Liability and compensation for damage resulting from CO2 storage sites

RING-FENCING THE POWER ENVELOPE OF HISTORY'S SECOND MOST IMPORTANT INVENTION OF ALL TIME

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> [[*N*]*et metering disputes are*] *one indication that this is "revolution now."*[1]
>
> –U.S. Energy Secretary Ernest Moniz

I. RING-FENCING POWER

The second most important invention of all time.[2] Several hundred billion dollars of annual transactions.[3] New law, government deregulation, legal 'ring-fences,' winners and losers. These are the stage directions in a significant legal drama now unfolding over a law altering the most important 21st century technology. A barrage of legal suits is challenging a new regulatory metric, and state governments are being held to have acted unconstitutionally. This Article explores each point of the regulatory change and increasing legal friction.

The second most important invention of all time: Electricity is identified as the second most important invention in human history

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[1] Ker Than, *As Solar Power Grows, Dispute Flares Over U.S. Utility Bills*, NAT'L GEOGRAPHIC (Dec. 25, 2013), http://news.nationalgeographic.com/news/energy/2013/12/131226-utilities-dispute-net-metering-for-solar/ [http://perma.cc/69DW-LJAY].

[2] James Fallows, *The Fifty Greatest Breakthroughs Since the Wheel*, THE ATLANTIC, Nov. 2013, *available at* http://www.theatlantic.com/magazine/archive/2013/11/innovations-list/309536/ [http://perma.cc/4CKA-V57L].

[3] *See Average Retail Price of Electricity to Ultimate Customers by End-Use Sector*, PUB. POLICY INST. OF N.Y. STATE, http://ppinys.org/reports/jtf/2011/employ/average-retail-price-of-electricity2010-11.htm [http://perma.cc/G4PR-ZWEE].

other than the wheel.[4] Having finished in second place among all inventions, behind only the movable-type printing press, electricity is the only invention in the rankings which also is indispensable to operate seven other top fifty inventions of all time: the internet, computers, air conditioning, radio, television, the telephone, and semiconductors.[5] This is a pivotal technology.

Electricity is not only essential in the modern American economy but also of sweeping scope with a delivered transacted value in the U.S. of approximately $375 billion annually.[6] Electricity's megafinancial value exceeds the total amount of corporate income taxes collected in the U.S.[7] Electricity is not static; its role is expanding: electronic books and messaging, displayed only through electricity, are now significantly replacing the use of the movable-type press, which was invented in China in 1041,[8] and occupies the only rung above electricity in the rating of the most important inventions of all time.[9] Nothing is more indispensable than electricity in the foundation of the modern economy.

Deregulation: Electricity is the last regulated industry in the U.S.[10] Approximately one-third of the U.S. states have chosen to increase power competition and partially or fully deregulate retail power transactions in their states, reversing the traditional utility monopoly position.[11] Restructuring and deregulation of the retail electric power sector, commencing at the state level in 1997, dramatically changed the regulatory paradigm.[12]

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[4] Fallows, *supra* note 2.

[5] *Id.*

[6] The average delivered price of all electricity nationwide in 2011 was $0.0966/kWh, and $0.1109/kWh for residential customers. *See* PUB. POL'Y INST. OF N.Y. STATE, *supra* note 3.

[7] *Historical Amount of Revenue by Source*, TAX POL'Y CTR., http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=203 [http://perma.cc/NQQ4-MUP3].

[8] *See* ENCYC. BRITANNICA, http://www.britannica.com/EBchecked/topic/477017/printing/36836/The-invention-of-typography-Gutenberg-1450 [http://perma.cc/CU5B-B7AU]. After this, movable print presses were invented in Korea and by Gutenberg in Europe in approximately 1450.

[9] Fallows, *supra* note 2.

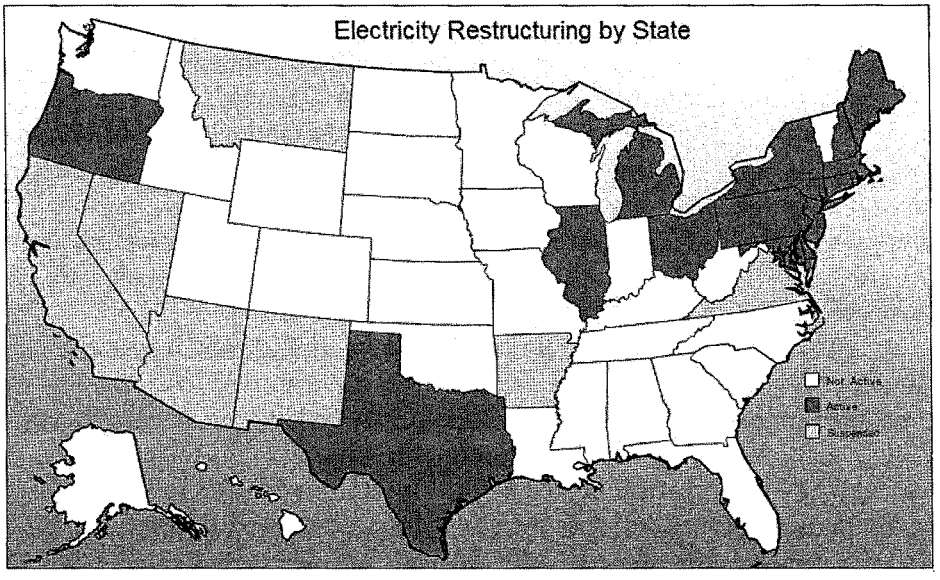
[10] *See* STEVEN FERREY, THE NEW RULES: A GUIDE TO ELECTRIC MARKET REGULATION, app. A (2000).

[11] *Id.*

[12] *See, e.g.*, *id.* at 149–50. About 40% of the states restructured prior to the electric sector problems in California in 2000–2001, and thereafter further progress nationwide in this direction was frustrated by the collapse of the California restructured power market in 2000–2001. *See* Steven Ferrey, *Soft Paths, Hard Choices: Environmental Lessons in the Aftermath of California's Electric Deregulation Debacle*, 23 VA. ENVTL. L.J. 251, 252, 338 (2004). After, the other 60% of the states retained traditionally structured retail electric

Today, thirteen deregulated plus seven partially deregulated states have retail competition as shown in Figure 1.[13]

Figure 1



Legal Ring-Fences: Change has consequences. The resulting pressure to now change the conventional utility model will implement policy to ring-fence cash benefits for certain customers at the expense of others[14]:

- certain new use of the power distribution grid by net-metering customers will continue at no cost to

sectors. *See* Steven Ferrey, *Sale of Electricity*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 218–19 (Michael B. Gerrard ed., 2011).

[13] *Status of Electricity Restructuring by State*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/electricity/policies/restructuring/restructure_elect.html [http://perma.cc/R53Z-CN8G].

[14] "Perhaps the most common function of ring-fencing is to protect a firm from becoming subject to liabilities and other risks associated with bankruptcy. . . . Another function of ring-fencing is to help ensure that a firm is able to operate on a standalone basis even if its affiliated firms fail." Steven L. Schwarcz, *Ring-Fencing*, 87 S. CAL. L. REV. 69, 73 (2014).

the customer, which reduction in power sales will reallocate those customers traditional portion of system fixed costs to other customers who do not have net metering;[15]

- premium feed-in tariffs paid for power from certain customers at above-market rates and above federally prescribed "avoided cost," shifts variable power costs to other customers who do not generate their own power;[16]
- renewable portfolio standards pay renewable energy customers an additional bonus monetized credit/fee for each kilowatt-hour generated, which cost correspondingly is shifted to all other customers who pay traditional rates;[17]
- utilities in ten states are required to purchase additional carbon credits for production, sale, or use of traditional power supplies, which costs are shifted to remaining customers.[18]

These new policies fundamentally change the traditional retail utility role in transacting approximately $400 billion of consumer sales each year.[19] Proponents of this new model assert that it will diversify democratic and distributed sources of power and accelerate a transition to more renewable resources, while changing the role of the utility from a monopoly to a neutral facilitator.[20] Critics counter that this will allow the more affluent customers to step away from shouldering a fair proportion of the cost of providing the second most important invention at the core of the modern American economy.[21] The model of the utility is changing.

New Regulation: Whichever perspective one takes, utilities are not social welfare agencies or charities to redistribute assets from one group of its consumers to another group of its consumers.[22] Under long-standing

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[15] *See infra* Part III.A.2.
[16] *See infra* Part III.A.1.
[17] *See infra* Part III.B.1.
[18] See *infra* Part III.B.3.
[19] PUB. POLICY INST. OF N.Y. STATE, *supra* note 3.
[20] *See infra* Part II.C.1.
[21] *See id.*
[22] *See* 12 EUGENE MCQUILLIN, THE LAW OF MUNICIPAL CORPORATIONS § 34:195 (3d ed.

law, utility rates must be designed and administered in order to recover from the person to whom they are provided the cost of each unit of electricity and each related service provided.[23] The legal obligation on state retail electricity regulatory commissions is to fairly and equitably set and administer retail rates based on the service provided. Public utility law tracks the legal obligation to allocate costs and benefits of electricity service in a manner that is "fair and equitable," "not unduly preferential," "just and reasonable," and "non-discriminatory" to each consumer.[24]

Different Winners and Losers: When fewer customers pay for the distribution grid, or when a utility is compelled by state regulation to pay more than market rate for power it is ordered to purchase from certain customers, the transaction becomes a zero-sum proposition. While there are significant benefits that flow from renewable power under the new utility model,[25] there are also costs.[26] The utility, by law, does not absorb these costs and losses from regulatory programs that it is mandated to undertake. All of these costs and losses are passed on to the utility's—often captive—customers.[27] There is no transparency or itemization of the costs of net metering, FiTs, carbon credits, or RPS on the retail customers' monthly bills, so that they do not see any of these separate costs transferred to them.

It is not just utilities that fear losing revenue in this new distributed generation model. State and local governments receive taxes embedded invisibly in the typical utility bill of up to 25–40% of the bill amount.[28] As self-generation behind the meter or through-net-metering

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2011); *see also* Narragansett Elec. Co. v. Harsch, 368 A.2d 1194, 1211–12 (R.I. 1977) (quoting State *ex rel.* Puget Sound Power & Light Co. v. Dep't of Pub. Works, 179 Wash. 461, 468 (1934)).

[23] *See infra* Part V.A.

[24] *EPA's Clean Power Plan: States' Tools for Reducing Costs and Increasing Benefits to Consumers*, ANALYSIS GRP. (July 2014), *available at* http://www.analysisgroup.com/uploadedFiles/Content/Insights/Publishing/Analysis_Group_EPA_Clean_Power_Plan_Report.pdf [http://perma.cc/7HK3-F8CR].

[25] *See infra* Part II.C.2.

[26] *See infra* Part II.C.2.

[27] Tom Tiernan, *Attention to Good Standby Rates Seen Key as Distributed Generation Plays Bigger Role*, ELEC. UTIL. WK., Dec. 31, 2012, at 10; Ralph Halper, Ralph Vartabedian & Julie Cart, *Taxpayers, Ratepayers Will Fund California Solar Plants*, L.A. TIMES (Sept. 20, 2012), http://articles.latimes.com/2012/sep/20/local/la-me-bigsolar-20120921 [http://perma.cc/FP8T-MW3W].

[28] *See* RICKERSON ET AL., IEA-RETD, RESIDENTIAL PROSUMERS—DRIVERS AND POLICY OPTIONS (RE-PROSUMERS) 40 tbl. 1 (June 2014), *available at* http://iea-retd.org/wp-content

transactions absorb a larger share of power supply, power sales and government taxes that are directly linked to power distributed by the utility decline commensurately.

No state has yet to carefully or adequately analyze these costs against the benefits being imposed in order to determine tariffs and subsidies. This Article examines the new administrative regulatory incentives now applied to this second most important invention and indispensable segment of the American economy. It assesses the new legal mechanisms and analyzes the winners, losers, and legal ring-fences around the new business model of energy.

Section II initiates the analysis by examining key legal aspects of this second most important invention, its unique position compared to all other things in commerce, and the significant legal transition now occurring with power. Section III dissects the legal and regulatory mechanisms deployed which affect the electric sector of the economy to facilitate change and examines recent successful constitutional legal attacks against some of this state energy regulation. Courts have stricken a significant part of what states have tried.

Section IV navigates policy options for the new power model, and assesses costs imposed and grid benefits which will now shift large amounts of money among different groups of American power consumers. Section V examines how the new models would be adjudicated under American regulatory law and precedent. We examine long-established principles of American law that prohibit deliberate cross-subsidies among consumers. Because no state has yet undertaken the required effort to quantify the exact value of and costs to the grid of distributed renewable generation, states risk legal challenges to setting rates and subsidies without accurate valuation of the costs and benefits these rates reflect.

States will also see tax revenues to state government diminish noticeably within the new regulatory model. This will create pressure to recoup these lost revenues through higher tax rates for those consumers still using the electric grid, exacerbating the shift of costs to those without renewable power as renewable energy owners consume less central power. To reconcile these significant impacts, Section VI constructs a solution to the controversy arising from new, changing administrative models for power.

First, we look at how power is changing.

/uploads/2014/06/RE-PROSUMERS_IEA-RETD_2014.pdf [http://perma.cc/R3NX-RW6E].

II. POWER CHANGE

A. *Revolution and Legal Responses to Technological Change*

Things are changing with power. The use of electricity is continuing to evolve, and the business of electricity is undergoing significant change. Who produces it, from what sources, and how far it travels, are all changing. This affects the role of the traditional, centralized utility as the creator and purveyor of all power. A fundamentally disruptive cause of alterations in the role of the U.S. utility is an accelerating increase in the use of distributed solar energy, microgrids, on-site power, and other consumer-generated energy sources.

1. The Power Base of the Revolution

The public continues to consume electricity. Three years ago, electric power had a delivered value in the U.S. of approximately $375 billion annually,[29] exceeding the total amount of corporate income taxes collected in the U.S.[30] Nonetheless, with a recent focus on climate change, there is a change in the electric sector's role and the societal impacts of power. In 1949, only 11% of global warming gases in the United States came from the electric sector; now, this sector is responsible for more than one-third of such gasses.[31] "The electric power sector offers the most cost-effective opportunities to reduce CO_2 emissions," compared to transportation and other sectors.[32]

Since humankind first created the wheel and harnessed animals to do productive labor, energy has been the means to organize production

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[29] The average delivered price of all electricity nationwide in 2011 was $0.0966/kWh, and $0.1109/kWh for residential customers. *See* PUB. POL'Y INST. OF N.Y. STATE, *supra* note 3.

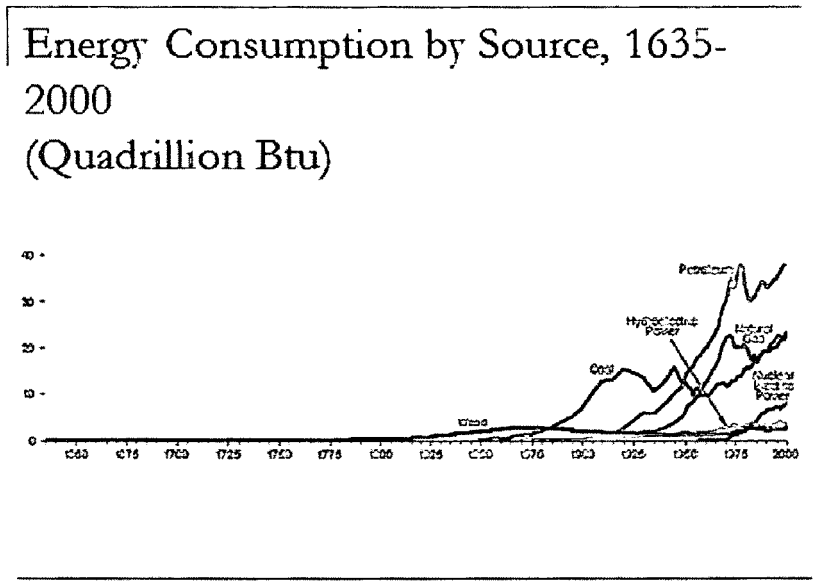
[30] TAX POL'Y CTR., *supra* note 7.

[31] *See Historical Data Series: Total Energy-Related Carbon Dioxide Emissions by End-Use Sector and the Electric Power Sector*, U.S. ENERGY INFO. ADMIN. 1 (2007), http://www.eia.doe.gov/oiaf/1605/ggrpt/excel/historical_co2.xls [http://perma.cc/LSN4-35YW].

[32] *Energy Estimates Show Rise in CO2 Emissions, Offer Mitigation Options*, CLEAN ENERGY REP. (July 2, 2008), http://cleanenergyreport.com/Energy-EW-Week/Energ-Washington-Week-07/02/2008/energy-estimates-show-rise-in-co2-emissions-offer-mitigation-options/menu-id-570.html.

and advance civilization.[33] The historic use of different energy sources over the past four centuries is illustrated in Figure 2.[34]

Figure 2



Among the different sources of energy, electricity is a unique form of energy—with no substitutes or alternatives to its use in the 21st century for operation of computers, the Internet, medical imaging, national defense and security, modern communication, and building size and climate control.[35] Electric energy is the fundamental technology essential

[33] STEVEN FERREY, LAW OF INDEPENDENT POWER §§ 2:1, 2:5–6 (34th ed. 2014) [hereinafter FERREY, LAW OF INDEPENDENT POWER].

[34] *Energy in the United States: 1635–2000: Energy Information Agency*, MINNESOTANS FOR SUSTAINABILITY (2003), http://www.mnforsustain.org/energy_in_the_united_states_1635-2000.htm [http://perma.cc/ME9R-ENF9].

[35] STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS, 539–40 (6th ed. 2013) [hereinafter FERREY, EXAMPLES & EXPLANATIONS]; *see* FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 2:1.10.

to power the developed American economy.[36] As the Supreme Court has noted, it is now "possible for a customer in Vermont [to] purchase electricity from an environmentally friendly power producer in California or a cogeneration facility in Oklahoma."[37] Since power is only usable when delivered to users over a copper wire network, this movement and transmission of power is the key connection.[38]

The high-voltage transmission network was recognized by engineers as the "most important engineering feat of the 20th century."[39] In terms of physical assets, the "grid" is composed not only of the approximately 4,800 interconnected power generation resources in the United States, but also of the cable connecting them with consumers and the hardware managing them in an energized instantaneous network.[40] The high-voltage transmission network at 230 kilovolts ("kv") and higher comprises 167,000 miles of line in America.[41] In the United States there is an eastern interconnection, a western interconnection and a separate interconnection that includes most of Texas,[42] as displayed in Figure 3.[43] The transmission system operates at fifteen different voltage levels,[44] with limited power transactions between these three major interconnections.

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[36] CRO FORUM, POWER BLACKOUT RISK 2 (2012), *available at* https://www.allianz.com/v_1339677769000/media/responsibility/documents/position_paper_power_blackout_risks.pdf [https://perma.cc/HF8S-9XFF].

[37] New York v. Fed. Energy Regulatory Comm'n, 535 U.S. 1, 8 (2002) (quoting Transmission Access Policy Grp. v. Fed. Energy Regulatory Comm'n, 225 F.3d 667, 681 (2000)).

[38] For more on distributed generation options, *see* Steven Ferrey, *Exit Strategy: State Legal Discretion to Environmentally Sculpt the Deregulating Electric Environment*, 26 HARV. ENVTL. L. REV. 109, 116 (2002).

[39] MASON WILLRICH, INDUS. PERFORMANCE CTR., ELECTRICITY TRANSMISSION POLICY FOR AMERICA: ENABLING A SMART GRID, END TO END 5 (2009), *available at* http://www.cleanlineenergy.com/sites/cleanline/media/resources/Electricity%20Transmission%20Policy%20for%20America-%20Enabling%20a%20Smart%20Grid,%20End-to-End%20.pdf [http://perma.cc/6W8S-7UWA].

[40] *Glossary*, U.S. ENERGY INFO. ADMIN., http://www.eia.doe.gov/glossary/glossary_e.htm#electr_pow_grid [http://perma.cc/9NZX-ZEA9].

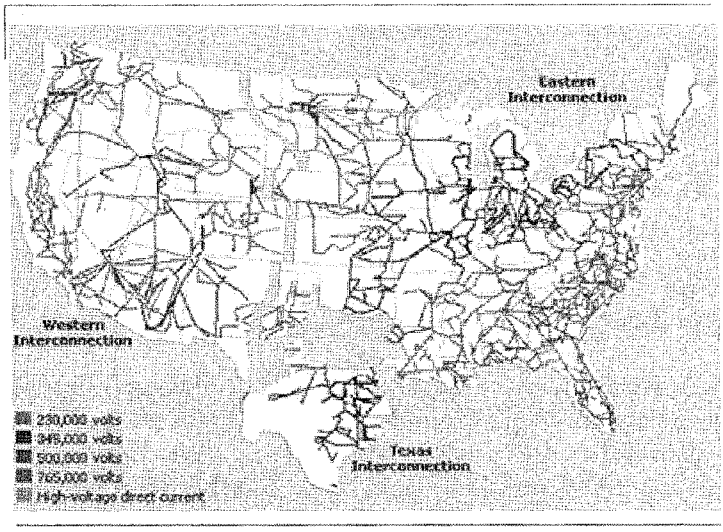
[41] STAN MARK KAPLAN, CONG. RESEARCH SERV., ELECTRIC POWER TRANSMISSION: BACKGROUND AND POLICY ISSUES 1–5 & n. 3 (2009) (discussing miles of transmission lines), *available at* http://fpc.state.gov/documents/organization/122949.pdf [http://perma.cc/3X79-799L].

[42] *Id.* at 3; *see* Figure 2 for a visual display of United States power system interconnections.

[43] *American National Electricity Grid*, GLOB. ENERGY NETWORK INST., http://www.geni.org/globalenergy/library/national_energy_grid/united-states-of-america/americannationalelectricitygrid.shtml [http://perma.cc/WS6T-PTCX] (last visited Oct. 26, 2015).

[44] Craig Cano, *Efficiency Should Be Viewed as Key Part of Entire Delivery System, Wellinghoff Says*, ELEC. UTIL. WK., Dec. 13, 2010, at 18–19.

Figure 3: U.S. Transmission Interconnections



2. Renewable Technology Economics Change

In the American economy, price matters. A big change is ushered in through the technological and cost declines of wind and solar photovoltaic ("PV") distributed generation. There has been a radical change in the cost of distributed generation.[45] As a result of declining costs, "since 1999, the Pacific Northwest has installed more than 7,000 megawatts ("MW") of additional wind generating capacity,"[46] which is expected to increase to 14,000 MW by 2020.[47] The cost to install photovoltaic solar panels has fallen dramatically by about 60% in "hard" costs.[48]

PV module prices have experienced a decline from about $1.90/watt in 2009 to $0.70/watt, and lower in some regions of the world.[49] Inverter

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[45] RICKERSON ET AL., *supra* note 28, at 5.

[46] *Administrator's Record of Decision P-1*, BONNEVILLE POWER ADMIN. (Mar. 27, 2014), *available at* http://www.bpa.gov/news/pubs/RecordsofDecision/rod-20140327-OS-14-Oversupply-Rate-Proceeding.pdf [http://perma.cc/9RU8-RTQ9].

[47] Comments of the BPA in FERC Docket No. RM10-11-000 at 1 (April 12, 2010).

[48] *See generally* LION HIRTH, NEON ENERGIEÖKONOMIK, THE MARKET VALUE OF SOLAR POWER: IS PHOTOVOLTAICS COST-COMPETITIVE? (2014), *available at* https://www.mcc-berlin.net/fileadmin/data/pdf/Publikationen/Hirth-2015-Market-Value-Solar-Power-Photovoltaics-Cost-Competitive.pdf [https://perma.cc/4D7M-53TU].

[49] RICKERSON ET AL., *supra* note 28, at 9 (relying on Jade Jones, *Regional PV Module Pricing Dynamics: What You Need to Know*, GREENTECHMEDIA (Nov. 3, 2013), http://www

prices, for the equipment necessary to convert photovoltaic direct current to alternating current, have also declined by more than 60% in cost from $0.60–$1.00+/watt in 2005 to under $0.20/watt in 2013.[50] In the United States, non-hardware "soft" costs for residential systems now account for over 50% of total systems.[51] This has allowed the solar photovoltaic markets to grow at an average of more than 40% each year since 2000[52]:

> As a result of these trends, PV could act as a disruptive technology that challenges the incumbent players in its industry. Many analysts have forecasted that the centralized utility model that has served most of the world for over 100 years could give way to new business operating paradigms.[53]

Since 2008, the price of photovoltaic panels has fallen by 75%, and solar installations have multiplied by 1000%.[54] The costs of renewable energy have declined significantly in recent years, there is distributed energy competition to conventional power supply, and there is a push to make the grid "smarter."[55] One additional rooftop solar system was being installed every four minutes in 2013 in the United States.[56] In the United States, there were more than 300,000 "distributed" solar installations installed in 2012—almost all of which occurred in the forty-three net-metering states.[57]

.greentechmedia.com/articles/read/regional-pv-module-pricing-dynamics-what-you-need-to-know [http://perma.cc/G7K9-BREZ]).

[50] *Id.* (relying on Ian Clover, *IHS Cuts Global Inverter Market Forecast in Face of Dramatic Price Drops*, PV MAG. (Oct. 16, 2013), http://m.pv-magazine.com/news/details/beitrag/ihs-cuts-global-inverter-market-forecast-in-face-of-dramatic-price-drops_100013052/ [http://perma.cc/39ZA-CP9Q]; NAVIGANT CONSULTING INC., NAT'L RENEWABLE ENERGY LAB., A REVIEW OF PV INVERTER TECHNOLOGY COST AND PERFORMANCE PROJECTIONS (2006)).

[51] Costs are $3.34/watt in 2011 in the U.S., compared to $0.62/watt in Germany. RICKERSON ET AL., *supra* note 28, at 72 (relying on Joachim Seel et al., *Why Are Residential PV Prices in Germany So Much Lower Than in the United States?*, LAWRENCE BERKELEY NAT'L LAB. (2013)).

[52] *Id.* at 10.

[53] RICKERSON ET AL., *supra* note 28, at 12.

[54] Than, *supra* note 1.

[55] The model is changing because bond ratings for IOUs are lower now. Ronald Lehr, *New Utility Business Models: Utility and Regulatory Models for the New Era*, 26 ELEC. J. 35, 40 (2013).

[56] Stephen Lacey, *A Solar System Is Installed in the US Every 4 Minutes*, GREENTECH MEDIA (Aug. 19, 2013), http://www.greentechmedia.com/articles/read/america-installs-a-solar-system-every-four-minutes [http://perma.cc/YQ5P-DJDW].

[57] Umair Ifran, *Renewable Energy: Solar, utility companies clash over changes to net metering*, CLIMATEWIRE (Sep. 3, 2013), http://www.eenews.net/stories/1059986606 [http://perma.cc/6U7C-DVJK].

Demand for rooftop solar paired with energy storage systems is predicted to reach $1 billion in the U.S. within four years; approximately 318 MW of solar-storage capacity will be in operation in the U.S. by 2018.[58]

Two-thirds of solar installations in California in 2013 were structured where the homeowner leased the panels, rather than where the homeowner purchased them.[59] Even with prices falling dramatically, the amount of usable power that one can get out of a PV unit is also a function of latitude. Solar insolation ranges from 2.0–2.5 kWh/m2/day in Scandinavia to as much as 6.5–7.0 kWh/m2/day in north-central Africa.[60]

Much of the innovation responsible for the solar industry's explosive growth has been financial rather than technological. Half the solar capacity in the U.S., for instance, was installed just in 2012.[61] Driving those sales was the ability of homeowners to avoid the five-figure cost of a photovoltaic system by leasing it for a monthly payment that often was lower than what they'd pay their local utility.[62] Anywhere between 75 and 90% of all solar systems are now leased as a result.[63] Studies of technical potential have found that rooftop PV could supply 20–40% or more of the total national electricity demand in Europe and the United States.[64]

The sheer amount of solar is impressive, though the 8 gigawatts ("GW") of solar installed in the U.S. today is still less than 1% of U.S. electricity production[65] and less than 2–3% of the market in places where

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[58] Ehren Goossens, *Solar With Batteries Market to Hit $1 Billion In U.S. by 2018*, 46 ENV'T REP. 22 (2014).

[59] Than, *supra* note 1.

[60] RICKERSON ET AL., *supra* note 28, at 27. A 1 kW PV system in Namibia achieves a capacity factor of ~23% and produces about 2000 kWh per year, while a similar-size system in Scandinavia operates at a capacity factor of half this value and produces half as much power output.

[61] *Id.* at 35.

[62] Than, *supra* note 1.

[63] Robert McIntosh, *Americans & Australians May Disagree on Solar Leasing*, ROCKY MOUNTAIN INST. (Aug. 21, 2014), http://www.cleantechnica.com/2014/08/21/americans-australians-may-disagree-solar-leasing/ [http://perma.cc/6H52-PGFP].

[64] RICKERSON ET AL., *supra* note 28, at 35 (relying on A. Lopez et al., *U.S. renewable energy technical potentials: A GIS-based analysis, Nat'l Renewable Energy Lab.* (2012)); Maya Chaudhari et al., *PV Grid Connected Market Potential under a Cost Breakthrough Scenario*, NAVIGANT CONSULTING (2005); International Energy Agency, Photovoltaic Power Systems Programme, Potential for building integrated photovoltaics—Achievable levels of electricity from photovoltaic roofs and facades: Methodology, case studies, rules of thumb and determination of the potential of building integrated-photovoltaics for selected countries, Report IEA-PVPS T7-4, 2002, at Summary; European Photovoltaic Indus. Ass'n & Greenpeace Int'l, Solar generation 6: Solar photovoltaic electricity empowering the world (2011).

[65] PETER KIND, EDISON ELEC. INST., DISRUPTIVE CHALLENGES: FINANCIAL IMPLICATIONS AND STRATEGIC RESPONSES TO A CHANGING RETAIL ELECTRIC BUSINESS 4 (2013), *available*

the market is the most vibrant. An exception is Hawaii, which has a market penetration of PV of approximately 7–10%.[66]

B. *System Exodus Allowed by Law*

The result of distributed generation and its distribution over microgrids is exodus, or partial exodus, of existing customers from the utility grid. Grid exodus could become a viable option for residential systems in Hawaii before 2020, in California by the early 2020s, and in New York by the late 2020s; additional southern latitudes could begin to achieve attractive internal rates of return around 2020.[67] In Hawaii, the rapid rise of distributed PV generation has already overloaded certain distribution lines, resulting in restrictions on new solar PV projects.[68]

Economically viable and financeable microsolar renewable power grid projects are only now just being implemented. Microgrids are still a relatively rare premium product, employed for customers with a critical need for high-quality reliable electricity to be used for national security, public safety, disaster recovery, corporate risk management, and in those remote locations either off the traditional grid or with reliability problems.[69]

Regulated utilities today are generally barred from providing solar photovoltaic units behind the meter on the customers' property to sell to their own customers.[70] Third-party ownership of residential PV systems has been a dominant business model, with third-party ownership constituting

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at http://www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf [http://perma.cc/EY5K-4U9U].

[66] Eric Wesoff, *Hawaii's Utility is Approving a Backlog of More Than 3,000 Solar Installations*, GREENTECHMEDIA (Apr. 19, 2015), http://www.greentechmedia.com/articles/read/Hawaiis-Utility-is-Approving-a-Backlog-of-More-Than-3000-Solar-Installati [http://perma.cc/WW69-NCE9]; DEP'T OF ENERGY, HIGH PENETRATION OF DISTRIBUTED SOLAR PV GENERATION: LESSONS LEARNED FROM HAWAII (2014), *available at* http://www.energy.gov/sites/prod/files/2014/12/f19/1-Champley-DEPresentation-Sep2014.pdf [http://perma.cc/46D8-285M].

[67] RICKERSON ET AL., *supra* note 28, at 18.

[68] *Id.* at 52.

[69] *See generally* ROBERT LIAM DOHN, SIEMENS, THE BUSINESS CASE FOR MICROGRIDS: THE NEW FACE OF ENERGY MODERNIZATION (2011), *available at* http://w3.usa.siemens.com/smartgrid/us/en/microgrid/Documents/The%20business%20case%20for%20microgrids_Siemens%20white%20paper.pdf [http://perma.cc/33WR-FLY8]; *Microgrid Activities*, DEP'T OF ENERGY, http://energy.gov/oe/services/technology-development/smart-grid/role-microgrids-helping-advance-nation-s-energy-syst-0 [http://perma.cc/4GWV-973R] (last visited Oct. 26, 2015).

[70] *See generally* ELEC. ENERGY MARKET COMPETITION TASK FORCE, *infra* note 181.

more than 60% of all residential PV ownership in California, Arizona, and Massachusetts.[71]

Utilities now do not earn a profit on PV distributed generation that others own.[72] Some utilities propose that they be allowed to recover through rate-base solar on customer rooftops—which very few states now permit.[73] Certain utilities are going into solar as a separate unregulated business venture: Dominion Energy recently announced it is divesting its retail business and that it plans to double down on solar with a 250 MW development target by 2016.[74] The New York Public Service Commission ("PSC") is proceeding with a regulatory proceeding to reform the state's energy industry and regulatory practices.[75]

C. *New Industry Architecture*

1. What, Where, When

Foreshadowed is a significant change in energy's economic architecture. Many recent articles discuss the utility business model and how it is changing, and even must change.[76] Some people in the power industry

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[71] GTM RESEARCH & SOLAR ENERGY INDUSTRIES ASSOC., U.S. SOLAR MARKET INSIGHT REPORT: Q2 2013 (2013), *available at* http://www.greentechmedia.com/research/ussmi [http://perma.cc/E726-KAH3].

[72] *See generally* Chuck Ross, *The Energy-Generation Puzzle: What Is The Value Of Rooftop Solar*, ELEC. CONTRACTOR (Dec. 2014), http://www.ecmag.com/section/green-building/energy-generation-puzzle [http://perma.cc/XAA3-GXXZ].

[73] James Tong & Jon Wellinghoff, *Should utilities be allowed to rate base solar? Should we even be asking this question?*, UTILITY DIVE (May 11, 2015), http://www.utilitydive.com/news/tong-wellinghoff-should-utilities-be-allowed-to-rate-base-solar/396283/ [http://perma.cc/DX5Z-ZVUS].

[74] Zacks Equity Research, *Dominion Multiplies Solar Projects*, ZACKS INV. RESEARCH (Apr. 2, 2014), http://www.zacks.com/stock/news/128536/Dominion-Multiplies-Solar-Projects [http://perma.cc/K863-8X4T].

[75] NYS DEP'T OF PUBLIC SERV., REFORMING THE ENERGY VISION 46 (2014), *available at* http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/26be8a93967e604785257cc40066b91a/$FILE/ATTK0J3L.pdf/Reforming%20The%20Energy%20Vision%20(REV)%20REPORT%204.25.%2014.pdf [http://perma.cc/RTC6-MMA4].

[76] *See generally* Lehr, *supra* note 55; Fereidoon P. Sioshansi, *Business Not as Usual: Fine-Tuning Utility Model Won't Do*, 27 ELEC. J. 1, 4–5 (2014); Fereidoon P. Sioshansi, *Why the Time Has Arrived to Rethink the Electric Business Model*, 25 ELEC. J. 65, 65–74 (2012); Tom Tiernan & Herman Wang, *Utility Business Model at 'Inflection Point' as Technology, Smart Grid Change the Game*, ELEC. UTIL. WK., Oct. 8, 2012; John Downey, *Technology Will Change Utility Business Model, Duke Energy Exec Says*, ENERGY INC. (July 15, 2014, 3:55 PM), http://www.bizjournals.com/charlotte/blog/energy/2014/07/technology-will-change

think a transition to the use of decentralized microgrids could be revolutionary.[77] There is a concern that these changes could usher in a new industry architecture, ultimately supplanting the centralized utility grid with a new decentralized, cellular topology.[78] While such a topology is of particular value in developing countries where the centralized grid does not stretch to all consumers, its future impact in the U.S. is still unknown.[79] Adam Browning, executive director of the nonprofit Vote Solar Initiative, stated:

> What we're looking at here is a total potential transformation of the energy business. There's a regulatory compact that gives utilities a monopoly to serve the public good. The public good is a renewable future, and either they adapt to these new realities, or they'll go the way of the dinosaurs.[80]

Some commentators forecast that utilities could become more like phone companies now in a new era of total competition.[81] However, there are important distinctions: there will remain only one set of utility transmission and distribution lines, unlike what we have now with multiple pole attachments of different phone and cable service lines, and wireless phone technology.[82] The distribution technology for power will remain monopolized, and that distribution grid is the most critical component of electricity.

Amid these new pressures, business models must evolve to meet the challenge posed by climate change.[83] The model will change because the fabric of electricity will be composed of more bulk power generation

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-utility-business-model-duke.html [http://perma.cc/P4TB-YCJK]; Davide Savenije, *How New Market Entrants Are Upending the Utility Business Model*, UTILITY DIVE (May 12, 2014), http://www.utilitydive.com/news/how-new-market-entrants-are-upending-the-utility-business-model/261442 [http://perma.cc/Y5SX-QTFW]; Kevin Wedman et al., *The Big Question: What Is the Future Utility Business Model?*, RENEWABLEENERGYWORLD.COM (Dec. 25, 2013), http://www.renewableenergyworld.com/articles/print/volume-16/issue-6/solar-energy/the-big-question-what-is-the-future-utility-business-model.html [http://perma.cc/9TX4-94ZD].

[77] Than, *supra* note 1.

[78] Michael Burr, *Microgrid Milestones*, PUB. UTILS. FORTNIGHTLY (Dec. 19, 2013), http://spark.fortnightly.com/fortnightly/microgrid-milestones [http://perma.cc/UT8M-J5MT].

[79] *Id.*

[80] Than, *supra* note 1.

[81] Lehr, *supra* note 55, at 40.

[82] For more on pole attachment, *see* FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 10:3.

[83] Lehr, *supra* note 55, at 35.

and movement and more distributed generation.[84] The traditional business model for regulated utilities was to sell kilowatt-hours of power. Now a broader range of services must be provided by utilities when they no longer have a monopoly on the supply of power, while managing the electric field carried through wires in America.[85]

Amory Lovins of the Rocky Mountain Institute claims that changing the role of a utility is essentially "turning the utility inside out."[86] Under a decoupled system, utilities become energy-services providers, with energy efficiency being one facet of their service, and not being only merchants of electrons for power.[87] There is a prediction that the new utility business model will focus on "outputs" rather than "inputs" in utility regulation, although the devil is in the details.[88]

Some forecast that under new business models, utilities would become neutral managers of grid infrastructure, brokers of new customer relationships, partners with service providers, or financiers of infrastructure.[89] A study for the International Energy Agency ("IEA") forecasts a new era of "prosumers,"[90] who will develop their own PV solar power on-site, with a resulting decentralization of electric supply internationally to "evolutionize the utility sector just as personal computers and cell phones changed their respective industries."[91]

With substantial on-site generation, utilities will earn less profit on the generation and supply components of electricity. This utility revenue

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[84] *Id.* at 37.

[85] *See infra* Part IV.A.

[86] Katherine Ling, *Rising Temps Melt Electric Utilities' Business Models*, N.Y. TIMES (Sept. 10, 2009), http://www.nytimes.com/gwire/2009/09/10/10greenwire-rising-temps-melt-electric-utilities-business-72148.html [http://perma.cc/T6WF-B2HM].

[87] *See id.* (quoting David Owens, Executive Vice President of Business Operations at the Edison Electric Institute: "The utility will not be a passive entity as it is today. . . . Folks believe a utility exists to sell kilowatt-hours; that is not going to be the model of the future. The model of the future is 'Let me look at how I can improve efficiency, how I can reduce greenhouse gas emissions.' That is what the utility is going to be focused on.").

[88] Lehr, *supra* note 55, at 50. Inputs are easily quantifiable in the form of costs of utility operation; outputs are more subjective elements.

[89] *See, e.g.*, L. BIRD ET AL., NAT'L RENEWABLE ENERGY LAB., REGULATORY CONSIDERATIONS ASSOCIATED WITH THE EXPANDED ADOPTION OF DISTRIBUTED SOLAR (2013), *available at* http://www.nrel.gov/docs/fy14osti/60613.pdf [https://perma.cc/45WM-CAS2]; JAMES NEWCOMB ET AL., ELEC. INNOVATION LAB., NEW BUSINESS MODELS FOR THE DISTRIBUTION EDGE 15 (2013).

[90] RICKERSON ET AL., *supra* note 28, at 13 ("Some studies have also recently suggested that a more robust definition of electricity prosumers would also incorporate elements such as the ability to react to dynamic pricing, the use of demand response, and integration with smart grid infrastructure.").

[91] *Id.*

erosion affects utility credit quality, increasing its cost of attracting needed capital and system investments. Amid this ongoing evolution of the industry, Tong and Wellinghoff write that current regulations leave the utilities with only two business strategies: (1) ". . . do nothing and lose their best customers," or (2) "'compete' against solar by making it less attractive."[92]

Most utilities are not against solar as a power generation technology, but are concerned with their grids being used for decentralized distribution power facilitation, which reduces the utility role as generators of power.[93] There is also concern about how a partial or total exodus from the grid by those with distributed generation undercuts the current utility business model. There are large fixed infrastructure costs for generation, transmission, and distribution networks.

Electricity consumers typically are charged for electric service as a variable function of the quantity of power purchased rather than through fixed costs.[94] With an exodus of customers, fixed utility grid costs are allocated over a smaller volume of retail sales to remaining customers, increasing costs for each unit of power.[95] This revenue erosion affects utility credit quality, increasing its cost of attracting needed capital for system investments and increasing the total costs of the system.

2. Distributed Generation—Netting Costs and Benefits

Under the current utility system, the motivation for self-generation is, in significant part, regulatory cost avoidance. While self-generation of power from smaller fossil-fired units typically is more expensive and has greater environmental impacts per kWh generated compared to similar-fuel larger units, distributed generation achieves avoidances of imposed regulatory costs:

- The generator avoids all transmission, distribution, system benefit charge, and tax costs in the retail bill

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[92] James Tong & Jon Wellinghoff, *Rooftop Parity*, PUB. UTILS. FORTNIGHTLY (Aug. 14, 2014), http://www.fortnightly.com/fortnightly/2014/08/rooftop-parity?page=0%2C1&authkey=694f9b6d88b73bb34af7a1dfe32592897cf7300b810bfb7d7d2030eab37ffed0 [http://perma.cc/U29B-KCGV].

[93] RICKERSON ET AL., *supra* note 28, at 48.

[94] *Id.*

[95] Jeff McMahon, *Steven Chu Solves Utility Companies' Death Spiral*, FORBES (Mar. 21, 2014), http://onforb.es/1iK959N [http://perma.cc/4453-AP8F]; Herman K. Trabish, *California PUC President: The Utility Death Spiral Is 'Last Year's Hype,'* GREENTECHMEDIA (Jan. 29, 2014), http://www.greentechmedia.com/articles/read/The-Utility-Death-Spiral-is-Last-Years-Hype-California-PUC-President [http://perma.cc/KTN2-H8WD].

for the amount generated, which avoided fractions collectively typically constitute as much as up to half, and in some cases more, of the retail bill.[96]

- The generator can receive a suite of cross-subsidies in the form of RECs, net-metering credit value, system benefit charges, carbon credits; in Massachusetts, as one example, these are collectively worth up to 1000% more than the value of power produced itself.[97]

a. Renewable Power Benefits to the Grid

Distributed generation creates benefits for the larger energy system: generating power on-site avoids energy loss experience by power traveling over the transmission and distribution grid and can defer costs otherwise necessary for distribution and transmission capacity upgrade modifications.[98] A value-of-solar tariff has previously been developed by the municipal utility in Austin, Texas, for residential PV.[99] Additional deployment of renewable energy resources has measurable significant positive public externalities:

- increasing power system reliability with more independent points of generation;[100]
- creating a reliable and appropriately more-mixed generation supply diversity for the electric power system;[101]
- putting less pressure on the use of the aging power distribution system by utilizing on-site private power

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[96] *See* JIM KENNERLY ET AL., RETHINKING STANDBY & FIXED COST CHARGES 37 (NC Clean Energy Technology Center 2014), http://www.solaroutreach.org/wp-content/uploads/2014/08/Rethinking-standby-and-Fixed-Cost-charges_FINAL.pdf [http://perma.cc/8RN4-Z2N8].
[97] *See* MASSACHUSETTS NET METERING AND SOLAR TASK FORCE, SOLAR INCENTIVE POLICY SUMMARIES 3, http://www.mass.gov/eea/docs/doer/renewables/task-1-report.pdf [http://perma.cc/T263-JML6].
[98] RICKERSON ET AL., *supra* note 28, at 44. Most countries in North America and Europe experience T&D losses of 4–8%. *Id.*
[99] Karl Rábago, *Designing Austin Energy's Solar Tariff Using A Distributed PV Value Calculator*, CLEAN POWER RESEARCH, 1 (2012), http://www.cleanpower.com/wp-content/uploads/090_DesigningAustinEnergysSolarTariff.pdf [http://perma.cc/5K3N-24LW].
[100] *See Distributed Energy Basics*, NAT'L RENEWABLE ENERGY LABS (July 6, 2013, 7:37 PM), http://www.democraticunderground.com/112748526 [http://perma.cc/6BKA-BCAL].
[101] *Id.*

rather than moving more power through the regulated power distribution system;[102]

- 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,[103] although this is dependent on a case-by-case locational determination of power flow.[104]

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.[105] This is 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 kWh.[106] In addition to these values to the utility system, articles note that there are other societal, environmental, and health benefits, jobs, and grid security, which increase the cumulative total by an estimated 50%.[107]

b. Grid Costs

Financial incentives can cause renewable energy to be implemented at "light speed." Massachusetts's RPS carve-out was originally designed in 2012 to try to reach 250 Mw of solar photovoltaic technology installations

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[102] *See* Steve Ehrlich, *Transforming into the Digital Utility: Six Steps to Implementing Effective Asset Analytics*, ENERGY CENTRAL (Oct. 14, 2014), http://www.energycentral.com/utilitybusiness/riskandoperations/articles/3010/Transforming-into-the-Digital-Utility-Six-Steps-to-Implementing-Effective-Asset-Analytics/ [http://perma.cc/M28W-GD3S].

[103] Edward Kahn, *Avoidable Transmission Cost Is a Substantial Benefit of Solar PV*, 21 ELEC. J. 41, 45 (2008).

[104] 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 27, at 10.

[105] 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, LAW OF INDEPENDENT POWER, *supra* note 33, at § 10:144 n.29.

[106] *Id.*

[107] Perez et al., *supra* note 105, at 7293.

by 2017.[108] 400 Mw were successfully implemented by 2013, with generous Massachusetts incentives.[109] The state argues that "[t]he mechanism does not burden the Commonwealth with financial liability."[110] While financial incentives might not burden the Commonwealth as a directly paying party, it is not without a cost that must be paid. The subsidies must be funded from some source. These utility-administered subsidies come from ratepayers, rather than the tax base.[111]

Once a state quantifies that positive or negative benefit of any particular distributed generation for the system, those benefits and costs should be reflected in system costs paid by ratepayers. There are real costs associated with necessarily greater amounts of spinning reserve, ramping-up of fossil-fuel power to compensate for renewable intermittency, and back-up power, which impose additional costs on maintenance for system reliability that were not there before.[112] The current practice in almost all states has not been based on these key facts. Subsidies for distributed generation have been randomly provided in many states rather than based on any quantification of net costs and benefits to the grid.[113]

The price impact of RPS-mandated renewable energy projects has been estimated to range between a 0.1% increase in retail rates (in Maine, Maryland, New Jersey, and New York) to up to 1.1% retail rate impact in Massachusetts.[114] In the 2004 ruling by an Administrative Law Judge of the New York Public Service Commission, it was concluded that this renewable portfolio standard "would raise residential rates by 1.8%, commercial by 2% and industrial by 2.4%."[115] It would cut statewide

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[108] Mark Del Franco, *Massachusetts Revising SREC Program To Promote Healthy Solar Growth*, SOLAR INDUS. (Jan. 9, 2014), http://www.solarindustrymag.com/e107_plugins/content/content.php?content.13669 [http://perma.cc/K2MV-8M5B].

[109] *Renewable Energy in Massachusetts*, AM. COUNCIL ON RENEWABLE ENERGY (June 2014), http://www.acore.org/files/pdfs/states/Massachusetts.pdf [http://perma.cc/5FUR-Z8RX].

[110] MASSACHUSETTS DEP'T OF ENERGY RESOURCES, MA RPS SOLAR CARVE-OUT PRICE SUPPORT MECHANISM: PROGRAM DESIGN AND ANALYSIS DOCUMENT 1 (2009), http://www.mass.gov/eea/docs/doer/renewables/solar/ma-rps-solar-carve-out-price-support-mechanism-design-document-102309-doer.pdf [http://perma.cc/5QNN-DZ9H]. The stated goal of the Massachusetts RPS is to "require sufficient rate of return for end users, as well as project investors . . . without the need for contracts with utility companies." *Id.*

[111] Halper et al., *supra* note 27.

[112] *See infra* Part IV.B.

[113] Halper et al., *supra* note 27.

[114] Ryan Wiser et al., *The Experience with Renewable Portfolio Standards in the United States*, 20 ELEC. J. 8, 16 at Fig. 4 (2007) (demonstrating an impact of not more than approximately one percent is forecast to be the cost of this implementation).

[115] *N.Y. ALJ Recommends Renewable Standard Reaching 25% by 2013, with Old Hydro,*

emissions of NOx by 6.8%, sulfur dioxide by 5.9%, and CO_2 by 7.7%.[116] New Jersey utility ratepayers already have paid $388 million in rebates and other financial incentives for programs "to promote solar panels, wind projects, and other renewable energy initiatives."[117] The New Jersey Division of Rate Counsel head asked for a more transparent pricing scheme for these incentives.[118]

Satisfying the California goal of having 33% of electricity supplied by renewable resources by 2020 is estimated by the California PUC to require the expenditure of approximately $115 billion.[119] According to PUC member, John Bohn, there should be more honesty about these facts and costs.[120] An article questioned the taxpayer and ratepayer subsidies concealed within California's push for a quick ramp-up of solar energy generation:

> Stanford University economist Frank Wolak, an expert in the California electricity market, said the state's renewable energy strategy could boost electricity rates 10% to 20%, depending on a number of factors. Potentially, consumers' bills could go up by 50%: 'It is easily in the billions of dollars,' he said.[121]

California in late 2015 increased the requirement of 33% renewable power by 2020 to also include 50% renewable power use by 2050. Even renewable-energy advocates, such as the Bay Area–based Climate Policy Initiative, estimates:

ELEC. UTIL. WK., June 7, 2004, at 7. The ruling also envisions a trading system of renewable energy credits.

[116] *Id.*

[117] Tom Johnson, *What Does It Really Cost Utility Customers to Subsidize Clean Energy?*, NEW JERSEY SPOTLIGHT (Oct. 8, 2013), http://www.njspotlight.com/stories/13/10/07/what-does-it-really-cost-utility-customers-to-subsidize-clean-energy/ [http://perma.cc/D8Q7-N4YC]. This does not include two more recent market-based solar programs funded by subsidies on customer utility bills, which in 2012 raised $309 million. *Id.* "We don't know exactly what the cost is," conceded New Jersey Division of Rate Counsel Director Stefanie Brand, who has been a proponent of bringing more transparency to the process. "It's good for the public to know what they are paying." *Id.*

[118] *Id.*

[119] Lisa Weinzimmer & Lynn Corum, *California Challenge Looks Bigger and Bigger Among Economic Woes*, ELEC. UTIL. WK., January 18, 2010, at 1.

[120] *Id.*

[121] Halper et al., *supra* note 27.

> that 43 cents of every dollar of energy produced by the Ivanpah facility will be paid for by taxpayers. . . . But outside experts, including Wolak, the Stanford economist, estimate that Ivanpah power is priced at $90 to $130 per megawatt hour—three to four times the cost of electricity in the state last year. . . . Powers estimated the cost of new transmission lines to reach remote solar and wind power plants could exceed $15 billion statewide in the next decade. Upgrading existing transmission lines would add billions more, he said.[122]

The California PUC Division of Ratepayer Advocates criticized the rapid escalation in California ratepayer costs to achieve the RPS mandate.[123] The cost of RPS compliance exceeded the cost of the power itself.[124] The California Division of Ratepayer Advocates reported "that the California Public Utilities Commission has 'approved nearly every renewable contract filed by the utilities, even when they rate poorly on least-cost, best-fit criteria.'"[125]

> The [California] PUC . . . has greenlighted all but two of 184 green-energy proposals since 2002 . . . . The state Division of Ratepayer Advocates, whose purpose is to represent consumers, concluded in a report last year [2011] that the power contracts the PUC has been approving have put consumers on the hook for $6 billion in excess costs. 'What the commission's practice has been is not to consider the cost of renewable power but to approve every renewable project that came before them,' said Joe Como, acting director of the division. 'We really spent too much money. It's frustrating as hell.'[126]

One commentator has noted that "many advocates of alternative energy . . . heap acclaim on feed-in tariffs, with one observer declaring them

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[122] *Id.*
[123] Geoffrey Craig, *Renewable Costs of California's Three Big Utilities Soared Last Year, CPUC Data Shows*, ELEC. UTIL. WK., Feb. 13, 2012, at 18.
[124] *Id.*
[125] *California's Coming Green-Outs: The Wind and Solar Mandate Means Future Power Shortages*, WALL ST. J. (Mar. 29, 2013), http://www.wsj.com/articles/SB10001424127887324582804578344500414630778 [http://perma.cc/RT6L-JVYW].
[126] Halper et al., *supra* note 27.

simply 'fabulous.'"[127] "The line of scholars, analysts, and advocates rushing to say that feed-in tariffs are better [than other mechanisms] is not a short one."[128] However, feed-in tariffs ("FiTs") have not been seamless in practice. Problems highlighted with FiTs have been:

- the longterm expense of FiTs;
- windfall profits realized by project developers;
- inequity between well-off citizens with distributed generation compared to lower-income citizens.[129]

United States RPS state programs have been criticized as to the invisible cost impact of RPS imposed on captive retail utility ratepayers.[130] The California PUC Division of Ratepayer Advocates criticized the rapid escalation in California ratepayer costs to achieve the state RPS mandate;[131] the cost of RPS compliance exceeded the cost of the power itself.[132]

Next, we examine RPS, net metering, and other regulatory techniques that underlie and are essential components of the accelerating change to a new model for distributing power.

III. MORPHING THE MODEL: DISTRIBUTED GENERATION INCENTIVES PROVIDED BY UTILITIES UNDER STATE REGULATORY ORDER

The states have undertaken most renewable energy policy initiatives in the past two decades, sculpting sustainable energy policy around five legal and policy initiatives:

- net metering (in 85% of states);
- renewable portfolio standards (in 65% of states);
- renewable System Benefit Charges (in 33% of states);
- carbon and GHG regulation (in 20% of states);
- Feed-in Tariffs (in 10% of states).[133]

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[127] Lincoln Davies & Kirsten Allen, *Feed-In Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 939 (2014).
[128] *Id.*
[129] *Id.* at 941.
[130] Tiernan, *supra* note 27, at 10.
[131] Craig, *supra* note 123, at 18.
[132] *Id.*
[133] Steven Ferrey, *Solving The Multimillion Dollar Constitutional Puzzle Surrounding State "Sustainable" Energy Policy*, 49 WAKE FOREST L. REV. 121, 122 at Table 1 (2014).

Each of these can be a powerful stimulant to sustainable renewable energy deployment in a market economy. Each provides a financial inflow at either the point of project construction or generation of renewable electric power. The state acts as a regulator and never owns the renewable power generation capital equipment nor itself transacts any sale of the power produced. Each of these state measures torques the operation of the electric energy market through regulation. And it is this action as a regulator, rather than a market participant, which raises constitutional issues with discriminatory state renewable energy initiatives.[134]

A. *State Electricity Incentives, Cross-Subsidies, and the Supremacy Clause*

1. Feed-in Tariffs

A FiT is a regulatory requirement imposed by some states on their regulated utilities to purchase certain designated types of independent power generation on a wholesale basis, typically from renewable resources or combined heat and power ("CHP") units, at prices well in excess of the market value of wholesale power.[135] The regulated utilities are forced to "buy high" in terms of other electric power available in the market.[136] 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 utility-incurred costs.[137] Costs of a FiT are passed on to retail consumers by the utilities.[138]

Despite a series of lawsuits and accessible articles in both the technical and general press,[139] advocates for renewable power are still urging

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[134] *See* FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 162–64 (examining the market participant exception).

[135] FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 10:134.

[136] Electric power in the Northeast has been available at an average price during the past years of $0.05/kWh or less. *See generally Electric Power Annual 2013*, U.S. ENERGY INFO. ADMIN. (Dec. 6, 2013), http://www.eia.gov/electricity/annual/pdf/epa.pdf [http://perma.cc/585L-CC92] (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 less than 15 kW at $0.20/kWh, for wind greater than 15 kW at $0.125/kWh, and for solar generation at $0.30/kWh. *Id.*

[137] FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 5:9.

[138] *Id.* § 10:134.

[139] *See* Steven Ferrey, Chad Laurent & Cameron Ferrey, *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 DUKE ENVTL. L. & POL'Y J. 125 (2010); Steven Ferrey, Chad Laurent & Cameron Ferrey, *FiT*

states to adopt FiTs in the U.S., despite the fact that they are unconstitutional when adopted at the state level:

> Feed-in tariffs are the alternative to net-metering and their time has come. FITs have been likened to PURPA on steroids and they are as American as apple pie. It was a crude feed-in tariff that launched renewable energy in California during the early 1980s. In that program, you could connect your biomass, wind, or solar plant to the grid, get paid a fixed-price for ten years, and then get paid a floating price for another twenty. And it worked—spectacularly.[140]

What is not mentioned is that the federal courts and FERC separately struck such FiTs in California before those 20 years were up.[141] After having been scolded by both the 9th Circuit Court of Appeals and FERC in the mid-1990s,[142] California tried the same already-stricken regulatory action fifteen years later. After enacting a feed-in tariff requiring California state utilities to make wholesale power purchases at well in excess of wholesale rates for power and in excess of avoided costs, there was a challenge at the FERC as to whether this violated the Federal Power Act and the Supremacy Clause of the United States' Constitution.[143] California argued that its environmental purpose for regulation should make it exempt from preemption in setting above-market wholesale feed-in renewable tariff rates for cogeneration facilities of less than 20 Mw and that environmental costs could be considered to inflate avoided costs.[144] The affected utilities and others countered that federal law does not allow

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in the U.S.A., PUB. UTIL. FORTNIGHTLY (June 2010); 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); Steven Ferrey, *Goblets of Fire: State Programs on Global Warming and the Constitution*, 35 ECOLOGY L.Q. 835 (2009); Steven Ferrey, *Shaping American Power: Federal Preemption and Technological Change*, 11 VA. ENVTL. L.J. 47 (1991); Brian Potts, *Regulating Greenhouse Gas "Leakage": How California Can Evade the Impending Constitutional Attacks*, ELEC. J., 43–44 (2006) ("because of these two Constitutional issues, courts are likely to strike down many or all of their proposals").

[140] Paul Gipe, *Time to Break Free of Net-Metering; We Need a 'FiT' Policy for Renewable Energy to Soar*, NAT'L GEOGRAPHIC, Dec. 26, 2013, http://energyblog.nationalgeographic.com/2013/12/26/break-free-net-metering/ [https://perma.cc/manage/vest/9AWF-4MMH].

[141] Indep. Energy Producers Ass'n v. Cal. Pub. Utils. Comm'n, 36 F.3d 848, 853 (9th Cir. 1994); S. Cal. Edison Co., 70 FERC ¶ 61,215 (1995).

[142] Indep. Energy Producers Ass'n, 36 F3d at 853; S. Cal. Edison Co. 70 FERC at 61,215.

[143] *In re* Cal. Pub. Utils. Comm'n, 132 FERC ¶ 61,047 (2010).

[144] *Id.*

state regulation of wholesale sales to achieve state environmental goals, that federal preemption cannot be avoided based on an environmental purpose of the preempted state regulation, and that states may not under the guise of environmental regulation adopt an economic regulation that requires purchases of electricity at a wholesale price outside the framework of the Federal Power Act, or if acting under PURPA, at a price that exceeds avoided cost.[145]

FERC did not agree with state feed-in tariffs, and held that wholesale generators can receive no more than system-wide avoided cost for power sales:

> even if a QF has been exempted pursuant to the Commission's regulations from the ratemaking provisions of the Federal Power Act, a state still cannot impose a ratemaking regime inconsistent with the requirements of PURPA and this Commission's regulations—i.e., a state cannot impose rates in excess of avoided cost.[146]

When FERC rejected all of California's arguments regarding generic environmental rationales for wholesale rates in excess of limits under federal law or as set by FERC,[147] California made unsuccessful and somewhat unusual assertions in its legal defense[148]:

- Past Constitutional principles in California precedent no longer apply to it because California's innovative purpose was to target global warming;
- Ordering its utilities to *offer* to buy power at illegally impermissible rates is not the same as ordering them to actually buy that power.

California was not successful arguing that it was regulating only the buyers of power and not the sellers of power in the transaction.[149] The California Attorney General argued that mandating that regulated utilities only "offer" to purchase wholesale power at substantially above wholesale

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[145] *Id.*
[146] *Id.* ¶ 66.
[147] *Id.*
[148] *See In re* Cal. Pub. Utils. Comm'n, 133 FERC ¶ 61,059 (2010).
[149] Teresa Morton & Jeffrey Peabody, *Feed-in Tariffs: Misfits in the Federal and State Regulatory Regime?*, 23 ELEC. J. 17 (Oct. 2010).

market rates is different from a requirement to actually "purchase" the sold power.[150] This argument was held unpersuasive by FERC.[151] It held that FERC's authority under the Federal Power Act includes the exclusive jurisdiction to regulate the rates, terms and conditions of sales for resale of electric energy in interstate commerce.[152]

California argued that its environmentally beneficial purposes should make it exempt from preemption in setting non-market-conforming wholesale rates for a state FiT.[153] FERC found state purpose to not permit illegal establishment of FiTs requiring purchases of electricity at inflated wholesale prices,[154] and renewable wholesale generators could receive no more than fair wholesale market prices under federal law.[155] FERC reiterated that only the federal government can regulate commerce between the states, and California cannot attempt to regulate commerce outside its borders.[156] California was preempted pursuant to the Supremacy Clause.

2. Net Metering

Net metering is allowed in 43 U.S. states. How it operates is straightforward technically, although somewhat controversial legally and in terms of regulatory precedent regarding how rates are established. With net metering, power passes in two, rather than one, direction(s) through the retail power meter. As with conventional power supply, during times when the retail customer needs additional electricity from the distribution utility, the meter runs forward conventionally. At other times, when more electricity is produced from the customer's distributed renewable energy facility than is consumed by the customer, the excess is exported to the electricity grid, running the meter in reverse direction.[157] When

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[150] *In re* Cal. Pub. Utils. Comm'n, 133 FERC ¶ 61,059, 72 (2010).
[151] *Id.*
[152] 16 U.S.C. §§ 824, 824(d), 824(e) (2006); *see, e.g.*, Miss. Power & Light Co. v. Miss. *ex rel.* Moore, 487 U.S. 354 (1988).
[153] *In re* Cal. Pub. Utils. Comm'n, 132 FERC ¶ 61,047 (2010).
[154] *Id.* ¶¶ 17–18. FERC rejected all of California's arguments regarding generic environmental rationales for wholesale rates in excess of limits under federal law or set by FERC. *Id.*
[155] *In re* Cal. Public Utils. Comm'n, 133 FERC ¶ 61,059, 72 (2010).
[156] *Id.*
[157] *See Glossary*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/support/glossary/ [http://perma.cc/DQ6L-ZWFE] ("When a customer's generation exceeds the customer's use, electricity from the customer flows back to the

turning the meter in reverse direction, the single rate at which the state has the meter register affords a value at the full retail rate, which includes approximately half of the retail rate attributable to transmission, distribution, and taxes.[158]

In essence, it receives for that power an amount that could be above the utility's avoided cost, and reflects distribution investments made by the utility, not the QF. Net metering is not designed to be a fair price based on rate-making law, it is a random price generally equal to the retail price, which has no direct correspondence to the value of wholesale power traded in the market. It adopts a retail price already determined in other tariffs, but bearing no relationship to the wholesale markets in which this power transaction actually occurs. It is wholly divorced from rate-making principles, ignoring that the net-metering customer uses the distribution grid twice (going and coming) and is assessed no fee, as if it does not use the grid at all. Convenience of a numeric retail value existing, does not justify its use for different wholesale purposes.

Associated Industries of Massachusetts ("AIM") voiced concern about the Massachusetts plan to further green technologies, which it claimed could cost billions for wind and solar power subsidies over just one decade.[159] AIM estimated that the cost could be $800 million annually, an increase of almost 30% in distribution charges.[160] In addition, $10 billion of subsidies could be distributed to the sector according to AIM.[161] Massachusetts had the third highest electric costs in the country prior to any of these subsidies. Utility National Grid was already seeking distribution rate increases of 18% in 2009.[162]

If there were two meters to register the amount of power transferred in each direction to and from the electric grid, each could register the appropriate value of power delivered to the customer and the value

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grid, offsetting electricity consumed by the customer at a different time during the same billing cycle.").

[158] *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 FERREY, THE NEW RULES, *supra* note 10, at 211–31 (2000).

[159] Martin LaMonica, *Cape Wind agrees to reduce cost of offshore wind*, Aug. 2, 2010, *available at* http://perma.cc/8969-CAU7; *and* letter from Robert A. Rio, Senior Vice President and Counsel, Associated Industries of Massachusetts, to Ms. Susan Leavitt, Department of Energy Resources, *available at* http://www.mass.gov/eea/docs/doer/renewables/solar/aim-robert-rio.pdf [http://perma.cc/N4NT-FAP4].

[160] *Id.*

[161] *Id.*

[162] *Id.*

of power received from the customer. Net metering does not separately apply to the actual value or correct rate to the power received by the grid or reflect rate-making precedent.[163] No two of the forty-three state net-metering programs are identical. They differ in key factors of allowable sizes of distributed renewable power generation units, the shelf life and longevity of credits earned, the ability to monetize credits, eligible customers, and technologies.[164]

The most distinct element of electricity often is overlooked: electricity, contrary to all other forms of energy, is not capable of being stored efficiently as electricity is automatically converted to waste heat.[165] The amount of electricity supplied at each instant must match the load (the demand for electricity) in the centralized utility grid or the electric system shuts down or expensive equipment is damaged.[166]

Case precedent has permitted, but also potentially narrowed, what net metering is within state legal authority. FERC determined in *MidAmerican*[167] that state net-metering programs were not preempted by the Federal Power Act in that no sale occurs when net metering accounts for less power export from the distributed energy customer to the grid than the amount of power sold from the grid to the distributed generator.[168] In the subsequent *Sun Edison*[169] precedent, FERC determined that the Commission is not required by the Federal Power Act to exert jurisdiction over the transfer of power if there is no *net* transfer of power to the utility during a billing period.[170] The direction of net power flow is the

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[163] 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 OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, *supra* note 157 (providing a definition of "net metering").

[164] *See Rules, Regulations & Policies for Renewable Energy*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/summarytables/rrpre.cfm [http://perma.cc/8DAY-7GBQ] (allowing users to click on each state's net-metering policy to view the specific rules and regulations of that policy) (last visited Oct. 26, 2015).

[165] *See infra* Part IV.B; *see also* FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 542 (describing inability to store electricity).

[166] STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX: KEY CHOICES FOR CARBON RESTRICTION AND SEQUESTRATION 149 (2010) (describing how the electric system operates).

[167] MidAmerican Energy Co., 94 FERC ¶ 61,340 (2001).

[168] *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 "Alternate Energy 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.*

[169] Sun Edison L.L.C., 129 FERC ¶ 61,146 (2009).

[170] *Id.* ¶ 61,620.

critical variable: these precedents construed, and are predicated on, the technical reality that there be no net export of electricity compared to the purchase of power from the utility within a billing period.[171] Both legal decisions limited their legal findings only to a set of facts where there was no net flow of power back to the power grid.

There was a challenge to net metering involving a wind generator in Rhode Island in which virtually 100% of net power produced by the distributed generator flowed back to the grid and was transferred to the utility.[172] The suit challenged whether the generator thus became an independent wholesale generator which could be paid no more than the avoided cost afforded to Qualifying Facilities under the Public Utility Regulatory Policies Act ("PURPA").[173] Instead, the net metered rate set a value approximately 300% of the wholesale avoided cost value.[174] The Rhode Island Division of Public Utilities and Carriers Advocacy Unit supported this complaint against the net-metering rule in Rhode Island.[175] In response to the suit, the state altered key definitions in its state net-metering law to allow the school which had the wind project to reallocate its net-metering credits to several municipal accounts, which allowed dismissal of the suit.[176]

The Federal Power Act provides that 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."[177] Supreme Court precedent holds that Congress meant to draw a "bright line," easily ascertained and not requiring any fact-specific case-by-case analysis or exceptions between state and federal jurisdiction.[178] A federal trial court decision, affirmed by the Second Circuit, ruled that state regulation of in-state wholesale power preferences and sales violated the

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[171] *Id.*

[172] *In re* Complaint by Benjamin Riggs Relating to Net-metering at the Town of Portsmouth Wind Generator Facility and Nat'l Grid–Electric, No. D-10-126 (R.I. Div. Pub. Util. & Carriers Oct. 13, 2011), *available at* http://www.ripuc.org/eventsactions /docket/D-10-126 -Riggs-Portsmouth-Ord20510(10-13-11).pdf [http://perma.cc/92KX-4JJM] (report and order).

[173] *See* 16 U.S.C. § 824a-3(e) (2006) (explaining that Qualifying Facilities are exempt from certain costs).

[174] 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), *available at* http://www.ripuc.org/eventsactions/docket/4268-PublicComments -Riggs(8-2-11).pdf [http://perma.cc/V7NS-BRQ5].

[175] Portsmouth Net-metering, *supra* note 172, at 19–20.

[176] Riggs Memorandum, *supra* note 174, at 1–2.

[177] New England Power Co., 455 U.S. at 340.

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

Federal Power Act and the U.S. Constitution.[179] 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)).[180]

An increasingly larger majority of U.S. power now proceeds through a wholesale power sale prior to its ultimate retail sale and disposition,[181] thereby fundamentally altering the legal analysis of what is and is not now jurisdictional for a state and the federal government to regulate.[182]

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[179] 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).

[180] *Id.* at 233 (second alteration in original) (parallel citations omitted).

[181] "In the 1970s, vertically integrated utility companies (investor-owned, municipal, or cooperative utilities) controlled over 95% of the electric generation in the United States . . . by 2004 electric utilities owned less than 60% of electric generating capacity. Increasingly, decisions affecting retail customers and electricity rates are split among federal, state, and new private, regional entities." ELEC. ENERGY MARKET COMPETITION TASK FORCE, REPORT TO CONGRESS ON COMPETITION IN WHOLESALE AND RETAIL MARKETS FOR ELECTRIC ENERGY 10, *available at* http://www.ferc.gov/legal/fed-sta/ene-pol-act/epact-final-rpt.pdf [http://perma.cc/5SZY-N79U].

[182] FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at §§ 5-26 through 5-28; FERREY, EXAMPLES AND EXPLANATIONS, *supra* note 35, at 560–61.

B. *State Distributed Power Incentives and the Commerce Clause*

1. State Renewable Portfolio Standards

A resource portfolio requirement requires certain electricity sellers and buyers to maintain evidence of a predetermined percentage of designated clean resources in their wholesale electric supply mixes.[183] Generators of PV power can make direct bilateral sales of their SRECs to retail suppliers of power, which will have to purchase enough SRECs each year to equal the required percentage of power generation set by the state. RPS programs have been characterized as a form of 'backdoor' renewable subsidies.[184] Twenty-nine states and the District of Columbia have RPS.[185] It is estimated that 45% of the 4300 MW of wind power installed in the U.S. between 2001 and 2004 was motivated by state renewable portfolio standards, while an additional 15% of these installations were motivated by state renewable energy trust funds and subsidies.[186] The current RPS standards are projected to add 76,750 MW of additional renewable generation by 2025.[187]

Renewable Portfolio Standards in the 29 states vary significantly. The state percentage of renewable energy delivered annually to consumers from eligible renewable energy sources, the definition of which varies in each state, ranges from a few percent to 40% of annual retail sales.[188]

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[183] The resources such as renewables, DSM, or high efficiency fossil combustion, as defined by a particular state, would be included in the company's overall resource portfolio. Portfolio requirements can be applied to electricity sellers, such as generation companies and vertically integrated utilities as a condition of continued market access. The requirements could also be applied to wholesale electricity buyers, such as distribution companies and electricity brokers, but the states do not exercise authority over wholesale markets.

[184] Robert Glennon & Andrew M. Reeves, *Solar Energy's Cloudy Future*, 1 ARIZ. J. ENVTL. L. & POL'Y 93, 106 (2010).

[185] *See Renewable Portfolio Standard Policies: March 2013*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf [http://perma.cc/ZH4F-F7HU].

[186] Ryan Wiser & Mark Bollinger, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, 19 ELEC. J. 48, 48 (2006).

[187] Brad Plumer, *The Biggest Fight Over Renewable Energy is Now in the States*, WASH. POST, Mar. 25, 2013, http://www.washingtonpost.com/news/wonkblog/wp/2013/03/25/the-biggest-fights-over-renewable-energy-are-now-happening-in-the-states/ [http://perma.cc/YKA4-YMLV].

[188] *See Indiana: Incentives / Policies for Renewable Energy*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://programs.dsireusa.org/system/program?state=IN [http://perma.cc/G5PH-4LVG] (showing 4% as Indiana's required state percentage of energy delivered to consumers from eligible renewable sources); *Hawaii Incentives / Policies for Renewable Energy*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY,

So-called solar carve-out RPS requirements in eleven states and Washington, D.C., require solar power distributed generation percentages in addition to other renewable power requirements.[189] Massachusetts' RPS carve-out was originally designed to try to reach 250 MW of solar photovoltaic technology installation by 2017.[190] Four hundred MW were achieved by 2013, with generous Massachusetts incentives.

Several states also reward rebates to customers who install solar systems.[191] Non-compliance penalties vary in each state.[192] The non-compliance penalty can range from around $.06/kWh in California, Connecticut, Washington, and Massachusetts, and lower amounts in other states (although New Jersey and New Hampshire have equally high penalties for non-compliance with Class I emissions).[193]

The cost of acquiring the required RECs is passed on to captive retail power consumers.[194] The California Public Utility Commission ("PUC") Division of Ratepayer Advocates criticized the rapid escalation in California ratepayer costs to achieve the RPS mandate.[195] The cost of RPS compliance exceeded the cost of the power itself.[196]

A number of states have enacted RPS law which treats renewable energy created in the state or immediate geographic region preferentially to renewable energy generated in other states. This raises significant constitutional issues.[197] A number of states prohibit or disadvantage the REC credit for out-of-state or out-of-region generation facilities.[198] These geographic program restrictions raise dormant commerce clause concerns under the U.S. Constitution. There are a number of the twenty-nine states

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http://programs.dsireusa.org/system/program?state=HI [http://perma.cc/3R38-999G] (showing 40% as Hawaii's required state percentage of energy delivered to consumers from eligible renewable sources).

[189] RYAN WISER & GALEN BARBOSE, RENEWABLES PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007 16–20 (2008), http://eetd.lbl.gov/sites/all/files/publications/report-lbnl-154e-revised.pdf [http://perma.cc/N7C9-TDWB].

[190] Mark Del Franco, *Massachusetts Revising SREC Program To Promote Healthy Solar Growth*, SOLAR INDUS. (Jan. 9, 2014), http://solarindustrymag.com/e107_plugins/content/content.php?content.13669 [http://perma.cc/Q4C9-Y4K5].

[191] K.S. CORY & B.J. SWEZEY, U.S. NAT'L RENEWABLE ENERGY LAB, RENEWABLE PORTFOLIO STANDARDS IN THE STATES: BALANCING GOALS AND IMPLEMENTATION STANDARDS 11, Table 3 (Dec. 2007), http://www.nrel.gov/docs/fy08osti/41409.pdf [http://perma.cc/YD7Y-56KQ].

[192] *Id.* at Table 5.

[193] *Id.*

[194] *See* Glennon & Reeves, *supra* note 184, at 108.

[195] Craig, *supra* note 123, at 18.

[196] *Id.*

[197] *See infra*, at notes 206–12.

[198] CORY & SWEZEY, *supra* note 191, at Table 2.

with RPS 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,[199] Colorado,[200] Delaware,[201] Maine,[202] Michigan,[203] Missouri,[204] Nevada,[205] and Washington.[206]
- 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,[207] Colorado,[208] North Carolina,[209] and Ohio.[210]
- 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,[211] Delaware,[212] Michigan,[213] and Montana.[214]
- 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

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[199] ARIZ. ADMIN. CODE § R14-2-1806(D)–(E) (2009).
[200] COLO. REV. STAT. § 40-2-124(c)(V)(A)–(D), (c)(IX), (d) (2013).
[201] DEL. CODE ANN. tit. 26, § 356(a)(1), (d)–(e) (2012).
[202] ME. REV. STAT. tit. 35-A, § 3605 (2010).
[203] MICH. COMP. LAWS SERV. § 460.1039(1) (LexisNexis 2010).
[204] MO. ANN. STAT. § 393.1030(1) (West 2013).
[205] NEV. REV. STAT. ANN. § 704.7822 (LexisNexis 2011).
[206] WASH. ADMIN. CODE § 194-37-110(1)(c)(i)–(iii) (2008).
[207] *California Incentives / Policies for Renewables Efficiency*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://web.archive.org/web/20141031211359/http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA25R [http://perma.cc/6C97-R37T] (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).
[208] COLO. REV. STAT. § 40-2-124(e)(II)–(III) (2013).
[209] N.C. GEN. STAT. ANN. § 62-133.8(b)(2)(e) (West 2012).
[210] OHIO REV. CODE ANN. § 4928.64(B)(3) (LexisNexis 2012).
[211] ARIZ. ADMIN. CODE § R14-2-1806(D)–(E) (2007).
[212] DEL. CODE ANN. tit. 26, § 351(b)–(c) (2009).
[213] MICH. COMP. LAWS SERV. § 460.1001(2)(a)–(d) (LexisNexis 2010).
[214] MONT. CODE ANN. § 69-3-2005(3)(a) (2013).

preference: Connecticut,[215] Illinois,[216] Maine,[217] Maryland,[218] Massachusetts,[219] New Hampshire,[220] North Carolina,[221] Ohio,[222] Oregon,[223] Pennsylvania,[224] and Rhode Island.[225]

- Eleven of the twenty-nine states, or 38%, have an in-state requirement for certain distributed power.[226]
- Four of the twenty-nine states, or 14%, have a benefit for an in-state capital component or labor.[227]
- Some states have multiple multipliers and preferences.[228]
- Only seven of the twenty-nine states, or 24%, have no geographic preferences in their laws.[229]

There has been litigation in several states, including New Jersey, Maryland, Colorado, Missouri, Massachusetts, California, Vermont, and elsewhere, contesting dormant Commerce Clause violations involved with state energy/electric power regulation,[230] including:

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[215] CONN. GEN. STAT. ANN. § 16-245a(b) (West 2013).
[216] 20 ILL. COMP. STAT. ANN. 3855/1-56(b) (West 2013).
[217] 65-407-311 ME. CODE R. § 6 (LexisNexis 2011).
[218] MD. CODE REGS. 20.61.03(D) (2011).
[219] MASS. ANN. LAWS ch. 25A, § 11F(a) (LexisNexis 2013).
[220] N.H. REV. STAT. ANN. § 362-F:6(I) (LexisNexis 2011).
[221] N.C. GEN. STAT. ANN. § 62-133.8(b)(2)(e) (West 2012).
[222] OHIO REV. CODE ANN. § 4928.64(C)(5) (LexisNexis 2012).
[223] OR. REV. STAT. § 469A.135(1)(a)(2) (2011).
[224] 73 PA. STAT. ANN. § 1648.4 (West 2008).
[225] R.I. GEN. LAWS § 39-26-4(d) (2012).
[226] 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, 75–77 (2012) (noting that resource eligibility in state RPS programs has expanded beyond traditional renewables).
[227] 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).
[228] *Id.* at 291–92.
[229] *Id.* at 292.
[230] 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). *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

- 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;[231]
- 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[232] (separate from California setting in-state wholesale tariffs);[233]

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to the effects of the law."); Energy 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).

[231] 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 [http://perma.cc/Y24B-4MZE].

[232] 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, holding, "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, "While 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 (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").

[233] Cal. Pub. Utils. Comm'n, 132 FERC ¶ 61,047, 20 (2010).

- Vermont's attempt to discriminate against the sale of cheaper interstate power that could be sold otherwise outside of its origin in Vermont;[234]
- The Seventh Circuit Court of Appeals declared unconstitutional a state regulation limiting state renewable portfolio standards to in-state generation as a violation of the Commerce Clause;[235]
- A 2013 decision of the federal court in Minnesota holding clearly unconstitutional a Minnesota statute which banned the import of foreign coal or new facility coal-produced power into Minnesota for power generation or the construction of new plants which would burn coal from out of state, prohibited any new power purchase agreements for power produced by out-of-state coal-burning plants, and raised the cost of future purchases of coal power by assigning environmental costs to use of the fuel.[236]

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[234] Entergy Nuclear Vt. Yankee, LLC 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 England 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.

[235] Ill. Commerce Comm'n v. FERC, 721 F.3d 764, 776 (7th Cir. 2013) ("[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."). 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 the tariff issue was not before the Court. *Id.* at 776. 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. *Id.*

[236] North Dakota v. Heydinger, 15 F. Supp. 3d 891, 891 (D. Minn. 2014). Exemptions were made for the proposed Excelsior Energy integrated gasification combined cycle ("IGCC")

In the last-bulleted Minnesota matter above, the Supreme Court held that "[s]uch a scenario is 'just the kind of competing and interlocking local economic regulation that the Commerce Clause was meant to preclude.'"[237] "[A]ny attempt directly to asset extraterritorial jurisdiction over persons or property would offend sister States and exceed the inherent limits of State's power."[238] The Minnesota court treated electricity distinctly from other energy sources, which it is both in terms of its physics and its status in American law.[239]

2. State System Benefit Charges

A system benefits charge ("SBC") is a per-kWh 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.[240] These state renewable trust funds distribute money to subsidize various renewable energy resource projects and technologies pursuant to state legislation.[241] Approximately one-third of U.S. states have enacted SBC and "public benefit funds," including seventeen states plus the District of Columbia.[242]

Between 1998 and 2012, approximately $3.5 billion was collected by 14 states with existing renewable system benefit charges to endow energy trust funds.[243] More than half the amount collected, at least $135

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plant in northern Minnesota, the Big Stone II coal plant in South Dakota, and the Maple Grove–based Great River Energy's Spiritwood Station plant in North Dakota. MINN. STAT. § 216B.1694, subd. 1 (2008); 2009 Minn. PUC LEXIS 6; 2010 Minn. PUC LEXIS 458; 2007 MINN. LAWS Ch. 136, art. 5 § 3; MINN. STAT., § 216H.03, subd.7.

[237] Healy v. Beer Inst., Inc., 491 U.S. 324, 337 (1989).

[238] *Id.* at n.13 (citing Edgar v. MITE Corp., 457 U.S. 624, 642 (1982)). North Dakota and representatives of its coal industry also sued Minnesota on Article VI grounds alleging the statute imposes Constitutional violations when it affects the wholesale price and transmission of power within exclusive federal authority regarding wholesale electricity pricing, which the court did not need to reach, having already found the statute unconstitutional. *Id.*

[239] Steven Ferrey, *Inverting Choice of Law in the Wired Universe: Thermodynamics, Mass and Energy*, 45 WM. & MARY L. REV. 1839, 1903 (2004); FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at 2-8 to 2-9; FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 568.

[240] *Public Benefits Funds for Renewables*, DATABASE FOR STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/ [http://perma.cc/3WWF-ZK5N].

[241] *Id.*

[242] ELIZABETH DORIS ET AL., STATE OF THE STATES 2009: RENEWABLE ENERGY DEVELOPMENT AND THE ROLE OF POLICY 65 (2009), http://www.nrel.gov/docs/fy10osti/46667.pdf [http://perma.cc/2U3S-PBDQ].

[243] MARK BOLINGER & RYAN WISER, THE IMPACT OF STATE CLEAN ENERGY FUND SUPPORT FOR UTILITY-SCALE RENEWABLE PROJECTS, CLEAN ENERGY STATES ALLIANCE (2006),

million/year, comes from just California. As of 2006, U.S. states' energy trust funds had committed almost $400 million to support 2249 MW of renewable energy capacity.[244] Most energy trust funds only provide assistance to new projects, and not existing renewable projects. The funding levels of these state charges on electric distribution range from $0.07/mWh in Wisconsin up to almost $0.6/mWh in Massachusetts.[245] The mean value is about 0.1 cents/kWh of consumption.[246]

The created funds range in size from less than $1 million to greater than $300 million per year.[247] 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.[248]

A state's primary interest with a system benefits charge is to support the in-state renewable energy industry and economic development.[249] Therefore, it is likely that a state will want to retain the funds collected from an SBC program to subsidize or provide incentive for in-state industries and development.[250] The Illinois legislature decided its program would "develop[] new renewable energy resources and clean coal technologies for use in Illinois [for distributing these funds]" and "[t]he criteria should promote the goal of fostering investment in and the development and use, *in Illinois*, of renewable energy resources."[251] However, the effectuation of the desire to retain subsidy funds for in-state benefit raises the dormant Commerce Clause constitutional issue of discriminating against commerce in out-of-state electricity.[252] No litigation on this issue has occurred.

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available at https://emp.lbl.gov/sites/all/files/CASE%20STUDY%20lbnl-56422.pdf [https://perma.cc/NEU7-TBXX].

[244] *Id.*

[245] *Id.*

[246] MARTIN KUSHLER ET AL., FIVE YEARS IN: AN EXAMINATION OF THE FIRST HALF-DECADE OF PUBLIC BENEFIT ENERGY EFFICIENCY POLICIES (Apr. 2004).

[247] *State Clean Energy Funds Fact Sheet*, EPA, http://www.epa.gov/chp/policies/funds_fs.html [http://perma.cc/NZ3Z-SLPD] (last updated April 2009).

[248] Kirsten H. Engel, *The Dormant Commerce Clause Threat to Market-Based Environmental Regulation: The Case of Electricity Deregulation*, 26 ECOLOGY L.Q. 243, 295 (1999).

[249] *Id.*

[250] *Id.* (explaining the possible desire for states to retain system benefits charge funds within the state).

[251] 20 ILL. COMP. STAT. § 6-3(b) (2008) (emphasis added); *see also id.* § 6-4(b).

[252] *See, e.g.*, 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, 130 (2012); Steven Ferrey, *Constitutional Barriers Confronting State Renewable Energy Programs*, ABA ENERGY COMM. NEWSLETTER (June 2006); Steven Ferrey, *Renewable Orphans: Adopting Legal Renewable Standards at the State Level*, 19 ELEC. J. 52, 52 (2006).

3. 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_2") emitted from their larger power plants.[253] Additionally, California has begun comprehensive regulation of all greenhouse gases ("GHGs") from all sources,[254] and other western[255] and midwestern[256] states initiated—but since postponed or abandoned—global warming gas regulation.

The Regional Greenhouse Gas Initiative[257] and California's A.B. 32 carbon regulation program[258] both adopted 'cap-and-trade' programs. RGGI in originally ten, and now nine, eastern states, regulates its 'cap-and-trade' allowances only for CO_2 emissions from power plants larger than 25 MW.[259] California's A.B. 32 regulates all carbon emissions from all major industries in the state.[260] RGGI is more limited than California in covered entities and industries, the kinds of GHGs emissions controlled,

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[253] *See* RGGI, *Regional Greenhouse Gas Initiative*, http://www.rggi.org/rggi [http://perma.cc/UTF8-BQ7H] (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 [http://perma.cc/K4QA-BRMH].

[254] Cal. Health & Safety Code §§ 38500–38599 (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.

[255] 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 [http://perma.cc/383A-P45R] (last visited Oct. 26, 2015). Six of the seven states withdrew in 2011, "leaving California alone in this now-unitary consortium, along with the four observing Canadian provinces." FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 6:9. Nothing was accomplished in its four years of existence. *Id.*

[256] 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 ENVTL. 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 ENVTL. REP., Feb. 22, 2008, at 343.

[257] RGGI, MEMORANDUM OF UNDERSTANDING (Dec. 20, 2005), http://www.rggi.org/docs/mou_12_20_05.pdf [http://perma.cc/5V6E-XCCK].

[258] CAL. HEALTH & SAFETY CODE § 38501.

[259] REG'L GREENHOUSE GAS INITIATIVE, GOALS, PROPOSED TASKS, SHORT-TERM ACTION ITEMS 1 (2003), http://www.rggi.org/docs/actionplanfinal.pdf [http://perma.cc/LM97-P3PW].

[260] *See Assembly Bill 32 Overview*, CAL. AIR RES. BD., http://www.arb.ca.gov/cc/ab32/ab32.htm [http://perma.cc/56GD-JL5D].

and the amount of emissions targeted and controlled: RGGI controls just CO_2 while California controls all six GHGs; RGGI controls just larger electric generation facilities while California controls, in three phases, electric generation and all other larger industrial emitters of GHGs, including transportation fuels. Both RGGI and California carbon credits are tradable.[261]

A major practical and policy problem identified by California[262] is so-called "leakage" into the state of less-costly power whose carbon content is not regulated or affected.[263] Laws that attempt to arrest leakage by regulating the conduct of out-of-state businesses also violate the Commerce Clause.[264] These laws can assume the form of added taxes and charges on out-of-state goods.[265] States are prohibited from attaching restrictions to any goods that they import from other states: "States and localities may not attach restrictions to . . . imports in order to control commerce in other States."[266] States cannot regulate in ways where the practical effect is to control conduct in other states.[267]

Where a state statute provided a tax exemption for sales of two types of wine, both produced from products produced in the state, even though not needing to mention the state by name, the effect was practically state-specific discrimination, and it was found to be discriminatory, and a violation of the dormant Commerce Clause.[268] A state cannot regulate to favor, or require use of, its own in-state energy resources even for a small percentage of total use,[269] nor can it, by regulation, harbor

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[261] GOALS, PROPOSED TASKS, AND SHORT-TERM ACTION ITEMS, *supra* note 259, at 1.

[262] CAP AND TRADE SUBGROUP, CAL. CLIMATE ACTION TEAM, CAP AND TRADE PROGRAM DESIGN OPTIONS 8, http://www.climatechange.ca.gov/climate_action_team/reports/2006 report/2006-03-27_CAP_AND_TRADE.PDF [http://perma.cc/FJE9-N4V9].

[263] *See* RGGI EMISSIONS LEAKAGE MULTI-STATE STAFF WORKING GROUP, POTENTIAL EMISSIONS LEAKAGE AND RGGI: EVALUATING MARKET DYNAMICS, MONITORING OPTIONS AND POSSIBLE MITIGATION MECHANISMS ES-1 (Mar. 14, 2007), http://www.rggi.org/docs/il_report_final_3_14_07.pdf [http://perma.cc/9P9D-89QN]; 2006 *Gross System Electricity Production*, CAL. ENERGY COMM'N, http://energyalmanac.ca.gov/electricity/system_power/2006_gross_system_power.html [http://perma.cc/B5SQ-NB4U] (showing California imports approximately 10% of its total electricity from out of state coal plants).

[264] *See, e.g.*, Healy v. Beer Inst., 491 U.S. 324, 326–27, 343 (striking requirement that the price of beer was not higher than that charged out-of-state).

[265] *See, e.g.*, Chem. Waste Mgmt., Inc. v. Hunt, 504 U.S. 334, 336–37 (1992) (invalidating an Alabama law imposing an extra fee on imported hazardous waste).

[266] C & A Carbone, Inc. v. Clarkstown, 511 U.S. 383, 393 (1994).

[267] *Healy*, 491 U.S. at 336; *C & A Carbone*, 511 U.S. at 393.

[268] Bacchus Imports, Ltd. v. Dias, 468 U.S. 263 (1984). *See also C & A Carbone*, 511 U.S. at 383.

[269] Wyoming v. Oklahoma, 502 U.S. 437, 454–56 (1992). The Oklahoma statute overturned involved only a 10% allocation of the market to in-state producers. As a result of the

energy-related resources originating in the state.[270] In-state fuels cannot be required to be used by a state even for the rationale to satisfy federal Clean Air Act requirements.[271] Income tax credits cannot be given by a state only to in-state producers of fuel additives.[272] The Supreme Court consistently has required that the regulation of power by the states must not discriminate regarding the origin of power or the ultimate impact which may discourage its flow in interstate commerce[273]:

> [We] consistently have held that the Commerce Clause of the Constitution 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.[274]

Recent federal court opinions construing state electric regulation have scrupulously followed this doctrine:

> [S]tates 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... [a] 'protectionist regulation' violating the Commerce Clause (quoting *New England Power*, at 338–39].[275]

Most recently, Judge Richard Posner, for the Seventh Circuit Court of Appeals in a unanimous decision, affirmed the Federal Energy

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statute, the market changed in response from use of almost all out-of-state coal to "the utilities purchased [in-state] Oklahoma coal in amounts ranging from 3.4% to 7.4% of their annual needs, with a necessarily corresponding reduction in purchases of Wyoming coal." *See also* Alliance for Clean Coal v. Craig, 840 F. Supp. 554, 560 (N.D. Ill. 1993).

[270] New England Power Co. v. New Hampshire, 455 U.S. 331, 339 (1982).

[271] Alliance for Clean Coal v. Miller, 44 F.3d 591, 596–97 (7th Cir. 1995).

[272] New Energy Co. of Ind. v. Limbach, 486 U.S. 269, 271, 278–80 (1988).

[273] New England Power Co. v. New Hampshire, 455 U.S. 331 (1982) (overturning as a violation of the dormant Commerce Clause an order of the state Public Utilities Commission that restrained within the state for the financial advantage of in-state ratepayers, renewable power produced within the state).

[274] *Id.*

[275] Entergy Nuclear Vt. Yankee, LLC v. Shumlin, slip op. at 83–84.

Regulatory Commission's approval of the Midwest Independent Service Operator's ("MISO")[276] proportionate customer utility allocation of transmission costs for high-voltage transmission lines to move renewable wind power to populated areas.[277] To provide the foundation of its holding on the respective jurisdiction of state and federal government to regulate electricity, the opinion relied on a law review article authored by Professor Ferrey.[278] The decision, in *dicta*, declared unconstitutional a state limiting state renewable portfolio standards to in-state generation, as a violation of the Commerce Clause: "it 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."[279] Justice Scalia, concurring in the majority prior opinion in *West Lynn Creamery,* submitted that, "subsidies for in-state industry . . . would clearly be invalid under any formulation of the Court's guiding principle" for "dormant" Commerce Clause cases.[280]

Regarding these five types of cross-subsidies in the foundation of the new energy model:

- FiTs have been struck as illegal/unconstitutional when implemented in the 48 contiguous continental U.S. states engaged in interstate commerce in power;[281]
- Renewable portfolio standards are unconstitutional if employed discriminatorily, as in some states, and

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[276] MISO's service area extends from the Canadian border, east to Michigan and parts of Indiana, south to northern Missouri, and west to eastern areas of Montana. *Locations*, MISO, https://www.misoenergy.org/AboutUs/Locations/Pages/Locations.aspx [https://perma.cc/FS6F-WWBY].

[277] Ill. Commerce Comm'n v. Fed. Regulatory Comm'n, 721 F.3d 764 (7th Cir. 2013). MISO allocated the costs of the transmission projects among all of the utilities who draw power from the MISO grid in proportion to each utilities' overall volume of usage; FERC approved MISO's rate design, which led some states to initiate court appeal.

[278] *Id.* (citing to article by Professor Steven Ferrey).

[279] *Id.* at 776. Michigan actually initiated the issue of in-state electric power discrimination in its RPS program as a demonstration that out-of-state power was not recognized as the same value as in-state electricity, 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. Instead of supporting its position, this assertion caused Judge Posner to respond to this assertion, even though it was not the tariff issue before the Court. *Id.*

[280] West Lynn Creamery, Inc., 512 U.S. 186, 208 (Scalia, J., concurring).

[281] Order on Petitions for Declaratory Order, Cal. Public Utils. Comm'n et al., 132 FERC ¶ 61047 (2010).

in mid-2013 were declared by the federal Court of Appeals to be unconstitutional if applying only to in-state renewable power;[282]

- System benefit charges, as implemented in some states, are at least *de jure* Constitutionally questionable on the face of some state statutes;[283]
- A recent federal adjudicatory order casts some doubt on the expansive legal scope of net metering;[284]
- Carbon regulation had at least one state withdraw participation due to a perceived lack of benefit given the cost imposed on power consumers.[285]

Federal courts in 2013, including the Supreme Court,[286] the federal circuit courts of appeals,[287] federal trial courts,[288] plus FERC,[289] confronted seven specific federal cases alleging states in regulating energy violated the Supremacy Clause and/or the Commerce Clause of the Constitution. At either the trial or appellate court levels, the states have lost each of these on a significant legal constitutional claim by the petitioners.[290] Of note, state losses on constitutional grounds result in challengers' attorney fees being shifted to state taxpayers.[291] Where states have prevailed, it is

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[282] Ill. Commerce Comm'n v. Fed. Regulatory Comm'n, 721 F.3d 764 (7th Cir. 2013).
[283] *See supra* Part III.B.2.
[284] *In re* Sun Edison, 129 FERC ¶ 61,146, 18 (Nov. 19, 2009).
[285] Santi & DeFalco, *supra* note 253.
[286] *E.g.*, Am. Trucking Ass'ns v. City of Los Angeles, 133 S. Ct. 2096 (2013); City of Arlington v. Federal Commc'n Comm'n, 133 S. Ct. 1863 (2013).
[287] *E.g.*, Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 733 F.3d 393 (2d Cir. 2013); Ill. Commerce Comm'n v. Fed. Regulatory Comm'n, 721 F.3d 764 (7th Cir. 2013); Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070 (9th Cir. 2013).
[288] *E.g.*, Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 838 F. Supp. 2d 183, 233 (D. Vt. 2012); Rocky Mountain Farmers Union v. Goldstene, 843 F. Supp. 2d 1071, 1099 (E.D. Cal. 2011); PPL Energyplus, LLC v. Nazarian, 974 F. Supp.2d 790 (D. Md. 2013), *aff'd*, 753 F.3d 467 (4th Cir. 2014) (field preemption and conflict preemption on wholesale power prices); PPL Energyplus, LLC v. Hanna, 977 F. Supp. 2d 372 (D. N.J. 2013), *aff'd*, PPL Energyplus, LLC v. Solomon, 766 F.3d 241 (3d Cir. 2014) (field preemption on wholesale power prices and rates).
[289] *E.g.*, FERC Order on Petitions for Declaratory Order, *In re* Cal. Pub. Utils. Comm'n, 132 FERC P 61047, 61337–38 (2010).
[290] *See supra* note 281.
[291] In the New Jersey case, the plaintiffs were allowed to submit an application for the state to cover their legal fees. PPL EnergyPlus, LLC v. Solomon, 2011WL5007972, No. 3:11-CV-00745-PGS-DEA (D.N.J. 2011). Scheduling Order, entered Oct. 18, 2013. Similarly in the Maryland case and the Entergy case, application for attorneys' fees were granted.

often by raising procedural defenses of standing, ripeness, redressability, concreteness, mootness or justiciability, to avoid having to defend their statutes on the substantive legal merits.[292] There also have been challenges to state energy regulation lodged under state administrative law:

- 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.[293]
- There was a successful suit in 2009 against New York's RGGI carbon control regulation affecting electric power generation facilities.[294]
- An additional suit against New York's participation in RGGI was deflected only by procedural defenses.[295]

PPL Energyplus, LLC v. Hanna, 977 F. Supp.2d 372(D. N.J. 2013); Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 838 F. Supp. 2d 183, 233 (D. Vt. 2012).

[292] *See generally supra* note 291.

[293] Tentative Statement of Decision, Ass'n of Irritated Residents v. Cal. Air Res. Bd., No. CPF-09-509562 (Cal. Super. Ct. 2011); Lisa Weinzimer & Geoffrey Craig, *Delaying California CHG Cap-and-Trade Regime a Year Draws Support from Stakeholders*, ELEC. UTIL. WK. (July 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/ [http://perma.cc/LP46-TKG3] (last visited Oct. 26, 2015). This delayed the plan until 2013. *Id.*

[294] *See Indeck Energy Sues State Questioning Legality of Regional Greenhouse Gas Program*, CLEAN TECHNOLOGY BUSINESS REVIEW, Jan. 29, 2009, http://www.cleantechnology-business-review.com/news/indeck_energy_sues_state_questioning_legality_of_regional_greenhouse_gas_program_090129 [http://perma.cc/YND4-FG9L] (last visited Oct. 26, 2015). *See also* Vicki Shiah, *Settlement Reached in Regional Greenhouse Gas Initiative Lawsuit*, SPR ENVTL. L. BLOG (Jan. 14, 2010, 2:28 PM), http://www.sprlaw.com/settlement-reached-in-regional-greenhouse-gas-initiative-lawsuit/ [http://perma.cc/V7W-7YR4]. 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).

[295] Thrun v. Cuomo 42 ELR 20132, No. 4358-11 (N.Y. Sup. Ct. 2012); Geoffrey Craig & Gail Roberts, *Lawsuit Disputes Legality of New York Participation in RGGI, Citing Lack of Legislative Approval*, ELEC. UTIL. WK., July 4, 2011, at 10.

IV. LEGAL ROOM TO MANEUVER WITHIN THE FORCE FIELD

A. *The Force Field*

The electromagnetic force is one of the four known primary forces in the universe. The so-called weak force and the electromagnetic force are united in quantum field theory, and both are associated with ripples in the fabric of space-time.[296] Electric circuits are the physical means for conveying energy within a force field.[297] Current is the rate of flow of electric charge from one point to another.[298] As the charged particles move within a cielrcuit, electrical potential energy is transferred from a source to a device in which that energy is stored or converted into another form or work.[299]

Electricity is identical in every U.S. state at every moment: It is an energy field transmitted as alternating current at 60 Hertz and cycles per second.[300] What is delivered and sold is electric potential, through access to the electric field.[301] While its voltage is transformed at different points on different lines, its critical status and movement are constant in every state, in every transaction, and at every moment.[302] For the last century, electricity has not changed as a uniform thing in American commerce.[303]

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[296] BRIAN GREENE, THE ELEGANT UNIVERSE 197 (1999).

[297] HUGH D. YOUNG & ROGER A. FREEDMAN, UNIVERSITY PHYSICS 799 (9th ed. 1996).

[298] *Id.* We measure electricity as energy transferred per unit time. The usual unit of energy is the kilowatt hour ("kWh"), which is a kilowatt for an hour. One kilowatt is 1,000 watts per second. A watt is a joule per second. So a kilowatt hour is 3,600,000 joules. One kWh is 1,000 watts for an hour. *Id.*

[299] *Id.* at 799–800. When a conductor, such as copper or aluminum wire, is not energized by a generator and is at rest, negatively charged electrons in the copper atoms are free to move randomly in all directions thermally in the conductor, in close orbit around their nuclei, similar to molecules in a gas moving in random motion. Because the motion of the electrons is random, there is not a net flow of charge in any direction inside the copper wire. When an electric field is applied to the copper wire by a power generation facility, controlled moving charges become current in a wire. *Id.* at 800.

[300] The electricity in the world is transmitted via alternating current, where the current changes direction of flow either fifty or sixty times per second. *See World Electricity Standards*, http://www.quantumbalancing.com/worldelectricity/electricityif.htm.

[301] MAGED E.A. MOHAMED & AYMAN H. AMER EISSA, Pulsed Electric Fields for Food Processing Technology, in STRUCTURE AND FUNCTION OF FOOD ENGINEERING 296 (2012), *available at* http://cdn.intechopen.com/pdfs-wm/38363.pdf [http://perma.cc/3EU7-B59Q].

[302] *See World Electricity Standards*, *supra* note 300.

[303] For a history of electric power, see FERREY, THE NEW RULES, *supra* note 10, at Appendix A. Until the early 20th century, electricity was supplied at different voltages ranging from 100–600 volts and 40–133 cycles per second, by different suppliers. For the past century, it is standardized throughout the United States at a set frequency of alternating current.

It is still the energized electrical-magnetic force transmitted in a nationwide transmission and distribution system.

In 2012, wind energy was the most deployed new U.S. electricity generation source of generation capacity, contributing 43% of all new electric generation capacity.[304] The U.S. Energy Information Administration projects that U.S. wind power capacity will total more than 77 GW at the end of 2015, constituting 4.6% of total U.S. electricity generation.[305] The U.S. Department of Energy calculated that approximately 20% wind power as a part of the system can be accommodated on the grid, which is equivalent to the amount of back-up reserve margin maintained in regional power systems, without requiring additional storage or other mechanisms to accommodate intermittency of wind power generation.[306]

New intermittent wind and solar renewable resources cannot supply reliable base load power, as they demonstrate a relatively low availability factor in the 10–40% range of hours during a week, month, or year.[307] Wind generators have plant effective capacity factors of 20–30%.

B. Stability, Missing Links, Storage

Lack of storage of electricity is the critical missing link. Unlike all other forms of energy, the moving electrons cannot be efficiently stored as electricity for more than a second before they are lost as waste heat.[308] Consequently, the supply of electricity must match the demand for electricity over the centralized utility grid on an instantaneous, constant, real-time and ongoing basis, or else the electric system shuts down or expensive equipment is damaged.[309] Either too much or too little power causes system instability on a second-by-second basis.[310]

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[304] *Energy Dept. Reports: U.S. Wind Energy Production and Manufacturing Reaches Record Heights*, DEP'T OF ENERGY (Aug. 6, 2013), http://energy.gov/articles/energy-dept-reports-us-wind-energy-production-and-manufacturing-reaches-record-highs [http://perma.cc/D5T6-FVJA].

[305] *See Annual Energy Outlook 2015*, ENERGY INFO. ADMIN.,http://www.eia.gov/forecasts/aeo/ [http://perma.cc/3C3Y-637L].

[306] J. DeCesaro et al., *Wind Energy and Power System Operations: A Review of Wind Integration Studies to Date*, 22 ELEC. J. 34, 34 (2009). Wind, being at off-peak times in many locations, will tend to displace typical coal baseload power, while solar PV units will tend to displace typical on-peak gas-fired peaking generation units. *Id.*

[307] *See* FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, § 10:101 (noting inability of intermittent sources to serve as baseload resource).

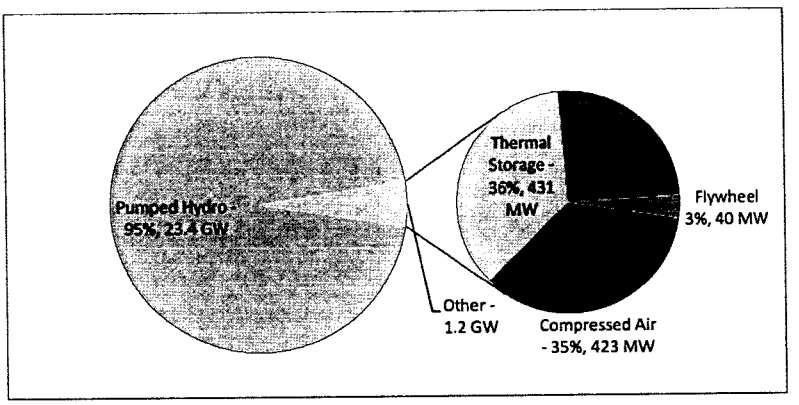
[308] FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 568.

[309] CRO FORUM, *supra* note 36, at 4; *see* FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 568.

[310] CRO FORUM, *supra* note 36, at 3.1.2.

We do not have any means to store electricity *per se*. As a substitute, we convert electricity either into chemical energy in batteries, into stored physical energy as potential compressed air or greater elevated reservoir capacity in hydroelectric pumped storage facilities, into active physical energy in flywheel movement, or into thermal storage as heat.[311] Electricity itself is not stored in any of these forms. Pumped hydro storage constitutes 95% of the storage utilized in the United States, and dominates how we store electric energy potential worldwide. See Figure 4.[312]

Figure 4: Rated Power of U.S. Grid Storage Projects (includes announced projects)



Battery storage has emerged as the key link for integrating more deployment of intermittent sources of renewable energy such as solar and wind. Lithium-ion and lead-acid batteries may or may not change electric technology in the near future by providing economic storage of intermittent power, although the storage costs are still quite high.[313] The recent bankruptcies of American battery makers such as A123 Systems and Ener1 over recent years, have caused uncertainty on economic battery development.[314]

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[311] *See* FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 2.21.

[312] DEP'T OF ENERGY, GRID ENERGY STORAGE 11 (Dec. 2013), *available at* http://energy.gov/sites/prod/files/2014/09/f18/Grid%20Energy%20Storage%20December%202013.pdf [http://perma.cc/MD45-ZU9U].

[313] RICKERSON ET AL., *supra* note 28, at 34 ("Prices for lithium-ion batteries are projected to fall from $700/kWh in 2013 to $300/kWh in 2020–2025.").

[314] *See* Bill Vlasic & Matthew L. Wald, *Maker of Batteries Files for Bankruptcy*, N.Y. TIMES (Oct. 16, 2012), http://www.nytimes.com/2012/10/17/business/battery-maker-a123-systems

Research at Stanford University calculated that the amount of energy required to create a large ground-mounted solar generation facility is comparable to the energy used to build each of five different battery technologies: "Using batteries to store solar power during periods of low demand would, therefore, be energetically favorable."[315] However, for wind farms, while curtailing wind power reduces the return on wind investment by 10 percent, storing surplus wind-generated electricity in batteries results in even greater reductions on investment return, from about 20 percent for lithium-ion batteries to more than 50 percent for lead-acid batteries:

> Ideally, the energetic cost of curtailing a resource should at least equal the amount of energy it cost to store it. . . . That's the case for photovoltaics, but for wind farms, the energetic cost of curtailment is much lower than for battery storage. Therefore, it would actually be more energetically efficient to shut down a wind turbine than to store the surplus electricity it generates.[316]

There are still carbon emissions associated with the manufacture of wind and solar energy capital components.[317] As the number of distributed

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-files-for-bankruptcy.html?_r=0 [http://perma.cc/AL3C-8TNV]; Phil Milford & Dawn McCarty, *Ener1, Battery Maker, Seeks Chapter 11 Bankruptcy Protection*, BUS. WK. (Feb. 8, 2012), http://www.businessweek.com/news/2012-02-08/ener1-battery-maker-seeks-chapter-11-bankruptcy-protection.html [http://perma.cc/AH8N-D58C]; Michael Bathon, *Wanxiang Wins U.S. Approval to Buy Battery Maker A123*, BLOOMBERG (Jan. 30, 2013), http://www.bloomberg.com/news/2013-01-29/wanxiang-wins-cfius-approval-to-buy-bankrupt-battery-maker-a123.html [http://perma.cc/9SB7-JUUS] A123, for instance, ended up in Chinese hands when Wanxiang Group bought the battery maker at a bankruptcy auction. Todd Woody, *California launches first "battery university" to push energy storage technology*, QUARTZ (Apr. 22, 2013), http://qz.com/77045/california-launches-first-battery-university-to-push-energy-storage-technology [http://perma.cc/MFS2-MQTH]. California is trying to take the lead in battery research at a time when China is also working hard on it. *Id.*

[315] Mark Shwartz, *Stanford scientists calculate the energy required to store wind and solar power on the grid*, STANFORD UNIV. (Sept. 9, 2013), http://news.stanford.edu/news/2013/september/curtail-energy-storage-090913.html [http://perma.cc/PH6R-FGPA] (according to Charles J. Barnhart, lead author of the study, "[p]umped hydro storage of water is used in almost all electricity grid storage, with an energy return on investment 10 times better than conventional batteries.").

[316] *Id.*

[317] Photovoltaics require much more aluminum for panel frames and other components than other technologies do, and alloys for wind turbines demand large amounts of nickel, produced by high-energy extracting and refining processes, which tend to emit large amounts of carbon. John Matson, *Renewable Energy's Hidden Costs: Low-carbon power depends on climate-unfriendly metals*, SCI. AM., Sep. 17, 2013, http://www.scientificamerican.com

grid-connected solar facilities has increased, the magnitude and frequency of voltage fluctuations become more of a problem, increasing maintenance costs and earlier replacement of certain components.[318] When solar PV output into distribution lines exceeds the instantaneous load on that line, power back-flows between the low-voltage and medium-voltage lines, causing reliability problems.[319] In the most solarized of all U.S. states, Hawaii, solar PV units in certain Hawaiian areas are back-feeding power into their interconnected circuits, causing circuit voltage increases and other power quality issues and problems.[320]

Grid management is projected to be able to handle up to 30% renewables penetration.[321] There can be grid stability issues caused when PV facility inverters trip off because of grid voltage or frequency fluctuations.[322] Even at 20% wind penetration in a grid, there could be a 33–50% decline in the running of combined cycle fossil-fuel generation units, and it is unclear whether these units could run profitably at these reduced operating levels, or would exit the market.[323]

Because the U.S. grid is served primarily by coal-fired units, they are one significant source which might be asked to operate more in a cycling mode.[324] Coal-fired units typically are large because of coal being a less dense fossil fuel, and must operate at no less than 45–50% of their

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/article/renewable-energys-hidden-costs/ [http://perma.cc/52TC-WBMA]. Large solar installations take one to seven years to break even with coal power on carbon emissions, while wind farms take one to twelve years to break even. *Id.*

[318] RICKERSON ET AL., *supra* note 28, at 53.

[319] *Id.* at 53–54.

[320] RICKERSON ET AL., *supra* note 28, at 52. Advanced inverters can provide support to network stability. Upgrading inverters can also help. Germany has required that inverters on an estimated 315,000 PV systems be retrofitted in an effort to improve electricity system reliability and prevent potential instability issues. *Id.*

[321] *See* PJM, *Executive Summary of Renewable Integration Study for PJM*, http://www.pjm.com/~/media/committees-groups/committees/mic/20140303/20140303-pris-pjm-cover-letter.ashx [http://perma.cc/DKL9-FDKK] (last accessed Aug. 30, 2015).

[322] RICKERSON ET AL., *supra* note 28. The current international standard for inverters is IEEE 1547, and some states, such as Massachusetts, are pushing further ahead. *See id.* Instability mitigation measures could include grid reinforcement, installation of onload tap changers, advanced voltage control for HV/MW transformers, installing static volt ampere reactive ("VAR") control, or installing a booster transformer. *Id.* at 55–56. Advanced PV inverters can provide low-voltage ride-through capabilities with frequency control or dynamic reactive support. *Id.* at 58.

[323] J. Nicolas Puga, *The Importance of Combined Cycle Generating Plants in Integrating Large Levels of Wind Power Generation*, 23 ELEC. J. 33, 34 (2010), http://www.bateswhite.com/media/pnc/4/media.344.pdf [http://perma.cc/EWS6-9YZK].

[324] *Id.*

design capacities.[325] If coal-fired power plants are forced to cycle on and off more, it will result in significantly higher operation and maintenance expenses; increased heat rate, which is a proxy for inefficiency; increased start-up costs; and a shorter life of the unit.[326] One analysis of coal-plant cycling against intermittent renewable power's hourly variations found that emissions during cycling were eight percent higher for sulfur dioxide and ten percent higher for nitrogen oxides than emissions of the same compounds during constant operation.[327]

Moreover, in a more intermittent distributed renewable energy system, while fossil-fuel generators are asked to spin to increase their temperatures to their design values, the power that these units produce may or may not be effectively used by the grid, thus incurring power "uplift" costs to the grid.[328] While the more modern coal plants have the ability to ramp up and down more flexibly than older units, they do not have the flexibility to mimic the real-time variability to match fluctuations in wind power availability to keep the grid constantly supplied.[329]

Even though more able to cycle variably up and down than coal plants, natural gas combined cycle turbine facilities, which can be modified to increase by up to 50% their minimum necessary start-up times to accommodate pressure and temperature transients of their steam turbines and readiness of their heat recovery steam generators, may still not have enough flexibility to be able to follow the more extreme intermittency associated with greater renewable power supply in the grid.[330] Even if able to be adapted to operate in a cycling role, gas combined cycle units will experience higher heat rates, less efficient operation, and greater maintenance and unavailability.[331] European data illustrates that since the regulation of CO_2 emissions, there has been a shift from traditional coal unit operation to more operation of gas combined cycle units, which resulted in an increase in these units' O&M costs, outages, and less availability.[332]

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[325] *Id.* at 37.
[326] *Id.*
[327] *Id.* at 38.
[328] *Id.* at 37.
[329] Puga, *supra* note 323, at 37.
[330] *Id.* at 38.
[331] *Id.*
[332] W. Edward Platt & Richard B. Jones, *The Impact of Carbon Trading on Performance: What Europe's Experience Can Teach North American Generators*, POWER (Jan. 2010), http://www.powermag.com/the-impact-of-carbon-trading-on-performance-what-europes-experience-can-teach-north-american-generators/?printmode=1 [http://perma.cc/NU26-9S6T].

Grid modifications, upgraded circuits and transformers, and expansion of the transmission and distribution infrastructure, are necessary to integrate more use of intermittent renewables, but not otherwise required at anywhere near this degree if intermittent new resources were not so prominent in the supply inventory.[333] In Germany, this already resulted in an additional €1 billion of cost, with tens of billions more of investment required.[334] In addition, there is a need for more installation on the system of more quick-start ramping or spinning generation reserves to respond to the constant intermittency of solar and wind generation and provide load-following generation.[335] This is a large and often uncalculated cost, only necessary because of the switch to intermittent generation as a larger component of grid supply.

Interconnection costs include both the direct costs to physically connect a new distributed PV system to the grid, as well as the cost to upgrade the grid to accommodate the extra distributed generation injected into the grid.[336] Some countries require that PV generators be responsible for all of these costs, while some countries allocate the cost of grid upgrades to all ratepayers.[337] If this is a cost of the interconnection of new and distinct generating technology, American legal precedent dictates that these costs be borne by the generator.[338] This was not an issue traditionally, as virtually all power generation was provided by monopoly utilities in each geographic region.[339] Whether the generation business side of the utility paid for this expense, or it was socialized as an expense of the transmission and distribution side of the same utility, the resulting cost to consumers was not affected: 100% of the approved costs were passed on to the utility's rate-paying customers.[340]

All of this changes in the new business model. Most generation for the past several years has been constructed by independent power companies ("IPPs"), rather than the utilities.[341] Interconnection-related costs for larger distributed PV systems in Massachusetts, based on the author's

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[333] Davies & Allen, *supra* note 127, at 1002.
[334] *Id.* at n. 419.
[335] Puga, *supra* note 323, at 34.
[336] RICKERSON ET AL., *supra* note 28, at 67.
[337] *Id.* at 52–53.
[338] 18 C.F.R. § 292.306; FERREY, LAW OF INDEPENDENT POWER, *supra* note 33, at § 4:35.
[339] FERREY, THE NEW RULES, *supra* note 10, at 260–66.
[340] 16 U.S.C. § 824(d); FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 582–83.
[341] *See* Sheldon Silver & Paul Tonko, *The Electric Industry in New York, Section II(C)*, http://assembly.state.ny.us/Reports/Energy/199710/#III.%20FACTORS%20AF [http://perma.cc/BY6Z-BBX7].

confidential information, have ranged from $25,000–$4,500,000 for small 2–6 Mw systems.[342]

Added costs for more system spinning reserves and quick-start power to integrate intermittent power into a grid without compromising gird reliability,[343] has not yet been passed on to the generators whose new intermittent projects cause incursion of these added costs, but rather are socialized to all customers of the utility as part of electric T & D system costs. All states still allocate these T & D costs not by a fixed fee per customer, but based on the traditional volume of each customer's electricity consumption.[344] By supplying power for their own self-use and therefore purchasing a much lower amount of power from the grid, new distributed generators in the new model can avoid what would otherwise be their *a priori* proportionate volumetric share of the cross-subsidy paid to them and others for system modification and additional ancillary and spinning reserve requirements they impose on the grid.[345]

V. ECONOMICS, LAW, CIRCUMVENTION

A. *A Critical Legal Variable: In Front of the Meter or Behind It?*

It is not just utilities that could lose revenue in this new distributed generation model. State government receives a significant benefit from invisible taxes embedded in the typical utility bill, as well as local government property tax on utility poles and wires, whose value could be decreased as a lesser amount of power is metered over it. A significant percentage of the residential retail bill is government taxes: 40% in Germany[346] and up to 25% for some utilities in New York.[347] See Table 1. Regulated utility companies pay taxes based on net income and on gross receipts.[348]

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[342] For small PV projects, as the costs gets in to six figures, it becomes significant. Information is confidential with project owners, but known by the author through his advising renewable energy projects.

[343] *See* Puga, *supra* note 323, at 24.

[344] *Id.*

[345] *Id.*

[346] RICKERSON ET AL., *supra* note 28, at 24.

[347] Silver & Tonko, *supra* note 341, at § III, Table 3.

[348] MARILYN M. RUBIN, A GUIDE TO NEW YORK STATE TAXES i, vii (2011), http://pjsc.magikcms.com/Tax%20guides/StateGuideWeb.pdf [http://perma.cc/Z9JE-LVSG]. Regulated utility companies pay taxes based on net income and on gross receipts. Taxes imposed on utilities include the 9A Corporate franchise Tax, the Gross Receipts Tax and the Sales/Use Tax. There also can be local taxes including business income/gross receipts taxes, sales taxes and property taxes. *Id.*

As self-generation and competition absorb more power creation and supply behind the meter or through net-metering transactions which run the retail meter in reverse, the utility retail meters will register lower gross receipts, and state taxes will decline commensurately.

TABLE 1: ELECTRIC UTILITY COST STRUCTURE AND TAXES IN NEW YORK, 1994 (CENTS/KWH)[349]

	LILCO	Con Edison	Orange & Rockland	NYSEG	RG&E	NIMO	Central Hudson	1992 US Average
Fuel and Purchased Energy	3.18	3.11	2.75	2.37	1.10	3.23	2.17	2.38
Wage & Benefits	1.28	1.98	1.32	0.83	1.41	1.67	1.07	0.81
Operations	1.56	1.58	1.15	1.07	1.66	0.78	1.28	0.78
Taxes	3.07	3.46	1.63	1.43	2.00	1.21	1.62	0.96
Capital	6.05	3.24	1.67	2.31	2.75	1.61	2.02	2.13
TOTAL	15.14	13.36	8.53	8.01	8.92	8.50	8.16	7.06

In contrast to whether the generation is in front of or behind the retail meter, if the utility, rather than distributed generators, owns the renewable units, all of the power still passes through the retail meter, gross receipts are unaffected, and state and local tax amounts don't change. The meter is everything; position matters. Arizona Public Service ("APS") in late July 2014 filed with the Arizona Corporation Commission a plan called AZ Sun DG, under which APS would lease conventionally consumer rooftops for its own PV generation purposes.[350] Under a 20-year conventional lease, APS would pay homeowners $30/month (set off as a bill billing credit) for use of the roof to install and own 20 MW of solar photoelectric systems on 3,000 customer homes.[351] APS would incur itself the

[349] Silver & Tonko, *supra* note 341, Section III, Table 3.
[350] Bruce W. Radford, *Rent the Rooftop*, PUB. UTILS. FORTNIGHTLY, http://pjsc.magikcms.com/Tax%20guides/StateGuideWeb.pdf (Aug. 2014), *available at* http://www.fortnightly.com/fortnightly/2014/08/rent-rooftop [http://perma.cc/69CF-RF92].
[351] *Id.*

capital, installation, and maintenance costs, estimated at $57–$70 million for 3,000 homes each with a 4–8 Kw system, or $19,000–$24,350 per home ($3,000–$5,000/Kw installed).[352]

The placement of the solar unit does not change. The PV unit wiring to either the front or back side of the retail meter is all that significantly changes. The key legal distinction is that these would *not* be distributed generation: they would be on the 'front' utility side of the meter at grade in the dwelling. Therefore, the power would be metered as any other utility-owned generation project delivered by the utility, but situated on land and the home roof structure owned by the customer rather than the utility. The meter is the message: on which side of the meter one interconnects the AC power generation inverters is critical. APS would own both the PV panels and the power output of them until the power reached the meter and is transacted at the regulated retail rate.[353]

This slight change in wiring generates the same amount of PV power. It is a means to accelerate use of solar, but not to accelerate deployment of distributed generation on the customer side of the meter. Traveling the same distance from the home roof to the home electrical panel interconnection, the utility would assess the same distribution charges as if the power traveled through several towns to arrive. With this arrangement, these PV customers pay conventional power distribution rates for use of the system. Ken Johnson, at Solar Energy Industries Association, reacted:

> In a move condemned by many solar companies in Arizona, the state's largest utility, APS, has announced that it will begin installing rooftop solar on customers' homes . . . this move would stack the deck in favor of a company which can rate base solar with a guaranteed rate of return. How is that fair? The Arizona Corporation Commission needs to think this through very carefully.[354]

This wiring to the front side of the utility meter established firm legal lines: the residential customer would receive $360/year in rent, or more than $7,000 over twenty years, for outlaying no capital, taking no risk, not altering electric service provision, and having a 'solar home.' If

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[352] *Id.*

[353] *Id.* This differs from the so-called "Buy All, Sell All" business model where the utility buys the customer-owned output at the lower wholesale rate and sells back the power to customers at the higher retail rate, thus still collecting and payment for transmission and distribution. *Id.*

[354] *Id.*

there is any central utility service disruption during peak daytime hours, depending on precisely how the solar output is wired, the customer could be insulated from a central service disruption by still receiving service from the rooftop array. It is a formula which is roughly equivalent to an approximately 50% reduction in the cost of electric service.

With a median size 5–6 Kw PV rooftop array, with a 15–20% PV capacity factor APS might generate something in the general range of 8000 kWh/year of electricity, which would have a wholesale retail value of approximately $400/year, and a retail value of more than twice that amount. The host consumer cuts its electricity costs roughly in half as a result of the lease payment, with no or little capital risk, the utility generates power worth more than its out-of-pocket capital and operational cost, and the utility is able to realize retail transmission and distribution charges associated with all power produced. State and local utility tax revenues are not affected, and the state realizes a policy goal of reducing criteria pollution and carbon emissions, while promoting residential solar.

The issue here, though, is not so much as to whether it is a viable solar PV promotional mechanism, but whether it undercuts expansion of on-site distributed generation, and whether it distorts the solar industry or competition in the state. It is argued that the grid operator has clear incentives to favor increasing the utility's assets rather than to encourage customer-owned distributed energy resources.[355] And some critics argue that "it is imperative that we separate grid operation from grid ownership and delegate operation to" an independent distribution system operator.[356]

There is also a question about this business model as to whether a utility should place on-site distributed generation in its rate base and earn a return on equipment it installs on the customers' residences. The traditional precedents of utility rate-making have never incorporated a litmus test as to whether utility-owned generation is on leased or owned property. The test has always been whether the investment is "just and reasonable"[357] and "prudent"[358] for utility generation of power. Where

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[355] Farrokh Rahimi & Sasan Mokhtari, *From ISO to DSO*, PUB. UTILS. FORTNIGHTLY, June 2014, at 42, *available at* http://www.fortnightly.com/fortnightly/2014/06/iso-dso [http://perma.cc/4VDG-SYQD]; Tong & Wellinghoff, *supra* note 92.

[356] *Id.*

[357] 16 U.S.C. §§ 824d(a), (e) (2012); Miss. Power & Light Co. v. Miss. *ex rel.* Moore, 487 U.S. 354, 374 (1988) ("FERC has properly exercised its jurisdiction to determine just and reasonable wholesale rates or to insure that agreements affecting wholesale rates are reasonable."); Town of Norwood v. FERC, 80 F.3d 526, 531 (D.C. Cir. 1996); Entergy Nuclear Vt. Yankee, L.L.C., 838 F. Supp. 2d 183, 233 (D. Vt. 2012).

[358] Midwestern Gas Transm. Co., 36 F.P.C. 61, 70 (1966), *aff'd sub nom.* Midwestern Gas Transm. Co. v. Fed. Power Comm'n, 388 F.2d 444 (7th Cir. 1968); Re Bos. Edison Co., 46

there is a state solar policy to encourage renewable power generation, and where customers are willing to have solar on their roofs—but do not want to or can't make the large capital investment for the expensive solar unit—and where the lease transaction is voluntary and arm's length, there is no *a priori* reason why it would violate regulatory law. However, it is a policy and competitive issue regarding whether energy regulatory commissions will allow certain types of utility business involvement on customer sites.

B. Benefits, Costs, Legal Conflicts

When combined with power sale revenues, the total value of solar PV benefits have been estimated in one estimate to be higher than the levelized cost to install PV (e.g., $0.15–$0.41/kWh in the U.S.).[359] If that estimate proves true, PV system owners actually now cross-subsidize other ratepayers, and subsidies for PV owners should be increased.[360] As with any significant social change for important infrastructure, there will be winners and losers. And it is a role of government to both manage some of this change, and look at the equities and the cost justification of that change. With utilities, the last of the regulated industries,[361] there is the ability for government to manage this change.

At present, there are few models for a transition to new business models. Meister's report concluded that there need to be supportive policy and regulatory conditions to foster this revolution, which are within the control of regulators.[362] Principal among these are the ability to interconnect to feed in electricity to the grid and the ability to get credit for excess power produced and not consumed through net metering, during times when residential PV output does not always match the time at which power is consumed on site.[363] The amount of self-use of distributed generation is a critical driver to capture the full value of distributed system output.[364]

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); Norwood, 80 F.3d at 531.

[359] LENA HANSEN ET AL., A REVIEW OF SOLAR PV BENEFIT & COST STUDIES 13–18 (2nd ed. 2013); RICKERSON ET AL., *supra* note 28, at 31 (citing Richard Perez et al., *Solar power generation in the US: Too expensive, or a bargain?*, 39 ENERGY POL'Y 7290, 7298 (2011)).

[360] BIRD ET AL., REGULATORY CONSIDERATIONS ASSOCIATED WITH THE EXPANDED ADOPTION OF DISTRIBUTED SOLAR 6 (2013); RICKERSON ET AL., *supra* note 28, at 43.

[361] FERREY, EXAMPLES & EXPLANATIONS, *supra* note 35, at 582.

[362] RICKERSON ET AL., *supra* note 28, at 5.

[363] *Id.* at 6.

[364] *Id.* at 26.

The foci of subsidy have been net energy metering, employed in 86% of the states, and renewable portfolio standards, employed in 60% of the states.[365] If not carefully designed based on quantitative data, both of these state policies could cause the conventionally served customer unknowingly to cross-subsidize net metering and RPS customers or vice versa. The costs of these cross-subsidies are not transparently revealed on the customers' bills.[366] FiTs are unconstitutional when adopted by U.S. states for their regulated investor-owned utilities,[367] and net metering[368] and RPS,[369] as applied, have attracted constitutional scrutiny.

As a quick calculation, the typical national cost to the utility to purchase RECs is approximately a 40% increase in cost of the value of the wholesale power itself (not the total cost of retail bundled cost including taxes).[370] For a utility in Massachusetts, the REC purchase price was recently approximately 120% the wholesale cost of the power itself.[371] With solar RECs, in some states, they are averaging a value 500% over the value of the power in terms of the cost to utilities to purchase solar RECs.[372] The ACP penalty price to the utility of not complying with solar REC requirements in some states is + 1000% the value of the power involved.[373]

National Grid estimated the cost of $3.95/month per residential customer to compensate for the Massachusetts RPS program, expected to rise by $1/month by 2015.[374] National Grid estimated that net-metering cost will more than double between summer 2013 and the end of the year ($0.09/month to $0.23/Month), and then more than triple again by the end of 2014 ($0.93/month).[375] $4.04/month is the cost of the two green Massachusetts energy mandates, which represents 5.4% of the typical National Grid customer's monthly bill of $74.38/month, not including the state

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[365] *See supra* Parts III.A.2 & III.B.1.
[366] *See* NSTAR monthly bill (on file with author).
[367] *See supra* Part III.A.1.
[368] *See supra* Part III.A.2.
[369] *See supra* Part III.B.1.
[370] Author's calculation assuming a trading price of $15–20 for a state REC.
[371] Author's calculation, assuming $60/REC selling price, with wholesale power being transacted in ISO-NE at approximately an average price of $50/mWh.
[372] Author's calculations with Massachusetts solar RECs selling in the $220–500/mWh SREC trading range.
[373] Author's calculation, comparing an ACP of $550/mWh SREC in Massachusetts with the $50/mWh average price of power.
[374] Bruce Mohl, *Green energy costs raising concerns*, COMMONWEALTH MAG., Aug. 8, 2013, http://commonwealthmagazine.org/environment/004-green-energy-costs-raising-concerns/ [http://perma.cc/XVH8-M59E].
[375] *Id.*

energy efficiency system benefit charges which cost the typical customer another $4.70 a month.[376] Thus, more than 12% of the customers' bill is for renewable energy and energy conservation subsidies—and rising—which indicates the slope of the trend line on net-metering costs on individual bills. Utilities in California estimate that net metering may mean as much as $1.4 billion a year in lost revenue, that will have to be added to the bills of non-net-metering customers.[377]

Some citizen groups, governors and other elected officials have begun to highlight cross-subsidies from all electric consumers to designated recipients possibly occurring through these state policies.[378] The President of NRG Energy noted that more distributed solar and wind power is forcing utilities to spread their increasing fixed grid costs over fewer customers, increasing the cost of service to non-exiting conventional customers.[379] In more than two-thirds of the states there is no alternative for retail power consumers other than purchase from the utility's monopoly supply including any invisible additional costs associated with state incentive mechanisms.[380]

The funds for subsidy costs do not come out of thin air, or from state government. In the U.S. electric power regulatory model, the costs of state wholesale power generation incentives are not absorbed by the utilities, but are passed on to its retail customer ratepayers. And that conflict is now manifest between those who give and receive subsidies.

Idaho moved in 2013 to adjust the amount net-metering facilities in the state are paid in order to lessen electric company/ratepayer impacts.[381] This increases customer demand charges in the distribution rates and commensurately decreasing retail energy rates, with the intent to even out rates paid by participating and non-participating net-metering customers, and alleviate the burden on their customers.[382] Virginia introduced legislation to allow Dominion Virginia Power to collect a standby charge from customers with net metered systems larger than 10 kW.[383] There have been

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[376] *Id.*

[377] Diane Cardwell, *On Rooftops, a Rival for Utilities*, N.Y. TIMES, July 26, 2013, at B1.

[378] *See supra* Part II.C.2.

[379] Andrew Engblom, *NRG CEO: Distributed Generation a 'Mortal Threat' to Utilities*, SNL ENERGY, Mar. 22, 2013 (copy available with author).

[380] *See* RESA, *State-By-State*, RETAIL ENERGY SUPPLY ASS'N, http://www.resausa.org/states [http://perma.cc/TM97-LMX5] (last visited Oct. 26, 2015) (showing that thirty-six states still maintain monopolies on the sale of electric power).

[381] Order of Notice of Schedule, Case No. IPC-E-12-27 (Idaho Pub. Utils. Comm'n 2013).

[382] *Id.*

[383] *Net-metering*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://

proposals on net metered tariff changes in Arizona and Georgia.[384] Arizona in late 2013 imposed an additional fee of approximately $4.90/month on solar installations to cover base grid access costs.[385]

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.[386] The California Public Utility Commission reported that by 2020 net-metering subsidy could cost nonsolar electricity customers $370 million–$1.1 billion per year.[387] It documented that most homeowners with distributed solar systems had an average household income about twice that of the average household.[388] California preserved net metering, but directed the state's Public Utility Commission to devise a new program by 2017 that ensures nonsolar customers do not bear an unfair burden.[389] Satisfying the California goal of having 33% of electricity supplied by renewable resources by 2020 requires, in an estimation by the California PUC, the expenditure of approximately $115 billion.[390]

The Wall Street Journal reported in 2013 that 14 of the 29 states that have RPS systems considered proposals in the first 6 months of 2013 to lessen or repeal the mandates.[391] In 2014, Ohio became the first state to freeze its RPS program, negating the annual legislated increase in RPS requirements for two years.[392] The RPS requirement remained, but did not

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programs.dsireusa.org/system/program/detail/40 [http://perma.cc/5BPS-FB2U] (last visited Oct. 26, 2015).

[384] *See Standby & Fixed Cost Charges And Net Energy Metering Debates: Current Status*, N.C. CLEAN ENERGY TECH. CTR. (August 2014), http://nccleantech.ncsu.edu/wp-content/uploads/State-Status-of-NEM-Standby-+-Fixed-Cost-Charge-Debates_V2.pdf [http://perma.cc/84SR-SWZX].

[385] *Id.* Arizona Public Service originally sought an amount ten times this amount. *Id.*

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

[387] Than, *supra* note 1.

[388] *Id.*

[389] *Id.*

[390] Lisa Weinzimer & Lynn Corum, *California Challenge looks bigger and bigger among Economic Woes*, ELEC. UTIL. WK., Jan. 18, 2010, at 1, 20.

[391] Ryan Tracy, *Green-Energy Mandates Find Improbable Allies*, WALL ST. J., July 17, 2013, at A-5. *The Wall Street Journal* article did not identify which states were involved, although this represents about half of the RPS states. *Id.* It would include Ohio, Michigan, Kansas, Missouri, North Carolina, Vermont, Pennsylvania, Connecticut, Maryland, and Wisconsin. In addition to Ohio, New Hampshire and New Jersey have had unsuccessful pressure for change brought as in North Carolina, Kansas, Texas, Colorado, and Connecticut.

[392] Tom Knox, *The freeze is on—Kasich signs S.B. 310, halts renewable and energy-efficiency standards*, COLUMBUS BUS. FIRST (June 13, 2014), http://www.bizjournals.com/columbus

advance as originally legislated. This did not repeal the Ohio RPS program, but retarded its inclining curve of greater renewable energy credit purchase by utilities for two years.

VI. MOVING FORWARD

The utility model is changing, and no one is yet sure where it will go. There must be a new model of cost allocation and recovery as the utility role changes, which one observer notes could include[393]:

- monthly infrastructure fees from solar users, as some are now doing (to compensate for a base amount of grid benefit afforded)
- itemized a la carte components of value separately and disaggregate which customers consume which features
- split energy used and consumed into separate transactions so that all DG energy is sold to a utility before buying back what's needed (as is done with gross net metering)

In 2014, the Natural Resources Defense Council and the Edison Electric Industry, an electric utility industry trade group, 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.[394] The groups jointly stated that "[r]ate designs will continue to develop that

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/news/2014/06/13/the-freeze-is-on-kasich-signs-s-b-310-halts.html [http://perma.cc/XX7N-YCZN]. In June 2014, Ohio enacted Senate Bill 310 to freeze for two years renewable energy and energy efficiency cross-subsidies, making Ohio the first state to back off its RPS. *Id.* As a result, Ohio's renewable energy mandate will remain at 2.5% and its energy efficiency standard at 4.2% compared to 2009 levels for the next two years. *Id.* A legislative committee will review the standards enacted in 2008, which provide that 25% of the electricity sold by Ohio utilities must be generated from alternative energy sources. *Id.* Half of that must come from renewables like wind power, solar must account for at least 0.5% of the renewables load, and utilities must slash customers' power usage by 22% in the same time frame. *Id.*

[393] Lehr, *supra* note 55, at 35.

[394] EEI/NRDC Joint Statement To State Utility Regulators, NRDC (Feb. 12, 2014), http://docs.nrdc.org/energy/files/ene_14021101a.pdf [http://perma.cc/9YLL-2XAK]; Christopher Martin, *NRDC and U.S. Utilities Urge Grid Payments for Solar*, BLOOMBERG BNA ENERGY AND CLIMATE REPORT (Feb. 12, 2014), http://www.bloomberg.com/news/articles/2014-02-12/nrdc-and-u-s-utilities-seek-compensation-for-rooftop-solar-cost [http://perma.cc/Z4ZW-JAE4].

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."[395]

Change is in the air in the first state. In 2014, Minnesota decided to take a more active step in navigating the minefield of renewable energy production. The Minnesota Public Utilities Commission decided to create a value-for-solar formula to determine the value of consumer-generated solar energy.[396] Under the Commission's mandate, utilities may adopt the value-for-solar formula on a volunteer basis. Up until this finds some form of implementation, Minnesota and 42 other states currently require the utility to pay the retail rate for excess power generated by consumers' net metered generator.[397] One commissioner was concerned that this formula would create a subsidy for individuals who use solar energy while increasing the rate for those who do not.[398]

States are now just beginning to respond to what is an imperative for a system when all allocated regulated amounts in tariffs are based on actual costs of service. If implemented appropriately, the ring-fences of RPS, net metering, and other state techniques, all of which segregate subsidies between customers, can be employed by the states without the current legal controversy. Moving forward, a quantitative determination of cost/benefit is the future route to satisfy legal and economic foundations for subsidies.

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[395] *Id.*

[396] DSIRE, *Wind and Solar Electric (PV) Systems Exemption*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://programs.dsireusa.org/system/program/detail/151 [http://perma.cc/MLA4-RMTE] (last updated Mar. 26, 2015). The Commission considered the value of consumer-generated renewable energy to the utility, to ratepayers, to society, and to the environment. *Id.* The Commission used a federally determined value for the cost of a carbon footprint. *Id.*

[397] *Id.*

[398] *Id.*