamentally changed its regulations. See Partial Settlement Agreement at 1–4, *TransCanada Power Mktg. Ltd.*, No. 4:10-cv-40070-FDS, available at <http://www.mass.gov/eea/docs/doer/renewables/solar/settlement-agreement.pdf>.

135. *Rocky Mountain Farmers Union v. Goldstene*, 843 F. Supp. 2d 1071, 1080–81 (E.D. Cal. 2011), *rev'd sub nom.* *Rocky Mountain Farmers Union v. Corey*, 730 F.3d 1070 (9th Cir. 2013). The trial court reiterated that only the federal government can regulate commerce between the states, and California, attempting to regulate commerce outside its borders, violated exclusive federal authority to regulate interstate commerce. *Id.* at 1088–90. California gave less value to the identical energy fuel, ethanol, when produced in the Midwest, because of the latter region's use of coal-fired power for electricity to produce ethanol and other products and the longer transportation distance for trucks to transport ethanol from there to California. *Id.* While such discrimination did reflect the total embedded energy emissions and transportation costs of different means to produce the energy products and to move them to market from geographically distant production sources, the court held that states cannot elect to discriminate against more-distant out-of-state products. *Id.* The trial court again distinguished motive from constitutional requirements: “Although [the State's] goal to combat global warming may be ‘legitimate,’ . . . it cannot ‘be achieved by the illegitimate means of isolating the State from the national economy.’” *Id.* at 1088–89 (quoting *City of Philadelphia v. New Jersey*, 437 U.S. 617, 626–27 (1978)). As noted by the Supreme Court, “[w]hile a State may seek lower prices for its consumers, it may not insist that producers or consumers in other States surrender whatever competitive advantages they may possess.” *Brown-Forman Distillers Corp. v. N.Y. State Liquor Auth.*, 476 U.S. 573, 580 (1986); see also *Baldwin v. G.A.F. Seelig, Inc.*, 294 U.S. 511, 521

- Vermont's attempt to discriminate against the sale of cheaper interstate power that could be sold otherwise outside of its origin in Vermont<sup>137</sup>

A note about the *TransCanada Power Marketing Ltd. v. Bowles*<sup>138</sup> litigation—TransCanada filed suit challenging Massachusetts for violating the dormant commerce clause in two respects.<sup>139</sup> First, that the Massachusetts legislation was facially discriminatory regarding out-of-state energy commerce for long-term contracts.<sup>140</sup> TransCanada made a similar argument highlighting a violation of the dormant commerce clause with respect to section 32 of the Green Communities Act<sup>141</sup>; because the “Solar Carve-Out” required utilities to purchase a certain amount of solar renewable energy credits from Massachusetts-based producers, the law discriminated against producers from other states.<sup>142</sup> The plaintiff's complaint asserted that Massachusetts ratepayers would be impacted negatively by the legislation because they might be forced to pay higher rates than if all out-of-state renewable energy providers were allowed to submit bids for the contracts.<sup>143</sup> The

(1935) (holding that one state “has no power to project its legislation into [another state] by regulating the price to be paid in that state for [products] acquired there”).

136. Cal. Pub. Utils. Comm'n, 132 F.E.R.C. ¶ 61,047, ¶ 61,047 (2010).

137. *Entergy Nuclear Vt. Yankee, L.L.C. v. Shumlin*, 838 F. Supp. 2d 183, 236 (D. Vt. 2012) (reasoning that “states are ‘without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the State’” and holding that the State’s regulation in question was a “protectionist regulation’ violating the Commerce Clause” (quoting *New Eng. Power Co. v. New Hampshire*, 455 U.S. 331, 338–39 (1982))), *aff’d in part, rev’d in part*, 733 F.3d 393 (2d Cir. 2013). The trial court found the regulation unconstitutional and issued an injunction “enjoin[ing] Defendants from conditioning Vermont Yankee’s continued operation on the existence of a below-market PPA with Vermont utilities.” *Id.* at 239. The Second Circuit did not disagree with the substantive decision on the dormant commerce clause but procedurally held that this issue was not yet ripe for review until plaintiffs actually entered into such a forced PPA with the State. *Entergy Nuclear Vt. Yankee*, 733 F.3d at 433–34.

138. *TransCanada Power Mktg. Ltd.*, No. 4:10-cv-40070-FDS.

139. Complaint, *supra* note 134. TransCanada challenged the constitutionality of allowing only in-state renewable energy companies to be able to bid for long-term contracts to supply utilities with the necessary amount of renewable energy, under section 83 of the Green Communities Act. *Id.* at 6. TransCanada’s interest was with its investment in a Maine wind project at Kibby Mountain, which had 132 MW capacity, at a cost of \$300 million in capital. *Id.* at 5 (noting the cost and location of the Kibby Wind Power Project); see also *Kibby Wind Power Project*, TRANSCANADA, <http://www.transcanada.com/kibby.html> (last updated Feb. 2, 2011) (discussing the 132 MW capacity).

140. Complaint, *supra* note 134, at 5–6.

141. *Id.* at 11–12, 22.

142. *Id.* at 12.

143. *Id.* at 8.

result of the *TransCanada* litigation was a partial change to the challenged regulations.<sup>144</sup>

The latest and highest federal court statement regarding in-state favoritism on state RPS programs was announced in 2013. Judge Richard Posner, speaking for the Seventh Circuit Court of Appeals in a unanimous decision, declared unconstitutional a state regulation limiting state renewable portfolio standards to in-state generation, as a violation of the Commerce Clause: "[I]t trips over an insurmountable constitutional objection. Michigan cannot, without violating the commerce clause of Article I of the Constitution, discriminate against out-of-state renewable energy."<sup>145</sup> As authority for its holding on the respective jurisdiction of state and federal government to regulate electricity, the opinion relied on precedent and a 2012 law review article on constitutional energy issues authored by Professor Ferrey.<sup>146</sup> Justice Scalia, previously concurring in the majority opinion in *West Lynn Creamery, Inc. v. Healy*,<sup>147</sup> noted that "subsidies for in-state industry . . . would *clearly* be invalid under any formulation of the Court's guiding principle" for dormant commerce clause cases.<sup>148</sup>

The follow-on from this mid-2013 ruling of the Seventh Circuit was immediate. Within a few days of the Seventh Circuit decision, petitions were filed in New York to reconsider prior state decisions in light of this new opinion.<sup>149</sup> The complaint of an interstate merchant power provider cited this recent Seventh Circuit decision and noted that

[i]n a recent, noteworthy case, the United States Court of Appeals for the Seventh Circuit had the opportunity to comment on an RPS program, that, like New York's current RPS program, facially discriminates against out-of-state sources of renewable power. . . . The court noted that "Michigan cannot, without violating the commerce clause of

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144. See Order Adopting Emergency Regulations, D.P.U. 10-58, 2010 WL 2376884 (Mass. Dep't Pub. Utils. June 9, 2010) (revising 220 MASS. CODE REGS. §§ 17.00-.09).

145. Ill. Commerce Comm'n v. FERC, 721 F.3d 764, 776 (7th Cir. 2013). Michigan actually initiated the issue of in-state electric power discrimination in its RPS program as a demonstration that out-of-state power transmitted to it was not recognized as of the same value as in-state electricity, and therefore Michigan should not pay a share of power line tariffs transmitting power from out of state that did not have equal recognition and benefit. *Id.* at 775. Instead of supporting its position, this assertion caused Judge Posner to respond, even though it was not the tariff issue before the Court. *Id.* at 776.

146. *Id.*

147. 512 U.S. 186 (1994).

148. *Id.* at 208 (Scalia, J., concurring).

149. See, e.g., Petition for Rehearing of H.Q. Energy Services. (U.S.) Inc., No. 03-E-0188 (N.Y. Pub. Serv. Comm'n June 21, 2013).

Article I of the Constitution, discriminate against out-of-state renewable energy.”<sup>150</sup>

These dormant commerce clause<sup>151</sup> decisions are consistent with a Supreme Court decision from three decades earlier involving state regulation of renewable power that discriminates based on the geographic origin of that power in state:

[We] consistently have held that the Commerce Clause of the Constitution, Art. I, § 8, cl. 3, precludes a state from mandating that its residents be given a preferred right of access, over out-of-state consumers, to natural resources located within its borders or to the products derived therefrom. . . . [A] State is without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the State.<sup>152</sup>

#### D. State System Benefit Charges

A system benefits charge (“SBC”) is a per-kilowatt-hour power surcharge imposed on all retail electricity consumers within a state utility’s service territory through monthly utility bills, which creates an additional state-controlled or state-administered energy fund.<sup>153</sup> These state renewable trust funds distribute money to subsidize various renewable energy resource projects and technologies pursuant to state legislation.<sup>154</sup> Approximately one-third of U.S. states have enacted SBC and “public benefit funds”<sup>155</sup>; seventeen states plus the District of Columbia.<sup>156</sup> The created funds range in size from less than \$1 million to greater than \$300 million per year.<sup>157</sup> A number of these states, either explicitly or as a matter of practice, will only fund sustainable energy projects within their own states, even though power from all sources inside and outside the state are taxed to create the SBC fund.

Compulsory regulatory requirements to create SBC garner funds from all consumers, while voluntary programs are not as successful. One-quarter of the nation’s utilities offer renewable

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150. *Id.* at 16–17.

151. U.S. CONST. art. I, § 8, cl. 3.

152. *New Eng. Power Co. v. New Hampshire*, 455 U.S. 331, 338 (1982) (internal quotation marks omitted).

153. *Public Benefits Funds for Renewables*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, [http://www.dsireusa.org/documents/summarymaps/PBF\\_Map.pdf](http://www.dsireusa.org/documents/summarymaps/PBF_Map.pdf) (last visited Dec. 12, 2013).

154. *Id.*

155. See DORIS ET AL., *supra* note 7.

156. *Id.*

157. *State Clean Energy Funds Fact Sheet*, U.S. ENVTL. PROTECTION AGENCY, [http://www.epa.gov/chp/policies/funds\\_fs.html](http://www.epa.gov/chp/policies/funds_fs.html) (last updated April 2009).

energy purchase options to customers; however, only about 1% to 2% of all customers, concentrated among industrial and commercial customer groups, elect to purchase a voluntary, more expensive green power option.<sup>158</sup> Since only about one-quarter of utilities offer this option, the overall national penetration rate is less: the 11 million megawatt-hour ("MWh") of these green purchases and an estimated 15 million MWh of total U.S. green energy purchases in 2008 represent less than 1% of the total 3,870 million MWh of electric consumption in 2008.<sup>159</sup>

Some states de jure or de facto restrict SBC funds to in-state projects. For example, the Illinois legislature aims to "develop[] new renewable energy resources and clean coal technologies for use in Illinois [for distributing these funds]" and has stated that "[t]he criteria should promote the goal of fostering investment in and the development and use, in Illinois, of renewable energy resources."<sup>160</sup> Articles delineated what was permissible for state benefit charges under the Commerce Clause.<sup>161</sup> New York Utilities in 2012 challenged New York's alleged misuse of system benefit charge funds for non-energy-related economic development programs.<sup>162</sup> There is a pending constitutional suit on renewable power incentives in Colorado,<sup>163</sup> and an initial court ruling in 2011, which

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158. See Ferrey et al., *FIT in the USA*, supra note 33; *Green Power Usage Edged Higher in 2009 Among EPA Partners*, U.S. ENVTL. PROTECTION AGENCY (Jan. 25, 2010), <http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceac8525735900400c27/f74df277c3c6c40f852576b60064db10> !OpenDocument (discussing an increase in renewable energy usage).

159. See generally *Short-Term Energy Outlook*, U.S. ENERGY INFO. ADMIN. (Jan. 7, 2014), <http://www.eia.gov/forecasts/steol>.

160. 20 ILL. COMP. STAT. § 6-3(b) (2008) (emphasis added); see also *id.* § 6-4(b).

161. See, e.g., Ferrey, *Follow the Money!*, supra note 33; see also Ferrey, *Constitutional Barriers*, supra note 128; Ferrey, *Renewable Orphans*, supra note 128.

162. Lisa Wood, *New York Utilities Challenge Proposal to Use Clean Energy Funds for Economic Development*, ELECTRIC UTIL. WK., Aug. 1, 2012, at 17. The utilities charged that the funds must be devoted to utility-based programs rather than start-up companies and underused technologies. *Id.*

163. *Am. Tradition Inst. v. Colorado*, 876 F. Supp. 2d 1222, 1226 (D. Colo. 2012). The Colorado suit claimed seven distinct ways in which the state RPS discriminates against out-of-state energy sources. Amended Complaint for Injunctive & Declaratory Relief at 17, 19–20, *Am. Tradition Inst.*, F. Supp. 2d at 1228 (No. 1:11-cv-00859-WJM-BNB). The Colorado RPS statute counts every kWh of renewable energy produced within the state at a 125% multiplier. COLO. CODE REGS. § 723-3:3654(e) (2010) ("For purposes of compliance with the renewable energy standard, each kilowatt-hour of eligible energy generated in Colorado, other than retail renewable distributed generation, shall be counted as 1.25 kilowatt-hours of eligible energy."). At least one-half of a regulated Colorado utility's distribution requirements must be met by retail distributed generation, COLO. REV. STAT. § 40-2-124(1)(c)(II)(A) (2013), which under Colorado law must be located within the state, see *id.* § 40-2-124(1). Wholesale distributed generation is defined by statute as "a renewable energy resource [in

held that the Missouri renewable regulation was illegal, was reversed on appeal and is still pending.<sup>164</sup> An environmental rationale for geographic discrimination based on place of origin of the commerce did not pass muster with the Supreme Court: “even if environmental preservation were the central purpose” of the regulation, it “would not be sufficient to uphold a [geographically] discriminatory regulation.”<sup>165</sup>

### E. State Climate Control

In the absence of federal climate change legislation in the United States, originally ten, and now nine, eastern states have combined into the Regional Greenhouse Gas Initiative (“RGGI”) to regulate carbon dioxide (“CO<sub>2</sub>”) emitted from their larger power plants.<sup>166</sup> Additionally, California has begun comprehensive regulation of all greenhouse gases (“GHGs”) from all sources,<sup>167</sup> and other western<sup>168</sup> and midwestern<sup>169</sup> states initiated—but since postponed or abandoned—global warming gas regulation.

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Colorado] with a nameplate rating of thirty megawatts or less and that does not qualify as retail [distributed] generation.” *Id.* § 40-2-124(1)(a)(IX).

164. *Mo. Energy Dev. Ass’n v. Mo. Pub. Serv. Comm’n*, No. 10AC-CC00512 (Dist. Ct. Cole Cnty. filed July 28, 2011).

165. *W. Lynn Creamery, Inc. v. Healey*, 512 U.S. 186, 204 n.20 (1994) (citing *Philadelphia v. New Jersey*, 437 U.S. 617, 626–27 (1978)).

166. See *RGGI, Inc.*, REGIONAL GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/rggi> (last visited Nov. 8, 2013) (listing participating states). New Jersey recently withdrew, and other states have considered withdrawal from this cap-and-trade program. Angela Delli Santi & Beth DeFalco, *New Jersey Withdrawing from Regional Greenhouse Gas Program*, CBS CONN., <http://connecticut.cbslocal.com/2011/05/26/42273> (last visited Nov. 8, 2013).

167. CAL. HEALTH & SAFETY CODE §§ 38500–99 (Deering 2010). The California carbon scheme requires that California reduce GHG emissions to 1990 levels by 2020, considering all in-state and out-of-state generation used to serve California electric load. *Id.* § 38550.

168. The Western Climate Initiative is a group of seven western states and four Canadian provinces that planned to release a carbon restriction program to cut GHG emissions 15% below 2005 levels. *History*, W. CLIMATE INITIATIVE, <http://www.westernclimateinitiative.org/history> (last visited Jan. 30, 2014). Six of the seven states withdrew in 2011, “leaving California alone in this now-unitary consortium, along with the four observing Canadian provinces.” 1 FERREY, *supra* note 19, § 6:9. Nothing was accomplished in its four years of existence. *Id.*

169. These states include “Illinois, Iowa, Kansas, Michigan, Minnesota and Wisconsin, and Canadian province of Manitoba.” *Kansas: Climate Action Regional Programs*, BLOOMBERG BNA, [http://climate.bna.com/climate/document\\_climapedia.aspx?id=212874](http://climate.bna.com/climate/document_climapedia.aspx?id=212874) (last visited Nov. 8, 2013). The three states of Indiana, Ohio, and South Dakota opted out of this scheme and are now observers. Nora Macaluso, *Midwest States to Commence Work on Details of Regional Climate Strategy*, BNA ENV’T REP., Nov. 30, 2007, at 2556; Dean Scott, *Midwestern States to Draw up Model Rule by End of 2008 to Implement Cap-and-Trade*, BNA ENV’T REP., Feb. 22, 2008, at 343.

A major practical and policy problem identified by the RGGI states<sup>170</sup> as well as California<sup>171</sup> is so-called "leakage" into the state of less-costly power whose carbon content is not regulated or affected.<sup>172</sup> California imports power from eleven other states.<sup>173</sup> An internal report found that a substantial proportion of CO<sub>2</sub> emissions avoided by RGGI could be offset by corresponding increases in power from non-RGGI states.<sup>174</sup> The governors in affected states agreed to "pursue technically sound measures to prevent leakage from undermining the integrity of the Program,"<sup>175</sup> including securing their borders or surcharging intruding power flows.<sup>176</sup>

Articles<sup>177</sup> provided states with legal guideposts, which were not always incorporated into state programs. The courts have determined that electrons in interstate commerce cannot be traced.<sup>178</sup> Because wholesale electricity is moving constantly in interstate commerce virtually at the speed of light,<sup>179</sup> this raises dormant commerce clause and other issues:

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170. *Memorandum of Understanding*, REGIONAL GREENHOUSE GAS INITIATIVE 1, 9 (Dec. 20, 2005), [http://www.rggi.org/docs/mou\\_12\\_20\\_05.pdf](http://www.rggi.org/docs/mou_12_20_05.pdf).

171. *Cap and Trade Program Design Options Report of the Cap and Trade Subgroup of the Climate Action Team Final Report*, CAP & TRADE SUBGROUP CLIMATE ACTION TEAM 1, 16–17 (Mar. 27, 2006), [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/2006report/2006-03-27\\_CAP\\_AND\\_TRADE.PDF](http://www.climatechange.ca.gov/climate_action_team/reports/2006report/2006-03-27_CAP_AND_TRADE.PDF).

172. *See Potential Emissions Leakage and the Regional Greenhouse Gas Initiative (RGGI): Evaluating Market Dynamics, Monitoring Options and Possible Mitigation Mechanisms*, REGIONAL GREENHOUSE GAS INITIATIVE 1, ES-1 (Mar. 14, 2007), [http://www.rggi.org/docs/il\\_report\\_final\\_3\\_14\\_07.pdf](http://www.rggi.org/docs/il_report_final_3_14_07.pdf). States "such as New Jersey, New York, and Maryland are bordered by states that are not signatories to RGGI and do historically produce a large of volume of electricity from coal-fueled power plants." Ferrey, *supra* note 3, at 840 n.24. Similarly, California imports power from eleven states, including a large amount of coal-fired power. *See California Gross System Power for 2006*, CAL. ENERGY COMMISSION, [http://energyalmanac.ca.gov/electricity/system\\_power/2006\\_gross\\_system\\_power.html](http://energyalmanac.ca.gov/electricity/system_power/2006_gross_system_power.html) (last visited Nov. 8, 2013) (showing California imports approximately 10% of its total electricity from out-of-state coal plants).

173. *The Power of California*, INDEP. ENERGY PRODUCERS 1, 2 (Mar. 25, 2008), [http://www.iepa.com/video/iepa\\_power\\_of\\_california.pdf](http://www.iepa.com/video/iepa_power_of_california.pdf).

174. FERREY, *supra* note 12, at 168.

175. *Memorandum of Understanding*, REGIONAL GREENHOUSE INITIATIVE 1, 10 (Dec. 20, 2005), [http://www.rggi.org/docs/mou\\_12\\_20\\_05.pdf](http://www.rggi.org/docs/mou_12_20_05.pdf).

176. Ferry et al., *FIT in the USA*, *supra* note 33.

177. *See, e.g., Steven Ferrey, Auctioning the Building Blocks of Life: Carbon Auction, the Law, and Global Warming*, 23 NOTRE DAME J.L. ETHICS & PUB. POLY 317 (2009); Steven Ferrey, *Carbon and the Constitution: State GHG Policies Confront Federal Roadblocks*, PUB. UTIL. FORT., April 1, 2009, at 41; Ferrey, *supra* note 3.

178. *New York v. FERC*, 535 U.S. 1, 7 n.5 (2002); *Fed. Power Comm'n v. Fla. Power & Light Co.*, 404 U.S. 453, 460 (1972).

179. *See 1 FERREY, supra* note 19, § 2:1; Steven Ferrey, *Inverting Choice of Law in the Wired Universe: Thermodynamic, Mass, and Energy*, 45 WM. & MARY L. REV. 1839, 1914 (2004).

- California in 2011 lost a suit on its carbon control cap-and-trade regulation, resulting in an additional year of delay in the program until 2013 while it made revisions.<sup>180</sup>
- There was a successful suit in 2009 against New York's RGGI carbon regulation.<sup>181</sup>
- An additional suit is pending against New York's participation in RGGI.<sup>182</sup>

In summary, there are major constitutional issues surrounding the design and implementation of each of the five primary state sustainable policy mechanisms. Several states, as itemized in the Subparts above, have sustainable energy policies that either cross the prohibited restriction on state retail-only energy regulation, or discriminate based on place of origin of the energy commerce, and thus are difficult to defend if legally challenged. Litigation is ongoing. State sustainable energy policy has endured several recent significant legal challenges, discussed above, pursuant to the Supremacy Clause of the Constitution<sup>183</sup>:

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180. Tentative Statement of Decision, *Ass'n of Irrigated Residents v. Cal. Air Res. Bd.*, No. CPF-09-509562 (Cal. Super. Ct. Jan. 24, 2011); Lisa Weinzimer & Geoffrey Craig, *Delaying California CHG Cap-and-Trade Regime a Year Draws Support from Stakeholders*, *ELECTRIC UTIL. WK.*, July 4, 2011, at 11–12. The court issued a writ of mandate enjoining the California Air Resources Board from any further cap-and-trade rule making until it has complied with the California Environmental Quality Act by analyzing alternatives to cap-and-trade and public comments. Joshua T. Bledsoe, *California Cap and Trade Back on Track, but Compliance Obligations Pushed from 2012 to 2013*, *LATHAM'S CLEAN ENERGY L. REP.*, <http://www.cleanenergylawreport.com/environmental-and-approvals/california-cap-and-trade-back-on-track-but-compliance-obligations-pushed-from-2012-to-2013/> (last visited Dec. 12, 2013). This delayed the plan until 2013. *Id.*

181. See *Indeck Energy Sues State Questioning Legality of Regional Greenhouse Gas Program*, *NEW STATESMAN*, <http://www.newstatesman.com/business/energy/indeck-energy-sues-state-questioning-legality-of-regional-greenhouse-gas-program> (last visited Feb. 7, 2014); see also Vicki Shiah, *Settlement Reached in Regional Greenhouse Gas Initiative Lawsuit*, *SPR ENVTL. L. BLOG.* (Jan. 14, 2010, 2:28 PM), <http://blog.sprlaw.com/2010/01/settlement-reached-in-regional-greenhouse-gas-initiative-lawsuit/>. New York's quick settlement had Consolidated Edison Company agreeing to pay the cogeneration project for the cost of its additional carbon allowances through the end of their preexisting long-term contracts. See Consent Decree, *Indeck Corinth, L.P. v. David Paterson*, No. 5280-09, at 5–6 (Sup. Ct. NY Cnty. Albany Dec. 17, 2009), available at [http://www.dec.ny.gov/docs/legal\\_protection\\_pdf/consdecree.pdf](http://www.dec.ny.gov/docs/legal_protection_pdf/consdecree.pdf).

182. *Thrun v. Cuomo*, No. 4358/11 (N.Y. Sup. Ct. filed Sept. 2, 2011); Geoffrey Craig & Gail Roberts, *Lawsuit Disputes Legality of New York Participation in RGGI, Citing Lack of Legislative Approval*, *ELECTRIC UTIL. WK.*, July 4, 2011, at 10.

183. See *supra* notes 32–42, 70, 135, and accompanying text.

- States either settled in favor of challengers or lost in a majority of these lawsuits.
- One was dismissed on procedural grounds without reaching the merits of the claim, with permission for the plaintiff/challenger to refile the complaint.
- One is still pending, with judges equally split—two finding it unconstitutional, and two not.

Separately, state sustainable energy policy recently has undergone thirteen significant legal challenges under the dormant commerce clause<sup>184</sup>:

- States either settled in favor of challengers or lost at the trial or appellate level in the majority of these matters.
- Others were dismissed on procedural grounds without reaching the merits of the claim or are still pending a final decision.

There is a compelling need for an alternative mechanism that will avoid this barrage of litigation but nonetheless promote sustainable energy. Part III proceeds "outside the box" to suggest such an alternative mechanism to avoid constitutional challenges to state sustainable energy policy within the American judicial system.

### III. THE LEGAL SOLUTION: IT WAS THERE ALL THE TIME

Having charted the constitutional trip wires and ongoing challenges, the purpose of this Article is to sculpt a bulletproof solution. Limiting global warming to a no more than a two degrees Centigrade increase from pre-Industrial Revolution levels will require stabilizing carbon dioxide concentrations in the atmosphere to no more than 450 parts per million ("ppm").<sup>185</sup> Complicating this, CO<sub>2</sub> lingers in the atmosphere, thus causing concentrations to hold steady for decades,<sup>186</sup> perhaps even hundreds of years.<sup>187</sup>

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184. See *supra* notes 129–37, 145, 149, 162–65, 180–82, and accompanying text.

185. See FERREY, *supra* note 2, at 243. At such modest levels, the degree of warming is not expected to result in radical loss of ice sheet, sea-level rise, and shift of agricultural areas. *Id.*

186. NAT'L ACAD. SCI. ET AL., UNDERSTANDING AND RESPONDING TO CLIMATE CHANGE: HIGHLIGHTS OF NATIONAL ACADEMIES REPORTS 20 (2008), available at [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1048006.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1048006.pdf).

187. See *id.*; Susan Soloman et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT'L ACAD. SCI. 1704, 1704 (2009) (showing that CO<sub>2</sub> warming impact could last 1,000 years).

“Limiting temperature to 2°C requires a low-carbon energy revolution.”<sup>188</sup> Fully two-thirds of emission savings are projected to need to come from the power sector.<sup>189</sup> Achieving this goal will require a “far-reaching transformation of the global energy system.”<sup>190</sup> This transition is vitally important to diversify the electric energy base with more renewable power and to lower carbon emissions and arrest climate change.<sup>191</sup>

To enable and accomplish this revolution, the U.S. Constitution is not going to be amended in the foreseeable future to alter the Supremacy Clause, the Supreme Court has not altered application of the dormant commerce clause, and there is no immediate prospect to amend the Federal Power Act. Therefore, there are constitutional barriers to some state actions and incentives:

- More challenges to state renewable energy policy (in addition to the dozen recent examples<sup>192</sup>), of which at least some will be successful and all will produce uncertainty and delay
- The expenditure of millions of dollars of taxpayer funds to reimburse plaintiff attorney fees of successful challengers and to pay government attorneys defending such policies<sup>193</sup>

188. INT’L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2009: EXECUTIVE SUMMARY 7 (2009), available at <https://www.iea.org/textbase/npsum/weo2009sum.pdf>.

189. *Id.* at 8.

190. INT’L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2010: EXECUTIVE SUMMARY 12 (2010), available at [http://www.worldenergyoutlook.org/media/weowebiste/2010/WEO2010\\_es\\_english.pdf](http://www.worldenergyoutlook.org/media/weowebiste/2010/WEO2010_es_english.pdf).

191. FERREY, *supra* note 12.

192. *See supra* Subpart II.D.

193. For example, in *Entergy Nuclear Vermont Yankee, LLC v. Shumlin*, 838 F. Supp. 2d 183 (D. Vt. 2012), *aff’d in part, rev’d in part*, 733 F.3d 393 (2d Cir. 2013), the first level of litigation at the trial court level resulted in an award against the state of Vermont of attorney fees for plaintiff Entergy of approximately \$4.6 million dollars, and mounting over time on appeal, as a result of enacting an unconstitutional energy regulation that was found to violate the Supremacy Clause and the dormant commerce clause. *See* Anne Galloway, *Entergy Seeks \$4.6 Million in Legal Fees from State of Vermont*, VTDIGGER (Feb. 4, 2012), <http://vtdigger.org/2012/02/04/entergy-seeks-4-6-million-in-legal-fees-from-state-of-vermont/>. Vermont is a small state, and this cost to reimburse the plaintiff’s attorney fees is in addition to the cost Vermont incurred for its fees defending the state. *Id.* That litigation is proceeding now through the Second Circuit Court of Appeals, and the cost to Vermont ratepayers continues to mount. *Id.* An eventual appeal to the U.S. Supreme Court is likely. *Id.*

A. *Principles to Make a Regulatory Solution Bulletproof*

There is an intriguing—yet totally unexplored for this purpose—tool to transcend the constitutional concerns.<sup>194</sup> Charting applicable precedent, principles of a new tool must (1) not vary any traditional utility rate-making principles, (2) build on traditional legal principles and tools, and (3) apply traditional rate-making concepts to new renewable energy policy challenges.

Google Inc. has proposed having all utilities provide a new retail voluntary tariff for any customer who wants to use renewable power.<sup>195</sup> This would be a self-contained tariff, internalizing all renewable costs to users.<sup>196</sup> The Natural Resources Defense Council and the Edison Electric Industry, an electric utility industry trade group, in 2014 jointly called for a new state retail rate structure to reflect more equitable prices, based on actual costs and benefits, for distributed renewable energy systems.<sup>197</sup> The groups jointly stated that “[r]ate designs will continue to develop that reward customers for using electricity more efficiently,” and an NRDC official stated that owners of rooftop solar panels “must provide reasonable cost-based compensation for the utility services they use.”<sup>198</sup>

We create this new tool by building on and quantifying the value of distributed renewable power. Additional deployment of renewable energy resources has measureable positive public externalities:

- Increasing power system reliability with more independent points of generation<sup>199</sup>
- Creating a reliable and appropriately more-mixed generation supply diversity for the electric power system<sup>200</sup>

194. See *supra* Part III.

195. See *Expanding Renewable Energy Options for Companies Through Utility-Offered “Renewable Energy Tariffs,”* GOOGLE (Apr. 19, 2013), [http://static.googleusercontent.com/external\\_content/untrusted\\_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf](http://static.googleusercontent.com/external_content/untrusted_dlcp/www.google.com/en/us/green/pdf/renewable-energy-options.pdf).

196. *Id.*

197. See EEI/NRDC Joint Statement to State Utility Regulators 2–3 (Feb. 12, 2014), [http://docs.nrdc.org/energy/files/ene\\_14021101a.pdf](http://docs.nrdc.org/energy/files/ene_14021101a.pdf) (listing “Key Recommendations” for increasing grid performance while decreasing emissions); see also Christopher Martin, *NRDC, Utility Group Urge Grid Payments, New Rate Structure for Rooftop Solar Users*, BLOOMBERG BNA (Feb. 12, 2014, 2:30 PM), <http://www.bloomberg.com/news/2014-02-12/nrdc-and-u-s-utilities-seek-compensation-for-rooftop-solar-cost.html> (explaining the new rate structure).

198. EEI/NRDC Joint Statement to State Utility Regulators, *supra* note 197, at 2.

199. See *Distributed Energy Basics*, NAT’L RENEWABLE ENERGY LAB., [http://www.nrel.gov/learning/eds\\_distributed\\_energy.html](http://www.nrel.gov/learning/eds_distributed_energy.html) (last updated Dec. 3, 2012).

- Putting less pressure on the use of the aging power distribution system by utilizing on-site private power rather than moving more power through the regulated power distribution system<sup>201</sup>
- Using solar photovoltaic (“PV”) systems that can add on-peak value to the power transmission network with which they interconnect by providing supply to proximately located end users,<sup>202</sup> although this is dependent on a case-by-case locational determination of power flow<sup>203</sup>

Some scholars have estimated that the value of distributed solar PV units that sell power back to the grid results in savings to the utility system due to not purchasing that amount of power elsewhere, saving use of transmission and distribution capacity, eliminating risk of changes in fossil fuel prices, and saving transmission and distribution losses of 5% to 10% in transmission—which they valued cumulatively at between \$0.09 and \$0.25 per kilowatt-hour (“kWh”).<sup>204</sup> In addition to these values to the utility system, articles note that there are other societal benefits in environmental and health benefits, jobs, and grid security, which increase the cumulative total by approximately 50%.<sup>205</sup> There is an estimate that power outages cost the U.S. economy losses of \$100 billion annually<sup>206</sup> and that a small amount of additional PV-distributed generation capacity could have prevented the East Coast blackout in 2003.<sup>207</sup>

The key point is that these positive externalities to the power system are quantifiable values. Any state could engage in a regulatory process to put a quantitative dollar value on these benefits of distributed generation, just as retail utility rate making

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200. *Id.*

201. *See Benefits of Solar*, STATES ADVANCING SOLAR, <http://www.statesadvancingsolar.org/solar-101/benefits-of-solar> (last visited Dec. 13, 2013).

202. Edward Kahn, *Avoidable Transmission Cost Is a Substantial Benefit of Solar PV*, 21 *ELECTRICITY J.* 41, 45 (2008).

203. While increased solar PV installations sited near load centers can defer substation and grid system investments, they can increase two-way power flows and add grid management costs for voltage fluctuations and equipment overload. Tiernan, *supra* note 57.

204. Richard Perez et al., *Solar Power Generation in the U.S.: Too Expensive, or a Bargain?*, 39 *ENERGY POL'Y* 7290, 7294 (2011). The range of value that this Article attaches to wholesale power is significantly above the average weighted price of wholesale power transactions in the last several years and uses the distributed power value in New York City, a location that is capacity constrained. *See FERREY, supra* note 19, § 10:144 n.29.

205. Perez et al., *supra* note 204, at 7293.

206. *Id.*; Clark W. Gellings & Kurt E. Yeager, *Transforming the Electric Infrastructure*, 57 *PHYSICS TODAY* 45, 48 (2004).

207. Perez et al., *supra* note 204, at 7291.

quantifies costs of serving different customer classes to determine and administer fair costs of service. To date, however, no state has rolled up its sleeves and quantified distributed energy supply values as a component of its rate making and rate setting of retail power rates. No state has done the work to create a separately priced class of retail electric service for distributed generation customers.<sup>208</sup> There is a positive value to this otherwise unreflected contribution of distributed generation.<sup>209</sup> The value would be utility specific and somewhat location specific based on the distribution system. And this quantification not only is doing something that already should have been done but also is less work than defending, and often losing, a barrage of lawsuits.

Electricity, unlike all other forms of energy, cannot be stored efficiently as electricity for more than a second before it is lost as waste heat.<sup>210</sup> Therefore, the supply of electricity must match the demand for electricity over the centralized utility grid of a nation on an instantaneous basis, or else the electric system shuts down or expensive equipment is damaged.<sup>211</sup> The cost of producing electricity varies greatly hour by hour. For most consumers, however, this volatile price is not instantaneously reflected in rates perceived or paid by consumers in their average-cost retail tariffs. The current rate structure in most states for residential consumers has consumers pay the same for the kilowatt-hour purchased during a hot midsummer day as they do for the kilowatt-hour consumed at four in the morning.<sup>212</sup>

While the retail cost to the consumer stays the same under a flat rate structure, the cost to the utility to produce the power is drastically varying and time sensitive. Base-load generation typically is supplied by a coal-fired or nuclear plant that runs continuously because these plants have slow start-up and require cool-down times if not run continuously.<sup>213</sup> When demand for

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208. There are standby service rates for self-generating customers, but these do not consider the benefit to the system of self-generated power as an element of the applicable rate. See generally 1 FERREY, *supra* note 19, § 4.33, app. 11 (discussing pricing for self-generating customers without the mention of any benefits considered when determining the applicable rates).

209. See RYAN FIRESTONE ET AL., THE VALUE OF DISTRIBUTED GENERATION UNDER DIFFERENT TARIFF STRUCTURES 1 (2006), available at <http://der.lbl.gov/publications/value-distributed-generation-different-tariff-structures>.

210. FERREY, *supra* note 2, at 542.

211. FERREY, *supra* note 12, at 149.

212. Severin Borenstein, *Time-Varying Retail Electricity Prices: Theory and Practice*, in ELECTRICITY DEREGULATION: CHOICES AND CHALLENGES 317, 317–18 (James M. Griffin & Steven L. Puller eds., 2005).

213. See *Electricity in the United States—Generation, Sales & Capacity*, U.S. ENERGY INFO. ADMIN., [http://www.eia.gov/energyexplained/index.cfm?page=electricity\\_in\\_the\\_united\\_states#tab2](http://www.eia.gov/energyexplained/index.cfm?page=electricity_in_the_united_states#tab2) (last updated Apr. 10, 2013) [hereinafter *Electricity in the United States*] (explaining base-load generating units); see also Borenstein, *supra* note 212, at 348 (explaining that coal plants operate with

electricity rises, more flexible fast-starting plants must come on line to meet that demand, and these secondary generators typically are natural gas or oil-fired generators.<sup>214</sup> These secondary generators are expensive to build and run, but they may only be on line for a low percentage of the total operating hours of the year.<sup>215</sup> If, however, peak demand can be lowered significantly enough to prevent the construction of these additional peak-time generating facilities, customers can avoid bearing the bill for the construction of generators whose purpose will only be to meet peak demand. With managed demand, costs for the entire electric system are less.

Utilizing incontestable traditional state regulatory principles, the value to the utility grid—at the margin, with greater reliability, power generation diversity, and power location diversity noted above—can be quantified and reflected as a reduced rate for retail electric service to eligible generation customers. Renewable energy generators would benefit from a subsidy through their state retail power *purchase* rates rather than through legally impermissible state FiT wholesale power *sale* rates.<sup>216</sup> The former are totally within state retail rate authority, while the latter are not within any state retail rate authority. This is the critical legal distinction separating defensible state electric regulatory actions.

Two later Parts of this Article<sup>217</sup> illustrate legal precedent under which several states already sanction routine discounted electric service rates for groups of consumers based not on the cost of providing service to them but on either a concession for using larger amounts of power<sup>218</sup> or a customer's old age or low income.<sup>219</sup> And in each of these situations, it is not the utility company but other electric consumers who, largely unknown to them, pay the cost of this subsidy.<sup>220</sup>

A new rate to serve distributed generation customers, however, would not need to go this far to make arbitrary discounts not related to the cost of service. What I propose is a distributed service generator rate for the sale of electricity based directly on traditional costs of service, net of the value of distributed generation to the grid.

high fixed-capacity costs and low variable costs that are generally characteristic of base-load generating).

214. *Electricity in the United States*, *supra* note 213.

215. Borenstein, *supra* note 212, at 348–49.

216. Cal. Pub. Utils. Comm'n, 132 F.E.R.C. ¶ 61,047, ¶ 61,337–38 (2010) (order on petitions for declaratory order), *clarified on reh'g*, 133 F.E.R.C. ¶ 61,059 (2010) (explaining that states may not set rates for wholesale sales in interstate commerce by public utilities); *see also* Tiernan, *supra* note 57.

217. *See infra* Parts IV & V.

218. *See infra* Part V.

219. *See infra* Part IV.

220. *See* CHARLES HARAK ET AL., ACCESS TO UTILITY SERVICE 163–71, 245 (5th ed. 2011). Professor Ferrey acknowledges the research of his students, Darius Pakrooh and Jesse Gag, relevant to this Part.

For distributed renewable power generators, a reduced retail rate for electric service would not be an arbitrary subsidy; it would be empirically based on the actual net cost of service to this class of customers. Therefore, it is more, not less, legally defensible than existing rate discounts to certain customers. It is bulletproof legally because it would finally reflect actual retail rate cost-of-service principles.<sup>221</sup>

*B. Principles of Supportable Legal Rates for Renewable Power Generation Customers*

Traditionally, electricity has been priced in a unique way. Electricity is priced based on its reasonable cost of production and the translation of total cost to "just and reasonable" rates that reflect these costs.<sup>222</sup> "The basic objective of regulation remains to attain efficiency and equity. Regulation of profits and rate levels are the principal focus of public utility regulation."<sup>223</sup> Gross revenues must cover the reasonable cost of running the system, and the allocation of rates among classes to raise those revenues must be made based on the principles of tracking and reflecting costs of serving each reasonably distinct class of customers.<sup>224</sup>

The legal standards guiding the regulatory commissions are broad. Each specific rate must be "just and reasonable."<sup>225</sup> A nearly universal obligation imposed by federal and state laws on public utilities is the obligation to furnish service and to charge rates that will avoid undue or unjust discrimination among customers.<sup>226</sup> Further, "'undue' or 'unjust' discrimination among customers is prohibited."<sup>227</sup> Policy considerations, such as providing environmental incentives or discounting rates to certain segments of the customer base, play a subsidiary role in the ultimate rate allocation among customer classes.<sup>228</sup> These principles are embedded in rate decisions of both FERC<sup>229</sup> and state regulatory

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221. See *infra* Subpart III.B.

222. 16 U.S.C. § 824d(e) (2012).

223. JAMES C. BONBRIGHT ET AL., PRINCIPLES OF PUBLIC UTILITY RATES 559 (2d ed. 1988).

224. See *Ala. Elec. Coop., Inc. v. FERC*, 684 F.2d 20, 27 (D.C. Cir. 1982) ("[I]t has come to be well established that electrical rates should be based on the costs of providing service to the utility's customers, plus a just and fair return on equity.").

225. 16 U.S.C. § 824d(a).

226. BONBRIGHT ET AL., *supra* note 223, at 515. If an electric plant is operating near full capacity, higher charges for on-peak versus off-peak would actually be required to avoid discrimination. *Id.* at 528.

227. CHARLES F. PHILLIPS, JR., THE REGULATION OF PUBLIC UTILITIES: THEORY AND PRACTICE 434 (3d ed. 1993).

228. BONBRIGHT ET AL., *supra* note 223, at 524.

229. *Ala. Elec. Coop., Inc.*, 684 F.2d at 21, 27.

commissions<sup>230</sup> and in principles when courts review the application of these principles by regulatory agencies.<sup>231</sup>

“The principles of *horizontal equity* that ‘equals should be treated equally,’ and *vertical equity* that ‘unequals should be treated unequally’ . . . [is interpreted to mean] that equal . . . cost causers for the provision of a good or service should pay the same . . . prices.”<sup>232</sup> Horizontal equity among different customer classes, based on cost of service, is a goal: it is illegal for a state to set rates that “grant any undue preference or advantage to any person or subject any person to any undue prejudice or disadvantage.”<sup>233</sup> An electric power customer only needs to show substantial vertical disparity in rates between customers of the same class in order to raise questions of discriminatory or preferential rates.<sup>234</sup>

The burden is on the applicant utility to justify all rates as just and reasonable.<sup>235</sup> Under the Federal Power Act, FERC may only allow “such rates as will prevent consumers from being charged [with] any unnecessary or illegal costs.”<sup>236</sup> Whenever FERC determines that a public utility’s rates, charges, or service classifications are unjust, unreasonable, or unduly discriminatory, FERC can determine and order rates that are just and reasonable.<sup>237</sup>

Notably, unlawful discrimination may arise under a single rate design where “a uniform rate creates an undue disparity between

230. MICH. COMP. LAWS SERV. §§ 460.557(3)–(4) (LexisNexis 2010); *see also* TEX. UTIL. CODE ANN. §§ 36.003(a)–(c) (West 2007).

231. *Ala. Elec. Coop., Inc.*, 684 F.2d at 27.

232. BONBRIGHT ET AL., *supra* note 223, at 568.

233. 16 U.S.C. § 824d(b)(1) (2012).

234. *Pub. Serv. Co. Ind. v. FERC*, 575 F.2d 1204, 1212 (7th Cir. 1978), *aff’d sub nom. City of Frankfort, Ind. v. FERC*, 678 F.2d 699 (7th Cir. 1982).

235. *Nantahala Power & Light Co. v. FERC*, 727 F.2d 1342, 1347, 1351 (4th Cir. 1984).

236. *NAACP v. Fed. Power Comm’n*, 425 U.S. 662, 666 (1976).

237. 16 U.S.C. § 824e(a). The court directly answered the issue of current “usefulness” and provided further insight into what types of canceled investments can be included in rate bases:

[T]he Commission’s decision to authorize full recovery was just and reasonable and consistent with Commission policy. We are unpersuaded by Norwood’s argument that forcing ratepayers to pay for a plant no longer producing electricity conflicts with the regulatory precept that ratepayers should only pay for items “used and useful” in providing service. Although a utility’s rate base normally consists only of items presently “used and useful” . . . a utility may include “prudent but canceled investments” in its rate base as long as the Commission reasonably balances consumers’ interest in fair rates against investors’ interest in “maintaining financial integrity and access to capital markets.”

*Town of Norwood v. FERC*, 80 F.3d 526, 531 (D.C. Cir. 1996) (citations omitted).

the rates of return on sales to different groups of customers."<sup>238</sup> If this rate design provides costs of service to one group that are different from costs of service to another, "the two groups are [then], in one important respect, quite dissimilar."<sup>239</sup> It is also illegal for a public utility to "maintain any unreasonable difference in rates . . . as between localities," which again is a geographically based discrimination.<sup>240</sup> "The provision and pricing of services to any person(s) should not impose unwarranted economic costs on other person(s)."<sup>241</sup>

Regulatory scrutiny is to ensure that only costs passed on to retail rates are "necessary and prudent."<sup>242</sup> In deciding on utility management prudence in a rate-making proceeding, the regulatory agency must judge whether actions

were prudent at the time, under all the circumstances, considering that the company had to operate at each step of the way prospectively rather than in reliance on hindsight . . . [and] in light of all conditions and circumstances which were known or which reasonably should have been known at the time the decisions were made.<sup>243</sup>

The rate charged to one group should not impose a cost burden derived from a different pricing policy of another group.<sup>244</sup> Additionally, a rate structure should avoid undue discrimination in rate relationships, avoid rate structures that encourage wasteful consumption, and include rates that fairly allocate total cost.<sup>245</sup>

### C. Precedent for Differentiated Classes of Customer Retail Rates

Principles of horizontal and vertical equity have not halted class distinction in retail power rates in many states. Distinctions are made for reasons that have nothing to do with the traditionally allowed cost of serving a particular customer. Reduced retail charges from the actual cost of providing electricity, in certain states, are provided to retail electricity customers who

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238. Ala. Elec. Coop., Inc. v. FERC, 684 F.2d 20, 27 (D.C. Cir. 1982).

239. *Id.* at 27.

240. 16 U.S.C. § 824d(b)(2).

241. BONBRIGHT ET AL., *supra* note 223, at 568.

242. Midwestern Gas Transmission Co., 36 F.P.C. 61, 70 (1966), *aff'd sub nom.* Midwestern Gas Transmission Co. v. Fed. Power Comm'n, 388 F.2d 444 (7th Cir. 1968).

243. Re Bos. Edison Co., 46 Pub. Util. Rep. 4th (PUR) 431, 438 (Mass. Dep't Pub. Utils. 1982), *enforced sub nom.* Att'y Gen. v. Dep't of Pub. Utils., 455 N.E.2d 414 (Mass. 1983).

244. BONBRIGHT ET AL., *supra* note 223, at 568.

245. PHILLIPS, *supra* note 227 (quoting BONBRIGHT ET AL., *supra* note 223, at 291).

- are low income,<sup>246</sup>
- receive forms of financial assistance from the government,<sup>247</sup>
- are elderly,<sup>248</sup>
- have more electricity-using appliances, such as electric heating,<sup>249</sup>
- use more power under declining block rates,<sup>250</sup> or
- use less power and are therefore deemed more efficient.<sup>251</sup>

None of these categories of classification necessarily reflect actual deviations in the cost of serving the customers in the class. They are implemented for policy reasons rather than based on the touchstone cost of service.<sup>252</sup> If such class-based distinctions can be implemented, other new preferences proposed herein, which scrupulously reflect actual lower cost of service for distributed renewable on-site generation, certainly are legally permissible.<sup>253</sup> This new mechanism contrasts with some of the class discounts afforded based on arbitrarily established percentage deductions.<sup>254</sup>

If instead the state regulatory commission promoted renewable energy or distributed generation by setting a real cost-based discounted retail rate at which that customer class is served with power—based strictly on the net contribution of that customer class to lower costs of operating a more geographically distributed and technologically diverse grid—such a retail rate tariff would be clearly within state authority.<sup>255</sup> Moreover, by establishing a retail tariff that affects retail customers of the utility, rather than discriminating on wholesale power generation based on its geographic location of generation before entering interstate

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246. See, e.g., *id.* at 449, 452.

247. See, e.g., *id.*

248. See, e.g., *id.* at 449, 451–52.

249. See, e.g., *Electric Heat Discount Rate*, CORNHUSKER PUB. POWER DIST., <http://www.cornhusker-power.com/discountrate.asp> (last visited Nov. 7, 2013).

250. See, e.g., *Rate 624*, N. IND. PUB. SERV. CO. 2 (Dec. 21, 2011), <http://www.nipsco.com/Libraries/electric-tariffs-122711/rate-624.sflb.ashx>.

251. See, e.g., *Schedule 7: Residential Service*, PORTLAND GEN. ELECTRIC CO. (Mar. 19, 2012), [http://www.portlandgeneral.com/our\\_company/corporate\\_info/regulatory\\_documents/pdfs/schedules/Sched\\_007.pdf](http://www.portlandgeneral.com/our_company/corporate_info/regulatory_documents/pdfs/schedules/Sched_007.pdf).

252. See PHILLIPS, *supra* note 227, at 449.

253. See *infra* Parts IV–V.

254. See *infra* Tables 4–6.

255. *Compare Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953, 962 (1986) (noting “interstate power rates filed with FERC or fixed by FERC must be given binding effect by state utility commissions determining intrastate rates”), with Ferrey, *Follow the Money!*, *supra* note 33, at 125–26 (discussing how to use renewable energy sources at the retail rate level without creating constitutional challenges).

commerce, legal scrutiny under the so-called dormant commerce clause is not triggered.<sup>256</sup> For both of these legal distinctions, this suggested alternative form of support for renewable power based on actual net benefits is much less subject to legal challenge. Without such a shift in the use of tools available to the states, there is no end yet in the often-successful challenges to state renewable incentives<sup>257</sup>—embedded in certain state renewable portfolio standards,<sup>258</sup> state system benefit charges,<sup>259</sup> and state net metering<sup>260</sup>—as well as the legal challenges to state climate control regulations<sup>261</sup> and state FITs.<sup>262</sup>

The next Part examines the legal precedent around distinctions in power sale rates for certain customer classes based on nontraditional economic principles of cost of service.

#### IV. HISTORIC RETAIL RATE DISCOUNTS BASED ON THE PURCHASER'S STATUS RATHER THAN THE POWER PURCHASED

In several states, rates consumers pay for the provision of retail electricity are intentionally inequitable by design. Some states have permitted this, while other states have held that a sale of identical

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256. See *Gen. Motors Corp. v. Tracy*, 519 U.S. 278, 292 (1997) (discussing Commerce Clause issues in the natural gas context); *C & A Carbone v. Town of Clarkstown*, 511 U.S. 383, 390 (1994) (discussing Commerce Clause issues in the solid waste disposal context); *W. Lynn Creamery, Inc. v. Healey*, 512 U.S. 186, 196, 206 (1994) (discussing Commerce Clause issues in the dairy industry context); *Fort Gratiot Sanitary Landfill, Inc. v. Mich. Dep't of Natural Res.*, 504 U.S. 353, 361 (1992) (discussing Commerce Clause issues in the solid waste disposal context); *New Eng. Power Co. v. New Hampshire*, 455 U.S. 331, 339 (1982) (noting protectionist regulations that favor one state "cannot be squared with the Commerce Clause"); *City of Philadelphia v. New Jersey*, 437 U.S. 617, 624 (1978) (noting that if a statute is facially discriminatory, it is virtually per se invalid).

257. 16 U.S.C. § 824a-2 (2012) (authorizing FERC-recommended electric utility industry standards for reliability, "including standards with respect to equipment, operating procedures and training personnel, and standards relating to the level or levels of reliability appropriate to adequately and reliably serve the needs of electric consumers"). See generally Ferrey, *supra* note 79 (examining Commerce Clause implications of current state renewable energy programs); Ferrey et al., *Fire and Ice*, *supra* note 33 (discussing recent legal challenges to state renewable energy regulations).

258. See generally Ferrey, *supra* note 79; Ferrey et al., *Fire and Ice*, *supra* note 33.

259. See Ferrey, *Follow the Money!*, *supra* note 33, at 129–30 (discussing possible legal hurdles for system benefit charges).

260. See generally Ferrey, *supra* note 46 (examining the constitutionality of net metering).

261. See generally Ferrey, *supra* note 3 (discussing the constitutionality of carbon regulatory measures).

262. See generally Ferrey et al., *Fire and Ice*, *supra* note 33; Ferrey et al., *FIT in the USA*, *supra* note 33.

units of electricity must be offered on equal terms to all customers at a nondiscriminatory price.

A. *Retail Energy Rate Discount Variations*

Approximately half of the states grant authority to PUCs to consider discounts for low-income consumers, while the other half of the states do not. In one model, all low-income customers get the same percentage reduction or discount. In another model, the discounts are tiered so the poorest customers get a larger discount based on their lower incomes. State regulatory commissions have developed straight discounts, tiered discounts, consumption-based discounts, and customer charge waivers.<sup>263</sup>

1. *Targeted Lifeline Retail Rates*

Some electric utilities provide discounted rates to low-income consumers through general or targeted "lifeline" rates.<sup>264</sup> These rates provide a certain amount of electricity below cost and are funded by a charge imposed on other residential customers and/or other customer classes, either through a targeted discount or a percentage-income plan.<sup>265</sup> Fourteen states provide targeted, set-amount lifeline rates for low-income customers.<sup>266</sup> Thereunder, utility companies provide a discount to eligible low-income customers for all or some of their electric utility bills.<sup>267</sup> No states, however, provide a general lifeline rate to all residential customers.<sup>268</sup> These variations are set forth in Table 2.

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263. See HARAK ET AL., *supra* note 220, at 163–71 (listing and explaining these four approaches). Professor Ferrey acknowledges the research of his students, Darius Pakrooh and Jesse Gag, relevant to this Part.

264. See MARGOT FREEMAN SAUNDERS & NANCY BROCKWAY, ACCESS TO UTILITY SERVICE 367–77 (1996) (cataloging discount rate programs in each state).

265. See *id.*

266. See FERREY, *supra* note 19, § 10:17.

267. *Id.*

268. *Id.*

TABLE 2: LIFELINE UTILITY RATES (AS OF 2002)

Type of Low-Income Assistance	States With Participating Utilities
General Lifeline Rate	None
Targeted Lifeline Rate: Straight Percentage Discount	California, Maine, Massachusetts, Montana, Oklahoma, Washington <sup>269</sup>
Targeted Lifeline Rate: Straight Percentage Discount for Certain Season	West Virginia (December–April), Arizona (November–March) <sup>270</sup>
Targeted Lifeline Rate: Marginal Rate for Certain Amount of Energy	Arizona, District of Columbia, Minnesota, New York, North Carolina, Rhode Island, Wisconsin <sup>271</sup>
Percentage-Income Plan	Colorado, Illinois, Kentucky, Maine, Ohio, Pennsylvania, Rhode Island <sup>272</sup>
Flat Credit	New Jersey <sup>273</sup>
Waiver of Customer Charges	Alabama, Georgia, Mississippi, New York <sup>274</sup>
Arrearage Forgiveness	Connecticut, Michigan <sup>275</sup>

269. *Id.*; see also *infra* text accompanying note 276.

270. FERREY, *supra* note 19, § 10.17; see also *infra* note 279 and accompanying text.

271. FERREY, *supra* note 19, § 10.17; see also *infra* text accompanying note 280.

272. FERREY, *supra* note 19, § 10.17; see also *infra* text accompanying note 292.

273. See *infra* note 297 and accompanying text.

274. See *infra* notes 300, 303, and accompanying text.

275. FERREY, *supra* note 19, § 10.17; see also *infra* text accompanying note 305.

California, Maine, Massachusetts, Montana, Oklahoma, and Washington provide a straight percentage discount of the total bill.<sup>276</sup> A straight discount is a specific percentage that is deducted from a customer's total bill.<sup>277</sup> In 1989, California enacted the Low Income Rates for Energy ("LIRA"), which established discounts to low-income customers in an amount of 15% to 20% of bills.<sup>278</sup> Two states provide a straight percentage discount for the winter season;<sup>279</sup> Arizona, the District of Columbia, Minnesota, New York, North Carolina, Rhode Island, and Wisconsin have marginal rates for a certain fixed amount of energy.<sup>280</sup>

A tiered discount program offers varying discounts depending upon a customer's income or poverty level.<sup>281</sup> Two Indiana utilities implemented tiered discount programs.<sup>282</sup> A consumption-based discount is set based on a customer's level of usage, to discourage overconsumption by a customer receiving a discounted price.<sup>283</sup> Arizona utilities have implemented consumption-based discounts.<sup>284</sup>

Massachusetts electric and gas distribution companies are required "to provide discounted rates for low-income customers, with the cost of the discount program recouped from the rates charged to all other customers of the company."<sup>285</sup> The discount to eligible customers is not borne by the utilities; rather, it is passed on with no explanation in the bill, to all other consumers:

Each [Local] Distribution Company shall have on file a low-income tariff that provides a reduction in the distribution charges to which such Customers would otherwise be subject. Each [Local] Distribution Company shall establish eligibility for its low-income rate tariff. . . . Each Local Distribution Company shall allocate to other rate classes, as part of a general rate case, the revenue deficiency resulting from the low-income rate tariff.<sup>286</sup>

In Massachusetts, a consumer on any public assistance gets an automatic discount on his or her distribution costs on the utility

276. FERREY, *supra* note 19, § 10:17.

277. HARAK ET AL., *supra* note 220, at 163.

278. See FERREY, *supra* note 19, § 10:29 n.6. LIRA was later renamed the California Alternative Rate for Energy ("CARE"). *Id.*

279. See *id.* § 10:17. West Virginia provides a discount from December to April, and Arizona provides a discount from November to March. *Id.*

280. *Id.*

281. HARAK ET AL., *supra* note 220, at 167.

282. *Id.*

283. *Id.* at 169.

284. *Id.*

285. 36 THOMAS B. MERRITT, MASSACHUSETTS PRACTICE SERIES: CONSUMER LAW § 27:20 (3d ed. 2013).

286. See 220 MASS. CODE REGS. 14.03(2A) (2008).

bills.<sup>287</sup> Customers are eligible for the low-income discounts if they can show that they are the head of a household or the principal wage earner and they receive "any means tested public benefit," which includes assistance through food stamps, subsidized housing, Supplemental Security Income ("SSI"), veteran benefits, or the Low-Income Home Energy Assistance Program ("LIHEAP").<sup>288</sup>

The Massachusetts Department of Public Utilities ("DPU") requires that the low-income tariff apply "to the distribution charge and, during the transition period, the discount . . . also appl[ies] to the stranded cost charge."<sup>289</sup> A total of \$22 million was transferred on low-income discounts in Massachusetts in 1994.<sup>290</sup> The companies are permitted to recoup the revenue lost from the subsidies in the "access rates" charged to the bills of other customers of all classes.<sup>291</sup>

## 2. Purchaser Percentage-Income Plans

Colorado, Illinois, Kentucky, Maine, Ohio, Pennsylvania, and Rhode Island offer a percentage-income plan.<sup>292</sup> In Ohio, customers who have a gross yearly household income at or below 150% of the federal poverty guidelines can apply for the Percentage of Income Payment Plan Plus, under which each month, customers enrolled pay ten dollars or 6% of their gross monthly household income, whichever is greater.<sup>293</sup> In Pennsylvania, residential customers can enroll in the Customer Assistance Program ("CAP") to lower their monthly utility bills and discharge past debts owed to utility companies.<sup>294</sup> Eligibility for the CAP is based on certain monthly household income limits, which vary by household size.<sup>295</sup>

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287. MASS. ANN. LAWS ch. 164, § 1F(4)(i) (LexisNexis 2013); see also FERREY, *supra* note 49, at 341 (listing eligible public assistance programs); MERRITT, *supra* note 285.

288. MASS. ANN. LAWS ch. 164 § 1F(4)(i); see also FERREY, *supra* note 19, § 10:13; FERREY, *supra* note 49, at 341 (listing eligible public assistance programs).

289. Commonwealth of Mass. Dep't of Pub. Utils., *Electric Industry Restructuring Plan: Model Rules and Legislative Proposal D.P.U. 96-100*, ENERGY & ENVTL. AFF. 36 (Dec. 30, 1996), <http://www.env.state.ma.us/dpu/docs/restruct/96-100/96-100p.pdf>.

290. FERREY, *supra* note 49, at 341.

291. See *id.* ("The cost of the subsidy is rolled into the rates of all customer classes."); FERREY, *supra* note 19, § 10:13; see also MERRITT, *supra* note 285.

292. See FERREY, *supra* note 19, § 10:17.

293. *Percentage of Income Payment Plan Plus (PIPP Plus)*, PUB. UTIL. COMM'N OHIO, <http://www.puco.ohio.gov/puco/index.cfm/consumer-information/consumer-topics/percentage-of-income-payment-plan-plus-pipp-plus/> (last visited Nov. 9, 2013).

294. *Energy Assistance Programs*, PA. PUB. UTIL. COMM'N, [http://www.puc.state.pa.us/consumer\\_info/electricity/energy\\_assistance\\_programs.aspx](http://www.puc.state.pa.us/consumer_info/electricity/energy_assistance_programs.aspx) (last visited Nov. 9, 2013).

295. *Id.*

Pennsylvania law explicitly preserves the utility companies' rights to fully recover costs of low-income assistance through a "nonbypassable rate mechanism."<sup>296</sup>

### 3. Flat Credits

New Jersey offers the Lifeline program, which is a \$225 flat credit to senior customers, disabled individuals, and low-income customers who have electric and gas costs included as a component in their rents.<sup>297</sup> New Jersey also offers the Universal Service Fund program, which provides a fixed credit each month for up to \$1,800 annually.<sup>298</sup> Alternatively, low-income customers facing a financial crisis can apply to NJ SHARES, a nonprofit corporation that provides a one-time grant of up to \$300 to apply to electric bills.<sup>299</sup>

### 4. Waiver of Customer Charges

Alabama and Georgia utilities have provided discounts for low-income customers through customer charge waivers,<sup>300</sup> which waive the fixed customer charge that is a small element of all monthly residential bills.<sup>301</sup> In Alabama, the waiver is based on the customer's eligibility for social security income.<sup>302</sup> Mississippi and New York also offer waivers of customer charges.<sup>303</sup> Mississippi Power will waive the monthly base charge of \$0.46 per day for qualified elderly and low-income customers.<sup>304</sup>

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296. See 66 PA. CONS. STAT. ANN. § 2802(17) (West 2013) (“[F]ull recovery of such costs is to be permitted through a nonbypassable rate mechanism.”).

297. *Customer Assistance*, N.J. BOARD PUB. UTIL., <http://www.nj.gov/bpu/assistance/programs/> (last visited Dec. 15, 2013); *Lifeline*, N.J. DEPT' HUM. SERVS. DIVISION AGING SERVS., <http://www.state.nj.us/humanservices/doas/home/lifeline.html> (last visited Dec. 15, 2013); see also FERREY, *supra* note 19, § 10:17.

298. *Universal Service Fund*, N.J. BOARD PUB. UTIL., <http://www.state.nj.us/bpu/residential/assistance/usf.html#nbr1> (last visited Dec. 15, 2013).

299. See *Customer Assistance*, N.J. BOARD PUB. UTIL., <http://www.nj.gov/bpu/assistance/programs/> (last visited Dec. 15, 2013); see also *NJ SHARES Provides Energy Assistance*, NJ SHARES, <http://www.njshares.org/aboutNJShares/energy-assistance.asp> (last visited Dec. 15, 2013).

300. HARAK ET AL., *supra* note 220, at 170–71, 245.

301. *Id.*

302. See ALA. POWER CO., RULES AND REGULATIONS FOR ELECTRIC SERVICE § 6.2 (2011), available at <http://www.alabamapower.com/residential/pricing-rates/pdf/APCRulesRegulations.pdf>.

303. See FERREY, *supra* note 19, § 10:17.

304. *Assistance and Help in Mississippi with Cooling and Utility Bills*, UTIL. BILL ASSISTANCE, [http://www.utilitybillassistance.com/html/mississippi\\_assistance\\_and\\_hel.html](http://www.utilitybillassistance.com/html/mississippi_assistance_and_hel.html) (last visited Dec. 15, 2013).

### 5. *Purchaser Bill Arrearage Forgiveness*

Connecticut and Michigan offer bill payment arrearage forgiveness to certain customers.<sup>305</sup> Of note, retail rate discounts based on the age of the customer are somewhat similar to local property tax discounts afforded to older taxpayers owning real property in a community. For example, some local governments provide an exemption from property tax for a homeowner over either sixty-five or sixty-seven years of age with a financial estate, excluding the home, below \$40,000 to \$43,000, depending on the city.<sup>306</sup> This can be a partial or total exemption in some cities.<sup>307</sup>

There is a distinction between tax policy and retail utility rates. Tax policy is initiated by the legislative branch to raise revenue for public services; utility rates are established by an executive agency of the state government under rate precedent to recover the fair and equitable cost of retail energy supply for a typically monopolized provider of private power service.<sup>308</sup> The former is able to exercise legislative discretion, while the latter makes a quasijudicial determination based on administrative law principles.<sup>309</sup> In determining the latter, there is less political discretion in addition to more requirements of law.

### B. *Legal Challenges to Discounted Energy Rates*

It is no secret that utility companies are neither charitable institutions nor government welfare agencies.<sup>310</sup> Utilities cannot be compelled to devote their property for a public use without compensation and are entitled to make a reasonable and fair return on their investments.<sup>311</sup> Utilities recoup costs from required discounts to a given class of customers through an invisible charge imposed on the utility bills of other classes of customers.<sup>312</sup>

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305. See FERREY, *supra* note 19, § 10:17.

306. See, e.g., *Tax Assistance Programs*, CITY NEWTON MASS., <http://www.newtonma.gov/gov/assessor/programs.asp> (last visited Dec. 15, 2013); *Tax Exemption Information*, TOWN CONCORD MASS., [http://www.concordma.gov/pages/ConcordMA\\_assessor/exemption\\_information](http://www.concordma.gov/pages/ConcordMA_assessor/exemption_information) (last visited Dec. 15, 2013).

307. See *id.*

308. Compare Kenneth L. Sokoloff & Eric M. Zolt, *Inequality and Taxation: Evidence from the Americas on How Inequality May Influence Tax Institutions*, 59 TAX L. REV. 167, 168 (2006), with PHILLIPS, *supra* note 227, at 171–72.

309. See PHILLIPS, *supra* note 227, at 148–53.

310. See 12 EUGENE MCQUILLIN, THE LAW OF MUNICIPAL CORPORATIONS § 34:195 (3d ed. 2011); see also *Narragansett Elec. Co. v. Harsch*, 368 A.2d 1194, 1211–12 (R.I. 1977).

311. *State ex rel. Puget Sound Power & Light Co. v. Dep't of Pub. Works*, 38 P.2d 350, 352 (Wash. 1934) (“One of the main purposes of our statutory public service law is that rates shall at all times be nondiscriminatory, nonpreferential, and just, reasonable, and sufficient to yield a reasonable compensation for the service rendered.” (quotation marks omitted)).

312. See FERREY, *supra* note 19, § 10:17; FERREY, *supra* note 49, at 341.

Residential class discounts may be imposed as increases on the rest of residential customers or may be spread over commercial- and industrial-class customers.<sup>313</sup>

The rate-making allocation is a zero-sum game: one class's gain is the other class's increased costs, dollar for dollar. As the legal touchstone, a public utility regulatory commission lacks the power to approve the collection of unjust, unreasonable, discriminatory, preferential, or prejudicial rates.<sup>314</sup> Depending on the language of the state constitution, the practice of discounted utility rates to one class and not to another class with identical costs of service may violate applicable state equal protection clauses.<sup>315</sup>

*1. Legal Metrics: Undue Rate Discrimination Violates the Equal Protection Clause*<sup>316</sup>

Despite the prohibition on setting or administering discriminatory, preferential, or prejudicial rates, a significant number of state commissions have implemented discounted rates to certain classes of retail consumers. When contested, the majority of legal challenges to policies of discounted rates have been based on the equal protection clause of the applicable state constitution.<sup>317</sup> Rate disparity among classes of consumers, alone, does not establish unlawful discrimination.<sup>318</sup> If classifications are reasonable, disparity in rates may exist between different classes of customers and, typically, industrial, residential, commercial, and municipal customers pay different rates for their services.<sup>319</sup> A state regulatory commission must make a determination as to whether different customers have paid variable "amounts for the same service under the same circumstances."<sup>320</sup>

At the federal level of regulation, section 205 of the Federal Power Act prohibits utilities from granting any "undue preference or advantage to any person or . . . maintain[ing] any unreasonable difference in rates . . . either as between localities or as between classes of service."<sup>321</sup> Utilities are permitted, however, to have reasonable differences in the rates charged to distinct classes of

313. See *id.*; see also *City of Pittsburgh v. Pa. Pub. Util. Comm'n*, 126 A.2d 777, 786 (Pa. Super. 1956).

314. 73B C.J.S. *Public Utilities* § 32 (2013).

315. See RICHARD J. PIERCE, JR. & ERNEST GELLHORN, *REGULATED INDUSTRIES: IN A NUTSHELL* 177–87 (4th ed. 1999).

316. *Id.*

317. FERREY, *supra* note 19, § 10:17; see also *Mountain States Legal Found. v. Pub. Utils. Comm'n*, 590 P.2d 495, 496–97 (Colo. 1979); *Re Cent. Me. Power Co.*, 26 Pub. Util. Rep. 4th (PUR) 388, 430 (Me. 1978); *Pa. Pub. Util. Comm'n v. Phila. Elec. Co.*, 91 Pub. Util. Rep. 3d (PUR) 321, 373 (Pa. 1971).

318. See *City of Bethany v. FERC*, 727 F.2d 1131, 1139 (D.C. Cir. 1984).

319. *Atl. Tel. Co. v. Pub. Serv. Comm'n*, 390 A.2d 439, 444 (D.C. 1978).

320. *Id.*

321. 16 U.S.C. § 824d(b) (2012).

customers.<sup>322</sup> It also is typical that customers who utilize electricity for heating their dwellings pay a lower rate for electricity than those who do not.<sup>323</sup> Larger-volume industrial and commercial customers often pay at a lower rate per unit of delivered power than do residential customers.<sup>324</sup>

FERC regulations specify that it is illegal to discriminate in rates between customers of the same class.<sup>325</sup> Utility rates should accurately reflect the cost of serving each customer class rather than the individual within that class.<sup>326</sup> There should be horizontal equity between different customer classes and vertical equity among customers of different amounts of electricity usage within the customer class.<sup>327</sup> It is against these principles that discounted rates to certain customers are often challenged, where certain customers within the residential class of customers receive the same-cost service at a discounted rate compared to other residential customers.

## 2. Successful Challenges to Retail Rates as Unjust Discrimination

Pennsylvania's energy regulatory commission held that utility charges must be applied equally within the residential class and that offering a special rate to low-income and fixed-income customers constituted unconstitutional discrimination.<sup>328</sup> The commission held that the rates should be based on the electric load

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322. See FERREY, *supra* note 2, at 583.

323. See, e.g., *Electric Heat Discount Rate*, CORNHUSKER PUB. POWER DIST., <http://www.cornhusker-power.com/discounttrate.asp> (last visited Nov. 7, 2013).

324. FERREY, *supra* note 2, at 566, 570, tbl.12.4; see also *Average Retail Price of Electricity to Ultimate Customers by End-Use Sector*, U.S. ENERGY INFO. ADMIN., [http://www.eia.gov/electricity/annual/html/epa\\_02\\_10.html](http://www.eia.gov/electricity/annual/html/epa_02_10.html) (last visited Dec. 15, 2013) (noting that in 2011 in Massachusetts, industrial customers paid 13.38 cents per kilowatt-hour, commercial customers paid 14.33 cents per kilowatt-hour, and residential customers paid 14.67 cents per kilowatt-hour, on average).

325. *Pub. Serv. Co. Ind. v. FERC*, 575 F.2d 1204, 1212 (7th Cir. 1978), *aff'd sub nom. City of Frankfort, Ind. v. FERC*, 678 F.2d 699 (7th Cir. 1982); *Wis. Mich. Power Co.*, 54 Pub. Util. Rep. 3d (PUR) 321 (Fed. Power Comm'n 1964) ("Section 205 [of the Power Act] does not prohibit all rate distinctions but only rate discrimination as between customers of same class."); FERREY, *supra* note 49, at 26.

326. See FERREY, *supra* note 2, at 583; see also *Am. Elec. Power Serv. Corp.*, 67 F.E.R.C. ¶ 61,168, ¶ 61,487 (1994).

327. See FERREY, *supra* note 2, at 583; see also *Am. Elec. Power Serv. Corp.*, 67 F.E.R.C. ¶ 61,490 (explaining that the "focal point of claims of undue discrimination has changed from discrimination in the treatment of different customers to discrimination in the rates and services the utility offers third parties when compared to its own use of the transmission system").

328. See *Pa. Pub. Util. Comm'n v. Phila. Elec. Co.*, 91 Pub. Util. Rep. 3d (PUR) 321, 373 (Pa. 1971).

and service characteristics of the customer class.<sup>329</sup> The commission was concerned about the spillover impact of decreased costs to the benefited group and the commensurate increased costs to similar-cost-to-serve customers.<sup>330</sup>

Indiana law prohibits utilities from charging different rates for customers who receive the “same service under the same circumstances.”<sup>331</sup> The Public Service Commission of Indiana held such rates to be prohibited by law; lifeline rates would not be effective in “[p]roviding assistance to low-income residential customers and should not be required.”<sup>332</sup> Targeted lifeline rates that provided a below-cost electric rate for specific customers based on their level of income or demography were found to violate state statutes prohibiting undue discrimination.<sup>333</sup> The court held that it was discriminatory to charge customers different rates when they were “receiving the same service under the same circumstances.”<sup>334</sup> The court found that the practice was discriminatory and that a general discount encourages overconsumption of electricity.<sup>335</sup>

Indiana utilities were given the opportunity to request regulatory approval of low-income programs.<sup>336</sup> The state initiated the Alternative Utility Regulation Act,<sup>337</sup> which allows Indiana utilities to request approval of an alternative regulatory plan from the Indiana Utility Regulatory Commission.<sup>338</sup> Eligibility for the

329. *Id.*

330. *Id.*

331. *Citizens Action Coal. of Ind. v. Pub. Serv. Co. of Ind.*, 450 N.E.2d 98, 101 (Ind. Ct. App. 1983). Section 8-1-2-103(a) of the Indiana Code states the following:

No public utility, or agent or officer thereof, or officer of any municipality constituting a public utility, as defined in this chapter, may charge, demand, collect, or receive from any person a greater or less compensation for any service rendered or to be rendered, or for any service in connection therewith, than that prescribed in the published schedules or tariffs then in force or established as provided herein, or than it charges, demands, collects, or receives from any other person for a like and contemporaneous service.

IND. CODE ANN. § 8-1-2-103(a) (LexisNexis 2012).

332. *Citizens Action Coal. of Ind.*, 450 N.E.2d at 100.

333. *Id.* at 101.

334. *Id.*

335. *Id.* at 102-04.

336. HARAK ET AL., *supra* note 220, at 168.

337. IND. CODE ANN. § 8-1-2.5-1 to -12 (LexisNexis 2012).

338. *Id.* § 8-1-2.5-6; *see also* *Re Ind. Gas Co., Ind. Util. Reg. Comm'n*, No. 43669, slip op. at 27 (Nov. 19, 2009). In making this decision, the Commission is required to consider the following factors:

1. Whether . . . operating conditions . . . render the exercise, in whole or in part, of jurisdiction by the commission unnecessary or wasteful.
2. Whether the commission's declining to exercise, in whole or in part, its jurisdiction will be beneficial for the energy utility, the energy utility's customers or the state.

discounted rates is based on a customer's gross household income being at or below federal LIHEAP eligibility levels, which assistance the customer must also receive.<sup>339</sup> Costs are recovered by a utility company's contribution to the program along with a monthly charge to the bills of residential, commercial, and industrial customers.<sup>340</sup>

Rhode Island employs a LIHEAP-based system, and pilot programs were implemented in Minnesota, Montana, and Wisconsin.<sup>341</sup> There are thirty-five million households in the United States with incomes low enough to qualify for LIHEAP, which generally covers about one-third of a household's heating bill.<sup>342</sup> A variant of this concept in Ohio and Pennsylvania is a non-LIHEAP-based plan that utilizes state revenues, charitable contributions, donations for fuel or emergency assistance, or other utility ratepayer funds.<sup>343</sup>

The Colorado Supreme Court held that targeted lifeline rates for low-income customers were unconstitutional because they were unjustly preferential, discriminatory, and contrary to legal prohibition of preferential rates.<sup>344</sup> The Colorado PUC could not implement a rate structure preferential to a narrowly defined group of low-income customers.<sup>345</sup> The court reasoned that the PUC is a nonelected body that cannot determine which customers could receive a special rate.<sup>346</sup> "To find otherwise would empower the PUC, an appointed, nonelected body, to create a special rate for any group it determined to be deserving."<sup>347</sup> The court expressed

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3. Whether the commission's declining to exercise, in whole or in part, its jurisdiction will promote energy utility efficiency.
  4. Whether the exercise of commission jurisdiction inhibits an energy utility from competing with other providers of functionally similar energy services or equipment.

*Id.* at 28.

339. U.S. Dep't Health & Hum. Servs., *Indiana: FY 2013/1014 Low-Income Energy Programs*, LIHEAP CLEARINGHOUSE, <http://liheap.ncat.org/profiles/Indiana.htm> (last updated Nov. 4, 2013).

340. *Re Ind. Gas Co., Ind. Util. Reg. Comm'n*, No. 43669, slip op. at 7–8.

341. SAUNDERS & BROCKWAY, *supra* note 264, at 303.

342. CAMPAIGN FOR HOME ENERGY ASSISTANCE, *THE LIHEAP INVESTMENT 3* (2010), available at [http://liheap.org/assets/investment/LIHEAP\\_investment\\_june2010.pdf](http://liheap.org/assets/investment/LIHEAP_investment_june2010.pdf) ("An estimated 35 million U.S. households—one out of every four in America—were eligible for LIHEAP in 2006."); see also U.S. Dep't Health & Hum. Servs., *MA Releases 2012 Program Overview*, LIHEAP CLEARINGHOUSE, <http://liheap.ncat.org/news/april13/marpt.htm> (last updated Nov. 8, 2013) (stating that the Massachusetts Department of Housing and Community Development estimates that its maximum benefit for FY 2013 will cover only about one-third of a household's heating bill).

343. SAUNDERS & BROCKWAY, *supra* note 264, at 303.

344. See *Mountain States Legal Found. v. Pub. Utils. Comm'n*, 590 P.2d 495, 498 (Colo. 1979).

345. *Id.* at 498.

346. *Id.*

347. *Id.*

concern that other ineligible captive retail customers were compelled to finance the lower rates.<sup>348</sup>

### 3. *Successful Retail Rate Challenges as Ultra Vires Administrative Action*

The Rhode Island Supreme Court ruled that the Rhode Island PUC is not authorized to mandate preferential rates to elderly or poor customers without a grant of power from the legislature.<sup>349</sup> The ruling held that without the legislature's grant of authority, only the utility company shareholders themselves could choose to offer discounted rates and might not be compensated for the same.<sup>350</sup> In a Pennsylvania case, the court held that it was beyond the Pennsylvania PUC's authority to determine subsidies for low-income customers.<sup>351</sup> The court determined that decisions regarding subsidies must be left to the legislature.<sup>352</sup>

The Maine PUC also found the reduced rate for elderly low-income customers to be unjust and unreasonable.<sup>353</sup> The Commission held that the reduced rate was an inappropriate "social judgment[]." <sup>354</sup> The Department of Public Works of Washington ordered utility companies to reduce the utility rates of distressed farmers.<sup>355</sup> On appeal, the Washington Supreme Court reasoned that the customer's value or ability to pay should not be the

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348. *Id.* at 497.

349. *Blackstone Valley Chamber of Commerce v. Pub. Util. Comm'n*, 396 A.2d 102, 104 (R.I. 1979).

350. *See id.* at 104-05.

351. *U.S. Steel Corp. v. Pa. Pub. Util. Comm'n*, 390 A.2d 865, 871 (Pa. Commw. Ct. 1978).

352. *Id.*

353. *See Re Cent. Me. Power Co.*, 26 Pub. Util. Rep. 4th (PUR) 388, 430 (Me. Pub. Util. Comm'n 1978), *appeal sustained in part, denied in part sub nom. Cent. Me. Power Co. v. Pub. Util. Comm'n*, 405 A.2d 153 (Me. 1979).

354. *Id.* The commission stated the following:

We cannot solve the nation's economic problems and we cannot solve ratepayers' financial problems. What we can do, however, is try to insure that those who buy electricity pay what it costs to generate and deliver that electricity to them, and that no one group of customers is subsidized at the expense of another. By doing this, we believe that all customers will be treated as fairly as possible; that they will be more able to choose wisely among competing energy technologies; that use of electricity will be neither promoted nor discouraged artificially; and that rates will, ultimately, be more stable than might otherwise be the case.

*Id.* at 429.

355. *See State ex rel. Puget Sound Power & Light Co. v. Dep't of Pub. Works*, 38 P.2d 350, 352 (Wash. 1934) (explaining that the Board held public hearings and made findings to decide that "rate reductions are both necessary and advisable" in light of the farmers' dire financial situation).

determinative factor to order rate reductions that were borne by other ratepayers.<sup>356</sup>

#### 4. *Discounts Upheld as Constitutional Under State Law*

Other state courts have reached contrary decisions on the legality of discounted rates to classes of customers not based on cost of service. The Public Service Commission of Utah concluded that lifeline rates were legal under state law<sup>357</sup> and that they were in the public interest.<sup>358</sup>

Massachusetts is the only state in which a discounted rate has been upheld by its highest court.<sup>359</sup> In Massachusetts, utility companies provide a straight percentage discount for low-income customers.<sup>360</sup> These residential discount costs are spread over several other classes of customers; the PUC estimated the discount would cost other customers about \$905,300 in decreased revenues, or an increase of \$1.91 per year on the bill of the average residential customer and \$30.58 per year on the bills of average industrial customers.<sup>361</sup>

The Massachusetts Supreme Judicial Court held that the Massachusetts Department of Public Utilities ("DPU") had the authority to approve a special reduced rate for certain low-income elderly customers.<sup>362</sup> The court found that although there was no express statutory grant of authority, the DPU had not exceeded its jurisdictional power over determining the rate structures of customers.<sup>363</sup> The court reasoned that the DPU had a rational basis for imposing a cost that had a minimal effect on ratepayers: regardless of "whether the rate is unduly or irrationally discriminatory," the court reinforced that "different treatment for different classes of customers, reasonably classified, is not unlawful discrimination."<sup>364</sup>

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356. *Id.*; see also *Narragansett Elec. Co. v. Harsch*, 368 A.2d 1194, 1213 (R.I. 1977) (holding that the commission erred in relying upon consumers' ability to pay in setting cost of equity).

357. See *Re PacifiCorp*, 192 Pub. Util. Rep. 4th (PUR) 289, 352-53 (Utah Pub. Serv. Comm'n 1999).

358. *Id.* at 355.

359. See *Am. Hoechst Corp. v. Dep't of Pub. Utils.*, 399 N.E.2d 1, 4 (Mass. 1980) (explaining that it was not improper for the Massachusetts Department of Public Utilities to consider the age and income of customers to offer a reduced rate); FERREY, *supra* note 19, § 10:17.

360. See *Am. Hoechst Corp.*, 399 N.E.2d at 2 (explaining that a customer qualifies for a rate reduced from the standard domestic rate if the customer is at least sixty-five years old, a head of household, and a recipient of supplemental social security income).

361. *Id.*; see also FERREY, *supra* note 19, § 10:17 n.16.

362. *Am. Hoechst Corp.*, 399 N.E.2d at 3.

363. See *id.*

364. *Id.*

Ultimately, the court held that the DPU had the authority to order all classes to share equally the costs of the reduced rate for the low-income elderly "as long as its choice does not have a confiscatory effect or is not otherwise illegal."<sup>365</sup> The DPU ordered that the costs of the discount be shared equally among all classes of customers, not just the residential class.<sup>366</sup>

The lessons from this Part are instructive. States allow both lower (lifeline or assistance) rates and higher rates per unit of energy supplied to be charged to groups of customers, apart from tracking the cost of serving these classes. The clear conclusion is that in many states, the rates can be set higher or lower than the cost of service for a given class of customers.

My proposal for a cost-based rate classification for electric service for distributed generators of renewable energy never enters this "gray zone" of arbitrarily discounted rates for the elderly or poor that are allowed in certain states while disallowed in other states as violating cost-of-service principles for the cost of a monopoly service. My proposal would actually track quantitatively and reflect the net cost of service for sale of power netted against the contribution of that distributed power to the utility system. As such, the resulting rates would conform to traditional rate principles rather than represent a legal aberration. Therefore, once the lower net costs of service for the class of distributed generation customers is quantified by a state regulatory commission, such differentiated retail rate classifications would be clearly justified under legal principles and precedent and would not be subject to any federal court or FERC review. Important for the states that are being challenged in their implementation of other subsidies, my proposed cost-based net retail rate category is completely within state authority and triggers no significant constitutional issues.

#### V. HISTORIC STATE RETAIL RATE DISCOUNTS BASED ON QUANTITY

Even beyond such state price distinctions based on customer income or age, there are existing state retail rate distinctions related to the amount of customer consumption. This occurs in two inverse modes: First, in many states, customers who have more electricity-consuming equipment are afforded discounted rates per unit of power consumption because of the greater amount of equipment and usage.<sup>367</sup> Discounted rates typically are afforded to all-electric heating customers, who use electricity for water heating

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365. *Id.* at 4.

366. *Id.* at 3.

367. See William K. Jones, *An Example of a Regulatory Alternative to Antitrust: New York Utilities in the Early Seventies*, 73 COLUM. L. REV. 462, 495 (1973) (explaining that customers with a high demand and low consumption rate traditionally pay much more per unit of consumption than customers with lower demand but the same or a higher volume of consumption).

or space heating in addition to conventional lighting applications.<sup>368</sup> The justification for this is general policy rather than a cost-based rationale.<sup>369</sup>

Conversely, a number of states in the age of conservation have adopted inclining block rates, which increase rates for greater usage in excess of a specified amount, accomplishing price signals to consumers to encourage more conservation of energy resources.<sup>370</sup> In neither rate is the altered price typically justified by a comparison of the cost of supplying the electric commodity or service. Customer demand is relatively inelastic when the customer has money or no suitable available substitutes, which can characterize electricity.<sup>371</sup> Quantity discounts provided in tariffs such as declining block tariffs have historically been justified if large customers are cheaper to serve than small ones.<sup>372</sup>

By way of quick example, the Massachusetts utility NSTAR, including Boston Edison and the largest utility in the state and in New England since a recent merger with Northeast Utilities, has five separate residential rates.<sup>373</sup> One is a time-of-use rate,<sup>374</sup> which assigns different electricity prices to different-cost periods during the day and year based on actual statistical data. As set forth in Table 3, the remaining residential rate structures provide a per unit (kWh) distribution charge based on

- (1) a base retail rate of \$0.05847 / kWh,<sup>375</sup>
- (2) a 13.55% less expensive rate for customers who also heat with electricity and therefore use more electricity,<sup>376</sup>

368. See *Summary of Rates*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013) (illustrating lower rates of distribution per kilowatt-hour and transmission per kilowatt-hour for A4-Residential Space Heating customers with electric space heating throughout their homes as compared to A1-Residential rates available to all residential customers for heating).

369. BONBRIGHT ET AL., *supra* note 223, at 561.

370. See *Understand Your Electric Charges*, PAC. GAS & ELEC. CO., <http://www.pge.com/en/myhome/myaccount/charges/index.page> (last visited Dec. 16, 2013) (explaining that California determines a baseline electricity quantity based on the energy needs of the average consumer in a region and increases price per kWh as customers move above the baseline quantity).

371. PHILLIPS, *supra* note 227, at 436.

372. BONBRIGHT ET AL., *supra* note 223, at 523 (referencing STEPHEN J. BROWN & DAVID S. SIBLEY, *THE THEORY OF PUBLIC UTILITY PRICING* 179 (1986)).

373. See *Summary of Rates*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013).

374. *A5—Optional Residential Time of Use (R-4)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp#REA5](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp#REA5) (last visited Dec. 16, 2013).

375. See *A1—Residential (R-1)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013).

- (3) a 12.02% less expensive rate for “assistance” customers,<sup>377</sup> and
- (4) a 25.57% less expensive rate for “assistance” electric-heating customers.<sup>378</sup>

TABLE 3: NSTAR SUMMARY OF DISTRIBUTION RATE AND PERCENT DISCOUNT BY CLASSIFICATION

Customer Classification	Distribution Rate / kWh	Percent Discount / kWh
A1—Residential (R-1)—Base Rate	\$0.05617 <sup>379</sup>	—
A2—Residential Assistance (R-2)	\$0.04942 <sup>380</sup>	12.02
A3—Residential Assistance (R-2) (with electric heat)— <i>October through May</i>	\$0.04181 <sup>381</sup>	25.57
A3—Residential Assistance (R-2) (with electric heat)— <i>June through September</i>	\$0.04940 <sup>382</sup>	12.05
A4—Residential Space Heating (R-3)— <i>October through May</i>	\$0.04856 <sup>383</sup>	13.55
A4—Residential Space Heating (R-3)— <i>June through September</i>	\$0.05615 <sup>384</sup>	0.04

There are rate discounts in the table above based on whether one already receives other public financial assistance as well as discounts for using more electricity if one has electric heat use; one can double-layer both discounts. Such differentiated rates, based on factors other than the cost of service to the customer class, also characterize NSTAR rates for other customer classes.<sup>385</sup> Moreover, similar rate classifications are provided by other Massachusetts

376. *A4—Residential Space Heating (R-3)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013).

377. *A2—Residential Assistance (R-2) (Without Electric Heat)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013).

378. *A3—Residential Assistance (R-2) (With Electric Heat)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013).

379. *A1—Residential (R-1)*, *supra* note 375.

380. *A2—Residential Assistance (R-2) (Without Electric Heat)*, *supra* note 377.

381. *A3—Residential Assistance (R-2) (With Electric Heat)*, *supra* note 378.

382. *Id.*

383. *A4—Residential Space Heating (R-3)*, *supra* note 376.

384. *Id.*

385. *See, e.g., A5—Optional Residential Time of Use (R-4)*, NSTAR, [http://www.nstar.com/ss3/residential/rates\\_tariffs/rates/rates.asp](http://www.nstar.com/ss3/residential/rates_tariffs/rates/rates.asp) (last visited Dec. 16, 2013) (applying a discount rate to condominium common areas and buildings used exclusively for public worship).

utilities (e.g., National Grid)<sup>386</sup> and utilities in other states.<sup>387</sup> Such deviations from cost principles are the norm rather than the exception. No deviations are based on strict cost-of-service principles.

By way of a second example from the opposite side of the country, Pacific Gas & Electric Company ("PG&E"), the largest California utility provider, similarly provides service discounts for qualified electricity consumers in block rate form.<sup>388</sup> PG&E classifies customers into two groups: Non-CARE Customers and CARE Customers.<sup>389</sup> CARE, California Alternate Rates for Energy, is an electric rate discount program for qualified customers.<sup>390</sup> A criterion for qualification is a factor of a household's gross annual income.<sup>391</sup> Annual gross income levels vary by household size.<sup>392</sup> Customers also may qualify for CARE benefits if they meet household income guidelines and a household member participates in a designated public assistance program, such as Women, Infants, and Children ("WIC"), CalFresh/Supplemental Nutrition Assistance Program ("SNAP" or "Food Stamps"), Head Start Income Eligible, National School Lunch Program ("NSLP"), and Medicaid/Medi-Cal.<sup>393</sup>

Non-CARE customers are subject to a four-tier block rate structure.<sup>394</sup> CARE customers are subject to a three-tier

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386. See *Service Rates*, NAT'L GRID, [http://www.nationalgridus.com/masselectric/business/rates/3\\_rates.asp](http://www.nationalgridus.com/masselectric/business/rates/3_rates.asp) (last visited Dec. 16, 2013) (showing three levels of service rates).

387. See N.Y. State Electric & Gas Corp., *Electric Rates Summary—October 2013*, NYSEG 1 (2013), <http://www.nyseg.com/MediaLibrary/2/5/Content%20Management/NYSEG/SuppliersPartners/PDFs%20and%20Docs/N%20Electric%20Rate%20Summary.pdf> (breaking down rate classifications in southern New York).

388. See Pac. Gas & Elec. Co., *Understand Your Electric Charges*, PG&E, <http://www.pge.com/en/myhome/myaccount/charges/index.page> (last visited Dec. 16, 2013) (laying out the four-tier rate structure).

389. *Id.*

390. See Pac. Gas & Elec. Co., *CARE (California Alternate Rates for Energy)*, PG&E, <http://www.pge.com/myhome/customerservice/financialassistance/care/> (last visited Dec. 16, 2013) ("The CARE program provides a monthly discount on energy bills for income-qualified households and housing facilities. Qualifications are based on the number of persons living in your home and your total annual household income.").

391. See Pac. Gas & Elec. Co., *Program Guidelines*, PG&E, <http://www.pge.com/en/myhome/customerservice/financialassistance/care/eligibility/index.page> (last visited Dec. 16, 2013) (explaining that to qualify for the CARE discount, a customer's gross annual household income must be at or below the amounts provided).

392. See *id.* (explaining that gross annual household income is "based on the number of household members").

393. *Id.*

394. See Pac. Gas & Elec. Co., *Understand Your Electric Charges*, PG&E, <http://www.pge.com/en/myhome/myaccount/charges/index.page> (last visited Dec. 16, 2013).

structure.<sup>395</sup> The first tier, a baseline amount, is a calculated amount of electric use by zip code, factoring seasons (summer and winter), set by state law and approved by the California Public Utilities Commission.<sup>396</sup> As consumption increases, the per kWh rate increases, as set forth in Table 4.<sup>397</sup>

TABLE 4: PG&E SUMMARY OF DISTRIBUTION RATE AND PERCENT DISCOUNT BY CUSTOMER CLASSIFICATION AND TIER

	Use as Percent of Baseline	NON CARE Rate / kWh <sup>398</sup>	CARE Rate / kWh <sup>399</sup>	Percent Delta
<b>Baseline</b>	0-100%	\$0.13	\$0.08	38%
<b>Tier 2</b>	101-130%	\$0.15	\$0.10	33%
<b>Tier 3</b>	131-200%	\$0.30	\$0.12	60%
<b>Tier 4</b>	201-300%	\$0.34	\$0.12	65%
<b>Tier 5</b>	>300%	\$0.34	\$0.12	65%

CARE rates are at approximately 65% of other residential rates.<sup>400</sup> For the same amount of 300% of the baseline rates for regular customers, the rate increases more than 150%, while increasing only 50% for CARE customers.<sup>401</sup> Thus, CARE provides discounts in several regards for customers based on customer income.

One final example in another part of the country, Georgia Power, electric provider to Atlanta, Georgia, distinguishes rates based on time of year and amount used.<sup>402</sup> The time of year is differentiated for the winter season, which runs October through May, and summer season, which runs from June through September.<sup>403</sup> This is a traditional declining block rate, but it also affords a per unit rate discount for all-electric customers with higher usage.<sup>404</sup> The tariff reduces rates in block form during the winter period but increases rates in block form during the summer period, as displayed in Table 5.<sup>405</sup>

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395. *Id.*

396. *Id.*

397. *Id.*

398. *Id.*

399. Pac. Gas & Elec. Co., *Energy Statement*, PG&E 3, <http://www.pge.com/includes/docs/pdfs/myhome/customerservice/financialassistance/sb38gtresl.pdf> (last visited Mar. 2, 2014).

400. Pac. Gas & Elec. Co., *supra* note 394.

401. *See id.*

402. *See Standard Service Plan*, GA. POWER, <http://www.georgiapower.com/pricing/residential/standard-service-plan.cshtml> (last visited Dec. 16, 2013) (setting different rates for October–May and June–September based upon amount of power used).

403. *Id.*

404. *Id.*

405. *Id.*

TABLE 5: GEORGIA POWER MONTHLY RATE SCHEDULE<sup>406</sup>

Time of Year (by season)	Up to 650 kWh (Baseline)	650–1000 kWh	Over 1000 kWh
Winter Rate (October–May)	5.2465¢ per kWh	4.5015¢ per kWh <i>14.2% price reduction from baseline</i>	4.4190¢ per kWh <i>15.8% price reduction from baseline</i>
Summer Rate (June–September)	5.2465¢ per kWh	8.7211¢ per kWh <i>66.2% price reduction from baseline</i>	9.0126¢ per kWh <i>71% price reduction from baseline</i>

Deviation from cost-of-service principles occurs in certain states for certain customer classes based on the size of individual consumption, for either larger usage customers (through declining block rates) or conservative customers (through inclining block rates). For distributed renewable energy customers, reduced net demands on the utility system resulting from the customers' on-site self-generation and usage, when analysis is performed would likely translate to a discounted retail service rate per unit of service reflecting their lesser demands on the system. This could be reflected in a discounted retail rate for service to the class of distributed energy generation customers.

Parts V and VI examined the state constitutional precedent to allow or disallow retail electric rate subsidies to the old and the poor and to large volume consumers, respectively. Approximately half of the states disallow discrimination not tracking actual cost of service in the pricing of retail electric utility rates, as a violation of constitutional requirements of equal protection; other states allow discounts rates to subsidize groups based on the age, income, or amount of consumption of the customer. Discrimination unrelated to the cost of service of electricity is permitted in some states and impermissible on equal protection grounds in others.

In contrast, my proposed new rate class for distributed generation customers would never undergo this level of legal scrutiny, because rather than discriminate from actual cost of service to serve a customer group, it actually reflects—better than do current rates—the cost of serving a customer who also generates some of his or her own electricity. My proposal tracks requirements of equal protection and the universally recognized principle that retail rates should reflect cost of service to each class of customers. Such a net discount in retail services rates accomplishes a subsidy for renewable distributed generation. This new rate class can be used along with some of the other renewable incentives discussed above<sup>407</sup> or as a substitute for them if they are stricken by the courts. This proposal is an elegant, simple solution and is no more

406. *Id.*407. *See supra* Part II.

difficult to implement than conventional rates, because it employs conventional rate principles.

## VI. THE NEW FRONTIER: WHERE NEW SOLUTIONS LEAD

### A. *Why It Matters*

The importance of the electric sector to the modern industrial economy—and the importance of correct, legal decisions in this last of the regulated industries—are reflected in the electric sector's changing role and the societal impacts of power. In 1949, only 11% of global warming gases in the United States came from the electric sector; as of 2007, this sector is responsible for more than one-third of such cases.<sup>408</sup> “The electric power sector offers the most cost-effective opportunities to reduce CO<sub>2</sub> emissions,” compared to transportation and other sectors.<sup>409</sup>

The Obama Administration stimulus package included a significant incentive package for the electric sector,<sup>410</sup> pouring \$50 billion in spending and \$20 billion in tax incentives into renewable energy and efficiency as part of the \$787 billion stimulus plan.<sup>411</sup> Notwithstanding federal tax incentives, the statutory and regulatory foundation for sustainable energy is a creature of state law and regulation. Ambitious recent legal challenges and a long history of Supreme Court constitutional jurisprudence indicate that several state programs may have overstepped legal limits.

It is understandable that states want to benefit in-state energy projects to the exclusion of out-of-state projects, given that states can influence regulation only in their states and expenditures are at the expense of state citizens. And absent state limits, in fact, there is significant arbitrage of credits benefiting out-of-state recipients at in-state utility ratepayer expense. In Massachusetts, only 9.3% of annual Class I RECs are awarded to power generation sited in-state, with generation in other New England states and beyond greatly exceeding these Massachusetts percentages of the credit market.<sup>412</sup>

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408. See *Historical Data Series: Total Energy-Related Carbon Dioxide Emissions by End-Use Sector and the Electric Power Sector, by Fuel Type, 1949–2007*, U.S. ENERGY INFO. ADMIN. 1 (2007), [http://www.eia.doe.gov/oiarf/1605/ggrpt/excel/historical\\_co2.xls](http://www.eia.doe.gov/oiarf/1605/ggrpt/excel/historical_co2.xls).

409. *Energy Estimates Show Rise in CO<sub>2</sub> Emissions, Offer Mitigation Options*, CLEAN ENERGY REP. (July 2, 2008), <http://cleanenergyreport.com/Energy-EW-Week/Energy-Washington-Week-07/02/2008/energy-estimates-show-rise-in-co2-emissions-offer-mitigation-options/menu-id-570.html>.

410. See generally American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115.

411. Amanda Ruggeri, *What the Stimulus Package Does for Renewable Energy*, U.S. NEWS (March 6, 2009), <http://www.usnews.com/news/energy/articles/2009/03/06/what-the-stimulus-package-does-for-renewable-energy>.

412. MASS. DEP'T. OF ENERGY RES., ANNUAL COMPLIANCE REPORT FOR 2009, at 12, figs.2 & 3 (rev. Jan. 11, 2011), available at <http://www.mass.gov/eea/docs/doer/rps/rps-and-aps-2009-annual-compliance-report-doer-20311.pdf>.

Electric power, however, is increasing in interstate commerce, proceeding through wholesale power transactions:

- (1) the former of which bars as unconstitutional geographic discrimination against out-of-state interstate commerce,<sup>413</sup> and
- (2) the latter of which wholly bars state regulation of the prices and terms at which utilities conduct these transactions.<sup>414</sup>

There have been legal excesses in several states under both constitutional rubrics. State RPS programs, FiTs, system benefit charges, climate control regulation, and net metering programs constitute a broad array of distinct policy tools.<sup>415</sup> These tools create different types of virtual credits and price incentives in favor of state-specified sustainable technologies.<sup>416</sup> These particular state tools, however, are not legally robust; their regulatory "torque" is significantly limited by law. In several states, their use has been applied in a geographically discriminatory manner favoring in-state electric commerce to the detriment of interstate commerce.

The Supreme Court has stated that nothing is more fundamentally part of interstate commerce than commerce in electricity,<sup>417</sup> and states cannot operate on the wholesale side of the regulatory toolbox.<sup>418</sup> Period. Moreover, in implanting an unconstitutional statute or regulation, a state can be held responsible for reimbursing the affected party's legal fees, which can be millions of additional dollars.<sup>419</sup>

To escape these legal trip wires, desperately needed is a new regulatory tool that does not aim at interstate renewable power commerce and operates exclusively on the *retail* side of transactions rather than on *wholesale* commercial transactions. This Article suggests a new mechanism that satisfies both of these key criteria. This mechanism is legally robust, already an accepted technique for other rate-making purposes in every state, and stays clear of the legal trip wires. States do not need to adopt this alternative mechanism to support renewable power; however, it can be tailored to work with whatever other renewable energy incentive programs a state has in place or chooses to implement. This mechanism eliminates any constitutional impacts of some other programs and

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413. See *C & A Carbone v. Town of Clarkstown*, 511 U.S. 383, 390 (1994).

414. See *Ark. Elec. Coop. Corp. v. Ark. Pub. Serv. Comm'n*, 461 U.S. 375, 380 (1983).

415. See *supra* Part II.

416. See *supra* Part II.

417. *FERC v. Mississippi*, 456 U.S. 742, 757 (1982).

418. See *supra* Subpart II.A.

419. See *supra* note 44 and accompanying text.

still seamlessly accomplishes directing state energy incentives to in-state programs.

*B. The New State Tools and Impacts*

Within law and precedent, states could implement this mechanism using the following tools:

- Combine a new separate class of retail service rates, based on actual net cost of service for renewable distributed generation units connected to the distribution system in the state, with state RPS programs that do not implement in-state preferences.
- Combine a new separate class of retail service rates based on actual net cost of service, with net metering in a manner consistent with recent FERC precedent.
- Combine a new separate class of retail service rates based on actual net cost of service, with system benefit charges to benefit in-state customers of state-regulated utilities.
- Combine a new separate class of retail service rates based on actual net cost of service, with GHG emission requirements.
- Replace state FiTs with a new separate class of retail service rates based on actual net costs of service to generators of distributed renewable energy.

The possibilities and combinations can be sculpted to state needs and preferences. Aside from the primary benefit of implementing a legally defensible program, this mechanism avoids expending taxpayer resources to unsuccessfully defend, and in some cases even pay legal fees to challengers of, unconstitutional regulations.<sup>420</sup> In many ways, this new mechanism can serve as the critical missing link, adopted and tailored as appropriate in a given state. There is no debate that we need to transition expeditiously to “sustainable” infrastructure development and ultimately to a more sustainable economy. To do this effectively, we require a carefully

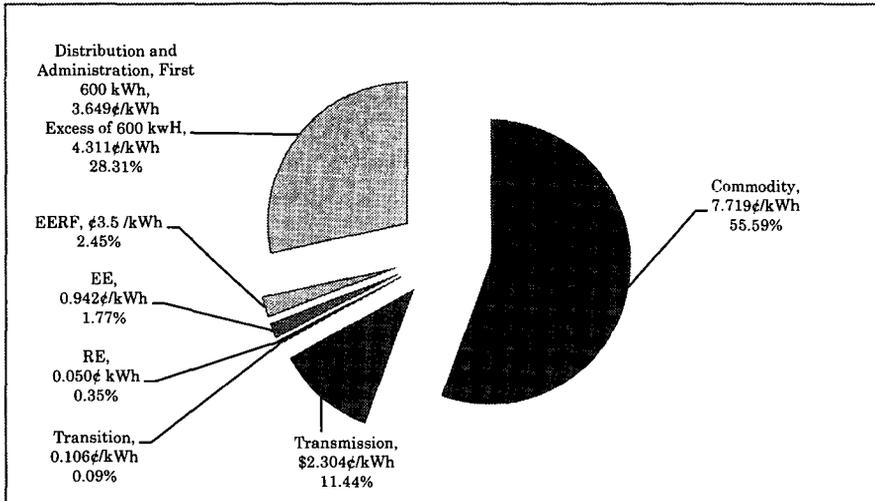
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420. See *supra* note 44 and accompanying text. In *Entergy Nuclear Vt. Yankee, LLC v. Shumlin*, 838 F. Supp. 2d 183, 242–43 (D. Vt. 2012), *aff'd in part, rev'd in part*, 733 F.3d 393 (2d Cir. 2013), the first level of litigation at the trial court level resulted in an award against the state of Vermont of attorney's fees for plaintiff Entergy of approximately \$4.6 million dollars, and mounting over time on appeal, as a result of enacting an unconstitutional energy regulation that was found to violate the Supremacy Clause and the dormant commerce clause. See Anne Galloway, *Entergy Seeks \$4.6 million in Legal Fees from State of Vermont*, VTDIGGER (Feb. 4, 2012), <http://vtdigger.org/2012/02/04/entergy-seeks-4-6-million-in-legal-fees-from-state-of-vermont/>.

designed and legally "bulletproof" regulatory structure at both the state and federal levels.

Figure 1 illustrates that as part of the Massachusetts electric bill, transmission and distribution expenses constitute a large slice of approximately 40% of the total retail cost of each unit of retail electricity purchased. A quantified netting of benefit versus cost would reduce significantly the cost of electricity service to the distributed power generation customer.

FIGURE 1: MASSACHUSETTS VARIABLE BILL COMPONENTS, 2014  
(TOTAL FOR R-1 CUSTOMER USING 500 KWH/MONTH: \$0.1411/KWH)<sup>421</sup>



1. No More FiTs

If the net cost of retail power were reduced for a class of distributed power generators, it could replace or supplement the current traditional state incentives for distributed renewable power in different ways. First, this mechanism could replace traditional state FiTs. Rather than implement an unconstitutional state FiT that causes utility ratepayers to subsidize the wholesale value of power from this customer, this alternative mechanism would reduce, based on actual value to the utility system, the net cost of retail service to this customer. Changing which side of the transaction the state regulates—retail or wholesale—is of critical legal distinction.

It is legally permissible for the state to implement a retail rate policy or classification on the retail side of the equation, instead of implementing a FiT on the wholesale side, and it avoids any federal court challenge. Rate authority over FiTs for wholesale power sale

421. See Home Rates, NAT'L GRID, [https://www.nationalgridus.com/masselectric/home/rates/4\\_res.asp](https://www.nationalgridus.com/masselectric/home/rates/4_res.asp) (last visited Mar. 2, 2013). The fixed customer charge component was not included in this chart.

is not within state discretion.<sup>422</sup> The renewable distributed power generation customer would receive a cross-subsidy through the reduced net retail rate cost of power sold to it.

Beyond its illegality if mandated by U.S. states, the government has done poorly with the design and implementation of FiTs. Those few U.S. states that have adopted FiTs despite the U.S. constitutional prohibition of such state wholesale price regulation have not fared well. In 2011, Oregon lowered the price paid under its solar FiT for the third time in its then only one year of existence, reducing it from its original \$0.65/Kwh to \$0.374/Kwh.<sup>423</sup> Each of Oregon's prior iterations of the FiT at high prices was oversubscribed within less than ten minutes of its availability, even though each time the tariff was lowered 10–20% from the prior available rate.<sup>424</sup> The Oregon PUC proposed to disaggregate the questionably high tariff that was above wholesale costs of power into two components: an avoided-cost payment plus a REC component for solar photovoltaic units.<sup>425</sup>

## 2. Net Metering

Second, this mechanism would change traditional state incentives regarding the separate policy of net metering. By reducing the net rates afforded to the class of distributed generation power customers who contribute distributed net metered power, this reduction in the cost of power sold by the utility to the generator would also reduce the credit rate for net metered power through the retail meter when it is spinning in reverse direction and power is flowing to the utility. While net metered customers would see a lower value credit for their banked net metered power, for a customer who is using all banked net meter power credits on site,<sup>426</sup> this change in rates would have no net impact at the end of a given billing period or year. So the situation that FERC construed in the two net metering cases presented to it for adjudication<sup>427</sup> would not be affected in any manner by use of such an alternative tool.

For other net metered customers, however, who export for credit value much more power than they import and purchase, this

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422. Cal. Pub. Utils. Comm'n, 132 F.E.R.C. ¶ 61,047, ¶ 61,339 (2010) (order on petitions for declaratory order), *clarified on reh'g*, 133 F.E.R.C. ¶ 61,059 (2010); *see also supra* notes 32–44 and accompanying text.

423. Pam Russell, *Oregon Reduces Solar Feed-In Tariff for Third Time, Looking for "Sweet Spot" Price*, ELECTRIC UTIL. WK., Aug. 8, 2011, at 7.

424. *Id.*

425. Amy Fickling, *Oregon Delays Solar Feed-In Pilot as Issues of Jurisdiction Continue to Be Unresolved*, ELECTRIC UTIL. WK., March 15, 2010, at 14–15.

426. Contrast the virtual net metering in Massachusetts *supra* notes 53–55.

427. Sun Edison L.L.C., 129 F.E.R.C. ¶ 61,146, ¶ 61,618–20 (2009), *reh'g granted in part*, 131 F.E.R.C. ¶ 61,213 (2010); MidAmerican Energy Co., 94 F.E.R.C. ¶ 61,340, ¶ 62,263 (2001).

alternative retail mechanism lowers the value at the same rate of both the credits earned and the cost of power. The directional net export of most distributed power affords a lesser rate incentive and subsidy than if this alternative were not implemented. Net metering has already come under recent legal attack for allowing large freestanding wholesale power generation units to reap a high retail credit value,<sup>428</sup> and FERC decisions have cast doubt on, but not yet reached, whether state net metering rules can apply to these net power export transactions.<sup>429</sup>

Many of the forty-three net metering states already have avoided this issue by restricting state net metering to no larger than distributed generation units scaled approximately to the size of the host facility on-site energy requirements.<sup>430</sup> Pennsylvania limited net metering by third-party operators of renewable units to facilities whose output is no more than 110% of prior year power consumption, in order to prevent merchant power plants, in the guise of net metering, from gaining ratepayer subsidies.<sup>431</sup> Maryland sets this limit at 200% of on-site usage for residential projects.<sup>432</sup> State utilities wanted stricter limits on the size of net metering units: San Diego Gas & Electric Company alleged that net metering provided an "unfair and unsustainable subsidy" of approximately \$34 from each other customer to net metering customers.<sup>433</sup>

Therefore, for many of these states that already restrict the size of eligible net metering units, reducing the net retail rate for customers in this class of service would not be a factor that significantly affected their net metering policies or the incentive levels for distributed generation. For those states that allow freestanding, very large net metering projects, this tool would be a factor to lower the retail rate for this class of customers, which rate would also set the net metered credit value. States, however, would have discretion whether or not to apply this new application of a distinct retail customer class distinction that could enjoy lower rates.

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428. See Portsmouth Net Metering, *supra* note 64.

429. See *Sun Edison L.L.C.*, 129 F.E.R.C. ¶ 61,620; *MidAmerican Energy Co.*, 94 F.E.R.C. ¶ 62,263.

430. See Ferrey, *supra* note 46.

431. Net Metering—Use of Third Party Operators, No. M-2011-2249441, at 8–9 (Pa. Pub. Util. Comm'n Mar. 29, 2012), available at <http://www.puc.state.pa.us/pdocs/1170832.docx>.

432. MD. CODE REGS. 20.50.10.01(D)(1)(b) (2011).

433. Lisa Weinzimer, *Consumer and Solar Groups Pan SDG&E's Planned Surcharge, Saying It May Be Illegal*, ELECTRIC UTIL. WK., Nov. 21, 2011, at 18.

### 3. *Renewable Portfolio Standards*

State RPS programs have been criticized as to the invisible cost impact of RPS imposed on captive retail utility ratepayers.<sup>434</sup> The California PUC Division of Ratepayer Advocates criticized the rapid escalation in California ratepayer costs to achieve the state RPS mandate;<sup>435</sup> the cost of RPS compliance exceeded the cost of the power itself.<sup>436</sup> New York City complained that it does not receive a fair share of benefits in return for the RPS payments its residents make<sup>437</sup>; New York City complained that it paid roughly half of the RPS payments because of its one-half share of the New York state population but received only 6% of the projects funded with the revenues raised.<sup>438</sup>

Renewable portfolio standards at the state level do not raise constitutional Supremacy Clause issues but in the design of some state programs raise dormant commerce clause issues.<sup>439</sup> The herein proposed new distributed generator retail rate class alternative could provide both a policy and a legal solution. dormant commerce clause issues arise when an RPS state favors renewable credits associated with in-state or geographically based power production and commerce.<sup>440</sup> By creating a distinct retail customer class for distributed generation customers, however, one still would be benefiting only in-state retail customers. But through this retail mechanism, this in-state benefit would be legally permissible. Out-of-state entities who are not customers of the in-state regulated utilities would not enjoy or be affected by such a mechanism.

Similar net subsidy of in-state retail distributed renewable power generators would be accomplished without doing so through facial constitutional violations associated with the state attempting to regulate or alter the wholesale power transaction. Each of the forty-nine states<sup>441</sup> that have state utility regulatory commissions

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434. See Tiernan, *supra* note 57, at 108.

435. Craig, *supra* note 83.

436. *Id.*

437. Lisa Wood, *New York City Calls for Revisions in State RPS, Claiming It Is "Grossly Underserved,"* ELECTRIC UTIL. WK., Nov. 30, 2009, at 19 (stating that New York funds RPS programs through a surcharge on ratepayer bills).

438. *Id.*

439. See *supra* Subpart II.C.

440. See *supra* Subpart II.C.

441. Nebraska has no regulated private utilities and is therefore the only state not having a state energy regulatory commission. See NEB. POWER REV. BOARD, <http://www.powerreview.nebraska.gov> (last visited Dec. 20, 2013); see also *Structure and Governance*, NEB. ENERGY OFF., <http://www.neo.ne.gov/phase1/chaptertwo.htm> (last visited Dec. 20, 2013) (describing Nebraska's consumer-owned utilities, which "contrast[] greatly with the electric industry as it is organized in other states . . . [because] in most states electricity is supplied

only regulates the terms and prices of retail electric service for retail customers in their individual states who take service from in-state regulated electric utility companies. Lower retail rates for the class of distributed generators would reflect actual calculated costs/savings of service. These rates would be consistent with long-standing legal principles of rate making.<sup>442</sup>

Since the RPS RECs awarded to a renewable generator *from* their generation are a legal creation totally divorced from the sale of electric power service *to* the customer, the RPS could be preserved intact, and an additional subsidy could be provided, by charging the renewable customer a lower retail rate for power it purchased and consumed from the utility grid. Again, this tool would be of more value to a customer consuming all of the renewable distributed power produced than it would be to a large freestanding renewable energy project, divorced from serving an actual customer, which purchases minimal retail power from the grid. Some of the litigation to date regarding renewable power subsidy has concerned state renewable incentives that benefit divorced, freestanding projects.<sup>443</sup> It is clear that states may regulate the mix of generating/efficiency resources that regulated utilities must procure:

[U]nder state authority, a state may choose to require a utility to construct generation capacity of a preferred technology or to purchase power from the supplier of a particular type of resource. The recovery of costs of utility-constructed generation would be regulated by the state. The rates for wholesale sales would be regulated by this Commission [FERC] on a cost-of-service or market-based rate basis, as appropriate.<sup>444</sup>

My proposed new mechanism operates on the retail side of the energy equation regarding the cost of service provided *to* the customer rather than intruding on the cost or value of commerce/power provided at wholesale *from* the distributed energy

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predominantly by private electric companies under the oversight of state regulatory commissions").

442. See *supra* Subpart III.B.

443. Complaint by Benjamin Riggs and the Town of Portsmouth Generator Facility to Luly E. Massaro, Comm'n Clerk, R.I. Pub. Util. Comm'n (May 19, 2010), available at <http://www.ripuc.org/eventsactions/docket/D-10-126page.html>.

444. S. Cal. Edison Co., 70 F.E.R.C. ¶ 61,215, ¶ 61,676 (1995). FERC goes on to note that "in setting an avoided cost rate, a state may account for environmental costs of all fuel sources included in an all source determination of avoided cost." *Id.* FERC notes that this could include a tax on fossil-fuel generators or could provide a subsidy to alternative generation. *Id.* FERC also states that the costs imposed in such evaluations must be only actual costs incurred by the utility buyer of the power. *Id.* Therefore, environmental "adders" or "subtractors" must be based on real environmental externality costs, substantiated on a record before the PUC. *Id.*

customer to the utility—there is tectonic legal distinction.<sup>445</sup> The net result on a policy level—subsidy for the generator of certain renewable generation options—can be similar. The legal mechanisms to accomplish the policy results, however, are bulletproof. A state moving to the *retail* side of regulation is a critical legal distinction under the Federal Power Act and the Supremacy Clause.

### C. *The Supreme Court Now Affords Greater Discretion to Regulators*

In spring 2013, the Supreme Court rendered a decision on whether a government regulator can broadly construe the scope of its own jurisdiction and whether it is entitled to judicial *Chevron* deference in this determination.<sup>446</sup> On both issues, the Supreme Court's answer was "yes."<sup>447</sup>

In *Arlington v. FCC*,<sup>448</sup> the majority held that based on circuit precedent holding that *Chevron U.S.A. Inc. v. Natural Resources Defense Council, Inc.*<sup>449</sup> applies to an agency's interpretation of the scope of its own statutory jurisdiction, and precedent on state utility regulation, "[s]tatutory ambiguities will be resolved, within the bounds of reasonable interpretation, not by the courts but by the administering agency."<sup>450</sup> There is no distinction in terms of deference afforded to the agency between an agency's "jurisdictional" and "nonjurisdictional" interpretations<sup>451</sup>: "[i]f 'the agency's answer is based on a permissible construction of the statute,' that is the end of the matter."<sup>452</sup>

445. See *supra* text accompanying notes 27–34.

446. *City of Arlington v. Fed. Comm'n Comm'n*, 133 S. Ct. 1863 (2013).

447. *Id.* at 1874.

448. *Id.*

449. *Chevron U.S.A., Inc. v. Natural Res. Def. Council, Inc.*, 467 U.S. 837 (1984).

450. *City of Arlington*, 133 S. Ct. at 1868 (citing *AT&T Corp. v. Iowa Utils. Bd.*, 525 U.S. 366, 397 (1999)). Under *Chevron*, the court must first ask whether Congress directly spoke to the precise question at issue; if so, the court must give effect to Congress' unambiguously expressed intent. *Chevron*, 467 U.S. at 842–43. If, however, "the statute is silent or ambiguous," the court must defer to the administering agency's construction of the statute so long as it is permissible. *Id.* at 843.

451. *NLRB v. City Disposal Sys., Inc.*, 465 U.S. 822, 830 n.7 (1984) (stating that no "exception exists to the normal [deferential] standard of review" for "jurisdictional or legal question[s] concerning the coverage" of an act). There is no principled basis for carving out an arbitrary subset of "jurisdictional" questions from the *Chevron* framework. See, e.g., *Nat'l Cable & Telecomms. Ass'n, v. Gulf Power Co.*, 534 U.S. 327, 333, 339 (2001).

452. *City of Arlington*, 133 S. Ct. at 1874–75 (quoting *Chevron*, 467 U.S. at 842). The Supreme Court has afforded *Chevron* deference to agencies' constructions of the scope of their own jurisdiction. See, e.g., *United States v. Eurodif S. A.*, 555 U.S. 305, 316 (2009); *Commodity Futures Trading Comm'n v. Schor*, 478 U.S. 833, 844 (1986).

Regulatory agencies have authority to determine their own jurisdiction and receive deference on these decisions.<sup>453</sup> There is precedent in several states for providing electricity retail rate discounts based on the age or income of the purchaser.<sup>454</sup> There is precedent in several states for providing electricity rate discounts for the amount of electricity purchased.<sup>455</sup> There is, however, an even stronger legal justification for distinct rates of service for renewable energy generators: if the rates are based to reflect the quantified value of net benefits received by the grid from distributed renewable energy generators, as recommended, then the rates are based on actual net cost of service and are beyond any legal question. Therefore, every state in the Union, regardless of its precedent on the legality of retail rate discounts based only on the income or age of the purchaser, would find such a rate consistent with fundamental cost-of-service rate-making principles.

And on such principles, the current constitutional crisis is avoided. This mechanism avoids the current checkmate situation confronting substantial parts of state renewable energy policy. It is a solution with broad precedent, impeccable principles, and ease of administration.

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453. *City of Arlington*, 133 S. Ct. at 1874–75.

454. *See supra* Part IV.

455. *See supra* Part V.

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# SMART REGULATION AND FEDERALISM FOR THE SMART GRID

*Joel B. Eisen\**

*This Article examines the “Smart Grid,” a set of concepts, technologies, and operating practices that may transform America’s electric grid as much as the Internet has done, redefining every aspect of electricity generation, distribution, and use. While the Smart Grid’s promise is great, this Article examines numerous key barriers to its development, including early stage resistance, a lack of incentives for consumers, and the adverse impacts of the federal-state tension in energy regulation. Overcoming these barriers requires both new technologies and transformative regulatory change, beginning with the development of a foundation of interoperability standards (rules of the road governing interactions on the Smart Grid) that will influence development for many years. This Article describes the federally coordinated standard-setting process started in the 2007 Energy Independence and Security Act, leading to a collaborative dialogue among hundreds of participants, with leadership from the National Institute of Standards and Technology (“NIST”). After setting forth the need for interoperability standards and elaborating on the standard-setting process, the Article focuses on a 2011 order by the Federal Energy Regulatory Commission (“FERC”) that declined to adopt an initial group of standards. While this may appear a step backward, the Article argues to the contrary, finding that FERC’s order supports the flexibility of the Smart Grid Interoperability Panel, the NIST-led process that will produce interoperability standards critical to a wide range of energy saving technologies. FERC’s order allows this process, not a regulator’s imprimatur, to give standards credibility. By holding off on forcing adoption of the standards, but preserving the potential for more significant federal intervention later, it may lead to state adoption of the resulting standards. In this adaptive approach to energy law federalism, neither top-down federal regulation nor private sector standard setting is the exclusive means of overseeing Smart Grid development. FERC’s approach may promote a more positive federal-state relationship in the development of the Smart Grid, and may even portend a more collaborative relationship in energy law federalism generally, avoiding the disruptive jurisdictional clashes that have marked recent attempts to innovate in the electric grid.*

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## INTRODUCTION

We are at the early stage of creating a Smart Grid, a radically upgraded national electric network that would resemble the Internet in anticipated scale and complexity. The efforts to develop a Smart Grid have two different but related objectives: modernizing our electric system's antiquated architecture, and providing consumers with dramatic new ways to make, use, and conserve electricity.<sup>1</sup> The electric grid delivers the product on which modern life depends,<sup>2</sup> but is the last major network to hold out against fundamental change.<sup>3</sup> Replacing it with a sophisticated energy ecosystem could enable interactive consumer applications that would yield immense environmental and economic benefits. There would be spectacular technological breakthroughs, the rise of entire new industries,<sup>4</sup> and consumer uses far beyond anyone's wildest dreams. The Smart Grid could be a strong, secure, multifunctional network<sup>5</sup> that would be a critical response to climate change, bringing together numerous generation sources and energy-saving technologies into a seamless web.

However, the Smart Grid begins with monopoly utilities in place. This is as if we developed the Internet with just one computer company, instead of the competitive ecosystem of hardware and software providers we have today. That company would have its profit guaranteed by government regulation and therefore little incentive to innovate.<sup>6</sup> The Smart Grid therefore requires both new technologies and transformative regulatory change. Allowing for the Internet era's mode of disruptive innovation<sup>7</sup> to bring new services and products

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<sup>1</sup> NAT'L INST. OF STANDARDS AND TECH., NIST FRAMEWORK AND ROADMAP FOR SMART GRID INTEROPERABILITY STANDARDS 23 (Release 1.0 2010) [hereinafter NIST FRAMEWORK 1.0]; MASS. INST. OF TECH., THE FUTURE OF THE ELECTRIC GRID 20 (2011). Section 1301 of the Energy Independence and Security Act of 2007 defines the Smart Grid in over ten different objectives that make up a broad collection of ambitious goals. See 42 U.S.C.A. § 17381 (West 2012).

<sup>2</sup> ANDRES CARVALLO & JOHN COOPER, THE ADVANCED SMART GRID: EDGE POWER DRIVING SUSTAINABILITY 185 (2011) ("Our society has become so dependent on electricity that electricity should be inserted into Maslow's Hierarchy of Needs, at its base.").

<sup>3</sup> *Smart Grid Initiatives and Technologies: Hearing Before the Senate Comm. on Energy and Natural Resources*, 111th Cong. (2009) (statement of Suedeem Kelly, Commissioner, Feder Energy Regulatory Commission), available at <http://www.energy.senate.gov/public/index.cfm/hearings-and-business-meetings?ID=aa1ce631-aae4-f0e3-0756-d667268c8551> ("Digital technologies have transformed other industries such as telecommunications. A similar change has not yet happened for the electric grid."); NAT'L SCI. AND TECH. COUNCIL, A POLICY FRAMEWORK FOR THE 21ST CENTURY GRID: ENABLING OUR SECURE ENERGY FUTURE v (2011) ("[T]he traditional electricity infrastructure has changed little from the original design and form of the electric grid as envisioned by Thomas Edison and George Westinghouse at the end of the 19th century.").

<sup>4</sup> See, e.g., PETER FOX-PENNER, SMART POWER: CLIMATE CHANGE, THE SMART GRID, AND THE FUTURE OF ELECTRIC UTILITIES 157-74 (2010) (discussing different business models for the Smart Grid, some of which would radically transform the electric utility industry).

<sup>5</sup> NAT'L INST. OF STANDARDS AND TECH., DRAFT NIST FRAMEWORK AND ROADMAP FOR SMART GRID INTEROPERABILITY STANDARDS 26 (Release 2.0 2011) [hereinafter NIST FRAMEWORK 2.0].

<sup>6</sup> See generally Joseph P. Tomain, "Steel in the Ground": Greening the Grid with the iUtility, 39 ENVTL. L. 931 (2009); see *infra* notes 76-79 and accompanying text.

<sup>7</sup> Joel B. Eisen, *Can Urban Solar Become a "Disruptive" Technology?: The Case for Solar Utilities*, 24 NOTRE DAME J.L. ETHICS & PUB. POL'Y 53, 58-60 (2010); Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. ON TELECOMM. & HIGH TECH. L. 141, 145 (2003) (referring to

to the electric utility industry requires a nimble and open foundation. The Smart Grid's regulatory base of "interoperability"<sup>8</sup> standards must be this foundation. Like Internet protocols, these technical standards will have impacts for decades.<sup>9</sup> Far from being dry technical documents, they will have profound effects on utilities, suppliers, vehicle and appliance manufacturers, and every consumer of electricity.<sup>10</sup>

Standards, in short, *are* regulations,<sup>11</sup> and the development of effective interoperability standards will influence Smart Grid development for years to come. Standard-setting normally involves consensus decisions by industry participants.<sup>12</sup> However, this Article contends that the Smart Grid requires a federally-coordinated standard-setting process, due to the size of the endeavor, massive coordination difficulties, risk of technology balkanization, and presence of important national interests. With numerous unconnected, proprietary utility systems, and little standardization,<sup>13</sup> Smart Grid standard-setting is a complex endeavor requiring considerable effort. Without national standards, 51 different state public utility commissions ("PUCs") could adopt 51 different Smart Grid models, or implement systems that fail to protect the grid from cyberattacks.<sup>14</sup>

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technology and business model innovations that deliver new value to consumers as "a system of belief about innovation, one that has gained significant popularity over [the] last two decades," which Wu terms the "evolutionary model.")

<sup>8</sup>The National Institute of Standards and Technology defines "interoperability" as "[t]he capability of two or more networks, systems, devices, applications, or components to exchange and readily use information—securely, effectively, and with little or no inconvenience to the user." NIST FRAMEWORK 2.0, *supra* note 5, at 21. See generally GRIDWISE ARCHITECTURE COUNCIL, INTEROPERABILITY CONTEXT-SETTING FRAMEWORK (2007) (discussing different levels and attributes of interoperability); see *infra* notes 145-55 and accompanying text.

<sup>9</sup>*Empowering Consumers and Promoting Innovation through the Smart Grid: Hearing Before the Subcommittee on Technology and Innovation of the Committee on Science, Space, and Technology*, 112th Cong. 4 (2011) (statement of George W. Arnold, National Coordinator for Smart Grid Interoperability, National Institute of Standards and Technology) [hereinafter *Arnold SS&T Testimony*] ("[T]he foundation we lay with these standards likely will establish the basic architecture of the grid for decades.").

<sup>10</sup>Fed. Energy Regulatory Comm'n, Technical Conference on Smart Grid Interoperability Standards, Opening Remarks by George Arnold, NIST (Jan. 31, 2011), at 4 [hereinafter Opening Remarks to FERC Technical Conference 2011], available at [http://www.nist.gov/smartgrid/upload/technical\\_conference\\_013111.pdf](http://www.nist.gov/smartgrid/upload/technical_conference_013111.pdf); see also generally Fed. Energy Regulatory Comm'n, Technical Conference Smart Grid Interoperability Standard Transcript Document No. RM11-2-000 (Jan. 31, 2011) [hereinafter FERC Technical Conference 2011] (containing additional supporting statements by industry participants) (on file with the Harvard Law School Library).

<sup>11</sup>Kevin Werbach, *Higher Standards Regulation in the Network Age*, 23 HARV. J. L. & TECH. 179, 179 (2009).

<sup>12</sup>*Arnold SS&T Testimony*, *supra* note 9, at 8 ("[F]ew, if any, interoperability standards have ever been adopted in regulation for national infrastructures such as the legacy electric grid, the telecommunications system, or the Internet . . . . In the US, the vast majority of standards are accepted by the market on a purely voluntary basis without any regulatory action or consideration.").

<sup>13</sup>*Arnold SS&T Testimony*, *supra* note 9, at 3 ("The U.S. grid, which is operated by over 3200 electric utilities using equipment and systems from hundreds of suppliers, has historically not had much emphasis on interoperability or standardization.").

<sup>14</sup>See generally U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-117, ELECTRICITY GRID MODERNIZATION: PROGRESS BEING MADE ON CYBERSECURITY GUIDELINES, BUT KEY CHALLENGES REMAIN TO BE ADDRESSED (2011).

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In the 2007 Energy Independence and Security Act (“EISA”), Congress established a process to set standards in collaborative dialogue among hundreds of participants, with leadership from the National Institute of Standards and Technology (“NIST”). NIST uses a process to develop standards, which it submits to the Federal Energy Regulatory Commission (“FERC”). FERC then decides whether to adopt the standards as legally binding regulations.<sup>15</sup> In July 2011, FERC decided, in its Order on Smart Grid Interoperability Standards,<sup>16</sup> that it would not begin a rulemaking proceeding on the first five standards sent to it. The result was a widespread perception that FERC had put the brakes on the standard-setting process, and therefore on Smart Grid development as a whole.

This Article argues to the contrary. It concludes that FERC’s order supports the flexibility of the NIST process and its creative federally-led crowdsourcing that puts different agents to work to solve the “wicked” problem<sup>17</sup> of standard-setting in a complex, heavily regulated environment. FERC’s order allows the process, not a regulator’s imprimatur, to give standards credibility. By holding off on forcing states to adopt the standards, but preserving the potential for more significant federal intervention later, it also embraces an adaptive approach to energy law federalism. This is necessary in the current landscape of jurisdictional clashes between the states and the federal government, because states suggested that a federal takeover of the standards process would provoke conflict and uncertainty. Under the FERC order, states will eventually rely on the standards, even if FERC does not technically mandate them and intervenes only in limited instances. Thus, rather than seeing federalism as a barrier to change, FERC’s approach may promote a more positive approach to the federal-state relationship.

Part I discusses the Smart Grid and its revolutionary potential for utilities and consumers. Part II discusses the numerous key barriers to Smart Grid development, including early stage resistance, lack of incentives for consumers, and the adverse impacts of the federal-state tension in energy regulation. Part III discusses the need for interoperability standards, the federally led process to set the standards, and a case study involving standards for energy use information that helped enable a recent “Green Button Initiative,” which allows consumers to view their electricity data.

Part IV discusses the FERC order and concludes that it was the proper result for two reasons. First, it validates the Smart Grid Interoperability Panel (“SGIP”), the NIST process that will produce results that will be hailed as foundational to a wide range of energy saving technologies. Second, and perhaps just as importantly, it may lead to state adoption of standards created in a federally-led process. This promotes an approach to energy law federalism in

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<sup>15</sup> 42 U.S.C.A. § 17385(d) (West 2012).

<sup>16</sup> FERC, *Smart Grid Interoperability Standards*, RM11-2-000, 136 FERC ¶ 61,039 (July 19, 2011) [hereinafter FERC Standards Order].

<sup>17</sup> See generally Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153 (2009), for a discussion of the literature on “wicked” problems and its application to multifaceted challenges such as this.

which neither top-down federal regulation nor private-sector standard-setting is the exclusive means of overseeing Smart Grid development. The SGIP process and FERC's response to it are therefore especially noteworthy, because they establish a novel approach to defining the federal-state relationship that would avoid the disruptive jurisdictional clashes that have marked recent attempts to innovate in the electric grid.

### I. THE SMART GRID'S POTENTIAL

As one observer puts it, “[t]hinking about building Smart Grids is similar to saying that we are going to ‘build the internet.’”<sup>18</sup> The “Smart Grid” is generally understood as “concepts, technologies, and operating practices intended to bring the electric grid into the 21st century.”<sup>19</sup> This will change the grid “more in the next 10 years than it has in the past 100 years,”<sup>20</sup> but there is little agreement on what that will entail. In 2009, the Department of Energy (“DOE”) reported in its first biennial report to Congress that the Smart Grid may transform America as much as the Internet has done, redefining every aspect of electricity generation, distribution, and use.<sup>21</sup> The EISA describes the Smart Grid as a system capable of accomplishing over ten diverse objectives.<sup>22</sup> Comprehensive policy frameworks from the federal government and state utility regulators,<sup>23</sup> Smart Grid alliances, individual utilities and trade associations,<sup>24</sup> and others contain proposals for specific actions and resource decisions.

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<sup>18</sup> A123 Systems, *Energy Storage Systems in Emerging Smart Grid Applications* (2009), available at [http://sdm.mit.edu/conf09/presentations/harvey\\_wilkinson.pdf](http://sdm.mit.edu/conf09/presentations/harvey_wilkinson.pdf).

This observation reflects the ease with which so many analogize the Internet's norms and practices to the Smart Grid. The two networks involve similar policy challenges, but the Smart Grid will be different in fundamental ways. For one, the Smart Grid involves revamping an existing network that features extensive commercial use and legalized monopolies. Where analogies prove useful, this Article will employ them, but caution about doing so reflexively is in order.

<sup>19</sup> LAWRENCE BERKELEY NAT'L LAB., *Chapters 1-3*, in Smart Grid Technical Advisory Project, *An Introduction – Smart Grid 101 1* (2011) [hereinafter LBNL SMART GRID 101 CH. 1-3] (on file with the Harvard Law School Library).

<sup>20</sup> Geoff Zeiss, *Distributech Utility University: Smart Grid in North America - Progress in Developing Standards*, BETWEEN THE POLES (Jan. 23, 2012 6:56 AM), <http://geospatial.blogs.com/geospatial/2012/01/distributech-utility-university-smart-grid-in-north-america-and-the-importance-of-standards.html>.

<sup>21</sup> U.S. DEP'T OF ENERGY, *SMART GRID SYSTEM REPORT* (2009), available at <http://energy.gov/sites/prod/files/2009%20Smart%20Grid%20System%20Report.pdf>.

<sup>22</sup> See 42 U.S.C.A. § 17381 (West 2012).

<sup>23</sup> See, e.g., NIST FRAMEWORK 2.0, *supra* note 5; FERC, *Smart Grid Policy*, 128 F.E.R.C. ¶ 61,060 (July 16, 2009) [hereinafter FERC Smart Grid Policy]. For a major state policy framework, see N.Y. PUB. SERV. COMM'N, CASE 10-E-0285, *SMART GRID POLICY STATEMENT* (2011), available at <http://nyssmartgrid.com/wp-content/uploads/2012/09/NYPSC-Smart-Grid-Policy-Statement.pdf>.

<sup>24</sup> See, e.g., DAVID MASTERS, *DUKE ENERGY: DEVELOPING THE COMMUNICATIONS PLATFORM TO ENABLE A MORE INTELLIGENT ELECTRIC GRID* (2011), available at <http://www.duke-energy.com/dfs/OP-David-Masters-SmartGrid-Comm-Platform-02-01-11.pdf>.

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These visions are so different that they cannot be summarized or reconciled easily.<sup>25</sup> Compare the electric grid to a reliable 10-year-old automobile that runs capably and enables its owner to commute each day. Improving electric utility infrastructure is like upgrading the car's systems, or replacing the car. The paradigm shift from centralized, one-directional power flow from generation resources through the transmission-distribution system, into two-way dynamic flows, is like selling the reliable car and switching to more complex but more efficient public transit. Consider the implications of this breathtaking statement: "Just as the Internet connected commerce, banking, entertainment, digital media, voicemail systems, and all the other systems that generate or consume information, tomorrow's energy system should connect — or integrate — all of the systems and community assets that will consume or generate electricity."<sup>26</sup>

Advanced information and communication systems for this are largely absent. The electric grid "has a tradition of using many proprietary customized systems, and there has never been a need for information systems on the utility side of the meter to interact with systems and devices on the customer side of the meter."<sup>27</sup> Yet a Smart Grid means more than "computerizing" the grid. The upheaval we foresee must take place using the spirit of innovation that dominates our time.

The "Smart" in "Smart Grid" should reflect the concept of dynamic innovation that has evolved over the past several decades. Innovation in networks takes place today on open platforms that draw on new energy, ideas, and distributed and meritocratic business practices. Disruptive technologies can produce rapid organizational changes, shifting power within an industry or displacing entire industries almost overnight.<sup>28</sup> This phenomenon is ubiquitous today,<sup>29</sup> and we must therefore avoid constraining the grid's Steve Jobs, who would see potential where no one has seen it before. One can imagine a Smart Grid decades from now that is entirely different from anything contemplated today. The term "Internet" (or "Internetting," as it was first called) was coined as the first network technologies were developed, but later evolved into a much different usage and understanding.<sup>30</sup>

A Smart Grid is therefore different from today's grid in two fundamental ways. The first requires adding hardware and software to make the grid more intelligent, in both the utility and consumer domains. The second requires recognition of the spirit of innovation and potential for dynamic competition and new uses.

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<sup>25</sup> MASS. INST. OF TECH., *supra* note 1, at 20 ("The term 'smart grid' has been used to refer to a wide variety of electric grid modernization efforts and ideas over the past several years.')

<sup>26</sup> PECAN ST. PROJ., WORKING GROUP RECOMMENDATIONS 10 (2010).

<sup>27</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 7.

<sup>28</sup> Eisen, *supra* note 7, at 58.

<sup>29</sup> Wu, *supra* note 7, at 145.

<sup>30</sup> See Leiner et al., *supra* note 30.

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A. *Operational Improvements for a More Efficient Grid*

Some useful short-term benefits will come from intelligent technologies that will provide enhanced information and make the grid more reliable.<sup>31</sup> Major infrastructure companies (in some cases the same ones that upgraded the Internet's switchgear) are making huge bets on the Smart Grid.<sup>32</sup>

At the outset, we are faced with a paradox. The National Academy of Engineering has called the electric grid the most significant engineering achievement of the 20th century, beating out such worthy contenders as the Interstate Highway System and the Internet.<sup>33</sup> This honor is well deserved. The grid is a "marvel of engineering" and one "of the most interconnected machines on Earth."<sup>34</sup> It works, delivering electricity on a steady, reliable basis. Utilities have spent hundreds of millions of dollars to update the grid with intelligence for their transmission and distribution systems. Peer into a modern control operator's "cockpit," and marvel at its human maestros' deftness in balancing the electricity system in real time.<sup>35</sup>

Yet this is not the same as a Smart Grid. For one, intelligence is not present everywhere on the network. Many locations lack sensors and other technologies that would allow system operators to understand how much electricity is flowing or what else is happening.<sup>36</sup> Some, but not all, utilities have Supervisory Control and Data Acquisition ("SCADA") systems that monitor grid components and communicate from the field about potential disaster situations.<sup>37</sup> A utility often only knows where an outage is located when it receives a customer's phone call.

Advanced systems are often "siloed," not interconnected.<sup>38</sup> SCADA systems use proprietary technology tailored to specific networks, which frequently

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<sup>31</sup> *Learn More about Smart Grid*, SMART GRID INFORMATION CLEARINGHOUSE, <http://www.sgclearinghouse.org/LearnMore> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library) ("Much in the way that a 'smart' phone these days means a phone with a computer in it, smart grid means 'computerizing' the electric utility grid.").

<sup>32</sup> See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 14, at 32–34.

<sup>33</sup> NAT'L SCI. AND TECH. COUNCIL, A POLICY FRAMEWORK FOR THE 21ST CENTURY GRID: ENABLING OUR SECURE ENERGY FUTURE 1 (2011), available at <http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc-smart-grid-june2011.pdf>.

<sup>34</sup> *NOVA: Smart Grid*, (PBS television broadcast Feb. 23, 2011), transcript available at <http://www.pbs.org/wgbh/nova/tech/power-grid.html>.

<sup>35</sup> The difficult duties of system operators are described in Matthew L. Wald, *On the Front Lines of the Power Grid*, N.Y. TIMES, Oct. 25, 2011, [http://www.nytimes.com/2011/10/26/business/energy-environment/behind-the-power-grid-humans-with-high-stakes-jobs.html?page-wanted=all&\\_r=0](http://www.nytimes.com/2011/10/26/business/energy-environment/behind-the-power-grid-humans-with-high-stakes-jobs.html?page-wanted=all&_r=0).

<sup>36</sup> See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 14, at 4–5.

<sup>37</sup> NAT'L COMM'N SYS., TECHNICAL INFORMATION BULLETIN 04-1, SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEMS 4 (2004), available at [http://www.ncs.gov/library/tech\\_bulletins/2004/tib\\_04-1.pdf](http://www.ncs.gov/library/tech_bulletins/2004/tib_04-1.pdf) ("SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation. These systems encompass the transfer of data between a SCADA central host computer and a number of Remote Terminal Units (RTUs) and/or Programmable Logic Controllers (PLCs), and the central host and the operator terminals.").

<sup>38</sup> The "walled silo" metaphor is often used to describe utility systems. Ali Ipakchi & Farokh Albuyeh, *Grid of the Future: Are We Ready to Transition to a Smart Grid?*, IEEE POWER &

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does not connect with other utilities' systems.<sup>39</sup> One utility might use a third-generation networked SCADA system built on standard communications protocols,<sup>40</sup> and another might have a simpler, older system. Proprietary systems present a major problem in the Smart Grid, which requires careful consideration of how to link billions of dollars worth of legacy equipment into an advanced communications network.

Digital technologies can improve the grid's reliability, security, and efficiency. This will involve deploying sensors and other intelligent components to provide system operators with more detailed data. High-tech synchrophasors (devices that measure conditions on transmission lines more effectively)<sup>41</sup> and expert communication systems would give system operators greater ability to observe the grid's overall condition (known as "wide-area situational awareness"). They could automatically balance power flows, report outages, and receive weather, demand, and performance data nearly in real time.<sup>42</sup>

This advanced intelligence also allows generation to be added and distributed throughout the grid.<sup>43</sup> Adding distributed generation ("DG") resources to the grid will diversify supply, reduce risks of major outages, and improve overall grid reliability.<sup>44</sup> This would also encourage the use of renewable energy generation sources (such as solar) which is an important response to climate change. A more supportive environment for DG would require communications protocols, data models, and intelligent controls that are still not yet well understood.<sup>45</sup> Researchers are working on ways to enable more widespread DG

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ENERGY, Mar. 2009, at 12 ("In most cases, the information in each organizational 'silo' is not easily accessible to applications and users in other functional units."); *Arnold SS&T Testimony*, *supra* note 9 (The electric utility industry has "many proprietary interfaces and technologies that result in the equivalents of stand-alone silos.").

<sup>39</sup> NAT'L COMM'N SYS., *supra* note 37, at 8.

<sup>40</sup> *Id.* at 15. A common standard is the IEC 60870-5 series, which, in its upgraded "6" version, was also one of first five families of Smart Grid standards submitted by NIST to FERC. GEORGE W. ARNOLD, SMART GRID STANDARDS READY FOR CONSIDERATION BY REGULATORS 2 (2010), available at <http://www.ferc.gov/EventCalendar/Files/20101119155511-Arnold,%20NIST.pdf>.

<sup>41</sup> Matthew L. Wald, *For the Smart Grid, a 'Synchrophasor'*, N.Y. TIMES GREEN BLOG (Apr. 1, 2010), <http://green.blogs.nytimes.com/2010/04/01/for-the-smart-grid-a-synchrophasor/>.

<sup>42</sup> See LISA SCHWARTZ, REGULATORY ASSISTANCE PROJ., SMART POLICIES BEFORE SMART GRIDS: HOW STATE REGULATORS CAN STEER INVESTMENTS TOWARD CUSTOMER-SIDE SOLUTIONS 7 (2010). One report notes the proliferation of large data centers throughout the nation, and suggests using them to handle and manage the flow of information. NAT'L ELEC. MFRS. ASS'N, STANDARDIZING THE CLASSIFICATION OF INTELLIGENCE LEVELS AND PERFORMANCE OF ELECTRICITY SUPPLY CHAINS 16 (2009).

<sup>43</sup> LBNL SMART GRID 101 CH. 1-3, *supra* note 19, at 8 (discussing the potential for adding generation "at bulk power transfer points, substations, other distribution locations and on the customer side of the meter.").

<sup>44</sup> Lesley K. McAllister, *Adaptive Mitigation in the Electric Power Sector*, 2011 B.Y.U. L. REV. 2115, 2137 (2011).

<sup>45</sup> NAT'L ELEC. MFRS. ASS'N, *supra* note 42, at 13 (noting that "the integration of DG sources into a utility's operation environment is still an active research field"); LAWRENCE BERKELEY NAT'L LAB., USE OF FREQUENCY RESPONSE METRICS TO ASSESS THE PLANNING AND OPERATING REQUIREMENTS FOR RELIABLE INTEGRATION OF VARIABLE RENEWABLE GENERATION (2010), available at <http://www.ferc.gov/industries/electric/indus-act/reliability/frequencyresponsemetrics-report.pdf> (discussing challenges of frequency regulation on the grid when integrating DG) [hereinafter LAWRENCE BERKELEY NAT'L LAB. FREQUENCY REPORT].

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integration, and more effective functioning of the grid under real-time conditions.<sup>46</sup> This is one way in which a Smart Grid entails more than simply upgrading a piece of hardware.

### B. Disruptive Consumer Applications

The Smart Grid's potential for consumers is enormous. At present, a typical customer's interaction with a utility is limited to a wire into the house, a monthly bill, and maintenance trucks that roll in during storms. Like the dashboard of an early 20th-century automobile, a typical utility meter today has rudimentary instrumentation and only measures electricity usage.<sup>47</sup> Customers receive monthly bills, often still on paper. Utility websites may not allow customers to see their usage data. Data presented are typically monthly usage totals, with little to no information on how much electricity individual appliances consume, or how consumers might alter their behavior to save energy and money.

The Smart Grid promises to dramatically change the relationship between utilities and their customers, starting with advanced communication systems. "Advanced metering infrastructure," better known as "smart meter" technology, is the Smart Grid component most visible to consumers.<sup>48</sup> By 2015, 65 million American homes and businesses may have smart meters that enable two-way communication between utilities and customers.<sup>49</sup> Smart meters allow customers to view their real-time electricity use. This has potential benefits for utilities, which, for example, can manage outages more efficiently, and connect new customers to the grid without sending trucks to their locations.<sup>50</sup>

Having near real-time information about energy usage can show consumers how to reduce consumption.<sup>51</sup> A smart meter could also show the real-time price of electricity,<sup>52</sup> and help consumers save money. Demand for electricity peaks at various times during the typical day. Using a smart meter, a consumer could time shift and lower her electricity usage when demand and prices are

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<sup>46</sup> LAWRENCE BERKELEY NAT'L LAB. FREQUENCY REPORT, *supra* note 45.

<sup>47</sup> MASS. INST. OF TECH, *supra* note 1, at 132-33.

<sup>48</sup> See LBNL SMART GRID 101 CH. 1-3, *supra* note 19, at 11, 17.

<sup>49</sup> INST. FOR ELEC. EFFICIENCY, UTILITY-SCALE SMART METER DEPLOYMENTS, PLANS, & PROPOSALS 1 (2012), available at [http://www.edisonfoundation.net/iee/Documents/IEE\\_SmartMeterRollouts\\_0512.pdf](http://www.edisonfoundation.net/iee/Documents/IEE_SmartMeterRollouts_0512.pdf).

<sup>50</sup> INST. FOR ELEC. EFFICIENCY, THE COSTS AND BENEFITS OF SMART METERS FOR RESIDENTIAL CUSTOMERS 3 (2011), available at [http://www.smartgridnews.com/artman/uploads/1/IEE\\_Benefits\\_of\\_Smart\\_Meters\\_Final.pdf](http://www.smartgridnews.com/artman/uploads/1/IEE_Benefits_of_Smart_Meters_Final.pdf) ("utility operational advantages such as outage detection and management, remote meter reading, and remote customer (dis)connections"). In the aftermath of Hurricane Sandy's widespread power outages in the Northeast in 2012, some observers noted that smart meters and other Smart Grid technologies cut the time necessary to bring power back after major storms. See Martin LaMonica, *Smart Meters Help Utility Speed Sandy Restoration*, MIT TECH. REV., Oct. 31, 2012, available at <http://www.technologyreview.com/view/506711/smart-meters-help-utility-speed-sandy-restoration/>.

<sup>51</sup> SCHWARTZ, *supra* note 42, at 6.

<sup>52</sup> *Id.*

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high.<sup>53</sup> As space age as it sounds, a properly- equipped washing machine could be programmed to run at lower-cost times, or the consumer could even allow the utility to control it, in return for financial incentives. Little of this is in place today, but manufacturers are scrambling to deliver advanced products to market.<sup>54</sup>

A smart meter can also make lower-cost charging of plug-in electric vehicles (“PEV”) possible by charging cars during off-peak periods. Together with a management system, a smart meter can also link with battery technology (including the batteries in PEVs and hybrid-electric vehicles) to store electricity generated when it is inexpensive to produce. Storage is a potential game changer for the Smart Grid, if it allows consumers to buy electricity at inexpensive times and use it later.<sup>55</sup>

Advanced communications systems can also expand consumers’ “demand response” (“DR”)<sup>56</sup> opportunities. Demand response includes consumers’ voluntary reductions in demand through programs that reward lower electricity use, and load control, by allowing a utility or authorized third party to control devices directly (for example, by shutting or cycling off a device such as an air conditioning unit in response to high demand on the system).<sup>57</sup> Direct load control is increasingly becoming a valuable commodity of its own in wholesale electricity markets.<sup>58</sup> Consumers could capture that value when a smart meter measures the reduction in demand, which today’s load control equipment typically cannot do.<sup>59</sup>

<sup>53</sup> Michael P. Vandenbergh & Jim Rossi, *Good for You, Bad for Us: The Financial Disincentive for Net Demand Reduction*, 65 VAND. L. REV. 1527, 1540 (2012) (“Smart meter programs also reflect the focus of DSM on shifting electricity use from peak to off-peak hours”).

<sup>54</sup> See, e.g., Green Biz Staff, *Whirlpool Set to Launch Smart Grid Compatible*, GREEN BIZ BLOG (May 8, 2009), <http://www.greenbiz.com/news/2009/05/08/whirlpool-set-launch-smart-grid-compatible-appliances-2015>; Katie Fehrenbacher, *10 Ways Big Data is Remaking Energy*, GIGAOM (Jan. 29, 2012), <http://gigaom.com/cleantech/10-ways-big-data-is-remaking-energy/> (“One of the biggest trends from DistribuTECH this year was the overwhelming amount of smart thermostats that are now being sold and marketed.”).

<sup>55</sup> Edward H. Comer, *The Future of Energy Law-Electricity*, 31 UTAH ENVTL. L. REV. 429, 430 (2011) (president of utility trade association Edison Electric Institute noting that “the ability to store electricity efficiently and cheaply can truly change the economics, and potentially the structure, of the industry”); see also A123 Systems, *supra* note 18; James Greenberger, *The Curious Disconnect Between Smart Grid and Energy Storage*, THE ENERGY COLLECTIVE (Oct. 27, 2011), available at <http://theenergycollective.com/jim-greenberger/67538/curious-disconnect-between-smart-grid-and-energy-storage>. R

<sup>56</sup> NAT’L ELEC. MFRS. ASS’N, *supra* note 42, at 13 (“Demand response (DR) is the adjustment of consumer demand in response to real-time system operating conditions.”). See also generally Joel B. Eisen, *Who Regulates The Smart Grid?: FERC’s Authority Over Demand Response Compensation in Wholesale Electricity Markets*, \_\_\_ SAN DIEGO J. OF CLIMATE AND ENERGY L. \_\_\_ (forthcoming 2013) (on file with Harvard Law School Library). R

<sup>57</sup> SCHWARTZ, *supra* note 42, at 6. The author has taken part in a pilot program by the utility Dominion Virginia Power involving direct load control of air conditioning units. See *Former Conservation Initiatives*, DOMINION, <http://www.dom.com/dominion-virginia-power/customer-service/energy-conservation/pilot-programs.jsp> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library). R

<sup>58</sup> INST. FOR ELEC. EFFICIENCY, *supra* note 49, at 10. R

<sup>59</sup> INST. FOR ELEC. EFFICIENCY, *supra* note 50, at 9 (noting that “load control equipment in use today generally cannot measure and verify usage during a load control event”). R

DR can be important to a utility as part of its overall strategy to meet future anticipated demand and avoid unnecessary expenses of building new generation, transmission, and distribution infrastructure.<sup>60</sup> Yet while utilities have offered DR programs for decades, they have underinvested in them. The utility is in effect “anti-selling” its product, and state regulation traditionally rewards utilities for increased sales. State PUCs are only recently embracing “decoupling” incentives that reward utilities for promoting DR.<sup>61</sup>

The challenge of promoting DR will look like an opportunity to many firms.<sup>62</sup> Third parties could compete with utilities by providing energy information and management services to consumers.<sup>63</sup> Over time, firms that analyze customer data (data analytics firms, for example) may become adept at parsing through the massive data smart meters generate.<sup>64</sup> Some are already hard at work trying to turn data into customer empowerment.<sup>65</sup> Eventually, these firms might even purchase power at wholesale and supply their customers, as some firms are already doing with commercial buildings. Another possibility is that entire buildings or “micro-grids” might go off the electric grid altogether, using intelligent technologies to create local networks for distribution of electricity generated locally.<sup>66</sup>

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<sup>60</sup> See generally PAUL PIETSCH, ASS'N FOR DEMAND RESPONSE AND SMART GRID, DEMAND RESPONSE & SMART GRID—STATE LEGISLATIVE AND REGULATORY POLICY ACTION REVIEW: MAY 2010 – JUNE 2011 (2011), available at [http://sgstage.nrel.gov/sites/default/files/doc/files/4512\\_doc\\_1.pdf](http://sgstage.nrel.gov/sites/default/files/doc/files/4512_doc_1.pdf) (describing DR programs in the states).

<sup>61</sup> BROWN, LEVITSKY, & SALTER, SMART GRID AND COMPETITION: A POLICY PAPER 94 (2011) (“[I]n the case of most states where rates are not de\_]coupled, a considerable part of the value of the new meters, namely energy saving, reduces utility revenue and, therefore, is contrary to their interest, so there is a real risk that the new devices will be underutilized with utilities in control.”); Vandenberg & Rossi, *supra* note 53, at 1534 (discussing this and other disincentives for DR and observing that “widespread demand reduction is not likely to occur until utilities shift from viewing efficiency and conservation as revenue erosion to a financial opportunity”).

<sup>62</sup> 2011 *State of the Consumer Report*, SMART GRID CONSUMER COLLABORATIVE, at 4 (Jan. 31, 2011), available at <http://www.pointview.com/data/files/4/3696/1942.pdf> (“Building on decades of commercial and industrial demand response, direct load control, and energy efficiency programs for consumers, the utility sector is on the cusp of a similar, disruptive transformation.”).

<sup>63</sup> Richard Tabors, *Why Today's Utilities May Soon Be Obsolete (and What May Replace Them)*, SMARTGRIDNEWS.COM (Jan. 27, 2010), [http://www.smartgridnews.com/artman/publish/Business\\_Markets\\_Pricing\\_News/Why-Today-s-Utilities-May-Soon-Be-Obsolete-and-What-May-Replace-Them-1782.html](http://www.smartgridnews.com/artman/publish/Business_Markets_Pricing_News/Why-Today-s-Utilities-May-Soon-Be-Obsolete-and-What-May-Replace-Them-1782.html).

<sup>64</sup> Elias L. Quinn & Adam L. Reed, *Envisioning the Smart Grid: Network Architecture, Information Control, and the Public Policy Balancing Act*, 81 U. COLO. L. REV. 833, 882 (2010); see also Steve Lohr, *The Age of Big Data*, N.Y. TIMES, Feb. 11, 2012, [http://www.nytimes.com/2012/02/12/sunday-review/big-datas-impact-in-the-world.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2012/02/12/sunday-review/big-datas-impact-in-the-world.html?pagewanted=all&_r=0) (arguing that a societal “explosion of data” creates new opportunities for “data-driven discovery and decision-making”).

<sup>65</sup> Katie Fehrenbacher, *supra* note 54 (discussing the job of startups like OPower and Tendril) (“Essentially these companies have collected data on consumers and demographics and they are using it to try to guess the best way to influence the consumer to do things like upgrade their home appliances and lights to more efficient ones.”).

<sup>66</sup> ELEC. POWER RESEARCH INST., NEEDED: A GRID OPERATING SYSTEM TO FACILITATE GRID TRANSFORMATION 6 (2011) [hereinafter “EPRI Grid 3.0”] (“[E]nergy sources and a power distribution infrastructure can be integrated at the local level. This could be an industrial facility, a commercial building, a campus of buildings, or a residential neighborhood.”). See generally Sara C. Bronin, *Curbing Energy Sprawl With Microgrids*, 43 CONN. L. REV. 547 (2010) for a description of some challenges involved.

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Sophisticated energy management systems can empower consumers, but simplicity will be a key variable.<sup>67</sup> Studies show that some homeowners react favorably to the prospect of saving on their electric bills.<sup>68</sup> Yet if an energy management system is not “set it and forget it,” demand for it may be ephemeral.

The literature on disruptive innovation suggests strongly that third parties are more likely than utilities to succeed with consumers.<sup>69</sup> As these do not yet exist, we cannot be sure what product or business model will become dominant. Utilities might morph into powerhouse “iUtilities”<sup>70</sup> to provide new energy services, but it may be too much to ask them to reverse their focus on supplying electricity and somehow develop an Apple-like responsiveness to consumers’ needs.<sup>71</sup> They understand technology upgrades that improve their operations and their bottom line, but they have never sold devices such as washing machines<sup>72</sup> or priced, marketed, or sold consumer products.

Therefore, we can and *should* expect that entrepreneurs will eventually make more effective use of the Smart Grid than utilities. Software companies working with data, like a certain company that started with a better way to search the Internet, might be the ultimate Smart Grid winners.<sup>73</sup>

## II. KEY BARRIERS TO SMART GRID DEVELOPMENT

As dazzling as the future appears, the pace of progress is not likely to be quick in the near-term, due to a number of barriers to more rapid development of the Smart Grid. These include the inherent conservatism of utilities and state PUCs that adopt utilities’ Smart Grid proposals, an existing regulatory system

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<sup>67</sup> SMART GRID CONSUMER COLLABORATIVE, *supra* note 62, at 5 (“[O]ptions and interfaces must evolve to meet the needs of less technically-oriented consumers.”) R

<sup>68</sup> See Ahmad Faruqui, Ryan Hledik & Sanem Sergici, *The Brattle Group, Piloting the Smart Grid 8–13* (June 2009) (manuscript), available at <http://ssrn.com/abstract=1414387> (describing customer participation in pilot programs); SMART GRID CONSUMER COLLABORATIVE, *supra* note 62, at 16. R

<sup>69</sup> Richard Tabors, *supra* note 63 (“In all likelihood, the actual form that the Smart Market takes will not fit neatly into one of these models. Rather, there will be mixing and matching as business strategies are rolled out and the results come back from early pilots.”) R

<sup>70</sup> Tomain, *Steel in the Ground*, *supra* note 6; JOSEPH P. TOMAIN, *ENDING DIRTY ENERGY POLICY: PRELUDE TO CLIMATE CHANGE 171-74* (2011) (discussing new products and services that an “iUtility” could offer). R

<sup>71</sup> Quinn & Reed, *supra* note 64, at 879 (noting that “there is no reason to think that utilities would be especially skilled in developing analysis and behavior modification applications, given their traditional supply-side concerns”). R

<sup>72</sup> LAWRENCE BERKELEY NAT’L LAB., *Chapter 7*, in *Smart Grid Technical Advisory Project, An Introduction – Smart Grid 101 4* (2011) [hereinafter *LBNL SMART GRID 101 CH. 7*] (on file with the Harvard Law School Library) (“While Utilities can provide customers with an air conditioner control switch, they cannot provide customers with the diversified range of appliances and electronic devices that populate their premises and business which have capability and are necessary to provide smart grid benefits.”).

<sup>73</sup> H. Russell Frisby, Jr. & Jonathan P. Trotta, *The Smart Grid: The Complexities and Importance of Data Privacy and Security*, 19 *COMMLAW CONCEPTUS* 297, 298 (2011) (claiming that “in our Smart Grid future, companies such as Google may play as important a role in providing energy services as traditional electric utilities do today.”).

that does not adequately encourage Smart Grid investments,<sup>74</sup> consumer unfamiliarity with the Smart Grid (and, in some cases, resistance to it), concerns with protecting privacy of data generated by smart meters, and a federalism tension between the FERC and state PUCs that threatens to hamper governments' abilities to cooperate in Smart Grid development.<sup>75</sup> Each of these barriers needs to be addressed, or the result, like everything in the utility industry, is likely to be exceedingly slow change.

#### A. Utilities Lack Incentives to Innovate

For years to come, progress in building out a Smart Grid will depend on actors (utilities) whose conservatism has retarded innovation. Under cost of service regulation, a utility has little incentive for taking risks. Utilities have to supply enough electricity to meet demand at all times. State regulation avoids risks to ratepayers and protects service and reliability.<sup>76</sup> It does not offer incentives for utilities to invest in innovative new technologies.<sup>77</sup> For example, it provides a disincentive to investing in equipment whose cost cannot be recovered over a long time horizon, unless the cost can be fully recovered from consumers.<sup>78</sup>

Although utilities have different time horizons, many plan decades ahead, and they want to know products are proven and will stand the test of time before they deploy them.<sup>79</sup> The regulatory process itself takes time, and leads to slow change. Smart innovation, with its dynamism and the ability to learn from failures, is not the norm. The result is stasis. Large utilities are like fourteenth-century Italian city-states: powerful, independent, and content with the status quo. Changing this system will take time.

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<sup>74</sup> CHARLES M. DAVIDSON & MICHAEL J. SANTORELLI, *Realizing the Smart Grid Imperative: A Framework for Enhancing Collaboration Between Energy Utilities and Broadband Service Providers*, 9 (Summer 2011) (“[T]here appears to be an inevitable tension between how various stakeholders, including those in the energy sector, want the smart grid to develop and the existing regulatory structure that will ultimately guide its deployment.”).

<sup>75</sup> See e.g., ASHLEY C. BROWN, *CONTROVERSIES AND SOURCES OF RESISTANCE TO SMART GRID DEPLOYMENT* (2010), available at [http://www.hks.harvard.edu/hepg/Papers/2010/Ashley\\_BrownHEPGSept2010.pdf](http://www.hks.harvard.edu/hepg/Papers/2010/Ashley_BrownHEPGSept2010.pdf); Paula M. Carmody, *Smarting from Resistance to the Smart Grid* (Presentation to the Harvard Energy Policy Group) (Sep. 29, 2010), available at [http://www.hks.harvard.edu/hepg/Papers/2010/Paula\\_Carmody\\_HEPGSept2010.pdf](http://www.hks.harvard.edu/hepg/Papers/2010/Paula_Carmody_HEPGSept2010.pdf).

<sup>76</sup> DAVIDSON & SANTORELLI, *supra* note 74, at 9, 18.

<sup>77</sup> Quinn & Reed, *supra* note 64, at 860 (noting the “now-familiar economic disincentives to investing in technologies that inhibit utility profitability”).

<sup>78</sup> BROWN ET AL., *supra* note 61, at 97.

<sup>79</sup> Kevin Dasso, *The Three Most Common Misconceptions about Smart Grid*, *ENTREPRENEURSHIP REV.* (Dec. 20, 2010), available at <http://minter.mit.edu/article3-most-common-misconceptions-about-smart-grid-utility-perspective-kevin-dasso-sr-director-sm/> (“[U]tilities have notoriously high standards for proven product performance before they are willing to invest. . . . Therefore, utilities will wait for convincing demonstrations of reliability before investing, beyond demonstrations of mere technological capability[.]”); Matthew Lynley, *Why Won't Utility Companies Innovate? Smart Grid Leaders Explain*, *VENTUREBEAT* (Nov. 4, 2010), <http://venturebeat.com/2010/11/04/why-wont-utility-companies-innovate-smart-grid-leaders-explain/> (“[U]tility providers are often the slowest to innovate because of both reliability and cost issues[.]”).

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*B. Consumers Know Little About the Smart Grid and Face High Transaction Costs in Translating Interest Into Action*

Consumer demand for the Smart Grid is lacking, as there are inadequate incentives for consumers to adopt systems to manage their electricity consumption. Today's Smart Grid products are not appealing to consumers. No one is standing in line at an Apple Store for a smart thermostat.<sup>80</sup> These products are "utilitarian" and do not "command the emotional connection we have with smart phones or tablets."<sup>81</sup> Also, consumers may not be interested in "demand response" because it involves using less electricity. Many consumers may not see the potential benefits of this,<sup>82</sup> because they typically have little to no real-time information about the price of electricity.<sup>83</sup> Utilities make inadequate attempts to educate their customers about the Smart Grid. Consequently, most consumers know little about it, and there is an "attitude-behavior gap": Those who view benefits most favorably are not inclined to purchase energy management systems.<sup>84</sup>

Another major problem with Smart Grid consumer applications is that even motivated consumers face high transaction costs simply to get started. To assess whether an energy management system might save electricity, a consumer needs fine-grained information about current baseline usage. Most current meters do not generate such data, but smart meters do. An open and important question that has yet to be comprehensively addressed is whether consumers would even have access to this fine-grained usage data. There are ongoing disputes about whether a customer or her utility owns the data a smart meter generates. Without a resolution of this problem, many Smart Grid benefits will be hard to come by.

<sup>80</sup> See SMART GRID CONSUMER COLLABORATIVE, *supra* note 62, at 26–28.

<sup>81</sup> Eric Wesoff, *Nest Labs' Thermostat: Sexy? Yes. Functional? Maybe Not.*, GREENTECH MEDIA (Jan. 18, 2012), <http://www.greentechmedia.com/articles/read/Nest-Labs-Thermostat-Sexy-Yes-Functional-Maybe/> (discussing the drawbacks of the Nest smart thermostat).

<sup>82</sup> Vandenberg & Rossi, *supra* note 53, at 1529 (noting that the "magnitude of the [DR] opportunity is subject to debate").

<sup>83</sup> *Id.* at 1541.

<sup>84</sup> SMART GRID CONSUMER COLLABORATIVE, *supra* note 62, at 26 (noting that "those who are most motivated by cost savings on their bill are not necessarily the ones willing to pay more for a home energy management system that will allow them to achieve their goals").

An intriguing development that might address this problem is the marriage of social media and energy efficiency in an app that allows users to post energy usage statistics and claim bragging rights over their friends. Leslie Meredith, *New Facebook App the 'Farmville' of Energy Conservation?*, FOXNEWS.COM (Oct. 21, 2011), <http://www.foxnews.com/scitech/2011/10/21/new-facebook-app-highlights-energy-conservation/>; see also William Pentland, *Can Smart Apps Save the Smart Grid?*, FORBES.COM (Oct. 18, 2011), <http://www.forbes.com/sites/williampentland/2011/10/18/can-smart-apps-save-the-smart-grid/> ("iPhone sales only started to really explode after the apps market came online," said Segall. "Smart Apps can do the same thing for utilities, customers and the smart grid.").

As Michael Vandenberg and Jim Rossi point out, utilities have been slow to embrace social media. Vandenberg & Rossi, *supra* note 53, at 1548 n.71; see also Carolyn Elefant, *The "Power" of Social Media: Legal Issues & Best Practice For Utilities Engaging Social Media*, 32 ENERGY L.J. 1, 1 (2011) (noting that utilities were once "Web 2.0 luddites" but are now increasingly experimenting with social media).

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*C. Privacy Concerns Present As-Yet Unresolved Challenges*

When large quantities of data are potentially transmitted over a network, we also confront substantial privacy implications. The voluminous literature on Internet privacy shows how modern network technologies present an ongoing threat to personal autonomy.<sup>85</sup> Similarly, smart meters, devices, and systems may generate reams of data never before available. Utilities are not accustomed to the challenges of real-time communication over a network.<sup>86</sup> They have not analyzed massive amounts of consumer data and do not understand the sophisticated techniques that third parties use to share data on the Internet without individuals' knowledge or consent.<sup>87</sup>

Some recent articles have begun to grapple with the complexities involved in protecting consumer privacy.<sup>88</sup> One commentator, for example, explores the difficulties of addressing privacy concerns when third parties enter the energy services business.<sup>89</sup> The prospect of meshing social networking and energy usage reduction adds the familiar challenges of maintaining privacy in social media.<sup>90</sup> If you can be fired because a friend posted racy pictures on your Facebook page, we have to wonder what could happen if a friend identified your air conditioner as an energy hog.

An additional privacy concern is that smart meters yield information that could identify environmental behavioral patterns that regulators might want to limit. There is an extensive body of literature on the potential link between environmental law (particularly addressing climate change) and individual behavior.<sup>91</sup> In the Smart Grid, we find ourselves on the frontier of balancing environmental gains and our need for eco-privacy. Regulators might be tempted to use Smart Grid data to achieve environmental goals, at the expense of consumer privacy.<sup>92</sup>

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<sup>85</sup> See generally A. Michael Froomkin, *The Death of Privacy?*, 52 STAN. L. REV. 1461 (2000); LORI ANDREWS, *I KNOW WHO YOU ARE AND I SAW WHAT YOU DID: SOCIAL NETWORKS AND THE DEATH OF PRIVACY* (2012).

<sup>86</sup> BROWN ET AL., *supra* note 61, at 94.

<sup>87</sup> See generally ANDREWS, *supra* note 85.

<sup>88</sup> See, e.g., Sonia McNeil, *Privacy and the Modern Grid*, 25 HARV. J. OF L. & TECH. 199 (2011); Frisby, Jr. & Trotta, *supra* note 73; Cheryl Dancy Balough, *Privacy Implications of Smart Meters*, 86 CHI.-KENT L. REV. 161 (2011); Stephanie M. Stern, *Smart-Grid and the Psychology of Environmental Behavior Change*, 86 CHI.-KENT L. REV. 139 (2011).

<sup>89</sup> Andreas S.V. Wokutch, *The Role of Non-Utility Service Providers in Smart Grid Development: Should They Be Regulated, and If So, Who Can Regulate Them?*, 9 J. ON TELECOMM. & HIGH TECH. L. 531 (2011).

<sup>90</sup> ANDREWS, *supra* note 85, at 4-5.

<sup>91</sup> See, e.g., Thomas Dietz et al., *Household Actions Can Provide a Behavioral Wedge to Rapidly Reduce U.S. Carbon Emissions*, 106 PROC. NAT'L. ACAD. SCI. 18,452 (2009); Michael P. Vandenberg & Anne C. Steinemann, *The Carbon-Neutral Individual*, 82 N.Y.U. L. REV. 1673 (2007); Michael P. Vandenberg et al., *Implementing the Behavioral Wedge: Designing and Adopting Effective Carbon Emissions Reduction Programs*, 40 ENVTL. L. REP. 10,547 (2010).

<sup>92</sup> This theme is explored in Katrina Fischer Kuh, *Personal Environmental Information: The Promise and Perils of the Emerging Capacity to Identify Individual Environmental Harms*, 65 VAND. L. REV. 1565 (2012).

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This and other important privacy issues must be addressed now. At present, efforts to address privacy issues are ad hoc, as concerned citizens and advocacy groups bring them to the attention of state PUCs, some of which have taken steps to address the relevant issues.<sup>93</sup> Without a more systematic approach, the entire Smart Grid effort might be derailed before it gets off the ground.<sup>94</sup>

#### D. State PUCs Have Resisted Approving Smart Grid Projects

State PUCs have authority to regulate retail sales of electricity by distribution utilities,<sup>95</sup> and evaluate Smart Grid project proposals subject to their jurisdiction on an individual basis. This often includes decisions whether to allow utilities to recover Smart Grid project costs from customers,<sup>96</sup> using the familiar tools of economic regulation to estimate project benefits and costs. Across the nation, utilities have had some successes with Smart Grid projects, but other projects have encountered resistance from PUCs.

##### 1. Concerns About Unquantifiable Project Benefits and Costs

The first concern for many PUCs is an asymmetry about market risk. The value of project benefits is hard to assess, and different in each utility's system.<sup>97</sup> There is no data from successful projects yet, and PUCs must predict the future. PUCs have been skeptical where utilities pitch the value of operational improvements, thinking consumers may not benefit.<sup>98</sup> In an early case, the Maryland PSC rejected a "tracker" mechanism to allow Baltimore Gas and Elec-

<sup>93</sup> See Decision Adopting Rules to Protect the Privacy and Security of Electricity Usage Data, CAL. PUB. UTIL. COMM'N (July 29, 2011), available at <https://www.cdt.org/files/pdfs/PUC%20Smart%20Grid%20Final.pdf>.

<sup>94</sup> Quinn & Reed, *supra* note 64, at 874-75; see also McNeil, *supra* note 88, at 25-31 (calling for federal legislation to address Smart Grid privacy issues). R

<sup>95</sup> See REGULATORY ASSISTANCE PROJ., ELECTRICITY REGULATION IN THE US: A GUIDE 11 (2011), available at <http://www.raonline.org/document/download/id/645> [hereinafter REGULATORY ASSISTANCE PROJ. REGULATION GUIDE].

<sup>96</sup> See REGULATORY ASSISTANCE PROJ. REGULATION GUIDE, *supra* note 95, at 36-37 (discussing costs recoverable by utilities). FERC regulates wholesale electricity sales and transmission of electricity in interstate commerce. *Id.* at 11. It therefore has authority to allow utilities to recover the costs of investments they make to the transmission system, and FERC's Smart Grid Policy set conditions for utilities to recover Smart Grid-related investments there. FERC Smart Grid Policy, *supra* note 23. R

<sup>97</sup> N.Y. PUB. SERV. COMM'N, *supra* note 23, at 32 ("[A]bsent pilot projects or other field studies, actual benefits are difficult to reliably predict."); see also ELEC. POWER RESEARCH INST., METHODOLOGICAL APPROACH FOR ESTIMATING THE BENEFITS AND COSTS OF SMART GRID DEMONSTRATION PROJECTS 2-16 to 2-23 (2010) (defining a comprehensive approach to estimating benefits). R

<sup>98</sup> See Petition of Massachusetts Electric Company and Nantucket Electric Company National Grid, each d/b/a National Grid for Approval of a Smart Grid Pilot Program, Order No. 09-32, MASS. DEP'T OF PUB. UTIL. x-xi, 35-36, 41 (2010), available at <http://www.env.state.ma.us/dpu/docs/electric/09-32/72710dpuord.pdf>.

tric Company (“BGE”) to begin recovering its investment while it was deploying over one million smart meters.<sup>99</sup>

Near-term Smart Grid approvals will be tentative, due in large part to a chicken and egg problem. We will not know the value of project benefits until we move forward, but we won’t move forward without knowing we will benefit. In addition, we cannot risk compromising reliability. Like an airplane flying at 30,000 feet, we can’t “stop” the grid,<sup>100</sup> but we have to try new ideas to learn what works. This makes R&D projects,<sup>101</sup> pilot projects and phased rollouts of smart meters an essential near-term strategy. It is better to let people test drive cars than force them to give up reliable 10-year-old vehicles.

Funding in the American Recovery and Reinvestment Act of 2009 (“ARRA” or the “stimulus bill”)<sup>102</sup> supported numerous Smart Grid pilot projects. Federal funds defraying half the cost made projects look more appealing to PUCs, and the stimulus bill had the desired stimulating effect, supporting deployment of 18 million smart meters.<sup>103</sup> There is considerable variety and experimentation in these early projects.<sup>104</sup> ARRA funding also prompted calls for rapid development of interoperability standards, which put pressure on that process to move quickly.

## 2. Concerns About Dynamic Pricing Programs

Another reason for PUC reluctance to approve many projects is that consumer benefits of smart meter deployment are said to depend on “dynamic”

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<sup>99</sup> Application of Baltimore Gas & Electric Company for Authorization to Deploy a Smart Grid Initiative and to Establish a Surcharge for the Recovery of Cost, Order No. 83410, MD. PUB. UTIL. COMM’N 3 (2010).

<sup>100</sup> EPRI GRID 3.0, *supra* note 66, at 16 (fundamental change to the grid is “like replacing an engine on a jet plane while it is flying at 30,000 feet. Much like the plane, the grid needs to be ‘on’ all of the time.”).

<sup>101</sup> Noteworthy examples of R&D aimed at testing Smart Grid concepts before their deployment in utility systems include the ongoing work at the National Renewable Energy Laboratory, *NREL Brings Plug and Play to Smart Grid Testing*, SMARTGRIDNEWS.COM (Jan. 31, 2012), [http://www.smartgridnews.com/artman/publish/Business\\_Strategy/NREL-brings-plug-and-play-to-smart-grid-testing-4423.html](http://www.smartgridnews.com/artman/publish/Business_Strategy/NREL-brings-plug-and-play-to-smart-grid-testing-4423.html), and the ambitious Pecan Street Project in Austin, Texas, PECAN STREET INC., <http://www.pecanstreet.org/about/what-is-pecan-street-inc/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>102</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009). Funding for Smart Grid activities was \$3.4 billion for grid modernization which was matched one to one by industry for funding of almost \$8 billion. U.S. DEP’T OF ENERGY, 2010 SMART GRID REPORT 20 (2012), available at <http://energy.gov/sites/prod/files/Smart%20Grid%20Investment%20Grant%20Program%20-%20Progress%20Report%20July%202012.pdf>.

<sup>103</sup> See Sunil Sharan, *Betting Smartly on the Smart Grid*, GREENTECHMEDIA (June 22, 2010), <http://www.greentechmedia.com/articles/read/betting-smartly-on-the-smart-grid/>. See INST. FOR ELEC. EFFICIENCY, UTILITY-SCALE SMART METER DEPLOYMENTS (2011), available at [http://www.edisonfoundation.net/iee/Documents/SmartMeter\\_Rollouts\\_0911.pdf](http://www.edisonfoundation.net/iee/Documents/SmartMeter_Rollouts_0911.pdf), for a list of utilities and their rollouts.

<sup>104</sup> For a description of some projects supported by ARRA funding, see Jeffrey D. Roark, *U.S. Government Support for Smart Grid*, ELECTRIC POWER INSTITUTE (Dec. 1, 2011), available at [http://www.hks.harvard.edu/hepg/Papers/New%20Folder/Jeff\\_Roark.pdf](http://www.hks.harvard.edu/hepg/Papers/New%20Folder/Jeff_Roark.pdf).

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pricing of electricity.<sup>105</sup> Dynamic pricing refers to any pricing structure that changes with the market price of electricity.<sup>106</sup> There are many different flavors, with esoteric names such as “time of use,”<sup>107</sup> “critical peak pricing,” “variable peak pricing,”<sup>108</sup> and “real-time retail pricing.”<sup>109</sup> All have different mechanisms for calibrating consumers’ rates to market prices.<sup>110</sup> Dynamic pricing has been the source of experiments for decades,<sup>111</sup> but it is not employed widely in the residential setting, although some large utilities have residential pricing plans with high enrollments.<sup>112</sup> Dynamic pricing offers price signals to consumers so they can respond actively to changing conditions, by, for example, reducing usage when rates go up.

This is dynamic pricing’s Achilles heel: It can expose consumers to market risks. Although research to date suggests it will yield consumer savings,<sup>113</sup> the conclusions are not definitive. Dynamic pricing has generated opposition from interest groups that believe their members’ rates will increase under dynamic pricing structures.<sup>114</sup> Research shows consumers can be satisfied with it once a

<sup>105</sup> LAWRENCE BERKELEY NAT’L LAB., *Chapter 5*, in Smart Grid Technical Advisory Project, *An Introduction – Smart Grid 101* 12 (2011) [hereinafter LBNL SMART GRID 101 CH. 5] (on file with the Harvard Law School Library) (“Are ‘Smart Rates’ necessary to achieve the benefits of Smart Grid? The answer is YES.”).

<sup>106</sup> REGULATORY ASSISTANCE PROJ. REGULATION GUIDE, *supra* note 95, at 55.

<sup>107</sup> *See* INST. FOR ELEC. EFFICIENCY, *supra* note 50, at 8–9.

<sup>108</sup> LBNL SMART GRID 101 CH. 5, *supra* note 105, at 7 (“Variable Peak Pricing (VPP) is a hybrid of time use and real-time pricing, where the rating periods are defined in advance but the prices are updated on a forecast basis.”).

<sup>109</sup> *Id.* (“For real-time retail pricing (RTP) tariffs, in an organized market, energy prices are typically linked to day-ahead or real-time energy markets and change hourly (or more frequently — e.g. every 30 minutes). In markets with vertically-integrated utilities that operate in regions without organized markets, real-time prices are typically set by the utilities administratively based on results from production cost models that reflect system conditions and estimate short-run marginal costs.”).

<sup>110</sup> REGULATORY ASSISTANCE PROJ. REGULATION GUIDE, *supra* note 95, at 55.

<sup>111</sup> LBNL SMART GRID 101 CH. 5, *supra* note 105, at 14 (noting that the “first tests of dynamic rates began in the early 1980’s”).

<sup>112</sup> *See, e.g., Tariff Book*, PACIFIC GAS & ELECTRIC, <http://www.pge.com/tariffs/ERS.SHTML#ERS> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library) (schedule of rates); John Farrell, *Electricity Priced by the Hour Boosts Distributed Solar Value by a Third or More*, CLIMATE PROGRESS (Jan. 26, 2012), <http://thinkprogress.org/romm/2012/01/26/411434/electricity-priced-by-the-hour-boosts-distributed-solar-value-by-a-third-or-more/> (discussing how PG&E’s dynamic pricing promotes solar power systems). Dynamic pricing has been more successful for industrial and commercial users of electricity. LBNL SMART GRID 101 CH. 5, *supra* note 105, at 10.

<sup>113</sup> *See generally* FARUQUI ET AL., *supra* note 68. A possible alternative to reduce risk might be a flat-fee pricing structure. Consumers would accept conditions such as more frequent direct load control. In return, they might have the option of flat-rate pricing for electricity, as long as they did not exceed a prescribed threshold amount of use. This could eliminate the need for dynamic pricing, simplify pricing options, and minimize consumer risk. *See, e.g.,* PECAN ST. PROJ., *supra* note 26, at 18.

<sup>114</sup> Richard J. Pierce, Jr., *The Past, Present and Future of Energy Regulation*, 31 UTAH ENVTL. L. REV. 291, 303 (2011); *Testimony of Rik Drummond Before the House Committee on Science, Space, and Technology* 12 (Sept. 8, 2011), available at [http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/090811\\_Drummond.pdf](http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/090811_Drummond.pdf) (“I predict the consumers, especially those within one of the largest voting blocks, baby boomers on a fixed income, will react negatively to even minor cost increases caused by various regulations and technical enhancements to the power grid.”). A notable example of interest group opposition is

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program is underway, but other studies show dynamic pricing is unpopular (particularly when it leads to high peak rates) and does not yield effective results.<sup>115</sup> On the basis of these uncertainties, in several high-profile cases, PUCs rejected dynamic pricing programs on the basis of risk to consumers.<sup>116</sup>

### 3. Other Concerns

Some consumers have other complaints about smart meters that have reduced the pace of PUC approval processes. They believe they are nefarious devices that control electricity use,<sup>117</sup> pose health risks,<sup>118</sup> or even are part of secret government plans to snoop on them.<sup>119</sup> Like the original objections to e-commerce, these concerns may seem quaint a decade from now. However, opponents have used these arguments to gain some traction and slow the Smart Grid's progress in some cases.<sup>120</sup>

#### E. Energy Law Federalism Poses a Challenge to Federal-State Cooperation in Building the Smart Grid

The involvement of state PUCs in building a Smart Grid, and their often tense relationship with the federal government, makes the Smart Grid different from any previous attempt at building networks.

Both the states and the federal government have jurisdiction over parts of the Smart Grid. Depending on which part of the system is involved, either

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that of the AARP. See, e.g., Maureen West, *Consumer Advocates Question the Benefits of Smart Meters*, AARP, Mar. 1, 2011, <http://www.aarp.org/politics-society/advocacy/info-03-2011/smart-meter-benefits-questioned-az.html>.

<sup>115</sup> LBNL SMART GRID 101 CH. 5, *supra* note 105, at 14; Vandenbergh & Rossi, *supra* note 53, at 1541.

<sup>116</sup> See Application for Rehearing of Baltimore Gas and Electric Company, Order No. 9208, PUB. UTIL. COMM'N OF MD. 1, 26 (2010).

<sup>117</sup> Compare Smart Grid Consumer Collaborative, *supra* note 62, at 8 (“Consumers do not always view benefits the same way as utilities believe they will and are wary of utility motives.”), with Leslie Kaufman & Kate Zernike, *Activists Fight Green Projects, Seeing U.N. Plot*, N.Y. TIMES, Feb. 3, 2012, <http://www.nytimes.com/2012/02/04/us/activists-fight-green-projects-seeing-un-plot.html?pagewanted=all> (quoting a protester as saying, “[t]he real job of smart meters is to spy on you and control you—when you can and cannot use electrical appliances.”).

<sup>118</sup> See, e.g., Mike Ludwig, *Smart Meter Scoop: California Utility Launches Opt-Out Program*, TRUTHOUT (Feb. 3, 2012) <http://www.truth-out.org/smart-meter-scoop-california-utility-launches-opt-out-program/1328294529> (discussing the California opt-out ruling about “controversial smart meters”); see also N.Y. PUB. SERV. COMM'N, *supra* note 23, at 35 (noting that “the RF emission levels of [smart meters] are exceedingly small relative to other commonly used devices (e.g., cellular telephones)”).

<sup>119</sup> Doug Peeples, *Smart Meters: Illegal, Dangerous, Un-American? Must Be True – It's on YouTube*, SMARTGRIDNEWS.COM (Aug. 10, 2011), [http://www.smartgridnews.com/artman/publish/Technologies\\_Metering/Smart-meters-Illegal-dangerous-un-American-Must-be-true-it-s-on-YouTube-3902.html](http://www.smartgridnews.com/artman/publish/Technologies_Metering/Smart-meters-Illegal-dangerous-un-American-Must-be-true-it-s-on-YouTube-3902.html) (quoting a YouTube video called “Smart Meters” in which the narrator describes smart meters as power company surveillance devices).

<sup>120</sup> In 2011, Marin County, California, banned smart meters in its unincorporated areas. Debra Kahn, *California County Criminalizes Smart-Meter Installations*, N.Y. TIMES, Jan. 5, 2011, <http://www.nytimes.com/gwire/2011/01/05/05greenwire-calif-county-criminalizes-smart-meter-install-66649.html>.

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FERC, a state PUC, or the governing council or board of a municipal or cooperative utility has jurisdiction. As noted above, state PUCs have authority to approve Smart Grid projects and cost recovery proposals for distribution utilities that make retail sales of electricity.

Yet the Smart Grid requires coordination of efforts between the different levels of government, and perhaps even a new distribution of regulatory authority.<sup>121</sup> If FERC attempted to change the existing distribution of authority between it and the states (for example, by setting national interoperability standards that the states would be required to force utilities to adopt in individual projects), it could exacerbate the well-documented tension between the federal and state governments in electric utility regulation.<sup>122</sup>

Addressing and resolving this tension makes standards development an early and highly significant test of how participants will establish their expectations about Smart Grid governance. Decisions made now about standard-setting powers will set precedents that may well be hard to reverse.

### III. A NEW REGULATORY FRAMEWORK FOR THE SMART GRID: INTEROPERABILITY STANDARDS

Early Smart Grid experiments may lead to new business models and further growth,<sup>123</sup> but numerous barriers exist to its rapid expansion. As a result, a fully robust network is many years away, and everything needed to support it is in the embryonic stage.<sup>124</sup> Along the way, learning will be expensive.

The same spirit of dynamic, distributed, and meritocratic innovation that extends to Smart Grid technologies should characterize our approach to the federal and state regulatory environment. Smart Grid regulation should be flexible and facilitate a wide range of applications and new businesses. Such regulation would be smart, but the current system is not. The rules for building a new network have no precedent in modern life or in electric utility regulation. Unlike the Internet, where commerce followed technology, the Smart Grid aims to overhaul an existing network that gives utilities monopolies and guarantees their rates of return. This system is ill-suited to encouraging progress today. Smart Grid regulation must evolve to address the titanic clash looming at every node on the network between the staid utility industry and the transformative force of modern innovation.<sup>125</sup>

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<sup>121</sup> See SGIP, SMART GRID CONCEPTUAL MODEL 8 (2010) (“The transition to the Smart Grid introduces new regulatory considerations, which may transcend jurisdictional boundaries and require increased coordination among federal, state, and local lawmakers and regulators.”).

<sup>122</sup> See generally Rossi & Vandenberg, *supra* note 53.

<sup>123</sup> *Smart Grid Initiatives and Technologies: Hearing Before the Senate Committee on Energy and Natural Resources*, *supra* note 3, at 8 (noting that “it is too early to assess the ‘lessons learned’”).

<sup>124</sup> BROWN ET AL., *supra* note 61, at 93.

<sup>125</sup> See Peter Fox-Penner & Heidi Bishop, *Mission, Structure, and Governance in Future Electric Markets: Some Observations*, 89 OR. L. REV. 1107, 1111 (2011) (“[W]hat we have today is a collision between public mandates that promote active or tacit vertical integration

A significant near-term test of regulatory evolution involves the development of interoperability standards. Many participants believe these are a necessary foundation for the Smart Grid.<sup>126</sup> The ARRA accelerated the push for standards, requiring federally funded projects to use “open” standards “if available and appropriate.”<sup>127</sup> Decisions about these standards are about far more than superior technical merit. Standards will have a considerable impact on the Smart Grid’s architecture. They will decide how utilities’ systems and smart meters will “talk” to one another, how the grid will foster DR and DG,<sup>128</sup> how electric vehicles will plug into and communicate with the grid, how consumers’ home networks will integrate energy management capabilities, and much, much more.<sup>129</sup> Like the Phoenician alphabet or Internet protocols, standards for the Smart Grid promise to eliminate barriers to interactions, while defining how those interactions take place. Choices about standards will shape the course of innovation, and even the most basic and fundamental choices will have enormous consequences. These important choices are also difficult, because a network under construction is hard to standardize.

Two major tensions characterize Smart Grid standard-setting. The first is that industry participants steeped in the decades-long traditions of technical standards development and with prior experience with reliability standards will expect the private sector to lead standards development. Notwithstanding that strong preference for standards developed by private sector experts, setting Smart Grid interoperability standards requires a national effort to coordinate the many actors and establish the basis for their interaction. There are also specific national objectives (notably, ensuring cybersecurity) too important to be left to the private sector.

The second tension, introduced above in Part II, involves the unique landscape of Smart Grid stakeholders and their impact on standard-setting. We are attempting to regulate and encourage innovation on a network that already has extensive commercial use and entrenched actors with monopoly control over part of it. Two different types of actors require careful consideration. The first is the utilities themselves. Encouraging them to collaborate with vendors and other participants in standard-setting could exacerbate their monopoly power and create a disadvantage for future entrants, even if near-term decisions appear

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alongside a disruptive technological change that is prompting new calls for retail deintegration and deregulation.”).

<sup>126</sup> See, e.g., *Empowering Consumers and Promoting Innovation through the Smart Grid: Hearing Before the Subcommittee on Technology and Innovation of the House Committee on Science, Space, and Technology*, 112th Cong. 5 (2011) (statement of Donna Nelson, Chairman, Pub. Util. Comm’n of Tex.) (calling for “the creation of a national set of standards that can provide direction for utilities, industry and market participants”).

<sup>127</sup> American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, § 405(3), 123 Stat. 144 (to be codified at 42 U.S.C. § 17384(b)(3)(F)).

<sup>128</sup> Alison C. Graab, *The Smart Grid: A Smart Solution to a Complicated Problem*, 52 WM. & MARY L. REV. 2051, 2054 (2011).

<sup>129</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 31.

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facially neutral.<sup>130</sup> A difficult issue, then, is striking the democratic balance between utilities and other stakeholders to overcome any possible capture of the process.

The second important set of actors is the state PUCs. Because their near-term decisions (not those of the marketplace) will determine what interoperability standards are adopted, providing guidance to them is important. As noted above in Part II, the prospect of any federal involvement in standard-setting cannot be considered in isolation, but must be viewed through the lens of contemporary energy law federalism.<sup>131</sup>

#### A. *The Need For Standards and the Foundation of “Interoperability”*

There are so many possible interactions and uncertainties in the Smart Grid that a foundation of standards is essential to specify how these interactions take place.<sup>132</sup> Without standards, trying to exchange information among utilities, vendors, regulators, and others, never mind linking thousands of utility systems together, would be a veritable “Tower of Babel.”<sup>133</sup>

The Smart Grid’s complexity is staggering, with multiple domains and thousands of actors connected in complex paths and subnetworks.<sup>134</sup> There are well over 100 points of interaction between subsystems in the NIST Smart Grid conceptual model,<sup>135</sup> and substantial variety in proposals for interactions at individual points. For example, should the “smart” interface between a residential customer and her utility be in a smart meter, or in a different device that communicates directly with the network and the utility?<sup>136</sup> This difficult and com-

<sup>130</sup> Wu, *supra* note 7, at 149 (“Neutrality, as a concept, is finicky, and depends entirely on what set of subjects you choose to be neutral among. A policy that appears neutral in a certain time period, like ‘all men may vote’, may lose its neutrality in a later time period, when the range of subjects is enlarged.”). R

<sup>131</sup> See, e.g., FERC Smart Grid Policy, *supra* note 23, ¶ 13 (noting that there is “a tension that the Proposed Policy Statement raises between federal jurisdiction and state jurisdiction . . . [with respect to] both standards adoption and applicability and whether deployed technology will be subject to state or federal rate authority”). R

<sup>132</sup> A useful comparison is to convergence in communications industries. Werbach, *supra* note 11, at 207 (“Communications regulation developed as a series of isolated silos covering broadcasting, telephone networks, cable television, wireless communications, and other services. Now those networks are converging. When everything can be reduced to an interchangeable digital bit, standards define how information flows across the interconnected network of networks.”). R

<sup>133</sup> UTIL. STANDARDS BD., SMART GRID: INTEROPERABILITY AND STANDARDS 5 (2008).

<sup>134</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 38-42; see also Werbach, *supra* note 11, at 182 (noting that “[n]etworks are non-linear, in that there are typically multiple potential paths between two nodes, making the behavior of the networked system surprisingly complicated”). R

<sup>135</sup> MASS. INST. OF TECH, *supra* note 1, at 205. R

<sup>136</sup> See, e.g., ZIGBEE ALLIANCE, ZIGBEE SMART ENERGY PROFILE SPECIFICATION 10-12 (2008) (containing graphic demonstrations of the different architectures); EMETER, VIEWS ON SMART METERS: END USE PERSPECTIVE (2011), available at <http://cat-iqconference.com/files/2011/09/Alicia-Carrosco-his-11-09-20-CAT-iq-plan-Smart-Metering-End-User-Perspective.pdf> (observing that “the communications may be directly between the SM and smart appliances or through a gateway, or potentially both”). R

plicated question is one of literally thousands that interoperability standards address.

Standards do more than make interaction possible. They can resolve confusion and promote investments in technology, giving firms the confidence to market products that meet the standards.<sup>137</sup> An open architecture can eliminate market obstacles, provide for competition among vendors, and encourage new third-party entrants.<sup>138</sup> This can ensure more rapid adoption of the underlying technologies and benefits for consumers.<sup>139</sup> If designed appropriately, standards can protect investments in legacy infrastructure by ensuring compatibility with older technologies as newer ones are deployed.<sup>140</sup> By definition, however, standards standardize, and they eliminate some opportunities for innovation.<sup>141</sup> Standards could lead to suboptimal decisions if their establishment shuts out tomorrow's more advanced technologies<sup>142</sup> or freezes out potential new firms.

Should we wait until ongoing Smart Grid projects yield valuable evidence about what works and what does not? With so many uncertainties, the risk of proceeding without foundational standards outweighs other risks.<sup>143</sup> Some standards can be flexible and account for future upgrades, mitigating the risk of being stuck with outdated technologies. Lessons learned from pilot projects can yield valuable knowledge that can be incorporated into newer versions of standards.<sup>144</sup>

### 1. Basic Concepts Behind Interoperability Standards

A "standard" includes "specifications that establish the fitness of a product for a particular use or that define the function and performance of a device or system."<sup>145</sup> Standards are technical documents that discuss requirements of

<sup>137</sup> NAT'L SCI. AND TECH. COUNCIL, *supra* note 3, at 26-27.

<sup>138</sup> GRIDWISE ARCHITECTURE COUNCIL, *supra* note 8, at 21 ("Open standards can encourage a competitive, multi-supplier environment.").

<sup>139</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 15-16; Chiao, Lerner, & Tirole, *The Rules of Standard-setting Organizations: An Empirical Analysis* 2-3 (Ctr. For Economic Policy Research, Discussion Paper No. 6141, 2007).

<sup>140</sup> NAT'L SCI. AND TECH. COUNCIL, *supra* note 3, at 26; *see also* Chiao et al., *supra* note 139, at 3 ("A standard that demands backwards compatibility can insure ongoing revenues for a legacy product for many years.").

<sup>141</sup> Quinn & Reed, *supra* note 64, at 840 (noting that "regulatory decisions at this nascent stage of smart grid development will unavoidably widen some avenues of innovation while foreclosing others").

<sup>142</sup> BROWN ET AL., *supra* note 61, at 89 n. 97 ("In theory, one could make the exact opposite argument, namely, that interoperability standards could impede progress in technology by forcing a kind of lowest common denominator factor into interoperability standards, particularly in regard to communications.").

<sup>143</sup> Werbach, *supra* note 11, at 211 (noting that "the greatest threat to market-driven innovation in convergence industries is not what is clearly prohibited, but what is uncertain").

<sup>144</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 175 ("As the experiences with new Smart Grid technologies are gained from these projects, NIST will use these lessons learned to further identify the gaps and shortcomings of applicable standards.").

<sup>145</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 22.

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minimum quality and the testing and certification of compliant products.<sup>146</sup> They take many forms. They may be normative (specifying “fully fledged implementable standards or safety and security practices”), guiding (providing “information on best practices”), or informative (providing “context and background information on Smart Grid technologies, practices and policies”).<sup>147</sup>

Interoperability standards are different from standards for one product.<sup>148</sup> They are foundational to networks, specifying parameters of how actors and components throughout the network interact with each other.<sup>149</sup> Interoperability’s fundamental attribute is the ability of users and devices to communicate with each other transparently, without special effort.<sup>150</sup> The familiar “WiFi” standard (actually a part of a standard) is an excellent example of an interoperability standard. It specifies the foundation for wireless local area network protocols, making it possible for a user to access these networks without specifying the details of how her computer communicates with the network system.<sup>151</sup>

To achieve interoperability in the Smart Grid, we are starting virtually from scratch, with hundreds of standards needed,<sup>152</sup> and no common understanding of foundational matters such as what types of data are gathered or how they are exchanged.<sup>153</sup> Talking about these matters is meaningless without grounding them in a broader context. It is impossible to talk about data without knowing what we are trying to accomplish with that data. Decisions about interoperability, then, are related to fundamental regulatory decisions.

<sup>146</sup> Technical standards are different from “performance standards,” such as those employed in the environmental setting, that set goals and objectives for those regulated by them. *See* Werbach, *supra* note 11, at 195; *see also* 15 U.S.C.A. §§ 272, 4301(a)(9) (West 2012) (defining “technical standards”).

<sup>147</sup> SGIP, STANDARDS CATALOG 2 (2011), available at [http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SGIPGBDocumentsUnderReview/Standards\\_Catalog\\_Process\\_and\\_Structure\\_V0\\_9\\_20110401.pdf](http://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SGIPGBDocumentsUnderReview/Standards_Catalog_Process_and_Structure_V0_9_20110401.pdf) [hereinafter SGIP STANDARDS CATALOG].

<sup>148</sup> For a discussion of the impact of environmental product standards, see Noah Sachs, *Can We Regulate Our Way to Energy Efficiency? Product Standards as a Climate Change Policy*, 61 VAND. L. REV. 1631 (2012).

<sup>149</sup> Werbach, *supra* note 11, at 197.

<sup>150</sup> NIST defines “interoperability” as “[t]he capability of two or more networks, systems, devices, applications, or components to exchange and readily use information—securely, effectively, and with little or no inconvenience to the user.” NIST FRAMEWORK 2.0, *supra* note 5, at 6. *See generally* GRIDWISE ARCHITECTURE COUNCIL, *supra* note 8, at 13-14 (discussing different levels and attributes of interoperability).

<sup>151</sup> *See IEEE 802 LAN/MAN Standards Committee*, IEEE 802, <http://www.ieee802.org/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library). Ethernet was first introduced in 1980 as a result of collaboration among three companies building upon work in the 1970s by computer scientists. THE ETHERNET: A LOCAL AREA NETWORK 1 (1980), available at <http://ethernethistory.typepad.com/papers/EthernetSpec.pdf>; Leiner et al., *supra* note 30. This family of standards was standardized through the work of SDOs, including IEEE. *Development of Ethernet Standards*, ETHERMANAGE.COM, [http://www.ethermanage.com/ethernet/10quickref/ch1qr\\_4.html](http://www.ethermanage.com/ethernet/10quickref/ch1qr_4.html) (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>152</sup> *See* NIST Framework 2.0, *supra* note 5, at 22.

<sup>153</sup> FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 13 (“[I]nteroperability in the smart grid requires a common language of data models and identifiers to enable communication across systems and applications.”).

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The technical challenges are daunting. Even a common vocabulary is hard to come by, as different technical disciplines use terms such as “reliability” in different ways. There is a spectrum of potential interaction among devices and systems. For example, two devices could be only physically connected, or have the ability to exchange data, or coordinate operations based on complex communication protocols and applications.<sup>154</sup> The approach will be different at various locations on the Smart Grid. At some points, the quality of interaction might be loosely defined, but at others it might be tightly governed.<sup>155</sup> The technology to accomplish interactions (as in the case of DG) is often not fully mature. Integrating legacy utility infrastructure, which generally lacks standardization, complicates matters further.

## 2. *Conceptual Models and “Use Cases”*

The breathtaking complexity of achieving interoperability in the Smart Grid is such that an agreed-upon vision of Smart Grid architecture is essential simply to get started. Tools such as semantic models,<sup>156</sup> use cases, and conceptual models<sup>157</sup> illustrate a wide range of interactions and serve as a foundation for standards. Choices made now, based on these models, are some of the most important decisions that will ever be made about the Smart Grid.

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<sup>154</sup> GRIDWISE ARCHITECTURE COUNCIL, *supra* note 8, at 23-25. The GWAC hierarchical conceptual model of different levels of interoperability, known colloquially as the “GWAC stack,” is widely followed in Smart Grid standards development. NIST FRAMEWORK 1.0, *supra* note 1, at 30.

<sup>155</sup> Werbach, *supra* note 11, at 207 (Network standards play a “complicated role” and “a relatively lightweight standard at the interface between key layers of the network may allow for great variety on either end.”).

<sup>156</sup> ELEC. POWER RESEARCH INST., REPORT TO NIST ON THE SMART GRID INTEROPERABILITY STANDARDS ROADMAP vi (2009), available at [http://www.nist.gov/smartgrid/upload/Report\\_to\\_NIST\\_August10\\_2.pdf](http://www.nist.gov/smartgrid/upload/Report_to_NIST_August10_2.pdf) [hereinafter EPRI NIST REPORT] (noting that a common semantic model for information is a high priority for the Smart Grid).

<sup>157</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 38-42 (describing the NIST conceptual model of the Smart Grid).

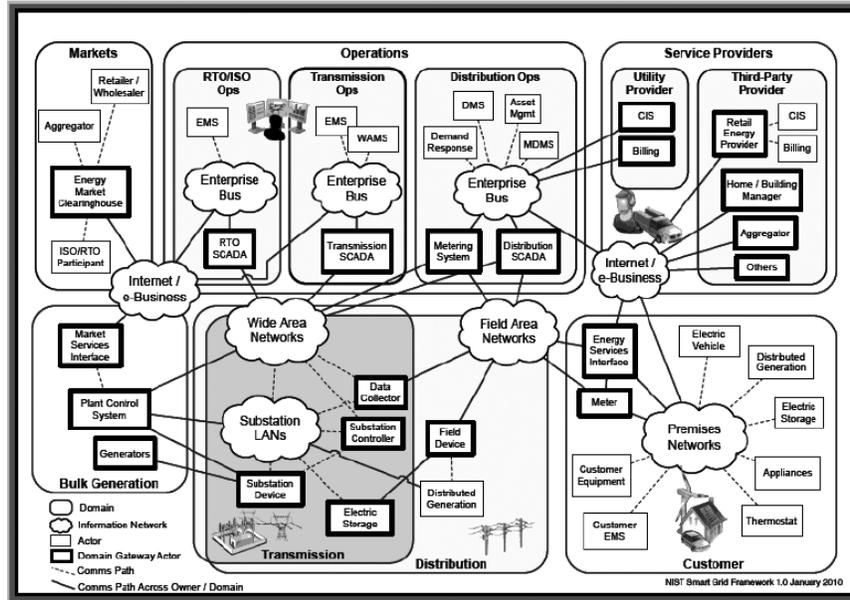
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FIGURE 1: NIST CONCEPTUAL MODEL FOR SMART GRID<sup>158</sup>



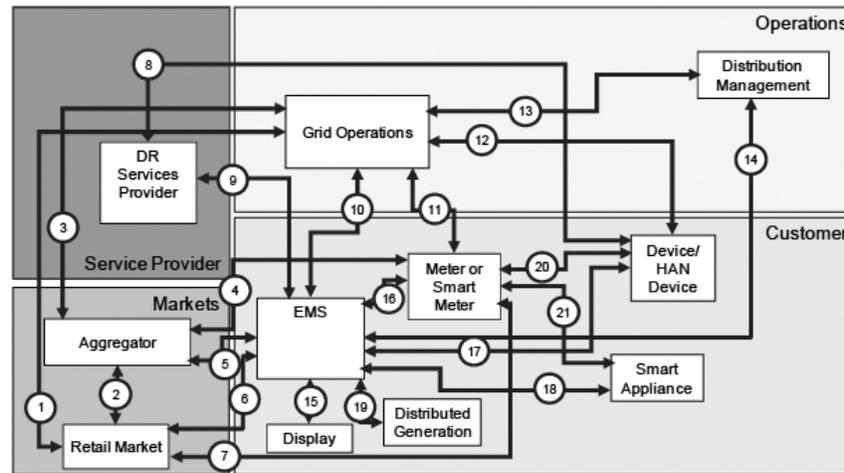
“Use cases,” as the name suggests, are narrative descriptions of how actors will interact in (“use”) the Smart Grid. A standard would enable these uses by specifying the required technical content. The SAE International (“SAE”) standard J2836 for “vehicle-to-grid” connections<sup>159</sup> specifies five different scenarios under which a vehicle owner could connect to the electrical grid to obtain power, or, possibly, provide power back from her battery to it. Under the use “U2,” for example, a vehicle battery is used in a utility’s direct load control program.<sup>160</sup>

<sup>158</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 35.

<sup>159</sup> See generally SAE INT’L, USE CASES FOR COMMUNICATION BETWEEN PLUG-IN VEHICLES AND THE UTILITY GRID (2010), available at [http://standards.sae.org/j2836/1\\_201004/](http://standards.sae.org/j2836/1_201004/).

<sup>160</sup> See THEODORE BOHN, U.S. DEP’T OF ENERGY, CHALLENGES OF THE COMING ELECTRIC CAR REVOLUTION 34 (2011), available at [http://www.ilmua.org/AnnualMeeting/Annual%20Meeting%202011\\_Bohn.pdf](http://www.ilmua.org/AnnualMeeting/Annual%20Meeting%202011_Bohn.pdf).

FIGURE 2: EXAMPLE OF A “USE CASE”<sup>161</sup>



**Demand Response Use Cases: Actors and Logical Interfaces**

HAN: Home Area Network  
EMS: Energy Management System  
DR: Demand Response



Some caution is in order, as the apparent comprehensiveness of a set of use cases may be illusory if some known interactions are excluded.<sup>162</sup> Also, if today’s Smart Grid is like the Internet of 1995, we cannot foresee all future new uses. Someone will come along at a later date and draw new lines, squiggles, or 3-D connections on a conceptual model, making connections previously thought impossible. However, we have to have some common frame of reference, which the use cases and conceptual models provide.

*B. How Standards Are Set*

A use case is descriptive, not normative. It identifies specific interactions that can take place across the Smart Grid, but does not prescribe how they happen. That leaves an important issue unsettled: *who* sets the standards’ content? There is no obvious answer. We are defining what it is while we are doing it, and could make big and expensive mistakes early and often.

<sup>161</sup> A use case is a graphical representation of the inputs, processes, outputs and responsibilities of actors in the system for demand response. See EPRI NIST REPORT, *supra* note 156, at 55.

<sup>162</sup> See Chuck Goldman & Rogery Levy, *Engaging the Customer*, LAWRENCE BERKELEY NAT’L LAB., SMART GRID TECHNICAL ADVISORY PROJECT (2009), available at <http://collaborate.nist.gov/twiki-sgrid/bin/view/SmartGrid/PAP10EnergyUsagetoEMS> (download from icon “NARUC-Webinar2-Dec16-FinalDraft-121609.ppt”) (detailing possible problems with use cases).

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With hundreds of standards to be set, a regularized process is necessary to avoid uncertainty.<sup>163</sup> Where we start, and how we proceed, are extremely important decisions.

1. *The Norm: Standard-setting By Private Sector Experts (Standards Development Organizations)*

There is a strong preference in the United States for “bottom up,”<sup>164</sup> participant-driven, private sector standard-setting processes. Many different types of groups develop standards, including formal organizations with rigorous procedures, industry consortia, and other actors.<sup>165</sup> A standard can also evolve without any action if a technology becomes so prevalent that it becomes the *de facto* standard.<sup>166</sup>

Formal “standards development organizations” (“SDOs”) such as the IEEE and SAE have decades of expertise in developing voluntary consensus standards. “Consensus” refers both to the process of developing standards, and to the acceptance of certified products in the marketplace. A manufacturer desiring to produce a specific grade of steel, for example, will refer to a standard set by the ASTM for the content of specific ingredients and the production process to guarantee quality.

This type of standards organization is well known to utilities and other Smart Grid participants.<sup>167</sup> Major SDOs already have standards in place for some important Smart Grid technologies. One notable example is the IEEE 802 family of standards, which includes the foundation for the familiar “WiFi” wireless local area network protocols, among others.<sup>168</sup> SDOs are developing standards, often in competition with one another, which they intend to become part of the Smart Grid.<sup>169</sup> These standards vary in their availability and maturity.<sup>170</sup> Some existing standards have been modified for the Smart Grid by addressing new issues. However, some either exist only in draft form, or would be new and developed specifically for the Smart Grid.<sup>171</sup>

<sup>163</sup> NIST SGIP, SMART GRID INTEROPERABILITY PANEL STANDARDS 6 (2010), available at [http://www.narucmeetings.org/Presentations/SGIP%20Update\\_2010\\_NARUC%20Summer\\_v81.pdf](http://www.narucmeetings.org/Presentations/SGIP%20Update_2010_NARUC%20Summer_v81.pdf) (noting that “[c]onsistent action will influence the vendor community”).

<sup>164</sup> NAT’L SCI. AND TECH. COUNCIL, *supra* note 3, at 4.

<sup>165</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 22.

<sup>166</sup> Stacy Baird, *The Government at the Standards Bazaar*, 18 STAN. L. & POL’Y REV. 35, 49 (2007).

<sup>167</sup> *Id.* at 42 (noting that “standards development organizations are exceedingly credible and common to all industries that rely on standards”).

<sup>168</sup> See IEEE 802, *supra* note 151; see also Leiner et al., *supra* note 30. The Wifi family of standards was standardized through the work of SDOs, including IEEE. ETHERMANAGE.COM, *supra* note 151.

<sup>169</sup> See PAC. NW. NAT’L LAB., HOME AREA NETWORKS AND THE SMART GRID 1 (2011) (noting that “[t]here are myriad standards and protocols vying for dominance in the smart grid market”).

<sup>170</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 3.

<sup>171</sup> *Id.*

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SDOs are indispensable to developing interoperability standards.<sup>172</sup> Participants' experience with them also creates a strong expectation about how standards are set. SDOs have formal participatory "processes marked by openness, balance, transparency, and characterized by due processes to address negative comments."<sup>173</sup> They typically involve their industry members in committees to draft new standards and submit them to the membership for approval.<sup>174</sup> This can be as complex as the workings of any legislature, with rules governing the composition of committees, voting procedures, and other matters. As a result, SDOs are generally "perceived to provide a more effective 'stamp of approval' than special interest groups dominated by technology sponsors."<sup>175</sup>

The American National Standards Institute ("ANSI") is the designated national standards body,<sup>176</sup> and itself an SDO that accredits other SDOs. Under its "Procedures for the Development and Coordination of American National Standards,"<sup>177</sup> the ANSI seeks "to verify that the principles of openness and due process have been followed and that a consensus of all interested parties has been reached."<sup>178</sup> The threshold for developing a standard is "sufficient evidence that the standard has a substantive reasonable basis for its existence and that it meets the needs of producers, users and other interest groups."<sup>179</sup> The SDO must follow procedures designed to ensure that the standard is a product of a consensus judgment that subordinates any one stakeholder's narrow economic interest.<sup>180</sup> These include requirements that the SDO have balanced representation from interested parties, that votes cannot be dominated or manipulated by those with economic interests or other influence, and that dissatisfied parties may appeal adverse decisions.<sup>181</sup> An important ANSI-accredited SDO that sets standards for utilities is the North American Energy Standards Board ("NAESB").<sup>182</sup> NAESB was expanded from a predecessor

<sup>172</sup> The EISA recognizes this by directing NIST to work with specified SDOs. See EPRI NIST REPORT, *supra* note 156, at vi.

<sup>173</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 45.

<sup>174</sup> See *Membership*, ASTM Int'l, <http://www.astm.org/MEMBERSHIP/standard-sdevelop.html> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>175</sup> Chiao et al., *supra* note 139, at 3.

<sup>176</sup> AM. NAT'L STANDARDS INST., OVERVIEW OF THE U.S. STANDARDIZATION SYSTEM, available at <http://publicaa.ansi.org/sites/apdl/Documents/News%20and%20Publications/Brochures/U.S.%20Standardization%20System-07.pdf>.

<sup>177</sup> *Id.*

<sup>178</sup> Amy A. Marasco, *Standards Development: Are You at Risk?*, AM. NAT'L STANDARDS INST., [http://www.ansi.org/news\\_publications/other\\_documents/risk.aspx?menuid=7](http://www.ansi.org/news_publications/other_documents/risk.aspx?menuid=7) (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>179</sup> *Id.*

<sup>180</sup> EPRI NIST REPORT, *supra* note 156, at 10.

<sup>181</sup> See Marasco, *supra* note 178; see also BROWN ET AL., *supra* note 61, at 65 (noting the line of Supreme Court cases that "emphasize[s] that industry standards must be developed and administered objectively, and not by a company or group that has a vested interest in an exclusionary outcome").

<sup>182</sup> See *About NAESB*, N. AM. ENERGY STANDARDS BD. <http://www.naesb.org/aboutus.asp> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

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organization in 2002 to develop standards for the wholesale gas and electric markets.<sup>183</sup>

The pluralistic ideal of SDO democratic engagement can break down in practice if companies co-opt the process by embedding content in standards that favors their interests.<sup>184</sup> This concern has led to criticism of SDO standard-setting as regulation outsourced to the private sector without appropriate checks,<sup>185</sup> and discussion about the antitrust impacts of potential competitors uniting to define and dominate an industry.<sup>186</sup> However, there is a strong preference in federal law for private standards development. The ANSI's "United States Standards Strategy" states that "[v]oluntary consensus standards are at the foundation of the U.S. economy."<sup>187</sup> The National Technology Transfer and Advancement Act ("NTTAA") requires federal agencies to "use technical standards that are developed or adopted by voluntary consensus standards bodies."<sup>188</sup> OMB Circular A-119 elaborates the definitions and requirements for voluntary consensus standards.<sup>189</sup>

## 2. *An Alternative Form of Standard-setting: Crowdsourcing (Internet Standards)*

An alternative standard-setting model is the highly decentralized structure for setting the Internet's technical standards. The main Internet standards organizations are the Internet Engineering Task Force ("IETF")<sup>190</sup> and World Wide

<sup>183</sup> See Letter from Jonathan Booe, Deputy Director, NAESB, to Dr. Patrick Gallagher, Director, NIST (Feb. 7, 2011) (on file with the Harvard Law School Library), available at <http://www.nist.gov/standardsgov/upload/NAESB.pdf>; William P. Boswell & James P. Cargas, *North American Energy Standards Board: Legal and Administrative Underpinnings of a Consensus Based Organization*, 27 ENERGY L.J. 147 (2006) (discussing the NAESB's creation). FERC incorporates by reference NAESB business practice standards for the wholesale power system. See, e.g., Incorporation by Reference of North American Energy Standards Board Wholesale Electric Quadrant Standards, 18 C.F.R. § 38.2 (2010); FERC, *Standards for Business Practices of Interstate Natural Gas Pipelines*, RM96-1-036, 140 FERC ¶ 61,036 (July 19, 2012).

<sup>184</sup> Sidney A. Shapiro, *Outsourcing Government Regulation*, 53 DUKE L.J. 389, 406-11 (2003) (discussing potential for individual actors' dominance of private SDOs); Chiao et al., *supra* note 139, at 6 (noting that standard-setting can involve a "war of attrition" in which "vested interests" delay a standard). See generally Tyler R.T. Wolf, *Existing in a Legal Limbo: The Precarious Legal Position of Standards-Development Organizations*, 65 WASH. & LEE L. REV. 807 (2008) (discussing this issue and more alleged defects of the SDO process).

<sup>185</sup> See generally Shapiro, *supra* note 184.

<sup>186</sup> Mark A. Lemley, *Antitrust and the Internet Standardization Problem*, 28 CONN. L. REV. 1041 (1996) (discussing antitrust concerns and private standards organizations); see also Standards Development Organization Advancement Act of 2004, Pub. L. No. 108-237, 118 Stat. 661 (2004).

<sup>187</sup> Baird, *supra* note 166, at 55-56.

<sup>188</sup> National Technology Transfer and Advancement Act of 2004, Pub. L. No. 104-113, § 12, 110 Stat. 775 (1996).

<sup>189</sup> OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, OMB CIRCULAR NO. A-119, REVISED FEDERAL PARTICIPATION IN THE DEVELOPMENT AND USE OF VOLUNTARY CONSENSUS STANDARDS AND IN CONFORMITY ASSESSMENT ACTIVITIES [hereinafter OMB CIRCULAR] § 4(a)(1)(v) (1998), available at <http://standards.gov/a119.cfm>.

<sup>190</sup> See PAUL HOFFMAN, THE TAO OF IETF: A NOVICE'S GUIDE TO THE INTERNET ENGINEERING TASK FORCE 1 (2012), available at <http://tools.ietf.org/rfcmarkup?doc=fyi17>.

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Web Consortium (“W3C”).<sup>191</sup> Neither relies on any government agency to administer standards. W3C membership is open to anyone, and the W3C process<sup>192</sup> is designed to produce standards that “maximize consensus” and “earn endorsement by W3C and the broader community.”<sup>193</sup>

The IETF’s “radically decentralized and open structure”<sup>194</sup> allows for the broadest exchange of views on standards, but it is doubtful that it is a good model for the Smart Grid. As one observer notes, the IETF is “rare in its ability to function so effectively” despite being fully decentralized.<sup>195</sup> This has led at least one observer to conclude that the Internet crowdsourcing model is not a realistic one for the Smart Grid.<sup>196</sup>

Internet standards, however, will be important in the Smart Grid,<sup>197</sup> and one cherished aspect of these standards is well worth emulating. A standard is “open” if a Fortune 500 company as well as a teenager in a garage in California can readily access it, design around it, and build new products. Internet standards are open and freely available,<sup>198</sup> and those of the Smart Grid should be as well.

### C. Reasons to Depart from the Norm: Federal Standard-setting Involvement for the Smart Grid

Private standard-setting may be the norm, but the difficulties of achieving any progress in developing Smart Grid interoperability standards seem insuperable unless the federal government is involved.<sup>199</sup> With Smart Grid rollouts

<sup>191</sup> See WORLD WIDE WEB CONSORTIUM, <http://www.w3.org/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library) (stating that “[t]he World Wide Web Consortium (W3C) is an international community that develops open standards to ensure the long-term growth of the Web”).

<sup>192</sup> *WC3 Process Document*, WORLD WIDE WEB CONSORTIUM, <http://www.w3.org/2005/10/Process-20051014/tr> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>193</sup> *Standards*, WORLD WIDE WEB CONSORTIUM, <http://www.w3.org/standards/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>194</sup> Werbach, *supra* note 11, at 199.

<sup>195</sup> *Id.*

<sup>196</sup> FERC Technical Conference 2011, *supra* note 10 (statement of Andrew Wright), at 57 (stating that “[t]he most farthest-reaching [sic] imaginative thing would be to create a new standards organizations [sic], something like the IETF. That’s probably unrealistic”).

<sup>197</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 48-49 (discussing the IETF’s “RFC 6272 Internet Protocols for the Smart Grid” that “provide[] Smart Grid designers with guidance on how to use the Internet Protocol Suite (IPS) in the Smart Grid [and] provide[] an overview of the IPS and the key infrastructure protocols that are critical in integrating Smart Grid devices into an IP-based infrastructure”).

<sup>198</sup> FERC TECHNICAL CONFERENCE 2011, *supra* note 10 (statement of Andrew Wright), at 41 (noting with respect to the first Smart Grid standards that “[t]he standards under consideration are open, in the sense that anyone can gain access to the standard, but they are not nearly as open or freely accessed as the IETF and W3C standards that can be downloaded free of cost and restrictions from many websites”).

<sup>199</sup> See Baird, *supra* note 166, at 38 (noting that “[t]he high demand for interoperability is in turn creating an environment wherein stakeholders are more likely to turn to government to intervene in the market to aid in achieving particular goals more rapidly than may occur in the natural course of market activity”).

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underway, many believe that standards will not be in place quickly enough if left to the market.

### 1. *The Smart Grid's Massive Scope and Complexity*

The first reason to depart from the norm is the enormous scope of the Smart Grid, involving thousands of stakeholders<sup>200</sup> and hundreds of standards that must be developed all at once. This requires a different standard-setting process<sup>201</sup> due to a lack of resources and coordination difficulties.<sup>202</sup> A typical technical standard can take years to develop.<sup>203</sup> The Ethernet standard for wired computer networking took ten years to ripen into a standard, and even longer to evolve into the more robust networking standard in wide use today.<sup>204</sup> Multiply that by hundreds, and one begins to see the extraordinary breadth of the task.

The number of standards and prospect of delay are hardly the only concerns. Many SDOs have little to no experience with the electric utility industry,<sup>205</sup> or with the impacts of their decisions on the electric grid. A recurring issue is the bridging of functionality across SDOs' respective areas of engagement. Setting Smart Grid standards often entails an "[a]nalysis of cross-functional area applications requiring coordination between one or more technologies beyond the original scope of the technology itself."<sup>206</sup> Vehicle-to-grid connections, for example, involve organizations developing electrical and automotive standards. These SDOs usually lack experience working with each other and coordinating their efforts will be difficult at best.<sup>207</sup>

### 2. *Federal Involvement is Necessary To Ensure Grid Reliability and Cybersecurity*

There are other reasons that innovation will be suboptimal without federal involvement. The electric grid has to work continuously, so some entity must be responsible for assuring reliability and that standards allow new devices to

<sup>200</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 34 (noting the involvement of "thousands of companies" that may build products for the Smart Grid). R

<sup>201</sup> EPRI NIST REPORT, *supra* note 156, at 18 (noting that "[t]he large number of stakeholders, different considerations, [and] number and complexity of standards available (and missing) requires a more formal nationally-driven governance structure"). R

<sup>202</sup> FERC Technical Conference 2011, *supra* note 10 (statement of Wayne Longcore), at 124-26. R

<sup>203</sup> PETER FOX-PENNER, *supra* note 4, at 61 (standards groups "convene committees of engineers who wrangle, often for years, over a standard"); Chiao et al., *supra* note 139, at 3 (noting the "frequently ponderous pace at which traditional standards development organizations move"). R

<sup>204</sup> FERC Technical Conference 2011, *supra* note 10 (statement of Ed Beronet), at 59. R

<sup>205</sup> See *Smart Grid Standards Adoption: Staff Update and Recommendations*, FERC, slide 4 (Jul. 15, 2010), available at <http://www.ferc.gov/legal/staff-reports/07-15-10-smart-grid.pdf> (noting that standards setting in the SGIP involves "a broad range of stakeholders, many of whom have not previously been involved in the electric industry.>"). R

<sup>206</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 130. R

<sup>207</sup> See *Energy Bar Association Panel Discussing the Smart Grid*, 31 ENERGY L.J. 81, 91 (2009) (attributing to NIST Administrator George Arnold the observation that getting SDOs to work together is like "herding cats").

work with utilities' legacy equipment. The North American Electric Reliability Corporation ("NERC"), certified by FERC as the "Electric Reliability Organization,"<sup>208</sup> plays an important role in this process. NERC conducts reliability assessments and enforces mandatory standards to ensure the reliability of the wholesale power system, in accordance with Section 215 of the Federal Power Act.<sup>209</sup> NERC views it as critical that interoperability standards for the Smart Grid work with its reliability standards.<sup>210</sup> This integration would be too difficult to leave to any one SDO.

Another worrisome issue is cybersecurity, which has emerged as a major Smart Grid concern.<sup>211</sup> Increasing the points of interaction on the grid<sup>212</sup> and exchanging more information than before can lead to vulnerabilities. A 2012 report by the Department of Energy's Inspector General found that 36% of Smart Grid projects receiving federal funds did not adequately discuss these risks,<sup>213</sup> and a sweeping 2011 report from the Government Accountability Office ("GAO") criticized progress on cybersecurity.<sup>214</sup> One key GAO finding is that no one entity oversees the entire grid to ensure that systems interoperate in a secure manner. The issue of institutional responsibilities for cybersecurity is important, and the subject of many ongoing discussions.<sup>215</sup> This and other na-

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<sup>208</sup> N. AM. ELEC. RELIABILITY CORP., <http://www.nerc.com/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>209</sup> 16 U.S.C.A. §§ 824o(a)(2), (c)(1) (West 2012). Under this section, FERC approves reliability standards that NERC develops and submits to it.

<sup>210</sup> N. AM. ELEC. RELIABILITY CORP., COMMENTS OF THE NORTH AMERICAN ELECTRICITY RELIABILITY CORPORATION ON NIST FRAMEWORK AND ROADMAP FOR SMART GRID INTEROPERABILITY STANDARDS, RELEASE 1.0 (DRAFT) 7-8 (Nov. 9, 2009) available at [http://www.nerc.com/docs/pc/sgtf/FinalNERCCCommentsNIST\\_Smart\\_Grid\\_Framework\\_Document.pdf](http://www.nerc.com/docs/pc/sgtf/FinalNERCCCommentsNIST_Smart_Grid_Framework_Document.pdf).

<sup>211</sup> See, e.g., INT'L ENERGY AGENCY, TECHNOLOGY ROADMAP: SMART GRIDS 32 (2011), available at [http://www.iea.org/publications/freepublications/publication/smartgrids\\_roadmap.pdf](http://www.iea.org/publications/freepublications/publication/smartgrids_roadmap.pdf) ("The introduction of information technologies in the smart grid introduces new cyber vulnerabilities that must be protected against by the rigorous application of cyber security standards."); Lance Whitney, *Billions to be Spent on Smart-Grid Cybersecurity*, CNET (Feb. 4, 2010), [http://news.cnet.com/8301-1009\\_3-10447430-83.html](http://news.cnet.com/8301-1009_3-10447430-83.html).

<sup>212</sup> See Marsha W. Johnston, *Smart Grid Initiatives Address Cyber Security, Renewable Energy Intermittency*, RENEWABLEENERGYWORLD.COM (Jan. 25, 2012), <http://www.renewableenergyworld.com/rea/news/article/2012/01/smart-grid-initiatives-address-cyber-security-renewable-energy-intermittency> (noting that renewable energy systems can be owned by consumers, not utilities, and therefore may pose cybersecurity risks).

<sup>213</sup> U.S. *Smart Grid Projects Failing on Security*, INFO. AGE (Jan. 27, 2012), <http://www.information-age.com/channels/information-management/news/1687918/us-smart-grid-projects-failing-on-security.thtml>.

<sup>214</sup> See U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 14, at 22-25 (identifying six challenges to smart grid cybersecurity).

<sup>215</sup> See NIST, GUIDELINES FOR SMART GRID CYBER SECURITY: VOL. 1, SMART GRID CYBER SECURITY STRATEGY, ARCHITECTURE, AND HIGH-LEVEL REQUIREMENT (2010), available at [http://csrc.nist.gov/publications/nistir/ir7628/nistir-7628\\_vol1.pdf](http://csrc.nist.gov/publications/nistir/ir7628/nistir-7628_vol1.pdf); NIST FRAMEWORK 2.0, *supra* note 5, at 126 (noting that NISTIR 7628 requires that "standards . . . undergo a thorough cybersecurity review"); TOM BAUMEISTER, LITERATURE REVIEW ON SMART GRID CYBER SECURITY (2010), available at <http://server.wattdepot.org/techreports/10-11/10-11.pdf> (reviewing the literature on many subissues relating to cybersecurity). In September 2012, FERC created an "Office of Energy Infrastructure Security" to coordinate its cybersecurity efforts. See *New FERC Office to Focus on Cyber Security*, FERC (Sept. 20, 2012), <http://www.ferc.gov/media/news-releases/2012/2012-3/09-20-12.asp>.

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tional concerns are too critical to be left to a single SDO. Nor does any one SDO have the ability to ensure that standards currently under development in Europe and China are harmonized with American standards.<sup>216</sup>

### 3. *Federal Involvement is Necessary to Provide Guidance to States and Overcome Federalism Barriers*

A final and important reason to have a federally-led standard-setting process is the involvement of state PUCs. As noted above, states, not the market, have the ultimate authority to determine whether to approve standards in projects affecting the distribution system.<sup>217</sup> They will look to standards development processes for guidance.<sup>218</sup> For the foreseeable future, they are the decision makers, and given their pivotal role, they either have to be involved in the standard-setting process or have confidence in its outcome. Utilities need to know whether PUCs will support the process. It would be wasteful for utilities to commit their resources to a national process, and then have to face duplicative technical evaluations in state proceedings.

Yet it would be inappropriate to expect the states themselves to lead the standards development process. Many PUCs have limited staffs and lack the necessary technical expertise.<sup>219</sup> Having 51 different points of approval may lead to balkanization, in which states choose different technologies and standards, and uniformity suffers.<sup>220</sup> Companies seeking to participate in regional or national projects would face the excessive transaction costs of multiple approvals.

<sup>216</sup> See NIST FRAMEWORK 2.0, *supra* note 5, at 32–34 for a discussion of ongoing activities to “harmonize” standards at the international level.

<sup>217</sup> See, e.g., U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 14, at 19 (“[S]tate regulatory bodies and other regulators with authority over the distribution system will play a key role in overseeing the extent to which interoperability and cybersecurity standards are followed since many smart grid upgrades will be installed on the distribution system.”); N.Y. PUB. SERV. COMM’N, *supra* note 23, at 60 (stating that “we conclude that the states are free to act within their jurisdiction on the standards, without specific federal statutory direction or constraint”).

<sup>218</sup> See, e.g., N.Y. PUB. SERV. COMM’N, *supra* note 23, at 61 (“We will look to the standards as a guide in our review of project proposals, and utilities should use them as a reference case of best practices.”); FERC Technical Conference 2011, *supra* note 10 (statement of Andy Bochman), at 98 (noting “there is a distinct possibility that state public utility commissions and other regulatory organizations might quickly promote [adopted standards] to fill what they see as a significant void in guidance”).

<sup>219</sup> U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 14, at 20 (noting with respect to PUCs that “limited resources and technical expertise made their roles in overseeing interoperability and cybersecurity, including participating in the NIST standards process, more challenging”).

<sup>220</sup> See, e.g., Quinn and Reed, *supra* note 64, at 881–82; Margaret Ryan, *Grid Week Analysis: Smart Grid Losing to EPA*, AolEnergy (Sep. 19, 2011), <http://energy.aol.com/2011/09/19/gridweek-analysis-smart-grid-losing-to-epa/> (noting that this leaves the industry having to deal with “51 bar fights”).

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D. *The National Governance Structure Established and in Place for Smart Grid Standards Development*

The federal government's overriding national interests require it to oversee the Smart Grid standards setting effort.<sup>221</sup> The model of government as catalyst is an appropriate one for the Smart Grid,<sup>222</sup> as the federal government has previously been a "public sector partner" and a "convener" in other standards development efforts.<sup>223</sup> The federal role is to coordinate the effort, ensure that national issues are addressed properly, and leverage SDOs' efforts. In the Smart Grid, utilities and PUCs would expect to be involved in the standards process, as would other stakeholders. In particular, PUCs need to be reassured that the federal convening process does not compromise their long-standing authority to approve utilities' projects at the distribution level. Designing a standard-setting regime that overcomes any possible reluctance or resistance on the part of states requires their involvement in the process.

Displacing SDOs from their traditional role as the basic standard-setting entities would be inapt. No federal agency has the technical expertise to set Smart Grid standards, so it is important to take advantage of existing standards and SDOs' expertise. Relying on SDOs as primary standard setters would not run afoul of the doctrine "prohibiting delegations of social policymaking authority to private groups," as Professor Michael Fromkin puts it in his criticism of the process for assignment of Internet domain names.<sup>224</sup> Fromkin notes, "[t]hat doctrine is not violated when the government relies on private groups to set technical standards."<sup>225</sup>

1. *The NIST-led Process (Smart Grid Interoperability Panel)*

The EISA<sup>226</sup> addressed standards development in its Title XIII, which established a national framework for Smart Grid development and began with a

<sup>221</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 7.

<sup>222</sup> *See id.*; EPRI NIST Report, *supra* note 156, at 12, 18.

<sup>223</sup> NAT'L SCI. AND TECH. COUNCIL, *supra* note 3, at 4; Aneesh Chopra and Patrick Gallagher, *Public-Private Standards Efforts to Make America Strong* (January 31, 2012), <http://www.whitehouse.gov/blog/2012/01/31/public-private-standards-efforts-make-america-strong>; Aneesh Chopra, Miriam Sapiro, Cass Sunstein, *Principles for Federal Engagement in Standards Activities to Address National Priorities*, OFFICE OF SCI. TECH. & POL., at 3 (Jan 17, 2012), *available at* [http://www.whitehouse.gov/sites/default/files/omb/memoranda/2012/m-12-08\\_1.pdf](http://www.whitehouse.gov/sites/default/files/omb/memoranda/2012/m-12-08_1.pdf) ("Agencies considering a convening or active engagement role in private sector standards developing organizations in order to address a national priority area should state their reasons plainly [including why private sector leadership alone is insufficient].").

<sup>224</sup> *See* A. Michael Fromkin, *Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution*, 50 DUKE L.J. 17, 170 (2000).

<sup>225</sup> *See, e.g., id.*; Boswell and Cargas, *supra* note 183, at 158-63 (noting that the creation of the NAESB was a "subdelegation" of this sort that would pass Constitutional muster, discussing relevant cases and noting that FERC did not delegate regulatory authority to the NAESB).

<sup>226</sup> *See, e.g.,* Amy J. Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 UTAH ENVTL. L. REV. 369, 382 (2011). The EISA is one of the omnibus energy acts in which Congress periodically reacts to a panoply of contemporary issues, leading to a fragmented body of energy law with "lots of pieces but no overall picture." Its many provisions

statement that it is the “policy of the United States to support the modernization of the Nation’s electricity transmission and distribution system.”<sup>227</sup> The statute enumerated the thirteen objectives described above. It created a Smart Grid Advisory Committee and Smart Grid Task Force to advise the Department of Energy, and gave the DOE the responsibility to establish a Smart Grid Investment Matching Grant Program for qualifying projects.<sup>228</sup>

EISA Section 1305 gave NIST “primary responsibility to coordinate the development of a framework that includes protocols and model standards for information management to achieve interoperability of smart grid devices and systems.”<sup>229</sup> This section directed NIST to seek input and collaborate with FERC, the new Smart Grid entities, SDOs (including IEEE and the National Electrical Manufacturers Association), NERC, and the GridWise Architecture Council.<sup>230</sup> NIST was directed to create flexible, uniform, and technology neutral” standards and enable traditional resources, distributed resources, renewables, storage, efficiency, and demand response to contribute to an efficient, reliable grid.<sup>231</sup>

Congress intended that FERC take an active review role,<sup>232</sup> given its expertise and statutory mandates to regulate the grid. Once FERC finds that NIST has developed a “sufficient consensus” on standards, it must institute a rulemaking proceeding to “adopt” standards it deems necessary “to insure smart-grid functionality and interoperability in the interstate transmission of electric power, and regional and wholesale electricity markets.”<sup>233</sup> “Sufficient consensus” is therefore a threshold determination.<sup>234</sup> Critically, the EISA did not give FERC any new powers to enforce any standards it might adopt, beyond its existing FPA authorities to regulate interstate transmission of electricity. Its role is limited to ensuring the standards’ functionality.

Congress created this two-step process because both agencies have expertise, but neither could handle the task alone. NIST has no regulatory role, and as the grid’s regulator, FERC would benefit from NIST’s technical expertise.<sup>235</sup> It was apparent that this would be an ongoing relationship, as hundreds of stan-

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encourage fossil fuel development, renewable energy, and energy efficiency. FRED SISSINE, CONG. RESEARCH SERV., ENERGY INDEPENDENCE AND SECURITY ACT OF 2007: A SUMMARY OF MAJOR PROVISIONS (2007), available at [http://www.seco.noaa.gov/Energy/2007\\_Dec\\_21\\_Summary\\_Security\\_Act\\_2007.pdf](http://www.seco.noaa.gov/Energy/2007_Dec_21_Summary_Security_Act_2007.pdf).

<sup>227</sup> 42 U.S.C.A. § 17381 (West 2012).

<sup>228</sup> 42 U.S.C.A. § 17386 (West 2012).

<sup>229</sup> 42 U.S.C.A. § 17385(a) (West 2012).

<sup>230</sup> 42 U.S.C.A. §§ 17385(a)(1)-(2) (West 2012).

<sup>231</sup> See 42 U.S.C.A. § 17385(b) (West 2012).

<sup>232</sup> JOSEPH P. TOMAIN, FOURTH ANNUAL CONFERENCE ON COMPETITION AND REGULATION IN NETWORK INDUSTRIES: SMART GRID INNOVATION: POLICY, POLITICS, AND LAW 9 (2011), available at [www.crninet.com/2011/d14c.pdf](http://www.crninet.com/2011/d14c.pdf). NIST does not have expertise in keeping the electric grid running. FERC does. It and it alone can evaluate “problems concerning cybersecurity, changes associated with our nation’s generation mix including reliance on intermittent renewable resources, and problems that may arise with the development of electric and hybrid vehicles.” *Id.*

<sup>233</sup> 42 U.S.C.A. § 17385(d) (West 2012).

<sup>234</sup> FERC, *supra* note 205, at slide 7 (“[Consensus] is really the first threshold determination that this Commission needs to make under the statute.”).

<sup>235</sup> Werbach, *supra* note 11, at 202.

dards would not be set overnight. Time, of course, was of the essence. The ARRA's enactment in 2009 lent a sense of urgency to the standards development effort, and put pressure on the two agencies to define the contours of their relationship quickly.

Some standards were needed sooner than others.<sup>236</sup> The first source of priorities was the FERC "Smart Grid Policy Statement," a comprehensive primer that (among other things) set forth FERC's position on near-term standards development.<sup>237</sup> FERC recommended a focus on key functions (wide-area situational awareness, demand response and consumer energy efficiency, energy storage, and electric transportation), and cybersecurity and network communications.<sup>238</sup> NIST accepted these priorities and added two of its own: advanced metering and distribution grid management.<sup>239</sup>

NIST devised a three-phase plan to "rapidly identify an initial set of standards, while providing a robust process for continued development and implementation of standards as needs and opportunities arise and as technology advances."<sup>240</sup> This began with a public outreach effort to "identify applicable standards and requirements, gaps in currently available standards, and priorities for additional standardization activities."<sup>241</sup> In an extraordinary undertaking perhaps unprecedented in the history of standards development, it held three public workshops in 2009, involving more than 1,500 participants and hundreds of organizations.<sup>242</sup>

Utility participants were a minority of those in attendance, and one observer wondered if being "severely underrepresented as the process moves to the various standards development organizations" would leave utilities with "little say over the final standards as they are developed without [their] significant input."<sup>243</sup> That theme would recur later.

NIST's contractor's report called for a "Smart Grid Panel and governance process to identify and guide the development of smart grid standards."<sup>244</sup> In

<sup>236</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 22.

<sup>237</sup> Frisby, Jr. & Trotta, *supra* note 73, at 309. One paragraph of the Smart Grid Policy Statement deserves special mention. FERC interpreted the EISA term "adopt" to give it "the authority to adopt a standard that will be applicable to all electric power facilities and devices with smart grid features, including those at the local distribution level and those used directly by retail customers so long as the standard is necessary for the purpose" of the EISA. FERC SMART GRID POLICY, *supra* note 23, ¶ 22. FERC claimed that EISA section 1305(d) does not exclude facilities used in local distribution, or otherwise limit FERC authority to approve standards. State PUCs subsequently interpreted that statement as throwing down the jurisdictional gauntlet, viewing it as unwarranted interference with their authority to implement standards in their approval proceedings for distribution-level projects. *See infra* notes 321-346 and accompanying text.

<sup>238</sup> FERC SMART GRID POLICY, *supra* note 23, ¶ 29.

<sup>239</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 8.

<sup>240</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 15.

<sup>241</sup> *Id.*

<sup>242</sup> *See, e.g.*, Third Smart Grid Interoperability Standards Interim Roadmap Public Workshop, 74 Fed. Reg. 36,672 (July 24, 2009) (notice of Washington, DC workshop).

<sup>243</sup> David Owens, *Time to Speak Up! Get Involved Developing Smart Grid Standards*, IEEE POWER & ENERGY MAG. 87 (Mar.-Apr. 2010) available at [http://www.ieee.org/portal/cms\\_docs\\_pes/pes/subpages/bullseye-folder/March10/March-IMV.pdf](http://www.ieee.org/portal/cms_docs_pes/pes/subpages/bullseye-folder/March10/March-IMV.pdf).

<sup>244</sup> EPRI NIST REPORT, *supra* note 156, at 19.

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November 2009, NIST created the Smart Grid Interoperability Panel (“SGIP”) to serve this function. The SGIP does not directly develop or write standards,<sup>245</sup> but instead participates in and coordinates their development.<sup>246</sup> It has nearly 2000 members representing over 780 organizations.<sup>247</sup> Its structure consists of a 25-member Governing Board (which sets priorities for the SGIP’s work), Program Management Office, standing committees, “domain expert working groups” (“DEWGs”) that provide expert technical advice,<sup>248</sup> and “Priority Action Plans” (“PAPs”).<sup>249</sup> The SGIP Governing Board strives for balance, with elected representatives from all twenty-two stakeholder categories.<sup>250</sup> As NIST Administrator Arnold puts it, the fact that many stakeholders object to this demonstrates that the Board is balanced.<sup>251</sup> Reflecting the importance of cybersecurity, the SGIP “has established one permanent working group, the Cybersecurity Working Group (“CSWG”),”<sup>252</sup> charged with reviewing standards to determine whether they meet appropriate security requirements. Unanimity of members is not required to approve a standard. That consists of two steps: a

<sup>245</sup> SGIP, SGIPGB AND SGIP CHARTER 3 (2012) [hereinafter SGIP BYLAWS AND CHARTER] (on file with the Harvard Law School Library). The SGIP is structurally similar to the Healthcare Information Technology Standards Panel. *Id.* at iii; *see also* Baird, *supra* note 166, at 73-75 (describing this panel and declaring it an important and necessary departure from private standard-setting).

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<sup>246</sup> *Introduction to the NIST Smart Grid Collaboration Wiki*, NIST SGIP, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIPAbout> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>247</sup> *Welcome to the NIST Smart Grid Collaboration Wiki, What is the Smart Grid Interoperability Panel?*, NIST SGIP, [http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/WebHome#What\\_is\\_the\\_Smart\\_Grid\\_Interoperability\\_Panel?](http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/WebHome#What_is_the_Smart_Grid_Interoperability_Panel?) (last visited Jan. 22, 2013) (on file with the Harvard Law School Library). Another organization that provides input to NIST is the Smart Grid Federal Advisory Committee, begun in September 2010, that consists of 15 experts from industry, academia, and trade associations. NIST Smart Grid Advisory Committee, NIST, <http://www.nist.gov/smartgrid/committee.cfm> (last visited Jan. 22, 2012) (on file with the Harvard Law School Library).

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<sup>248</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 16, 160; *Domain Expert Working Groups*, GRIDWISE ARCHITECTURE COUNCIL, <http://www.gridwiseac.org/about/dewg.aspx> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library) (discussing formation of DEWGs in conjunction with the GridWise Architecture Council); CARVALLO & COOPER, *supra* note 2, at 163. Current DEWGs include Transmission and Distribution, Home-to-Grid, Building-to-Grid, Industry-to-Grid, PEV-to-Grid, Business and Policy, and Distributed Renewables, Generation and Storage. *Domain Expert Working Groups (Analysis), Current DEWGs within the SSGP*, NIST SGIP, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/DEWGs> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

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<sup>249</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 136, 160.

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<sup>250</sup> SGIP BYLAWS AND CHARTER, *supra* note 245, at 5-6; *NIST Smart Grid Collaboration Wiki, SGIP Leadership*, NIST SGIP, [http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/WebHome#SGIP\\_Leadership](http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/WebHome#SGIP_Leadership) (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

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<sup>251</sup> FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 12 (noting that utilities claim they are underrepresented while others claim the Board “is dominated by the utilities,” so “[t]his is probably an indication that we have struck a reasonable balance”).

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<sup>252</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 130.

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Governing Board recommendation and a vote by the SGIP members, with both votes requiring 75% in favor of approval.<sup>253</sup>

FIGURE 3: SGIP TECHNICAL ACTIVITIES<sup>254</sup>

Name of Committee or Working Group	Purpose or Mandate	Notes
Smart Grid Architecture Committee (“SGAC”)	Maintains a conceptual reference model for the Smart Grid; develops high-level architectural principles and requirements.	
Smart Grid Testing and Certification Committee (“SGTCC”)	Creates and maintains a framework for compliance, interoperability and cybersecurity testing and certification for recommended Smart Grid standards.	
Cyber Security Working Group (“CSWG”)	Identifies and analyzes security requirements and develops a risk mitigation strategy to ensure the security and integrity of the Smart Grid.	
Priority Action Plans (“PAPs”)	Address specific standards-related gaps and issues for which resolution is most urgently needed.	Currently there are 16 PAPs; more will be added as necessary.
Domain Expert Working Groups (“DEWGs”)	Perform analyses and provide expertise in specific application domains.	Seven current DEWGs are: Transmission and Distribution; Building to Grid; Industry to Grid; Home to Grid; Business and Policy; Vehicle to Grid; Distributed Renewables, Generation, and Storage

A “PAP” is NIST’s term for a focused SGIP effort to “coordinate . . . resolving urgent standards issues.”<sup>255</sup> The SGIP PAP leadership team identifies a standards organization to lead the effort and produce a standard, which must then go through the approval process. Any organization assuming this responsibility must have a “robust consensus process” meeting the principles of OMB

<sup>253</sup> SGIP BYLAWS AND CHARTER, *supra* note 245, at 23 (“Seventy-five percent (75%) of the quorum must approve a technical measure for it to pass.”); SGIP STANDARDS CATALOG, *supra* note 147, at 5 (requiring 75% votes of both to approve a standard for the Catalog of Standards).

<sup>254</sup> *Welcome to the NIST Smart Grid Collaboration Wiki, SGIP Site*, NIST SGIP, <http://collaborate.nist.gov/wiki-sgrid/bin/view/SmartGrid/WebHome> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>255</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 64.

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Circular A119 and the NTTAA.<sup>256</sup> SGIP works to “facilitate this process, ensure that all PAP materials are publicly available to the extent possible as they are developed on the NIST Smart Grid Collaboration Site, and provide guidance as needed when significant differences among the participants in the PAP occur, or there is uncertainty about the PAP goals.”<sup>257</sup> In the spirit of openness and transparency, each PAP has a collaborative wiki page to engage stakeholders.<sup>258</sup>

In 2010, after its preparatory efforts, NIST issued a “Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0” (“Framework”).<sup>259</sup> The Framework identified seventy-five existing standards applicable (or likely to be applicable) to the Smart Grid. Of these, twenty-five were identified as having “strong stakeholder consensus,” even though they might require modifications or further development, and the rest were marked “for further review.”<sup>260</sup> An example of the first group is the ZigBee Alliance’s “Smart Energy Profile” 2.0 (“SEP 2.0”) specification for home area network communications.<sup>261</sup>

There was, and is, much work to be done. The Framework specified 15 high-priority gaps, harmonization issues (in addition to cybersecurity) and PAPs to address important near-term concerns.<sup>262</sup> It described a high-level “conceptual reference model” for the Smart Grid that is “meant to foster understanding of Smart Grid operational intricacies but not meant to prescribe how a particular stakeholder will implement the Smart Grid.” The NIST conceptual model maps the Smart Grid’s “system of systems,”<sup>263</sup> identifying “domains” (for example, the “Customer” domain) and potential paths of information flow among them, but not specifying how interactions take

<sup>256</sup> Opening remarks to FERC Technical Conference 2011, *supra* note 10, at 6.

<sup>257</sup> NIST FRAMEWORK 2.0, *supra* note 5, at 64.

<sup>258</sup> For example, NIST’s website for PAP10, “Standard Energy Usage Information,” details the extensive work that went into the development of the standard, with numerous webinars and open meetings, and outreach activities to other standards organizations. *NIST Smart Grid Collaboration Wiki, PAP10: Standard Energy Usage Information*, NIST SGIP, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/PAP10EnergyUsagetoEMS> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library); *see infra* notes 269-285 and accompanying text.

<sup>259</sup> *See generally* NIST FRAMEWORK 1.0, *supra* note 1.

<sup>260</sup> *Id.* at 61. The list of standards is set forth at pages 50-60.

<sup>261</sup> *Id.* at 7. The Smart Energy Profile specification was listed in the set of twenty-five Framework standards. *See id.* at 57. This specification provides a set of functionality for home area networks designed to meet the requirements established in the OpenHAN specification of the Utility Communications Architecture International Users Group, which itself was included as a Framework standard. *See* UCA INT’L USERS GRP., UTILITY AMI 2008 HOME AREA NETWORK SYSTEM REQUIREMENTS SPECIFICATION (2008), *available at* <http://osgug.ucaiug.org/sgstore/Shared%20Documents/UtilityAMI%20HAN%20SRS%20-%20v1.04%20-%20080819-1.pdf>; NIST FRAMEWORK 1.0, *supra* note 1, at 57-58; *see also* SGIP, PAP 18: SEP 1.X TO SEP 2.0 TRANSITION AND COEXISTENCE GUIDELINES AND BEST PRACTICES (2011) (detailing how utilities that installed smart meters meeting earlier versions of SEP can transition to version 2.0 when it is complete).

<sup>262</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 7.

<sup>263</sup> *IEEE: The Expertise to Make Smart Grid a Reality*, IEEE SMART GRID, <http://smartgrid.ieee.org/ieee-smart-grid/smart-grid-conceptual-model> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

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place.<sup>264</sup> The Framework also described the strategy to help ensure Smart Grid cybersecurity. An updated version 2.0 of the Framework was released for comment in late 2011.

In July 2011, NIST added six standards to a new “Catalog of Standards” (“Catalog”),<sup>265</sup> a major new toolkit for all Smart Grid stakeholders. The Catalog is a “compendium of standards and practices considered to be relevant for the development and deployment of a robust and interoperable Smart Grid.” It is not “a ‘cookbook’ to ensure interoperability,” but a list of “specifications that have significant import to enabling the Smart Grid and enhancing its capabilities.”<sup>266</sup> The criteria for a standard’s listing in the Catalog include “Community Acceptance,” in which the standard is “widely acknowledged as facilitating interoperability related to the integration of devices or systems that enable Smart Grid capabilities.”<sup>267</sup>

In the third phase of its plan, NIST is developing and implementing a framework for testing and certification of how standards are implemented in Smart Grid devices, systems, and processes. This is essential to ensure interoperability and security under real world conditions. In 2012, NIST issued the second version of the document explaining this process, the Interoperability Process Reference Manual.<sup>268</sup>

## 2. *The SGIP in Operation: PAPI0 (Standard Energy Usage Information)*

One of the SGIP’s first and most important priorities was PAPI0, “Standard Energy Usage Information.”<sup>269</sup> PAPI0 activities focused on an “Energy Usage Information” (“EUI”) data model. As the name suggests, this model was intended to define and standardize energy usage information throughout the Smart Grid, with the goal of making information more readily available to consumers and third parties. This standard is extremely important,<sup>270</sup> specifying the “vocabulary that will be used by devices and services” across the Smart

<sup>264</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 32-36.

<sup>265</sup> *SGIP Catalog of Standards*, NIST SGIP, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIPCatalogOfStandards> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library). The process for adding standards to the Catalog was completed in May 2011. NIST FRAMEWORK 2.0, *supra* note 5, at 65. This was after the initial submission of standards to FERC, and therefore led to criticism that those standards had not completed the full SGIP process life cycle. *See infra* notes 295-298 and accompanying text.

<sup>266</sup> *SGIP STANDARDS CATALOG*, *supra* note 147, at 2.

<sup>267</sup> *Id.* at 5.

<sup>268</sup> *Updated Guidelines to Help Ensure Electrical Devices are Smart Grid Ready*, NIST ENG’G LAB. (Jan. 24, 2012), <http://www.nist.gov/el/smartgrid-012412.cfm>. The IPRM may be found at *Smart Grid Testing & Certification Committee (SGTCC)*, NIST SGIP, Jan., 2012, [https://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SmartGridTestingAndCertificationCommittee/IPRM\\_final\\_-\\_011612.pdf](https://collaborate.nist.gov/twiki-sggrid/pub/SmartGrid/SmartGridTestingAndCertificationCommittee/IPRM_final_-_011612.pdf).

<sup>269</sup> NIST FRAMEWORK 1.0, *supra* note 1, at 79. The PAPI0 Standard Energy Usage Information website is located at NIST SGIP, *supra* note 258.

<sup>270</sup> *See, e.g.*, GRIDWISE ARCHITECTURE COUNCIL, *supra* note 8, at 30 (discussing the importance of data models to “bridge between different communities”).

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Grid's domains.<sup>271</sup> California and Texas had already required their consumers to have electronic access to energy usage data.<sup>272</sup> Prompt development of a standard was essential to this and other functions: facilitating DR, consumer participation in energy markets, and connecting electric vehicles and DG to the grid, among others.<sup>273</sup>

The EUI was not meant to standardize the means for exchanging data, but instead to create a "seed" — a core set of information that could be made available to consumers or authorized third parties. Subsequent standards would use this foundation to address specific uses.<sup>274</sup> The need for this type of information model was compelling. Without a standard that defined key terms, every interaction across the Smart Grid would have to redefine them anew.<sup>275</sup>

In 2010, the SGIP Governing Board requested that the PAPI0 leadership team expedite the production of an information model standard "by a recognized Standards Developing Organization" meeting NTTAA requirements.<sup>276</sup> NIST selected the NAESB for this purpose, with a parallel effort by the American Society of Heating, Refrigerating and Air-Conditioning Engineers ("ASHRAE") to settle on facility energy information models. By the normal standards clock, this was a quick turnaround.

Development continued throughout 2010, culminating in the production of the NAESB EUI standard in December 2010.<sup>277</sup> A CSWG review found that the EUI did not present cybersecurity problems by itself because it "does not present requirements for communication, storage, or access to energy usage information."<sup>278</sup> By separate votes of the SGIP Governing Board and members

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<sup>271</sup> *Summaries of First Six Catalog of Standards Entries*, NIST (July 26, 2011), <http://www.nist.gov/smartgrid/sgip-072611-factsheet.cfm>.

<sup>272</sup> See 2010 Cal. Stat. Ch. 497; CAL. PUB. UTIL. COMM'N, DRAFT DECISION ADOPTING RULES TO PROTECT THE PRIVACY AND SECURITY OF THE ELECTRICITY USAGE DATA OF THE CUSTOMERS OF PACIFIC GAS AND ELECTRIC COMPANY, SOUTHERN CALIFORNIA EDISON COMPANY, AND SAN DIEGO GAS & ELECTRIC COMPANY, R.8-12-009 (2008), available at <http://docs.cpuc.ca.gov/efile/PD/134875.pdf> (implementing the statutory mandate and establishing privacy and security provisions for data).

<sup>273</sup> NIST SGIP, *supra* note 258.

<sup>274</sup> SGIP, REPORT TO THE SGIP GOVERNING BOARD: PAPI0 PLAN 2 (2010), available at [http://www.naesb.org/pdf4/smart\\_grid\\_pap10\\_062210w6.pdf](http://www.naesb.org/pdf4/smart_grid_pap10_062210w6.pdf) [hereinafter SGIP PAPI0 2010 PLAN] ("PAPI0 will not cover all interactions associated with energy in the home or commercial space. Additional standard information models will be necessary to support load management, for example. Additionally, the proposed standard will be limited to defining an information model only. The implementation of messaging using the model and the syntax by which messaging is encoded is left to SDOs and Standards Setting Organizations that will use the 'seed' standard.").

<sup>275</sup> NIST SGIP, *supra* note 258 (noting that "[i]n the absence of these standards, software developers and utilities would have to negotiate pair-wise interfaces, an impractical situation").

<sup>276</sup> SGIP PAPI0 2010 PLAN, *supra* note 274, at 1.

<sup>277</sup> The NAESB EUI model is described in detail in NAESB, NAESB ENERGY USAGE INFORMATION MODEL (2010), available at [http://www.naesb.org/pdf4/naesb\\_energy\\_usage\\_information\\_model.pdf](http://www.naesb.org/pdf4/naesb_energy_usage_information_model.pdf).

<sup>278</sup> See NIST Smart Grid Collaboration Wiki, SGIP CoS: NAESB PAPI0 Energy Usage Information, NIST SGIP, <http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIPCoS-SIFNAESBREQ18WEQ19> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

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(in January and June 2011, respectively), the standard was approved and added to the Catalog of Standards.<sup>279</sup>

Among the most anticipated extensions of the EUI was the actual exchange mechanism for customer access to energy usage information. “The NAESB Energy Services Provider Interface” (“ESPI”) standard, designed to provide a standardized process and interface for this purpose, became official at the end of 2011.<sup>280</sup> The standard “defines a consistent method for the authorization of third party access to retail consumer’s usage information and a standardized interface for the exchange of that information.”<sup>281</sup>

An excellent example of how the combination of the EUI and ESPI are already being used in the Smart Grid is the “Green Button Initiative,” announced by U.S. Chief Technology Officer Aneesh Chopra in January 2012 as an effort to give consumers “standard, routine, easy-to-understand access to their own energy usage data.”<sup>282</sup> California’s three major investor-owned utilities (PG&E, SDG&E, and Southern California Edison) promoted the Green Button idea.<sup>283</sup> Their websites are based on the NAESB standards. They allow consumers to download their energy usage information in a straightforward, standardized format, and share it (if they so choose) with authorized third parties.<sup>284</sup>

This is as revolutionary in its significance as the Internet’s first uses, for it hints at the potential for much more robust uses of the data.<sup>285</sup>

#### IV. FERC’S ORDER AND ITS IMPLICATIONS FOR SMART GRID DEVELOPMENT AND ENERGY LAW FEDERALISM

In 2010, NIST requested that FERC put a stamp of approval on a handful of standards, a small fraction of those identified in the Framework. However,

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<sup>279</sup> See NIST FRAMEWORK 2.0, *supra* note 5, at 83; NIST SGIP, *supra* note 278; Press Release, Smart Grid Panel Approves Six Standards for Catalog, NIST, <http://www.nist.gov/smart-grid/sgip-072611.cfm> (John McDonald, SGIP Governing Board Chair, commenting that “[t]he energy usage information standard may very well be the most interesting to consumers at this point”).

<sup>280</sup> Press Release, NAESB, NAESB Announces Launch of ESPI Web Site to Support the Green Button Initiative (Jan. 25, 2012), [http://www.naesb.org/pdf4/012512press\\_release.pdf](http://www.naesb.org/pdf4/012512press_release.pdf).

<sup>281</sup> *Id.*

<sup>282</sup> See, e.g., *Green Button: Providing Consumers with Access to Their Energy Data*, DOE (Jan. 19, 2012), <http://energy.gov/articles/green-button-providing-consumers-access-their-energy-data>; *Introducing Green Button*, NIST (Jan. 20, 2012), available at [http://www.nist.gov/smartgrid/upload/1-20-12\\_Green\\_Button\\_Webinar\\_-\\_Wollman\\_and\\_Irwin.pdf](http://www.nist.gov/smartgrid/upload/1-20-12_Green_Button_Webinar_-_Wollman_and_Irwin.pdf); Jeff St. John, *How Federal Legislation Could Change Digital Energy Data*, GIGAOM (June 1, 2011), <http://gigaom.com/cleantech/how-federal-legislation-could-change-digital-energy-data/>.

<sup>283</sup> *Standards Gurus Propose Way to Get More Utilities on Board with SGIP*, SMART GRID TODAY (Nov. 23, 2011), <http://www.smartgridtoday.com/public/3488print.cfm>.

<sup>284</sup> *Green Button*, PGE, <http://www.pge.com/greenbutton/> (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>285</sup> Mike Orcutt, *The Energy Use of New York City’s Buildings, Visualized*, TECH. REVIEW (Feb. 13, 2012) <http://www.technologyreview.com/blog/energy/27550/?nld=nldly&nld=2012-02-14> (discussing the use of a model for energy consumption in New York that could be improved with better data).

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the significance of the request extended far beyond the standards' technical merits. The discussion over whether FERC should "adopt" the standards became a high-stakes test of the Smart Grid's future and the process by which it will be developed. Utilities, vendors, PUCs, and others debated major themes, including how stakeholders should govern the standard-setting process (and, by extension, have authority over the Smart Grid going forward) and how federal and state actors will interact with each other. These issues dominated a lengthy public discussion.

The request itself involved five families of standards developed by the International Electrotechnical Commission ("IEC"),<sup>286</sup> one of three organizations that set international standards for electric and electronic technologies. The IEC standards are "extremely detailed, highly prescriptive technical specifications, down to the point of directing which bytes go where in electronic packets on the wire."<sup>287</sup> As industry standards go, they are a no-brainer. NIST Administrator Arnold noted later that major IOUs rely on them in their existing systems, quoting a utility executive's statement that the "five IEC standards are among the most mature in the industry."<sup>288</sup>

Criticisms voiced to FERC ranged from fine-grained observations about the SGIP process to broad concerns about FERC's role and its implications for the federal-state relationship in electric utility regulation. After receiving the standards, FERC solicited considerable input from Smart Grid stakeholders in two technical conferences and a rulemaking docket. Nearly all commenters opposed FERC adoption. However, most commenters praised the SGIP's work.<sup>289</sup>

FERC's response addressed both viewpoints, and in doing so supported the democratic NIST-led process for standards development, turning federalism from a hindrance for Smart Grid development to a positive framework for implementation. Its order stated that the standards did not have "sufficient consensus," so it would not proceed with a rulemaking proceeding to "adopt" those standards as mandatory FERC regulations.<sup>290</sup> This sounds like rejection,

<sup>286</sup> *Welcome to the IEC*, IEC, <http://www.iec.ch/about/>, (last visited Jan. 22, 2013) (on file with the Harvard Law School Library).

<sup>287</sup> FERC Technical Conference 2011, *supra* note 10 (statement of Ron Highfill), at 29. As an example, the IEC 61970 standards "define application-level energy management system interfaces and messaging for distribution grid management in the utility space." NIST FRAMEWORK 1.0, *supra* note 1, at 54; INT'L ELECTROTECH-NICAL COMM'N, SUMMARY OF USE, APPLICATION, CYBERSECURITY, AND FUNCTIONALITY OF SMART GRID INTEROPERABILITY STANDARDS IDENTIFIED BY NIST 1 (2010), *available at* [www.smartgridlegalnews.com/5\\_standards.pdf](http://www.smartgridlegalnews.com/5_standards.pdf) (discussing the standards in depth). An ongoing activity of NIST's PAP10 is work to establish the relationship of the NAESB EUI standard with this family of standards. NIST SGIP, *supra* note 258.

<sup>288</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 5.

<sup>289</sup> *Before the Department of Energy, In the Matter of Addressing Policy and Logistical Challenges to Smart Grid Implementation*, Dep't of Energy Third Request for Info. On Smart Grid Issues (comments of AT&T, Inc.) (on file with the Harvard Law School Library) ("NIST working groups developing Smart Grid interoperability standards have been productive endeavors with excellent output that will foster innovation in connection with the Smart Grid.")

<sup>290</sup> Understanding the implications of FERC's decision not to adopt the standards requires some careful thought about two unclear terms in the EISA: the threshold inquiry of "sufficient

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but its benefits are readily apparent. For one, FERC's order demonstrates that regulatory agency rulemaking is not necessary in a legal framework for standards development. FERC recognized the SGIP as an appropriate and necessary forum, which is producing results and will continue to do so. Noticing that, without making a separate judgment about "sufficient consensus," allowed the SGIP process to continue without superimposing the additional layer of review of a rulemaking proceeding. This decision also let states act first in adopting the NIST standards, rather than triggering their resentment of federal energy regulations they perceive as intruding on their authority (and potential litigation).

### A. *Blessing the Process*

Although FERC does not develop interoperability standards, its role as an energy regulator and standards adopter via the EISA makes its view critical. The EISA allows FERC to make judgments about NIST's efforts "[a]t any time."<sup>291</sup> This envisions periodic submissions,<sup>292</sup> but provides no guidance about how FERC should decide when and whether "the Institute's work" has "led to sufficient consensus in the Commission's judgment."<sup>293</sup> This gives FERC significant leeway in interpreting the effectiveness of the NIST-led process.<sup>294</sup>

#### 1. *Criticisms of the Process*

There were a number of criticisms of the SGIP. Some focused on the SGIP's due process attributes. Commenters believed "consensus" meant that Smart Grid stakeholders must agree that NIST has properly identified standards for submission.<sup>295</sup> They criticized the initial submission's hasty timing and

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consensus" and FERC's responsibility to "adopt" standards. NIST's transmittal to FERC was a brief letter naming the standards and describing their role in the Smart Grid. NIST, NIST SMART GRID ADVISORY COMMITTEE (SGAC) REPORT 28 (2012) [hereinafter NIST SGAC REPORT] available at [www.nist.gov/smartgrid/upload/NIST\\_SGAC\\_Final\\_Recommendations\\_Report\\_3-05-12\\_with\\_Attachments.pdf](http://www.nist.gov/smartgrid/upload/NIST_SGAC_Final_Recommendations_Report_3-05-12_with_Attachments.pdf). That left others free to interpret the statute as they saw fit.

<sup>291</sup> 42 U.S.C.A. § 17385(d) (West 2012).

<sup>292</sup> FERC, *supra* note 205, at slide 5 (FERC staff proposing to conduct periodic rulemakings).

<sup>293</sup> *Id.* at 7. FERC staff had recommended "that the Commission generally rely on the National Technology Transfer and Advancement Act (NTTAA) as guidance in determining sufficient consensus, along with comments received in the rulemaking proceeding."

<sup>294</sup> See, e.g., Chris King, *FERC says "consensus" lacking for smart grid standards: What consensus?*, SMART GRID WATCH (July 27, 2011), <http://www.emeter.com/smart-grid-watch/2011/ferc-says-consensus-lacking-for-smart-grid-standards-what-consensus/>. (noting that Enernex chairman and CTO Erich W. Gunther observed that while FERC did not define "sufficient consensus," it could mean five different things); see also Frisby, Jr. & Trotta, *supra* note 73, at 313-14.

<sup>295</sup> *Before the Federal Energy Regulatory Commission, Smart Grid interoperability Standards*, Docket No. RM11-2-000 8 (comments of the Midwest Independent Transmission System Operators, Inc.), available at <https://www.midwestiso.org/Library/Repository/Tariff/FERC%20Filings/2011-04-22%20Docket%20No.%20RM11-2-000.pdf> (calling for FERC to "independently determine whether there is sufficient consensus that the NIST process created appropriate standards").

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form.<sup>296</sup> One commenter argued NIST did not have a “formal and transparent process so that there is broad, documented industry consensus as to exactly when and which standards will be provided to the Commission.”<sup>297</sup> Others pointed out (correctly) that NIST had submitted the first batch of standards before it had its full suite of procedures in place to add standards to the Catalog.<sup>298</sup>

Utilities’ most persistent arguments are claims of underrepresentation in the SGIP process. One utility executive argued there was no “sufficient consensus” because standards are not “subject to review and vote by the entire SGIP pursuant to a *balanced* voting process before being placed in the SGIP’s Catalog of Standards.”<sup>299</sup> Utilities object to the SGIP’s supermajority voting requirement, believing they should have a larger voice in standard-setting to reflect their significant investments in the Smart Grid. They make up about 10% of SGIP members, so the SGIP could therefore vote to approve a standard over the objection of every utility member.<sup>300</sup>

<sup>296</sup> FERC Technical Conference 2011, *supra* note 10 (statement of John Lucas), at 36 (noting that “the current pace and the broad scope of the process is in our view inconsistent with establishing true and informed industry consensus, as you would find in the NERC process for setting a standard or the NAESB process for establishing a business practice standard”).

<sup>297</sup> *Smart Grid Interoperability Standards: United States of America Before the Federal Energy Regulatory Commission*, Docket No. RM-11-2-000 2 (2011) (comments of John A. Lucas, Southern Company Services, Inc.), available at <http://www.ferc.gov/eventcalendar/Files/20110131084230-Lucas,%20Southern.pdf> [hereinafter “*Lucas Docket Comments*”] (adding that “I must admit Southern is among those who were not aware that these standards would be the first standards provided to the Commission by NIST”). Another commenter observed that sending standards five at a time would lead to piecemeal development and give inadequate guidance to the states. FERC Technical Conference 2011, *supra* note 10 (statement of Gib Sorebo), at 54.

John Lucas also believed that the standards had not achieved consensus because utilities are underrepresented in the IEC. *Lucas Docket Comments*, at 2 (noting that “regulated electric utilities have had limited involvement in the IEC process for the referenced five families of standards”). Utilities do not have votes in the IEC process, but it is one of the “well-recognized, international standards bodies” that follow the essential principles for standards development. *Introduction to AWSI*, AM. NAT’L STANDARDS INST., [http://www.ansi.org/about\\_ansi/introduction/introduction.aspx](http://www.ansi.org/about_ansi/introduction/introduction.aspx) (last visited Jan. 22, 2013) (on file with the Harvard Law School Library) (noting that “[a]ll ANSI-accredited standards developers follow the *Essential Requirements* which embrace globally-accepted principles of standardization implemented by well-recognized, international standards bodies such as the . . . IEC [International Electrotechnical Commission]”); see INT’L ELECTROTECH-NICAL COMM’N, *supra* note 287, at 9 (comments by IEC on cybersecurity review of its standards, noting that “IEC meets the requirements of NTTAA as a voluntary consensus standards development organization”).

<sup>298</sup> FERC Standards Order, *supra* note 16, ¶ 7 (noting that “certain aspects of the current NIST process were not in place during development of the NIST Framework document and identification of the IEC standards”).

<sup>299</sup> FERC Technical Conference 2011, *supra* note 10 (statement of John Lucas), at 38 (emphasis added).

<sup>300</sup> NIST SGAC REPORT, *supra* note 290, at 31 (noting that “100% of the utility companies could vote against some issue in the SGIP, but it could still carry the day because of the current majority voting procedures”). In practice, the approval level is much higher than the requisite 75%. The first six standards added to the Catalog of Standards (including the NAESB EUI standard) were approved by 90% of the SGIP’s members. *Market News, Smart Grid Panel Approved First Six Standards*, KLEANINDUSTRIES (Aug. 23, 2011), [http://www.kleanindustries.com/s/environmental\\_market\\_industry\\_news.asp?ReportID=475904](http://www.kleanindustries.com/s/environmental_market_industry_news.asp?ReportID=475904).

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To remedy this, the commenter proposed a “super-majority of voting members [and] a level of support from all industry segments” to approve a standard.<sup>301</sup> Some SDOs, including NAESB, require this.<sup>302</sup> By definition, this invokes a much broader issue: how the process should protect the interests of other stakeholders, including future entrants. The SGIP supermajority voting requirement reflects the OMB/NTTAA principle that, “substantial agreement” is “general agreement, but not necessarily unanimity.”<sup>303</sup> Granting utilities a greater say allows them to take part in the SGIP and then reject its outcome on the grounds that the process was not “balanced.”<sup>304</sup> It should be weighed carefully against the OMB/NTTAA principle that no one stakeholder should dominate the process.<sup>305</sup>

Commenters also claimed that the standards were not ready because they would not promote reliability and were not cybersecure. While the CSWG had assessed the standards’ cybersecurity,<sup>306</sup> some argued that the NIST three-volume set of guidelines was “much more of a philosophical document than a handbook for achieving a secure operating environment.”<sup>307</sup> Numerous participants called for more rigorous review, and several called for development of a “security addendum” to address important issues.<sup>308</sup> NIST also would need to coordinate with federal agencies, such as the Department of Homeland Security, with relevant expertise and jurisdiction. As for reliability, commenters called for formal reviews by industry participants in conjunction with NERC, which had not happened prior to the submission of the standards.<sup>309</sup>

<sup>301</sup> UNITED STATES BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION, SMART GRID INTEROPERABILITY STANDARDS, DOCKET NO. RM11-2-000 (comments of John Lucas), available at <http://www.ferc.gov/eventcalendar/Files/20110131084230-Lucas,%20Southern.pdf>.

<sup>302</sup> CERTIFICATE OF INCORPORATION OF THE NORTH AMERICAN ENERGY STANDARDS BOARD, INC. 6 (2008) available at [http://www.naesb.org/pdf/naesb\\_certificate\\_112108.pdf](http://www.naesb.org/pdf/naesb_certificate_112108.pdf) (requiring a 67% supermajority and 40% approval within each market segment).

<sup>303</sup> OMB CIRCULAR, *supra* note 189, § 4(a)(1)(v); see also SGIP BYLAWS AND CHARTER, *supra* note 245, at 3-4; NAT’L SCI. AND TECH. COUNCIL, *supra* note 3, at 29; Werbach, *supra* note 11, at 209 (“[C]onsensus” is “defined as general agreement, not necessarily unanimity.”). This requires careful consideration of views, including “a process for attempting to resolve objections by interested parties, as long as all comments have been fairly considered, each objector is advised of the disposition of his or her objection(s) and the reasons why, and the consensus body members are given an opportunity to change their votes after reviewing the comments.” OMB CIRCULAR, *supra* note 303, § 4(a)(1)(v).

<sup>304</sup> FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 12.

<sup>305</sup> OMB CIRCULAR, *supra* note 303, § 4(a)(1)(ii).

<sup>306</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 5.

<sup>307</sup> NIST SGAC REPORT, *supra* note 290, at 29.

<sup>308</sup> See, e.g., FERC Technical Conference 2011, *supra* note 10 (statement of Michael Asante), at 79, 83 (noting that “an insufficient number of experts in cyber security, control system security, and utility operations were engaged in an informed manner throughout the review process” and that “direct necessary addendums . . . to address identified concerns and provide credible security guidance [should be provided] along with adoption or design implementation of the standards”); FERC Technical Conference 2011, *supra* note 10 (statement of Daniel Thanos), at 25 (commenting that the optimal cybersecurity solution was “the developing of an overriding security addendum that must be adopted along with the standards”).

<sup>309</sup> NIST SGAC REPORT, *supra* note 290, at 19 (“There is a gap in terms of reliability and implementation reviews within the SGIP . . . . There needs to be a formal review of these inter-operability standards with respect to the reliability and implementation readiness by industry representatives who have the primary responsibility for safety, operation and reliability of the grid.”).

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## 2. *FERC's Response*

FERC had to enable standards development to move forward, while addressing these complaints. However, the EISA language boxed in FERC. FERC had to decide whether the five families of standards had “sufficient consensus.” If that consensus existed, FERC was required to commence a rulemaking proceeding and make a substantive judgment about the standards. Adopting the standards would incur the wrath of those objecting to a federal mandate. Rejecting them, for whatever reason, might cast doubt on the SGIP process. If FERC found there was no consensus, it might also impugn that process.

NIST itself suggested that FERC “could send appropriate signals to the marketplace by recommending use of the NIST Framework without mandating compliance with particular standards.”<sup>310</sup> Simultaneously, FERC could value the SGIP’s work by endorsing the SGIP process. In its order of July 2011, FERC therefore stated, “we find insufficient consensus to institute a rulemaking proceeding at this time to adopt the five families of standards.”<sup>311</sup> It did not elaborate on what it meant by “consensus,” except to observe that “[c]ommenters are nearly unanimous that we should not adopt these standards at this time, citing concerns with cyber security deficiencies and potential unintended consequences from premature adoption of individual standards.”<sup>312</sup> It added an important paragraph, which stated: “We believe that the best vehicle for developing smart grid interoperability standards is the NIST interoperability framework process, including the work of the SGIP and its committees and working groups.”<sup>313</sup>

As an example, FERC could not have been clearer about how it expects cybersecurity to be addressed. In the order, it stated, “[s]takeholders concerned with smart grid cyber security should actively participate in the NIST interoperability framework process, including the SGIP Cyber Security Working Group.”<sup>314</sup> As FERC noted, NIST has strengthened its reliability and cybersecurity review processes.<sup>315</sup> FERC expects these processes to be the central forum for resolving these important issues.

It may be appropriate for FERC to review some standards to the extent they are necessary to ensure cybersecurity or reliability.<sup>316</sup> However, FERC’s order makes its review secondary to allowing the crowd of stakeholders to address and resolve important issues. This allows the SGIP flexibility to adapt to concerns about “sufficient consensus” more quickly than a regulatory process

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<sup>310</sup> FERC Standards Order, *supra* note 16, ¶ 9.

<sup>311</sup> *Id.* ¶ 1.

<sup>312</sup> *Id.* ¶ 7.

<sup>313</sup> *Id.* ¶ 10.

<sup>314</sup> *Id.* ¶ 12.

<sup>315</sup> *Id.* ¶ 11.

<sup>316</sup> See NAT’L SCI. AND TECH. COUNCIL, *supra* note 3, at 29 n.32 (“We firmly believe that there will be appropriate reasons for FERC to mandate the use of specific standards in the future and EISA gives them the authority to make that call.”).

can.<sup>317</sup> In some cases, the SGIP has made changes already (for example, developing the Catalog),<sup>318</sup> and others are contemplated. This evolution is useful. The dynamic relationship between standards and Smart Grid architecture<sup>319</sup> dictates that standard-setting itself should be an evolving process. Like standards themselves, the structure has to be flexible and accommodate change. By not interpreting “sufficient consensus,” FERC recognized that stakeholders themselves can steer the SGIP’s evolution, making process changes when they deem it necessary.

This has major significance for future Smart Grid governance. Smart Grid stakeholders, like those of the Internet, should have a strong stake in the network’s future. If achieving “sufficient consensus” requires changes to the SGIP process, the appropriate remedy is not first and foremost for FERC to make those decisions, although FERC’s position guarantees it will have influence if it chooses to use it. If utilities believe they are underrepresented in the SGIP process, they should make that argument to the full complement of Smart Grid stakeholders, not one central regulator. The open public process also makes capture of the SGIP process less likely than capture of a regulatory agency.<sup>320</sup> However, if FERC notices that one actor has dominated the SGIP’s process for setting a specific standard, it might step in to articulate that a consensus has not been reached.

### *B. Treating Federalism as a Means for Implementation Instead of a Barrier*

In the technical conferences and rulemaking docket, the meaning of “adopt” was “the question everyone [had] in mind,”<sup>321</sup> and it became a lightning rod for a host of concerns about federalism and FERC’s role in the standard-setting process.

#### *1. Concerns of Smart Grid Stakeholders*

A FERC staff member asked a technical conference panelist whether “there is a spectrum of ‘adopt’ where it really means ‘not necessarily looking to adopt individual standards, but as I understood it, kind of blessing a process somehow or other.’”<sup>322</sup> According to this interpretation, “adopt” might mean “approve” or “endorse,” as in “I adopt the Chairman’s view of the issue.” As

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<sup>317</sup> *United States of America Before the Federal Energy Regulatory Commission, Smart Grid Interoperability Standards*, Docket No. RM11-2-000 27 (2011) (comments of Edison Elec. Inst.) (on file with the Harvard Law School Library) (suggesting that the “five families of standards” should be referred back for evaluation through improved NIST processes).

<sup>318</sup> Presumably, going forward, NIST would submit only those standards to FERC that are in the Catalog, “thereby assuring they have completed the SGIP life cycle and they have documented stakeholder support.” FERC Technical Conference 2011, *supra* note 10 (statement of Ron Ambrosio), at 85-86.

<sup>319</sup> Quinn & Reed, *supra* note 64, at 868.

<sup>320</sup> Lemley, *supra* note 186, at 1063-64.

<sup>321</sup> Opening Remarks to FERC Technical Conference 2011, *supra* note 10, at 6.

<sup>322</sup> FERC Technical Conference 2011, *supra* note 10 (statement of Ray Palmer), at 75.

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numerous commenters recognized, “adopt” could also mean “to select as basic or required,” as, for example, “adopting” a textbook. FERC had suggested in 2009 that it could mandate standards for all domains of the grid and all participants,<sup>323</sup> although, as noted above, it was not clear how it would enforce a mandate.<sup>324</sup>

Mandatory regulation was commenters’ single greatest concern. The most frequent argument against it was that technical standards are typically adopted by the private sector in a “voluntary” process, not “mandatory” federal rulemaking.<sup>325</sup> PUCs also opposed mandatory standards because they, not FERC, have authority over distribution-level projects.<sup>326</sup> One PUC believed FERC should merely encourage states to adopt standards and limit its role to securing compliance and enforcement once standards were in place.<sup>327</sup> A FERC mandate would diminish PUCs’ power, tilting regulatory authority toward FERC and away from them.<sup>328</sup> States are virtually unwilling to cede any authority to FERC. In their comments, several states refused to endorse FERC support for the SGIP process, viewing even that relatively benign step as an intrusive federal mandate. States want guidance, but not if FERC tells them what to do.

State commenters even opposed a FERC mandate to comply with the standards in FERC’s own area of exclusive jurisdiction, “interstate transmission of electric power, and regional and wholesale electricity markets.”<sup>329</sup> They worried that standards might gain traction and work their way down to the local level. States are responsible for distribution-level activities, but that line will seem arbitrary when the issue under consideration is whether a smart meter can communicate with a device located on another part of the grid in another state.

Many commenters (including utilities and PUCs) supported their objections to FERC mandates by arguing that mandated standards preserve technolo-

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<sup>323</sup> FERC Smart Grid Policy, *supra* note 23, ¶ 22. Utilities’ fears may stem in part from their experience with standards that transformed from voluntary to mandatory: Reliability standards morphed from guidelines of an informal, industry-centered regime to a mandatory regime that NERC enforces. That required an act of Congress. See 16 U.S.C. § 824o(e)(3) (West 2012). The EISA, of course, gave FERC the authority to adopt mandatory standards within its jurisdictional area.

<sup>324</sup> U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 14, at 23-24 (discussing the lack of oversight authority).

<sup>325</sup> FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 16 (“In general, industry has a strong preference not to see standards adopted in regulation. This concern will naturally motivate many industry participants to cite reasons why FERC should not consider adopting these or other standards.”).

<sup>326</sup> See, e.g., *Empowering Consumers and Promoting Innovation through the Smart Grid: Hearing Before the Subcommittee on Technology and Innovation of the Committee on Science, Space, and Technology*, 112th Cong. 5-6 (2011) (comments of Donna Nelson, Chairman, Public Utility Commission of Texas: “State commissions maintain jurisdiction over the distribution grid . . . . While some have advocated for a federal package of mandatory standards for adoption, we do not believe that the federal government should take action to mandate standards.”)

<sup>327</sup> *Smart Grid Interoperability Standards: United States of America Before the Federal Energy Regulatory Commission*, Docket No. RM112-000 5-6 (2011) (comments of Colorado Public Utility Commission).

<sup>328</sup> BROWN ET AL., *supra* note 61, at 90 n.99.

<sup>329</sup> 42 U.S.C.A. §17385(d) (West 2012).

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gies in amber, making them potentially obsolete later. Coming from utilities, the irony of this is palpable. Monopolists with control over the electricity system are arguing that setting standards will retard innovation by fostering the entrenchment of a status quo at some unspecified later date.<sup>330</sup> If standards are not developed, the outcome *is* the status quo: utilities' continued economic dominance, in part due to government mandates that have fostered the existing electric system's development. In any event, if the NIST Catalog is a "toolkit," and not a "rulebook," this objection is less relevant. A state that believes the Catalog standards are not state-of-the-art is free to depart from them.

## 2. FERC's Response

FERC's response finessed the question about whether regulatory "adoption" is *necessary* to ensure that the Smart Grid is standardized and what steps FERC will take going forward.<sup>331</sup> As counterintuitive as it might seem, FERC's decision may have been the best choice for the Smart Grid's future. Silence on many matters is indeed golden. One executive of an SDO observed, "the FERC decision is neither a rejection of the NIST consensus process nor the adoption of global standards for the Smart Grid."<sup>332</sup>

FERC has recognized, without saying so, that adoption will be unnecessary for most interoperability standards.<sup>333</sup> There are compelling reasons why FERC need not substitute its judgment for that of the SGIP process. As Professor Mark Lemley has observed, "government agencies are generally composed of career public servants, not market participants [and] often do not involve the most qualified individuals in the industry at the moment in the standard-setting process."<sup>334</sup> He describes this as "an inherent danger of bureaucracy, particularly when it attempts to regulate such a fast-moving area of commerce as the Internet."<sup>335</sup> Given the similarity of the Smart Grid to the Internet in size, scale, and dynamism, this is a serious concern here, too. The involvement of the

<sup>330</sup> BROWN ET AL., *supra* note 61, at 98 n. 105.

<sup>331</sup> See, e.g., Chris King, *FERC Says "Consensus" Lacking for Smart Grid Standards: What Consensus?*, SMART GRID WATCH (Jul. 27, 2011), <http://www.emeter.com/smart-grid-watch/2011/ferc-says-consensus-lacking-for-smart-grid-standards-what-consensus/> ("[S]aying that 'consensus has not been reached' alone is too vague without saying consensus on what."); Jesse Berst, *Smart Grid Standards Slowdown Puts Utilities at Risk*, SMARTGRIDNEWS.COM (Jul. 26, 2011), [http://www.smartgridnews.com/artman/publish/Technologies\\_Standards/Smart-grid-standards-slowdown-puts-utilities-at-risk-3863.html](http://www.smartgridnews.com/artman/publish/Technologies_Standards/Smart-grid-standards-slowdown-puts-utilities-at-risk-3863.html) ("FERC also failed to give any guidance on what happens next. Whether the National Institute of Standards and Technology (NIST) should continue to work on the standards. Whether and when FERC should reconsider them. Whether we should just give up and pack it in.").

<sup>332</sup> NEMA Responds to FERC Ruling on Smart Grid Standards, NAT'L ELEC. MFRS. ASS'N (Jul. 21, 2011), <http://www.nema.org/News/Pages/NEMA-Responds-to-FERC-Ruling-on-Smart-Grid-Standards.aspx>.

<sup>333</sup> This is consistent with the comments of NIST Administrator Arnold at the technical conference. FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 8 ("I recommend that the Commission consider taking a different approach that focuses on the question of whether regulatory adoption is needed to insure use of the standards by industry to achieve smart grid interoperability.").

<sup>334</sup> Lemley, *supra* note 186, at 1063.

<sup>335</sup> *Id.*

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states adds a layer of complexity. FERC would face serious challenges if it tried to keep track of the electricity standards “market”: what 51 different jurisdictions are doing at any given moment.<sup>336</sup>

Instead, FERC is now able to play a more ideal role for a central government actor in a vibrant and functioning federalist system of standard-setting. The federal government is at its best in standard-setting when it brokers a collaboration of collaborations in which participants without common understanding can work together.<sup>337</sup> It is a creative and dynamic approach that we might think of as government-led crowdsourcing.<sup>338</sup> As one SDO executive observed, the “[c]atalog of Standards provides the perfect venue to conform to the FERC order.”<sup>339</sup> Congress believed mandated standards were necessary to promote rapid standard-setting and to overcome coordination difficulties. However, acceptance by the community that implements them — the touchstone of all consensus standards — does not flow from a regulator’s endorsement, but from use of standards in practice.

Agency rulemaking is inconsistent with that tradition. It is also an inefficient means for establishing standards. Standards are dynamic instruments, and if a standard imposed by rule did not work in practice, the only recourse would be a new rule. The threshold for considering a revised rule would be different (the agency could refuse to revisit its decision), and, of course, the new rule would be subject to all of the procedural requirements, and potential for delay, as the original one. The principal check on a suboptimal decision by an agency is judicial review, which employs standards that focus on whether a court should substitute its judgment for that of the agency, not on the standards’ technical merits.

With hundreds of standards to be evaluated, setting standards by rule introduces the potential for high transaction costs and delay.<sup>340</sup> Approval of the first five standards encountered strong opposition, so it is entirely foreseeable that powerful stakeholders would attempt to tie up standards in costly litigation that could potentially keep them from becoming final for years. Such uncer-

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<sup>336</sup> U.S. GOV’T ACCOUNTABILITY OFFICE, *supra* note 14, at 21 (“Unless FERC and other regulators have a good understanding of whether utilities and manufacturers are following smart grid standards, it will be difficult to know whether a voluntary approach to standards setting is effective or if changes are needed.”).

<sup>337</sup> FERC Standards Order, *supra* note 16, ¶ 10 (noting that the SGIP “brings together smart grid stakeholders from numerous industries and areas of expertise to guide the development of smart grid interoperability standards”).

<sup>338</sup> Cf. Kara Platoni, *Tide Pools and Terrorists*, STAN. MAG. (Jan.-Feb. 2012), available at [http://alumni.stanford.edu/get/page/magazine/article/?article\\_id=46396](http://alumni.stanford.edu/get/page/magazine/article/?article_id=46396) (“Instead of relying on a centralized brain or controller for everything, you farm out the responsibility of searching for and responding to changes in the environment to many, many different agents.”).

<sup>339</sup> NAT’L ELEC. MFRS. ASS’N, *supra* note 332.

<sup>340</sup> FERC, *supra* note 205, at slide 5 (“Because the first group of standards is not likely to address all key priorities identified by NIST and the Commission, Staff anticipates continuing development of new standards and modification to existing standards to address these priorities, with additional notifications from NIST on a regular basis. As such, staff recommends that the Commission periodically initiate rulemaking proceedings in response to postings of new smart grid interoperability standards by NIST.”).

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tainty would mean that projects would proceed without standards, which could jeopardize interoperability.<sup>341</sup>

Given the rulemaking process's inefficiencies, the SGIP process should yield quicker results. Without federal rules, NIST cannot require adoption of standards, but the Catalog will send strong signals about the preferences of large numbers of stakeholders. Utilities and PUCs have relied on voluntary consensus standards for decades and can do so here. Some already have, such as the three major California utilities implementing the Green Button Initiative. This shows how the interoperability "toolkit" may find repeated use in the future, and also demonstrates, as noted above, how utilities may support the SGIP process. The force of the standards may eventually crowd out objectors.

### C. *The Future of Standards — Adoption at the State Level*

Where does this leave the states? After the FERC order, they do not have to adopt standards in the Catalog, but they are free to do so.<sup>342</sup> They can review projects under their normal criteria, and deem imprudent any project that does not follow applicable standards, disallowing cost recovery.<sup>343</sup> Some states have indicated that they want utilities to use standards as a source of best practices. As the Catalog grows, the states may rely upon it as a valuable technical resource. Proceeding without FERC's approval signals that the standards' credibility, like that of other voluntary consensus standards, will derive from their use in Smart Grid projects.

By not adopting the standards, FERC left the distribution of jurisdiction over the electric grid unchanged and postponed perhaps forever the threat of a federal/state power struggle over the Smart Grid's foundation. This decision signals that suggesting FERC could affect the retail electricity market with Smart Grid standards was overreaching. By declining to mandate standards, FERC has neither regulated nor ceded the prospect of a regulatory role in the distribution side of the Smart Grid. It retains its authority under the EISA, and in limited instances, FERC can take discrete actions on standards to preserve reliability and ensure cybersecurity.

In the near-term, NIST will add more standards to the Catalog. States should become more comfortable with the standards as they approve projects that rely on them. Other events may provide additional reasons to use the standards. States' energy and climate change policies (for example, the California and Texas data availability requirements that led to the Green Button Initiative)

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<sup>341</sup> FERC Technical Conference 2011, *supra* note 10 (statement of George Arnold), at 7-8 ("By the time the Commission adopts rules on the many individual standards in the NIST Framework, which could take years, significant investments in grid modernization will already have occurred, and there is the danger that a lot of investment will continue to be made in proprietary systems that do not support smart grid interoperability.").

<sup>342</sup> BROWN ET AL., *supra* note 61, at 90; NIST SGIP, *supra* note 265 ("[I]MPLEMENTERS MAY HAVE GOOD REASONS TO CHOOSE SOMETHING NOT LISTED. HOWEVER, USING AN ENTRY IN THE CATALOG MAY HELP EXPLAIN CHOICES TO OTHERS.")

<sup>343</sup> BROWN ET AL., *supra* note 61, at 90.

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may drive use of the standards. The Smart Grid will grow and evolve, without mandatory standards. FERC can limit its role to resolving conflicts between states if the states adopt incompatible technologies and standards.

FERC can step in if necessary in three distinct cases: when it sees states' actions leading to balkanization of Smart Grid standards, when it believes economic interests unfairly dominated the SGIP process, and when it believes national objectives such as cybersecurity have not been achieved.<sup>344</sup> Think of this as a dynamic fine-tuning federalism. The large and diverse group of Smart Grid stakeholders is defining what the Smart Grid is in real time, with concurrent decisions about law and technology.<sup>345</sup> Smartness in this complex, multifaceted environment, with its many uncertainties, demands that regulators adapt to changing ideas of how to govern the Smart Grid. Smart Grid federalism can be smart: an open, evolving relationship, not a static entity. In a sense, the dynamism called for here compares to climate change federalism, where the relationship between states and the federal government has evolved as states innovate to respond to climate concerns and federal activity promotes uniform solutions.<sup>346</sup> FERC's action, and the continuation of the SGIP process, will allow for standards to be developed while striking a balance between necessary caution about upending the electricity system all at once and doing what will eventually be essential to promote innovation.

#### CONCLUSION

The need for Smart Grid interoperability standards is obvious, and some support from the federal government in developing them is necessary. Yet FERC's order appeared to reject a set of standards that had widespread approval. That decision, this Article argues, was proper. A flexible approach that allows the Smart Grid to evolve, just as the Internet developed, will yield better results than trying to dictate mandatory standards today.

The significance of NIST's standard-setting efforts cannot be underestimated. When the Smart Grid's history is written, standards in the NIST Framework such as SEP 2.0 and early stage uses of the interoperability standards such as the Green Button Initiative will be seen as the forerunners of many more

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<sup>344</sup> At least one state that opposed mandatory standards suggested they might be necessary in the third case listed here. See *United States of America Before the Federal Energy Regulatory Commission, Smart Grid Interoperability Standards*, Docket No. RM11-2-000 1-3, 5-6 (2011) (initial comments of Michigan Public Service Commission) (on file with Harvard Law School Library) (opposing enforceable standards, with the exception of limited areas such as those needed to ensure cybersecurity).

<sup>345</sup> LBNL SMART GRID 101 CH. 1-3, *supra* note 19, at 16 (“[A]lmost all of the benefits require concurrent implementation of policy, rate, and technology options.”).

<sup>346</sup> See Alexandra B. Klass, *State Innovation and Preemption: Lessons From State Climate Change Efforts*, 41 *LOY. L.A. L. REV.* 1653 (2008) for a discussion of dynamism under tension between the states and federal government in fashioning climate change solutions”; see also Ann E. Carlson, *Iterative Federalism and Climate Change*, 103 *Nw. U. L. REV.* 1097, 1100 (2009) (discussing “iterative federalism” whereby “federal law consciously designates a particular and distinct state or group of states to regulate and relies on that regulatory arrangement to enhance compliance with federal standards”).

robust and useful uses of energy information. The SGIP process will be hailed as foundational to a wide range of energy saving technologies, and the standards will be honored as landmarks of the modern technology age.

An expanded federal role may be necessary in the long run. Federal preemption with an open access law may eventually be required to match the Smart Grid's national scale and promote new firms and applications. Yet for now, relying on the states' authority over local distribution is essential. The shift to a Smart Grid will not occur instantaneously. New firms that would seek to use local distribution wires largely do not yet exist. Profound near-term regulatory change would be like swapping pilots in an airplane at 30,000 feet. One can envision that shifting market conditions may motivate utilities to seek change, just as shifting market conditions for phone service in the 1990s, in particular with the rise of cheap long distance calling, led phone companies to seek change by federal regulation.<sup>347</sup> For now, that is years away. Adopting standards today would require making a lasting statement about the federal-state relationship, at a time when preemption is not yet warranted.

In the current climate, it is difficult for FERC to expand its power. Later, it may not be. After circumstances change, a decision about adopting standards may do no more than ratify an existing consensus, instead of forcing it on stakeholders today. However, FERC's decision puts off this confrontation until a point when it may not appear to be a confrontation at all. That is profoundly smart.

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<sup>347</sup> See, e.g., Nicholas Economides, *Telecommunications Regulation: An Introduction* 45, 55-56, in *THE LIMITS AND COMPLEXITY OF ORGANIZATIONS* (Richard R. Nelson, ed. 2005), available at [http://www.stern.nyu.edu/networks/Telecommunications\\_Regulation.pdf](http://www.stern.nyu.edu/networks/Telecommunications_Regulation.pdf).

Utilities have led industry transitions before. In the early 20th century, utilities supported the move from municipal franchises to state regulation. ASHLEY C. BROWN, *THE STRUCTURE AND PROCESS FOR REGULATION OF THE ELECTRICITY INDUSTRY IN THE UNITED STATES* 1-2 (2005), available at [http://www.hks.harvard.edu/hepg/brown\\_papers/ABrown\\_IndiaPlanning\\_1-05.pdf](http://www.hks.harvard.edu/hepg/brown_papers/ABrown_IndiaPlanning_1-05.pdf). Although it may appear unlikely today, if market conditions change, utilities may eventually prompt a similar move to federal Smart Grid regulation.



The Geoengineering Option: A Last Resort Against Global Warming?

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# The Geoengineering Option

## A Last Resort Against Global Warming?

*David G. Victor, M. Granger Morgan, Jay Apt,  
John Steinbruner, and Katharine Ricke*

EACH YEAR, the effects of climate change are coming into sharper focus. Barely a month goes by without some fresh bad news: ice sheets and glaciers are melting faster than expected, sea levels are rising more rapidly than ever in recorded history, plants are blooming earlier in the spring, water supplies and habitats are in danger, birds are being forced to find new migratory patterns.

The odds that the global climate will reach a dangerous tipping point are increasing. Over the course of the twenty-first century, key ocean currents, such as the Gulf Stream, could shift radically, and thawing permafrost could release huge amounts of additional greenhouse gases into the atmosphere. Such scenarios, although still remote, would dramatically accelerate and compound the consequences of global warming. Scientists are taking these doomsday scenarios seriously because the steady accumulation of warming gases in the atmosphere

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is forcing change in the climate system at rates so rapid that the outcomes are extremely difficult to predict.

Eliminating all the risks of climate change is impossible because carbon dioxide emissions, the chief human contribution to global warming, are unlike conventional air pollutants, which stay in the atmosphere for only hours or days. Once carbon dioxide enters the atmosphere, much of it remains for over a hundred years. Emissions from anywhere on the planet contribute to the global problem, and once headed in the wrong direction, the climate system is slow to respond to attempts at reversal. As with a bathtub that has a large faucet and a small drain, the only practical way to lower the level is by dramatically cutting the inflow. Holding global warming steady at its current rate would require a worldwide 60–80 percent cut in emissions, and it would still take decades for the atmospheric concentration of carbon dioxide to stabilize.

Most human emissions of carbon dioxide come from burning fossil fuels, and most governments have been reluctant to force the radical changes necessary to reduce those emissions. Economic growth tends to trump vague and elusive global aspirations. The United States has yet to impose even a cap on its emissions, let alone a reduction. The European Union has adopted an emissions-trading scheme that, although promising in theory, has not yet had much real effect because carbon prices are still too low to cause any significant change in behavior. Even Norway, which in 1991 became one of the first nations to impose a stiff tax on emissions, has seen a net increase in its carbon dioxide emissions. Japan, too, has professed its commitment to taming global warming. Nevertheless, Tokyo is struggling to square the need for economic growth with continued dependence on an energy system powered mainly by conventional fossil fuels. And China's emissions recently surpassed those of the United States, thanks to coal-fueled industrialization and a staggering pace of economic growth. The global economic crisis is stanching emissions a bit, but it will not come close to shutting off the faucet.

The world's slow progress in cutting carbon dioxide emissions and the looming danger that the climate could take a sudden turn for the worse require policymakers to take a closer look at emergency strategies for curbing the effects of global warming. These strategies, often called "geoengineering," envision deploying systems on a planetary scale, such

as launching reflective particles into the atmosphere or positioning sunshades to cool the earth. These strategies could cool the planet, but they would not stop the buildup of carbon dioxide or lessen all its harmful impacts. For this reason, geoengineering has been widely shunned by those committed to reducing emissions.

Serious research on geoengineering is still in its infancy, and it has not received the attention it deserves from politicians. The time has come to take it seriously. Geoengineering could provide a useful defense for the planet—an emergency shield that could be deployed if surprisingly nasty climatic shifts put vital ecosystems and billions of people at risk. Actually raising the shield, however, would be a political choice. One nation's emergency can be another's opportunity, and it is unlikely that all countries will have similar assessments of how to balance the ills of unchecked climate change with the risk that geoengineering could do more harm than good. Governments should immediately begin to undertake serious research on geoengineering and help create international norms governing its use.

#### THE RAINMAKERS

GEOENGINEERING IS not a new idea. In 1965, when President Lyndon Johnson received the first-ever U.S. presidential briefing on the dangers of climate change, the only remedy prescribed to counter the effects of global warming was geoengineering. That advice reflected the scientific culture of the time, which imagined that engineering could fix almost any problem.

By the late 1940s, both the United States and the Soviet Union had begun exploring strategies for modifying the weather to gain battlefield advantage. Many schemes focused on “seeding” clouds with substances that would coax them to drop more rain. Despite offering no clear advantage to the military, “weather makers” were routinely employed (rarely with much effect) to squeeze more rain from clouds for thirsty crops. Starting in 1962, U.S. government researchers for Project Stormfury tried to make tropical hurricanes less intense through cloud seeding, but with no clear success. Military experts also dreamed of using nuclear explosions and other interventions to create a more advantageous climate. These applications were frightening

enough that in 1976 the United Nations adopted the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques to bar such projects. By the 1970s, after a string of failures, the idea of weather modification for war and farming had largely faded away.

Today's proposals for geo-engineering are more likely to have an impact because the interventions needed for global-scale geoengineering are much less subtle than those that sought to influence local weather patterns. The earth's climate is largely driven by the fine balance between the light energy with which the sun bathes the earth and the heat that the earth radiates back to space. On average, about 70 percent of the earth's incoming sunlight is absorbed by the atmosphere and the planet's surface; the remainder is reflected back into space. Increasing the reflectivity of the planet (known as the albedo) by about one percentage point could have an effect on the climate system large enough to offset the gross increase in warming that is likely over the next century as a result of a doubling of the amount of carbon dioxide in the atmosphere. Making such tweaks is much more straightforward than causing rain or fog at a particular location in the ways that the weather makers of the late 1940s and 1950s dreamed of doing.

In fact, every few decades, volcanoes validate the theory that it is possible to engineer the climate. When Mount Pinatubo, in the Philippines, erupted in 1991, it ejected plumes of sulfate and other fine particles into the atmosphere, which reflected a bit more sunlight and cooled the planet by about 0.5 degrees Celsius over the course of a year. Larger



eruptions, such as the 1883 eruption of Krakatau, in Indonesia, have caused even greater cooling that lasted longer. Unlike efforts to control emissions of greenhouse gases, which will take many years to yield a noticeable effect, volcano-like strategies for cooling the planet would work relatively promptly.

Another lesson from volcanoes is that a geoengineering system would require frequent maintenance, since most particles lofted into the stratosphere would disappear after a year or two. Once a geoengineering project were under way, there would be strong incentives to continue it, since failure to keep the shield in place could allow particularly harmful changes in the earth's climate, such as warming so speedy that ecosystems would collapse because they had no time to adjust. By carefully measuring the climatic effects of the next major volcanic eruption with satellites and aircraft, geoengineers could design a number of climate-cooling technologies.

#### ALBEDO ENHANCERS

TODAY, THE term "geoengineering" refers to a variety of strategies designed to cool the climate. Some, for example, would slowly remove carbon dioxide from the atmosphere, either by manipulating the biosphere (such as by fertilizing the ocean with nutrients that would allow plankton to grow faster and thus absorb more carbon) or by directly scrubbing the air with devices that resemble big cooling towers. However, from what is known today, increasing the earth's albedo offers the most promising method for rapidly cooling the planet.

Most schemes that would alter the earth's albedo envision putting reflective particles into the upper atmosphere, much as volcanoes do already. Such schemes offer quick impacts with relatively little effort. For example, just one kilogram of sulfur well placed in the stratosphere would roughly offset the warming effect of several hundred thousand kilograms of carbon dioxide. Other schemes include seeding bright reflective clouds by blowing seawater or other substances into the lower atmosphere. Substantial reductions of global warming are also possible to achieve by converting dark places that absorb lots of sunlight to lighter shades—for example, by replacing dark forests with more reflective grasslands. (Engineered plants might be designed for the task.)

## *The Geoengineering Option*

More ambitious projects could include launching a huge cloud of thin refracting discs into a special space orbit that parks the discs between the sun and the earth in order to bend just a bit of sunlight away before it hits the planet.

So far, launching reflective materials into the upper stratosphere seems to be the easiest and most cost-effective option. This could be accomplished by using high-flying aircraft, naval guns, or giant balloons. The appropriate materials could include sulfate aerosols (which would be created by releasing sulfur dioxide gas), aluminum oxide dust, or even self-levitating and self-orienting designer particles engineered to migrate to the Polar Regions and remain in place for long periods. If it can be done, concentrating sunshades over the poles would be a particularly interesting option, since those latitudes appear to be the most sensitive to global warming. Most cost estimates for such geoengineering strategies are preliminary and unreliable. However, there is general agreement that the strategies are cheap; the total expense of the most cost-effective options would amount to perhaps as little as a few billion dollars, just one percent (or less) of the cost of dramatically cutting emissions.

Cooling the planet through geoengineering will not, however, fix all of the problems related to climate change. Offsetting warming by reflecting more sunlight back into space will not stop the rising concentration of carbon dioxide in the atmosphere. Sooner or later, much of that carbon dioxide ends up in the oceans, where it forms carbonic acid. Ocean acidification is a catastrophe for marine ecosystems, for the 100 million people who depend on coral reefs for their livelihoods, and for the many more who depend on them for coastal protection from storms and for biological support of the greater ocean food web. Over the last century, the oceans have become markedly more acidic, and current projections suggest that without a serious effort to control emissions, the concentration of carbon dioxide will be so high by the end of the century that many organisms that make shells will disappear and most coral reef ecosystems will collapse, devastating the marine fishing industry. Recent studies have also

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suggested that ocean acidification will increase the size and depth of “dead zones,” areas of the sea that are so oxygen depleted that larger marine life, such as squid, are unable to breathe properly.

Altering the albedo of the earth would also affect atmospheric circulation, rainfall, and other aspects of the hydrologic cycle. In the six to 18 months following the eruption of Mount Pinatubo, rainfall and river flows dropped, particularly in the tropics. Understanding these dangers better would help convince government leaders in rainfall-sensitive regions, such as parts of China and India (along with North Africa, the Middle East, and the desert regions of the southwestern United States), not to prematurely deploy poorly designed geoengineering schemes that could wreak havoc on agricultural productivity. Indeed, some climate models already suggest that negative outcomes—decreased precipitation over land (especially in the tropics) and increased precipitation over the oceans—would accompany a geoengineering scheme that sought to lower average temperatures by raising the planet’s albedo. Such changes could increase the risk of major droughts in some regions and have a major impact on agriculture and the supply of fresh water. Complementary policies—such as investing in better water-management schemes—may be needed.

The highly uncertain but possibly disastrous side effects of geoengineering interventions are difficult to compare to the dangers of unchecked global climate change. Chances are that if countries begin deploying geoengineering systems, it will be because calamitous climate change is near at hand. Yet the assignment





of blame after a geoengineering disaster would be very different from the current debates over who is responsible for climate change, which is the result of centuries of accumulated emissions from activities across the world. By contrast, the side effects of geoengineering projects could be readily pinned on the geoengineers themselves. That is one reason why nations must begin building useful international norms to govern geoengineering in order to assess its dangers and decide when to act in the event of an impending climatic disaster.

#### LONE RANGERS

AN EFFECTIVE foreign policy strategy for managing geoengineering is difficult to formulate because the technology involved turns the normal debate over climate change on its head. The best way to reduce the danger of global warming is, of course, to cut emissions of carbon dioxide and other greenhouse gases. But success in that venture will require all the major emitting countries, with their divergent interests, to cooperate for several decades in a sustained effort to develop and deploy completely new energy systems with much lower emissions. Incentives to defect and avoid the high cost of emissions controls will be strong.

By contrast, geoengineering is an option at the disposal of any reasonably advanced nation. A single country could deploy geoengineering systems from its own territory without consulting the rest of the planet. Geoengineers keen to alter their own country's climate might not assess or even care about the dangers their actions could create for climates, ecosystems, and economies elsewhere. A unilateral geoengineering project could impose costs on other countries, such as changes in precipitation patterns and river flows or adverse

impacts on agriculture, marine fishing, and tourism. And merely knowing that geoengineering exists as an option may take the pressure off governments to implement the policies needed to cut emissions.

At some point in the near future, it is conceivable that a nation that has not done enough to confront climate change will conclude

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Fiddling with the climate  
to fix the climate strikes  
most people as a  
shockingly bad idea.

that global warming has become so harmful to its interests that it should unilaterally engage in geoengineering. Although it is hardly wise to mess with a poorly understood global climate system using instruments whose effects are also unknown, politicians must take geoengineering seriously because it is cheap, easy, and takes only one government with sufficient hubris or desperation to set it in motion. Except in the most dire climatic emergency, universal agreement on the best approach is highly unlikely. Unilateral action would create a crisis of legitimacy that could make it especially difficult to manage geoengineering schemes once they are under way.

Although governments are the most likely actors, some geoengineering options are cheap enough to be deployed by wealthy and capable individuals or corporations. Although it may sound like the stuff of a future James Bond movie, private-sector geoengineers might very well attempt to deploy affordable geoengineering schemes on their own. And even if governments manage to keep freelance geoengineers in check, the private sector could emerge as a potent force by becoming an interest group that pushes for deployment or drives the direction of geoengineering research and assessment. Already, private companies are running experiments on ocean fertilization in the hope of sequestering carbon dioxide and earning credits that they could trade in carbon markets. Private developers of technology for albedo modification could obstruct an open and transparent research environment as they jockey for position in the potentially lucrative market for testing and deploying geoengineering systems. To prevent such scenarios and to establish the rules that should govern the use of geoengineering technology for the good of the entire planet, a cooperative, international research agenda is vital.

## *The Geoengineering Option*

### FROM SCIENCE FICTION TO FACTS

DESPITE YEARS of speculation and vague talk, peer-reviewed research on geoengineering is remarkably scarce. Nearly the entire community of geoengineering scientists could fit comfortably in a single university seminar room, and the entire scientific literature on the subject could be read during the course of a transatlantic flight. Geoengineering continues to be considered a fringe topic.

Many scientists have been reluctant to raise the issue for fear that it might create a moral hazard: encouraging governments to deploy geoengineering rather than invest in cutting emissions. Indeed, geoengineering ventures will be viewed with particular suspicion if the nations funding geoengineering research are not also investing in dramatically reducing their emissions of carbon dioxide and other greenhouse gases. Many scientists also rightly fear that grants for geoengineering research would be subtracted from the existing funds for urgently needed climate-science research and carbon-abatement technologies. But there is a pressing need for a better understanding of geoengineering, rooted in theoretical studies and empirical field measurements. The subject also requires the talents of engineers, few of whom have joined the small group of scientists studying these techniques.

The scientific academies in the leading industrialized and emerging countries—which often control the purse strings for major research grants—must orchestrate a serious and transparent international research effort funded by their governments. Although some work is already under way, a more comprehensive understanding of geoengineering options and of risk-assessment procedures would make countries less trigger-happy and more inclined to consider deploying geoengineering systems in concert rather than on their own. (The International Council for Science, which has a long and successful history of coordinating scientific assessments of technical topics, could also lend a helping hand.) Eventually, a dedicated international entity overseen by the leading academies, provided with a large budget, and suffused with the norms of transparency and peer review will be necessary.

In time, international institutions such as the Intergovernmental Panel on Climate Change could be expected to synthesize the findings

from the published research. The IPCC, which shared the Nobel Peace Prize in 2007 for its pivotal role in building a consensus around climate science, has not considered geoengineering so far because the topic is politically radioactive and there is a dearth of peer-reviewed research on it. The IPCC's fifth assessment report on climate change, which is being planned right now, should promise to take a closer look at geoengineering. Attention from the IPCC and the world's major scientific academies would help encourage new research.

A broad and solid foundation of research would help on three fronts. First, it would transform the discussion about geoengineering from an abstract debate into one focused on real risk assessment. Second,

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The option of  
geoengineering exists.  
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ignore it.

a research program that was backed by the world's top scientific academies could secure funding and political cover for essential but controversial experiments. (Field trials of engineered aerosols, for example, could spark protests comparable to those that accompanied trials of genetically modified crops.) Such experiments will be seen as more acceptable if they are designed and overseen by the world's leading scientists and evaluated in a

fully transparent fashion. Third, and what is crucial, a better understanding of the dangers of geoengineering would help nations craft the norms that should govern the testing and possible deployment of newly developed technologies. Scientists could be influential in creating these norms, just as nuclear scientists framed the options on nuclear testing and influenced pivotal governments during the Cold War.

If countries were actually to contemplate the deployment of geoengineering technologies, there would inevitably be questions raised about what triggers would compel the use of these systems. Today, nobody knows which climatic triggers are most important for geoengineering because research on the harmful effects of climate change has not been coupled tightly enough with research on whether and how geoengineering might offset those effects.

Although the international scientific community should take the lead in developing a research agenda, social scientists, international lawyers,

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and foreign policy experts will also have to play a role. Eventually, there will have to be international laws to ensure that globally credible and legitimate rules govern the deployment of geoengineering systems. But effective legal norms cannot be imperiously declared. They must be carefully developed by informed consensus in order to avoid encouraging the rogue forms of geoengineering they are intended to prevent.

Those who worry that such research will cause governments to abandon their efforts to control emissions, including much of the environmental community, are prone to seek a categorical prohibition against geoengineering. But a taboo would interfere with much-needed scientific research on an option that might be better for humanity and the world's ecosystems than allowing unchecked climate change or reckless unilateral geoengineering. Formal prohibition is unlikely to stop determined rogues, but a smart and scientifically sanctioned research program could gather data essential to understanding the risks of geoengineering strategies and to establishing responsible criteria for their testing and deployment.

### BRAVE NEW WORLD

FIDDLING WITH the climate to fix the climate strikes most people as a shockingly bad idea. Many worry that research on geoengineering will make governments less willing to regulate emissions. It is more likely, however, that serious study will reveal the many dangerous side effects of geoengineering, exposing it as a true option of last resort. But because the option exists, and might be used, it would be dangerous for scientists and policymakers to ignore it. Assessing and managing the risks of geoengineering may not require radically different approaches from those used for other seemingly risky endeavors, such as genetic engineering (research on which was paused in the 1970s as scientists worked out useful regulatory systems), the construction and use of high-energy particle accelerators (which a few physicists suggest could create black holes that might swallow the earth), and the development of nanotechnology (which some worry could unleash self-replicating nanomachines that could reduce the world to "gray goo"). The option of eliminating risk altogether does not exist. Countries have kept smallpox samples on hand, along with samples

of many other diseases, such as the Ebola and Marburg viruses, despite the danger of their inadvertent release. All of these are potentially dangerous endeavors that governments, with scientific support, have been able to manage for the greater good.

Humans have already engaged in a dangerous geophysical experiment by pumping massive amounts of carbon dioxide and other greenhouse gases into the atmosphere. The best and safest strategy for reversing climate change is to halt this buildup of greenhouse gases, but this solution will take time, and it involves myriad practical and political difficulties. Meanwhile, the dangers are mounting. In a few decades, the option of geoengineering could look less ugly for some countries than unchecked changes in the climate. Nor is it impossible that later in the century the planet will experience a climatic disaster that puts ecosystems and human prosperity at risk. It is time to take geoengineering out of the closet—to better control the risk of unilateral action and also to know the costs and consequences of its use so that the nations of the world can collectively decide whether to raise the shield if they think the planet needs it. 🌍