SMALL IS (STILL) BEAUTIFUL: DESIGNING U.S. ENERGY POLICIES TO INCREASE LOCALIZED RENEWABLE ENERGY GENERATION

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I. INTRODUCTION

The U.S. electricity system is in a state of deep disruption and, perhaps, a major transformation. Production of electricity from coal-fired power plants has fallen,[1] and several large utilities have announced plans to retire several coal plants in the near future.[2] Natural gas production levels have soared and prices have dropped,[3] making natural gas economically enticing, just as doubts about its environmental

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1 *Monthly Coal- and Natural Gas-Fired Generation Equal for First Time in April 2012*, U.S. ENERGY INFO. ADMIN. (July 6, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6990 [hereinafter EIA TODAY IN ENERGY].

2 Mary Ann Hitt, *The Nation's 100th Coal-Fired Power Plant Retirement*, HUFFINGTONPOST (Feb. 29, 2012), http://www.huffingtonpost.com/mary-anne-hitt/big-news-nations-100th-an_b_1310663.html.

3 EIA TODAY IN ENERGY, *supra* note 1.

sustainability have increased.[4] Nuclear energy faces a particularly unclear future. Political support for nuclear power has declined since the accident at the Japanese Fukushima Daiichi facility in March 2011,[5] but some states have maintained their support and commitment to nuclear power.[6] Questions thus abound about which of the traditional electricity fuels[7] will provide U.S. power in the future, particularly as some politicians seek to repeal tax breaks for fossil fuels[8] and as regulations governing air emissions, water pollution, and safety become more stringent and make fossil fuel–based power more expensive.[9] It is likely that the traditional electricity sector could remain in a state of upheaval for years to come.

Indeed, the electricity sector may be in the midst of a paradigm shift as it produces more and more renewable power. Due to federal and state financial support, and as a result of several state-level policies that mandate the use of renewable energy, the U.S. renewable energy sector witnessed unprecedented growth from 2001 to 2011.[10] Polls demonstrate

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4 For reports about some of the environmental risks associated with natural gas extraction and use, *see* Jim Efstathiou Jr., *Gas Fracking Poses Serious Environmental Risks, Panel Finds*, BLOOMBERG (Aug. 11, 2011), http://www.bloomberg.com/news/2011-08-11/gas-fracking-poses-serious-environmental-risks-u-s-panel-finds.html; *Fracking: Gas Drilling's Environmental Threat*, PROPUBLICA, http://www.propublica.org/series/fracking (last visited July 22, 2012) (listing 100 articles discussing natural gas extraction using hydraulic fracturing).

5 Press Release, Civil Soc'y Inst., Survey: Americans Not Warming Up to Nuclear Power One Year After Fukushima (Mar. 7, 2012), *available at* http://www.civilsocietyinstitute.org/media/030712release.cfm. Global support for nuclear energy production has similarly declined. *See generally* Oliver Morton, *Special Report: Nuclear Energy: The Dream that Failed*, THE ECONOMIST, Mar. 10, 2012, at 63.

6 Kristi E. Swartz, *Plant Vogtle Nuclear Expansion Approved 4-1*, ATLANTA J. CONST. (Feb. 9, 2012), http://www.ajc.com/business/plant-vogtle-nuclear-expansion-1340522.html (explaining that the Nuclear Regulatory Commission issued a preliminary authorization for a new nuclear power plant supported by the state of Georgia).

7 Traditional electricity fuels include coal, natural gas, and nuclear power, which have collectively provided approximately 90% of U.S. electricity for the past five decades. *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW 2010, at 236 fig. 8.2a (2011), *available at* http://www.eia.gov/totalenergy/data/annual/archive/038410.pdf. Hydroelectric power generated from large dams might also fit into the category; although only about 6% of the nation's electricity comes from hydropower dams, hydroelectricity has been a major source of power in some regions for the past several decades. *Id.*; *see also Hydropower Has a Long History in the United States*, U.S. ENERGY INFO. ADMIN. (Jul. 8, 2011), http://www.eia.gov/todayinenergy/detail.cfm?id=2130.

8 *See* End Polluter Welfare Act of 2012, H.R. 5745, 112th Cong. § 2 (2d Sess. 2012).

9 *See* U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2012 WITH PROJECTIONS TO 2035 iii, 5–14 (2012), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf [hereinafter ANNUAL ENERGY OUTLOOK 2012] (summarizing various regulations that will affect electricity production and the costs of different fuels).

10 *See* U.S. ENERGY INFO. ADMIN., MONTHLY ENERGY REVIEW APRIL 2012, at 139 tbl. 10.1 (2012), *available at* http://www.eia.gov/totalenergy/data/monthly/archive/00351204.pdf [hereinafter MONTHLY ENERGY REVIEW] (showing that wind energy increased from 70 trillion

that the public broadly supports expanded renewable energy production,[11] and more politicians—particularly at the state and local level—have expressed their support for renewable power.[12] Technology has also advanced to a point that renewable energy is becoming more reliable and cost-effective.[13] With additional advancement, many experts think it is feasible for renewable power to fuel the entire electricity grid within a relatively short period of time.[14]

Despite these successes, the renewable energy sector has reached a particularly precarious stage in its development. The economic recession, weak economic forecasts, and partisanship have prompted politicians to reduce fiscal support for renewable power.[15] Although

British thermal units (BTUs) in 2001 to 1,168 trillion BTUs in 2011, and solar power increased from 64 to 158 trillion BTUs during the same period).

[11] *CNN Opinion Research Poll*, CNN 6 (Mar. 22, 2011), http://i2.cdn.turner.com/cnn/2011/images/03/22/rel5c.pdf (83% of the poll respondents supported an increase in wind power and 88% supported an increase in solar power); Jeffrey M. Jones, *Americans Split on Energy vs. Environment Trade-Off*, GALLUP (Mar. 23, 2012), http://www.gallup.com/poll/153404/Americans-Split-Energy-Environment-Trade-Off.aspx ("Americans are nearly twice as likely to say the United States should put greater emphasis on the development of alternative energy supplies such as wind and solar power (59%) as to say the U.S. should emphasize production of more oil, gas, and coal supplies (34%)."). *See also* Michael Mariotte, *Nuclear Power and Public Opinion: What the Polls Say*, DAILY KOS (June 5, 2012), http://www.dailykos.com/story/2012/06/05/1097574/-Nuclear-Power-and-Public-Opinion-What-the-polls-say.

[12] Most states have enacted at least one renewable energy policy, and many have multiple policies. *See Financial Incentives for Renewable Energy*, DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/summarytables/finre.cfm (last visited Aug. 15, 2012) [hereinafter DSIRE *Financial Incentives*]; *Rules, Regulations, & Policies for Renewable Energy*, DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/summarytables/rrpre.cfm (last visited Aug. 15, 2012) [hereinafter DSIRE *State Policies Summary*].

[13] ANNUAL ENERGY OUTLOOK 2012, *supra* note 9, at 90; ADAM BROWN ET AL., INT'L ENERGY AGENCY, RENEWABLE ENERGY: MARKETS AND PROSPECTS BY TECHNOLOGY 36–39, 49–50 (2011), http://www.iea.org/publications/freepublications/publication/Renew_Tech.pdf

[14] *See, e.g.*, Mark Z. Jacobson & Mark A. Delucchi, *Providing All Global Energy with Wind, Water, and Solar Power, Part I: Technologies, Energy Resources, Quantities and Areas of Infrastructure, and Materials*, 39 ENERGY POL'Y 1154 (2011); Mark A. Delucchi & Mark Z. Jacobson, *Providing All Global Energy With Wind, Water, and Solar Power, Part II: Reliability, System and Transmission Costs, and Policies*, 39 ENERGY POL'Y, 1170, 1178–79 (2011); WORLD WILDLIFE FOUND. ET AL., THE ENERGY REPORT: 100% RENEWABLE BY 2050 23, 85 (Stephan Singer et al. eds., 2011); Maria da Graça Carvalho et al., *Building a Low Carbon Society*, 36 ENERGY 1842 (2011); 1 NAT'L RENEWABLE ENERGY LAB., RENEWABLE ELECTRICITY FUTURES STUDY xviii (2012) (concluding that renewable energy can meet 80% of electricity demand by 2050) [hereinafter NREL ELECTRICITY FUTURES].

[15] *See* Ben Block, *U.S. Renewable Energy Growth Accelerates*, WORLDWATCH INST., http://www.worldwatch.org/node/5855 (last updated Sept. 15, 2012) (explaining that accelerated development of wind farms was a response to the looming expiration of tax credits for renewable power); JESSE JENKINS ET AL., BREAKTHROUGH INST., BEYOND BOOM & BUST: PUTTING CLEAN TECH ON A PATH TO SUBSIDY INDEPENDENCE 4 (2012).

federal tax credits and subsidies continue to incentivize renewable sources to a certain extent, the level of support has dropped off, and it is unclear if politicians will have the stomach to fund more subsidies if the U.S. economy remains anemic.[16] Private investors, moreover, have had a fickle attitude towards renewable energy, and many have expressed wariness in investing in renewable energy when federal legislation reducing greenhouse gases or supporting renewable power seems unlikely.[17] In addition, while renewable energy developers have always faced some hurdles in the siting process, newer siting challenges could increase impediments to renewable energy development.[18] Getting renewable power onto the transmission grid has also become increasingly complicated as grid managers must accommodate many more new sources of intermittent power.[19] In short, the remarkable growth of the renewable energy sector over the past decade has brought the industry to a point where several problems could impede future growth. Policymakers must address these problems soon to ensure renewable energy remains viable over the long term.

For years, some electricity experts have advocated for the use of distributed renewable energy generation as a way to continue expanding renewable energy production while averting problems common with large, remote renewable facilities.[20] Distributed generation is the

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16 JENKINS ET AL., *supra* note 15. As discussed in greater detail below, the major subsidy supporting wind energy production—the federal Production Tax Credit—required eligible wind farms to come online no later than December 31, 2012. *See infra* notes 75–80 and accompanying discussion. Many politicians, most notably the 2012 Republican presidential candidate Mitt Romney, have favored an end to the subsidy. *See* James Murray, *Mitt Romney Confirms He Would End U.S. Wind Power Subsidies*, GUARDIAN ENV'T NETWORK (Aug. 2, 2012), http://www.guardian.co.uk/environment/2012/aug/02/mitt-romney-end-us-wind-subsidies.

17 *See, e.g.*, Felix Mormann, *Requirements for a Renewables Revolution*, 38 ECOLOGY L.Q. 903, 947 (2012); Felix Mormann, *Enhancing the Investor Appeal of Renewable Energy*, 42 ENVTL. L. 681, 687 (2012) [hereinafter Mormann, *Investor Appeal*].

18 *See infra* notes 124–135 and accompanying discussion.

19 *See* AM. PHYSICAL SOC'Y, INTEGRATING RENEWABLE ELECTRICITY ON THE GRID: A REPORT BY THE APS PANEL ON PUBLIC AFFAIRS 2 (noting that increased renewable energy production will make integration more difficult); EDISON ELEC. INST., RENEWABLE ENERGY: GROWTH AND CHALLENGES IN THE ELECTRIC POWER INDUSTRY 18 (2008) (discussing challenges of integration presented by distributed generation); *see also infra* notes 145–149 and accompanying discussion.

20 *See* U.S. DEP'T OF ENERGY, THE POTENTIAL BENEFITS OF DISTRIBUTED GENERATION AND RATE-RELATED ISSUES THAT MAY IMPEDE THEIR EXPANSION: A STUDY PURSUANT TO SECTION 1817 OF THE ENERGY POLICY ACT OF 2005 (2007) [hereinafter DOE DISTRIBUTED GENERATION]; *see also* AMORY B. LOVINS ET AL., SMALL IS PROFITABLE: THE HIDDEN ECONOMIC BENEFITS OF MAKING ELECTRICAL RESOURCES THE RIGHT SIZE (2002).

production of electricity at or near the site of consumption.[21] If properly deployed, distributed generation systems could help improve the overall reliability of the power grid and thus pave the way for increased growth of larger renewable sources.[22] Distributed generation could also increase overall efficiency and reduce transmission congestion, thereby removing two primary impediments to the development of larger, remote renewable energy systems.[23] Finally, distributed generation could increase certainty in the renewable energy industry by providing developers multiple investment opportunities and allowing them to proceed with many projects at once.[24] In short, distributed generation could enhance the transition toward a carbon-free electricity system by creating more pathways for renewable electricity production and delivery.[25]

Despite the benefits of distributed generation, renewable energy policies tend to promote development of large renewable energy generation systems located far from urban centers of power consumption.[26] The dominant renewable energy incentive strategies—tax credits and renewable portfolio standards—reward producers for increased power production, often with disregard to the location of the production.[27] Smart investors respond to these strategies by building plants capable of achieving economies of scale, with little to no regard for where that power will ultimately end up. Meanwhile, policies specifically promoting distributed generation either fail to consider the financial impediments developers face or risk preemption when they do.[28] In many places, limits on these policies make the financial rewards too small or uncertain to incentivize broad investments.[29] In other places

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[21] The Department of Energy defines distributed generation as "electric generation that feeds into the distribution grid, rather than the bulk transmission grid, whether on the utility side of the meter, or on the customer side." DOE DISTRIBUTED GENERATION, *supra* note 20, at xvi. It defines distributed power as the "generic term for any power supply located near the point where the power is used[; the o]pposite of central power." *Id.*

[22] *Id.* at iii, 2-17.

[23] LOVINS ET AL., *supra* note 20, at 220–23 (discussing reductions in grid losses), 231–33 (discussing avoided voltage drop, which can occur when transmission lines become heavily loaded or congested).

[24] *Id.* at 99–104.

[25] Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 EMORY L.J. 877, 899–900 (2011).

[26] *See* Deborah Behles, *An Integrated Green Urban Electrical Grid*, 36 WM. & MARY ENVTL. L. & POL'Y REV. 671, 674–75 (2012); *see also infra* notes 54–112 and accompanying discussion.

[27] *See infra* notes 62–112 and accompanying discussion.

[28] *See infra* notes 246–324 accompanying discussion.

[29] *See id.*

where distributed generation policies have successfully spurred significant investment, they have come under attack as unfair subsidies borne by some ratepayers to pay for their wealthier neighbors' voluntary decisions to install expensive solar panels.[30] Unless policies to promote renewable energy change, the benefits of distributed generation may never be realized.

A broader underlying problem distributed generation advocates face is that a successful transition to a distributed generation system could undermine the economic and political foundations of the current electricity regulatory system in many states.[31] In most states, vertically integrated monopolies subject to regulation by state public utility commissions ("PUCs") run the electricity system.[32] Increased distributed generation by independent power producers could undermine the monopoly status of investor-owned utilities ("IOUs").[33] Even in states with restructured electricity systems,[34] utilities and independent power producers that generate power for sale on the wholesale market may view distributed generation producers as competitors benefitting from unfair policies.[35] Moreover, in most states, utilities' revenues depend on the amount of power the utilities sell to their ratepayers.[36] If the utilities' customers are encouraged to generate their own power, utilities' sales-

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30 *See infra* note 374 and accompanying discussion.

31 *See infra* notes 325, 384–395 and accompanying discussion.

32 A vertically integrated electric monopoly typically generates, transmits, and delivers electricity to customers within an exclusive service territory established by state regulators. *See Electricity Terms and Definitions*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/cneaf/electricity/page/glossary.html#uv (last visited Aug. 1, 2012) (defining "Vertical Integration"). Private investor-owned utilities operating as vertically integrated monopolies provided about 57% of the electricity in the United States in 2010. *Electricity Explained, Electricity in the United States, Generation, Sales and Capacity*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/energyexplained/index.cfm?page=electricity_in_the_united_states#tab2 (last updated May 16, 2012).

33 *See infra* notes 384–395 and accompanying discussion.

34 In a restructured electricity system, independent power producers generate electricity and sell it at wholesale to utilities. The utilities typically continue to provide transmission and delivery services. *See Electricity Terms and Definitions*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/cneaf/electricity/page/glossary.html#cd (last visited Aug. 20, 2012) (defining "Utility Distribution Company").

35 *See infra* note 368 and accompanying discussion.

36 *See* NAT'L ASS'N OF REGULATORY UTIL. COMM'RS, DECOUPLING FOR ELECTRIC & GAS UTILITIES: FREQUENTLY ASKED QUESTIONS (FAQ) 3 (2007), *available at* www.naruc.org/Publications/NARUCDecouplingFAQ9_07.pdf (explaining how utilities' profits typically depend on their electricity sales); *id.* at 6 (map showing that only 10 states had decoupled sales from profits as of 2007).

based revenues and profits may decline.[37] Similarly, distributed generation may threaten utilities' revenue if the utilities do not receive full payment for power delivery and grid management associated with distributed generation.[38] While these concerns may seem remote at this early point in the emergence of distributed generation, effective policies should consider and address these regulatory and economic dynamics.

Advocates of distributed generation could pursue a number of options to better promote distributed generation as part of a comprehensive effort to transition to a renewable electricity system. A fundamental starting point of this transition is the development of comprehensive energy plans that would map out a strategy for steadily increasing renewable power and decreasing fossil fuel use.[39] The strategy would use historical and anticipated energy consumption data to calculate power demand, map out the ideal locations for the development of distributed generation systems and large renewable facilities to serve this demand, and detail the infrastructure changes and improvements needed to accommodate the new energy sources.[40] Much like land-use plans provide a blueprint for strategic development, a comprehensive energy plan would map out a strategy for a state to transition to a renewable electricity system that integrates large remote facilities with distributed generation. Absent an energy blueprint designed to accommodate more distributed generation, however, it is unlikely that renewable policies alone will lead to robust distributed generation deployment.

At the same time, reformed renewable energy policies will play a key role in transitioning to an expanded distributed generation system. However, distributed generation advocates should not pursue one-size-fits-all strategies because the power of utilities and the politics revolving around that power make some distributed generation policies unworkable in some states. Thus, in states with strong vertically integrated electricity monopolies, the best strategy to promote distributed generation may involve renewable portfolio standards designed specifically to increase distributed generation by the utilities themselves.[41] In restructured states and states with weaker IOUs, a mix of improved policies, including better net metering, feed-in tariffs, and focused renewable portfolio

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37 *See* NAT'L ASS'N OF REGULATORY UTIL. COMM'RS, *supra* note 36.

38 *See infra* notes 357–367 and accompanying discussion.

39 *See* discussion *infra* Part V.

40 *See* discussion *infra* Part V.

41 *See* discussion *infra* Part V.

standards, could lead to more investment in distributed generation.[42] When these policies are accompanied by measures to improve the quality of the electricity transmission and distribution system—and to compensate utilities for making some of these improvements—efforts to expand the distributed generation system could produce long-term benefits for the environment, ratepayers, and renewable energy developers.

This article therefore explains why a piecemeal approach to promoting distributed generation development will not lead to necessary changes in the electricity system and introduces a framework for bringing more distributed generation online. Part II of this article explains how the major U.S. renewable energy policies have led to an expansion in renewable energy development, particularly at larger facilities located far away from the major areas of electricity demand, and explores the risks of this expansion. Part III then introduces distributed generation and explains how increased development of distributed generation could mitigate the risks described in Part II and create a stronger electricity system that integrates large remote renewable power facilities with distributed renewable generation.

Next, Part IV explores the economic, technological, and political difficulties involved in bringing more distributed generation online within our dominant regulatory models. It first describes net metering and feed-in tariffs and examines why they currently serve as weak incentives for distributed generation. It also explains how expansion of distributed generation could undermine the monopolies of traditional vertically integrated utilities and threaten independent power producers and distribution utilities in restructured electricity markets.[43] While these threats may seem remote based on the current low rates of distributed generation development, recent controversies in California highlight the fears utilities have about distributed generation and suggest that distributed generation advocates should develop policies that address these concerns.

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42 *See* discussion *infra* Part V.

43 A distribution utility—sometimes also called a transmission utility—operates the transmission and distribution parts of the electricity sector, typically pursuant to a monopoly charter, but does not generate its own power. In some states, utilities have responsibility only over the transmission and distribution systems (including their reliability), and independent companies have responsibility for sales and service to electricity end users. In other states, distribution utilities handle all aspects of electricity operations and sales other than power production. U.S. ENERGY INFO. ADMIN., *supra* note 34. (defining "Utility Distribution Company").

Part V thus outlines strategies that could offer a long-term, sustainable pathway for transitioning to more distributed generation and renewable energy production overall.[44] First, it proposes that states embark upon comprehensive electricity development planning to chart a path for transitioning to a renewable power–based system. Second, it explains how improved net metering and feed-in tariffs could promote some amount of distributed generation development in some states, but also recommends that renewable portfolio standards with distributed generation carve-outs should play a much greater role. Last, the proposal recommends increased implementation of other incentive structures that would enable utilities to realize greater profits from accommodating increased amounts of distributed generation. Although these strategies would not necessarily mesh with some proposals to "democratize the grid,"[45] this article concludes that comprehensive planning, combined with improved policies, could promote and deploy distributed generation on a meaningful scale.

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[44] This article will serve as an introduction to the strategies states should pursue to expand distributed generation development, but it will not discuss the strategies in detail. A forthcoming article will provide much more detail about these recommendations.

[45] Some advocates of distributed generation have emphasized how the installation of distributed generation systems—particularly solar panels—by homeowners and businesses could diminish the power of monopolistic utilities and lead to a more democratic power system in which power production is in the hands of citizens. *See, e.g.*, Jim Hightower, *Democratize the Grid*, THE PROGRESSIVE (Dec. 2010/Jan. 2011), *available at* http://www.progressive.org/hightower1210.html; JOHN FARRELL, NEW RULES PROJECT, DEMOCRATIZING THE ELECTRICITY SYSTEM: A VISION FOR THE 21ST CENTURY GRID (2011) i–iii, *available at* http://www.ilsr.org/wp-content/uploads/2011/06/democratizing-electricity-system.pdf. As explained in Part IV of this article, the underlying premise that independent power production could reduce the power of monopolies has merit. It may also be true that the electricity system would benefit overall from more diverse ownership of power generation facilities, although some commentators might dispute that idea. *See* Timothy P. Duane, *Regulation's Rationale: Learning from the California Electricity Crisis*, 19 YALE J. ON REG. 471, 514–15 (2002) (explaining how, due to the physical realities of the electricity system, it is possible for very small energy producers to exercise market power under certain conditions). This article, however, does not directly address the strength or validity of the democratization idea. Instead, it argues that distributed generation is more likely to expand if policies align with the dominant political trends in each state. Admittedly, these proposals will not appeal to distributed generation advocates who view distributed generation primarily as a tool to break up monopolistic utilities.

II. THE RISE AND RISKS OF LARGE RENEWABLES

The renewable energy sector has experienced remarkable growth over the past two decades.[46] Policies to promote renewable energy initially emerged in the 1970s in response to concerns about energy costs and lack of domestic energy production.[47] These policies led to a first wave of renewable energy development, but this wave subsided in the 1980s when federal and state support for renewable energy waned as fossil fuel prices declined and government support for renewable energy ended.[48] However, as concerns about climate change, local air pollution, and energy independence again emerged in the late 1990s, governments at all levels renewed their support for renewable energy development.[49] Today, most states have at least one renewable energy development policy in place, and many states use several different policies to promote renewable energy development.[50] When combined with federal tax incentives, these policies have helped spur renewable energy boom.[51]

Most growth in the renewable energy sector has occurred at large and remote facilities because economies of scale favor the development of such facilities.[52] While this growth in larger renewable facilities has several advantages and should continue, it also involves a number of risks that, if not addressed, could threaten the long-term stability of the renewable energy industry.[53] This section thus briefly introduces the dominant policies that promote large-scale renewable energy

[46] MONTHLY ENERGY REVIEW, *supra* note 10, at 139 tbl. 10.1.

[47] SALVATORE LAZZARI, CONG. RESEARCH SERV., RL 33578, ENERGY TAX POLICY: HISTORY AND CURRENT ISSUES 1 (2008), *available at* http://www.fas.org/sgp/crs/misc/RL33578.pdf.

[48] *Id*. at 6.

[49] *Id.* at 8–9.

[50] DSIRE *State Policies Summary*, *supra* note 12.

[51] MONTHLY ENERGY REVIEW, *supra* note 10, at 139 tbl. 10.1.

[52] *See* RYAN WISER & GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., RENEWABLES PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007, at 13 (2008), *available at* http://eetd.lbl.gov/ea/ems/reports/lbnl-154e.pdf (explaining that 93% of new renewable energy development in states with RPSs came from wind power); Miguel Mendonça et al., *Stability, Participation and Transparency in Renewable Energy Policy: Lessons from Denmark and the United States*, 27 POL'Y & SOC'Y 379, 381 (2009), *available at* http://www.sciencedirect.com/science/article/pii/S144940350900006X.

[53] *See* Behles, *supra* note 26, at 680–81; *see also* Cal. Pub. Util. Comm'n, Decision 11-03-036 (Mar. 24, 2011), *available at* http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/132654-08.htm (order rejecting application for large wind project because PUC thought the project was too expensive and faced the risk of curtailment if wind turbines injured or killed protected species).

development, explains how they have led to an expansion of large and remote facilities, and identifies the risks this expansion has created.

A. RENEWABLE ENERGY POLICIES PROMOTE LARGE REMOTE FACILITIES

Renewable energy experienced a remarkable decade of growth from 2001–2011. Renewable energy production actually eclipsed electricity production from nuclear plants in the first quarter of 2011.[54] While hydroelectric facilities produced the majority of renewable electricity, the growth of other renewable energy sources, notably wind and solar, demonstrates the effect that renewable energy policies have had.[55] Wind power production increased by more than 1,500 percent from 2001 to 2011.[56] Electricity production from solar photovoltaic ("PV") arrays increased by almost 150 percent during the same period.[57] This growth tracks the use of incentives and other policies designed to promote renewable energy production.

The comparative increases in wind and solar energy production also reveal that renewable energy policies mainly promote the development of larger facilities located away from the sites of most power consumption. By and large, most solar PV systems are distributed generation systems,[58] and while solar PV use grew by nearly 150 percent over a ten-year period, total solar PV production accounted for a small fraction of total renewable power production in 2011.[59] Wind power systems, unlike solar PV, are typically located in rural areas but sell their power to urban consumers. [60] Wind electricity expanded both at an enormous rate and in total electricity output.[61] This section explains how the dominant renewable energy incentive policies—tax credits and

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[54] Erica Gies, *Renewable Energy Production Surpasses Nuclear in U.S.*, FORBES (July 7, 2011), http://www.forbes.com/sites/ericagies/2011/07/07/renewable-energy-production-surpasses-nuclear-in-u-s-2/.

[55] MONTHLY ENERGY REVIEW, *supra* note 10, at 139 tbl. 10.1.

[56] *Id*. In 2001, wind power totaled 70 trillion British thermal units (BTUs); by 2011, it had climbed to 1,168 trillion BTUs. *Id.*

[57] *Id*. Solar PV power production increased from 64 trillion BTUs in 2001 to 158 trillion BTUs in 2011. *Id*.

[58] Behles, *supra* note 26, at 677.

[59] MONTHLY ENERGY REVIEW, *supra* note 10, at 139 tbl 10.1.

[60] U.S. DEP'T OF ENERGY, WIND PROGRAM: ADVANTAGES AND CHALLENGES OF WIND ENERGY, http:// www1.eere.energy.gov/wind/wind_ad.html (last updated Nov. 07, 2011).

[61] MONTHLY ENERGY REVIEW, *supra* note 10, at 139 tbl 10.1.

renewable portfolio standards—have led to such an expansion from large, remote power systems.

1. Renewable Energy Tax Credits

Since the 1990s, subsidies and tax breaks have served as the primary federal renewable energy development tools.[62] Many states have also used subsidies and tax breaks to promote renewable energy deployment.[63] These financial incentives, when combined with other programs, have played a significant role in promoting investment in renewable energy. This section uses two federal tax credits, the Investment Tax Credit ("ITC") and the Production Tax Credit ("PTC"), to highlight the importance of tax credits and other economic incentives to the renewable energy industry.[64]

The ITC has long served as the dominant subsidy for large solar thermal plants and other large solar energy facilities. The ITC gives investors a tax credit based on the amount of money they invest in qualifying renewable installations.[65] Investors can receive the credit for five years after a facility is placed in service.[66] The amount of credit depends on the type of power and size of the investment, rather than the amount of electricity produced, with credits beginning at 10 percent of the investment in geothermal and maxing out at 30 percent for solar energy and small wind farms.[67] For many years, the ITC has served as the dominant program to promote solar thermal energy installations because Congress excluded solar energy from eligibility under the PTC in 2005.[68] Moreover, the ITC offers greater certainty for developers of large power facilities with high upfront capital costs and uncertain production

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[62] GILBERT E. METCALF, CTR. FOR ENERGY POLICY AND THE ENV'T AT THE MANHATTAN INST., TAXING ENERGY IN THE UNITED STATES: WHICH FUELS DOES THE TAX CODE FAVOR? 4 (Jan. 2009), *available at* http://www.manhattan-institute.org/pdf/eper_04.pdf.

[63] *See* Roberta F. Mann & E. Margaret Rowe, *Taxation*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 145, 154–60 (Michael B. Gerrard, ed.) (2011).

[64] Several other federal tax incentives not discussed in this article also promote research, development, and investment in renewable energy. *Id.* at 145–67.

[65] *Id.* at 149.

[66] Craig M. Kline, *Solar*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 391, 394 (Michael B. Gerrard, ed.) (2011).

[67] I.R.C. § 48(a) (2012). The tax credit for solar facilities will decline from 30 percent to 10 percent after January 1, 2017. I.R.C. § 48(a)(2).

[68] I.R.C. § 45(d)(4); *see also* Daniel K. Tracey, *The Missing Lending Link: Why a Federal Loan Guarantee Program is Critical to the Continued Growth of the Solar Power Industry*, 16 N.C. BANKING INST. 349, 354 (2012).

forecasts.[69] Investors in solar facilities, therefore, have benefitted from the certainty of the ITC while solar technology has developed and capital-intensive facilities have undergone construction.

The PTC, in contrast, rewards actual production and delivery of renewable electricity to the power grid.[70] Wind energy is particularly suited to the PTC because wind turbine technology was already quite mature when the U.S. wind energy industry began its buildup in the late 1990s. For wind energy developers, the question was not whether they could build operational facilities, but whether they could sell power at rates that were competitive with fossil fuel-based electricity. The PTC enables this competition by allowing qualifying facilities to earn a specified inflation-adjusted amount in tax credits for each kilowatt of electricity they deliver to the grid.[71] The credits are available for the first ten years of a facility's operation.[72] Although the value of the credits may decline if the market price of electricity reaches a certain level (and the subsidy is therefore no longer necessary), production levels do not affect the availability or value of credits.[73] Wind power companies therefore have had incentives to build as many large facilities as they could to take advantage of the credits. Renewable energy experts attribute a substantial amount of the growth in renewable energy facilities, and particularly wind farms, to the PTC.[74]

While both credit systems have spurred significant growth in the renewable energy sector, they have also led to boom-and-bust cycles in the industry. Under both systems, eligibility for the credits depends on when a facility goes into service, which is essentially the date on which the facility is able to produce power.[75] These eligibility dates have been

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[69] Greg Pfahl, *ITC or PTC for Your Renewable Energy Project?*, RENEWABLE ENERGY WORLD (Jul. 19, 2010), http://www.renewableenergyworld.com/rea/news/article/2010/07/itc-or-ptc-for-your-renewable-energy-project (discussing the suitability of the ITC and PTC for renewable energy facilities).

[70] I.R.C. § 45 (2012).

[71] The credit ranges from .75 cents to 1.5 cents per kilowatt-hour, depending upon the type of energy source. Mann & Rowe, *supra* note 63, at 147. Wind energy receives the full credit amount. *Id.* at 148.

[72] *Id.* at 147.

[73] *Id.* at 147–48 (citing I.R.C. § 45(b)(1)).

[74] RYAN WISER & MARK BOLINGER, U.S. DEP'T OF ENERGY, 2009 WIND TECHNOLOGIES MARKET REPORT 57 (2010) [hereinafter 2009 WIND TECHNOLOGIES MARKET REPORT].

[75] *See* Howard A. Cooper, *Tax Credits for Electricity from Renewables—Updated*, 125 TAX NOTES 221, 234 (Oct. 12, 2009), *available at* http://www.troutmansanders.com/files/Uploads/Documents/My%20article%20from%20Tax%20Analysts.pdf (explaining that the Internal Revenue Service considers a facility to be placed in service when it is "in a condition or state of readiness and availability"). *See also* Mann & Rowe,

quite short under both programs, particularly the PTC. In fact, the PTC expired three times between 1999 and 2005 and was scheduled to expire again at the end of 2012.[76] Whenever the credits have expired, investment has stagnated and growth in the renewables industry has stopped.[77] The restoration of the tax credits has typically spurred new rounds of investment and redevelopment.[78] The on-and-off again development cycle, particularly during the recent financial crisis, has put the renewable energy industry in a precarious position.[79] It also explains why companies would rush to build as many large facilities as possible within the limited window of time the tax credits allow.[80]

In the aggregate, it is not surprising that federal tax credits have spurred growth of large renewable energy facilities. Both the ITC and PTC offer great rewards the more a company invests (in the case of the ITC) or produces (in the case of the PTC). They also promote intensive development through sunset dates; if companies want to get the credits they need, they will need to get their facilities built quickly. This dynamic favors construction of larger facilities because companies will want to limit the transaction costs and delay associated with siting and development; if they can earn as much money through building a few major facilities as they could if they built several dozen smaller facilities, there is no reason for them to pursue anything other than large renewable power plants. It also favors the development of renewable energy systems in remote locations, both because those locations have the best wind and solar resources, and because siting processes may often be less

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supra note 63, at 147–49. Under the most recent iteration of the PTC, a facility placed in service before January 1, 2013, qualified for PTC credits. *Id.* at 148. The ITC applies to facilities placed in service by December 31, 2016. Kline, *supra* note 66, at 394.

76 *The American Wind Industry Urges Congress To Take Immediate Action To Pass an Extension of the PTC,* AM. WIND ENERGY ASS'N, 1, 2, http://www.awea.org/issues/federal_policy/upload/PTC-Fact-Sheet.pdf (last visited Aug. 15, 2012) [hereinafter AWEA PTC].

77 *Id.*

78 *Id.*

79 *See* Press Release, Am. Wind Energy Ass'n, Layoffs Mount in U.S. Wind Power Manufacturing Plants This Week (Aug. 9, 2012), *available at* http://www.awea.org/newsroom/pressreleases/layoffs_mounting.cfm.

80 This seems to be exactly what companies have done. When Congress has renewed the PTC in the past, facility construction has spiked the following year. *See* AWEA PTC, *supra* note 76, at 2. Similarly, when the PTC is nearing expiration, installation spikes again as companies rush to meet the eligibility deadline. RYAN WISER & MARK BOLINGER, U.S. DEP'T OF ENERGY, 2011 WIND TECHNOLOGIES MARKET REPORT 3 (2012) [hereinafter 2011 WIND TECHNOLOGIES MARKET REPORT].

cumbersome in rural areas eager for additional development.[81] Federal tax credits, therefore, are a major driver of the boom in large renewable energy development.

2. Renewable Portfolio Standards

While tax credits have played a significant role in promoting development of large, remote facilities, renewable portfolio standards ("RPSs") enhance this dynamic.[82] RPSs are state-level policies that direct utilities to produce or purchase a certain percentage of electricity from renewable energy within a specific period of time.[83] These programs usually set interim targets as well, thereby insuring progressive increases in renewable energy development.[84] As of May 2012, twenty-nine states had RPSs, and another eight states had goals for renewable energy production or procurement.[85] Experience with existing RPSs shows that they often favor development of large, remote energy systems by allowing companies to comply with the RPSs through certificates rather than actual energy production or purchasing.[86]

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81 *See* Sara Pizzo, Note, *When Saving the Environment Hurts the Environment: Balancing Solar Energy Development with Land and Wildlife Conservation in a Warming Climate*, 22 COLO. J. INT'L ENVTL. L. & POL'Y 123, 133–34 (2011).

82 2009 WIND TECHNOLOGIES MARKET REPORT, *supra* note 74, at 59 (noting that 61% of wind power capacity development occurred in states with RPSs).

83 Mormann, *Investor Appeal*, *supra* note 17, at 691; *see also* Reinhard Haas, et al., *A Historical Review of Promotion Strategies for Electricity from Renewable Energy Sources in EU Countries*, 15 RENEWABLE & SUSTAINABLE ENERGY R. 1011, 1014 (2011).

84 *Incentives/Policies for Renewable Energy, Rules, Regulations, and Policies,* DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/incentives/allsummaries.cfm?SearchType=RPS&&re=1&ee=0 (last visited Dec. 7, 2012) [hereinafter DSIRE *Rules, Regulations, and Policies*] (e.g., Arizona's standard establishes annual requirements, and California establishes interim requirements for 2013 and 2016 before requiring utilities to meet a 33% by 2020 final RPS).

85 *Renewable Portfolio Standard Policies*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY (Sept. 2012), http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf.

86 This dynamic is particularly strong where states establish RPSs and allow the use of renewable electricity certificates or credits (RECs) without establishing geographical or size limitations on eligible facilities. *See* EDWARD A. HOLT & RYAN H. WISER, ERNEST ORLANDO LAWRENCE BERKELEY NAT'L LAB., THE TREATMENT OF RENEWABLE ENERGY CERTIFICATES, EMISSIONS ALLOWANCES, AND GREEN POWER PROGRAMS IN STATE RENEWABLES PORTFOLIO STANDARDS 3 (2007) (noting that tradable renewable energy certificates "widen[] the geographic scope of eligible renewable energy projects"); EDWARD HOLT, JENNY SUMMNER & LORI BIRD., NAT'L RENEWABLE ENERGY LAB., THE ROLE OF RENEWABLE ENERGY CERTIFICATES IN DEVELOPING NEW RENEWABLE ENERGY PROJECTS 11 (2011) (explaining that large projects can achieve economies of scale, resulting in lower REC prices). However, where a state has created an RPS that requires utilities to purchase or procure a certain amount of power or a certain percentage of RECs from solar facilities or distributed generation facilities, facilities may be smaller and closer

Most states require utilities to use Renewable Electricity Credits ("RECs") to demonstrate compliance with their RPSs.[87] Depending on a state's RPS, a utility may purchase either "bundled" or "unbundled" RECs.[88] While unbundled RECs provide greater incentives for the construction of large remote facilities, bundled RECs can also create these incentives in certain circumstances.

Bundled RECs are identification numbers that accompany the electricity and demonstrate that the electricity actually comes from an eligible renewable source.[89] By requiring utilities to obtain bundled RECs, states are essentially requiring utilities to either produce or procure renewable electricity that actually reaches in-state customers (or at least makes it onto the electricity grid).[90] The RECs are considered "bundled" because the utility must obtain both the renewable electricity and the credits representing the renewable properties of the electricity.[91] Bundled RECs typically incentivize renewable electricity production closer to the site of consumption by requiring utilities to deliver the actual electricity to the utilities' own customers.[92] They are therefore more likely to convey the benefits of renewable power—including reduced pollution emissions, increased efficiency, and clean energy jobs—to the customers paying for the renewable power.[93] However, bundled RECs reduce flexibility for utilities by forcing them to buy power from facilities located in close proximity to the state.[94] Reduced flexibility may mean less availability and higher prices for renewable

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to the site of consumption. *See* HOLT ET AL. at 20; LORI BIRD ET AL., NAT'L RENEWABLE ENERGY LAB., SOLAR RENEWABLE ENERGY CERTIFICATE (SREC) MARKETS: STATUS AND TRENDS 22–23 (2011). Nonetheless, even with solar facilities, "[s]ystem size has been trending larger in recent years." *Id.* at 27; *see also id.* at 26–28.

[87] Mormann, *Investor Appeal*, *supra* note 17, at 691–92.

[88] *See* BRUCE ELDER, ENERGY POLICY INITIATIVES CTR., UNIV.OF SAN DIEGO LAW SCH., RENEWABLE ENERGY CREDITS (RECS) IN CALIFORNIA: STATUS AFTER PASSAGE OF SENATE BILL 107 OF 2006, at 7 (2007), *available at* http://www.sandiego.edu/epic/research_reports/documents/070625_RECs_SB107_FINAL_000.pdf.

[89] *Id*.

[90] *Id.*

[91] *Id*.

[92] *See* NANCY RADER & SCOTT HEMPLING, THE RENEWABLE PORTFOLIO STANDARD: A PRACTICAL GUIDE, 32–34 (2001), *available at* http://www.naruc.org/grants/Documents/rps.pdf (discussing benefits of RPS programs generally and restrictive RPS programs that do not contemplate tradable RECs).

[93] *Id.*

[94] *See* ELDER, *supra* note 88, at 8–9.

power.[95] To avoid these impacts, states with bundled REC requirements may define eligible RECs in a way that allows energy from large, remote facilities to qualify.[96] Thus, while bundled RECs can limit eligible facilities so as to reduce the incentives to build large renewable energy facilities, they typically include provisions that, in fact, promote such development.

In contrast to those states that require bundled RECs, many states allow utilities to purchase unbundled RECs—which are certificates representing the "renewable" component of the electricity—rather than the renewable electricity.[97] Utilities can accordingly meet their RPS obligations simply by purchasing certificates without actually delivering renewable energy to their customers.[98] Unbundled RECs thus typically emphasize cost control and flexibility over efficiency and localized benefits.[99] States that allow unbundled RECs may authorize utilities to buy RECs from facilities located thousands of miles away from the utilities' customers.[100] The utilities' customers may not receive any of the renewable electricity or localized benefits associated with renewable energy production; instead, these consumers receive the generalized benefit of having their utilities support renewable electricity, even if the renewable power never enters the state.[101] The cost of the unbundled RECs should be lower as a consequence, because the utilities have greater flexibility to purchase the lowest-priced RECs.[102] Moreover, for utilities in states with few renewable energy facilities, unbundled RECs present a good way for utilities to satisfy their RPS obligations without building their own renewable energy systems or paying a premium for the limited renewable energy that is available.[103] Unbundled RECs also

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95 *See id.* at 9.

96 *See id.* at 13. For example, California's RPS, which requires RECs to come either from in-state facilities or out-of-state facilities with immediate access to California's transmission system, has spurred significant growth of wind systems outside of California. Wind farms have sprung up in central and eastern Oregon, where access to a transmission line owned by the Bonneville Power Administration ensures the required interconnection to satisfy California's RPS. Arizona and Nevada have also witnessed a surge in large-scale solar power development designed to satisfy California's RPS. Personal communication from Christian Yoder, General Counsel, Iberdrola Renewables, to Melissa Powers, Associate Professor, Lewis & Clark Law School (Apr. 13, 2012).

97 ELDER, *supra* note 88, at 7.

98 *Id.* at 6–7.

99 *Id.* at 8–9.

100 *Id.*

101 *See id.*

102 *Id.*

103 *Id.*

create a clear incentive for the construction of large, remote renewable energy facilities that can provide abundant RECs at low prices.

When RPSs and tax credits work together, they tend to promote investment in large-scale installations that are often located many miles away from the cities that need the renewable power.[104] Both systems create incentives to maximize power production from eligible systems. Economies of scale and the potential hurdles of facility permitting and development further lead to the installation of large, remote systems.

Smart investors take advantage of these programs by locating their facilities in areas most capable of producing large amounts of electricity at the cheapest rates. To date, the cheapest sources of renewable power are wind turbines,[105] and the most reliable wind production areas are in rural areas in the upper western and midwestern states.[106] Other reliable wind generation locations include west Texas and the eastern parts of Washington and Oregon.[107] Rural areas often welcome renewable energy facilities because they expand the tax base and may increase revenues from agricultural and other rural lands,[108] and developers may benefit from easier permitting processes in some cases.[109] The lure of tax credits, combined with the ease of developing wind farms in certain areas, has spurred wind developers to produce as much power as possible as quickly and cheaply as possible in the rural West and Midwest.[110] Renewable portfolio standards have only increased this trend.[111]

Prudent investors in renewable electricity will prefer to invest in plants that can produce the greatest amount of electricity for the least amount of money, particularly if the plants will be able to sell more

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[104] Sanya Carley, *The Era of State Energy Policy Innovation: A Review of Policy Instruments*, 28 REV. POL'Y RES. 265, 267–68 (2011); MICHAEL MENDELSOHN & JOHN HARPER, § 1603 TREASURY GRANT EXPIRATION: INDUSTRY INSIGHT ON FINANCING AND MARKET IMPLICATIONS iii (2012) ("Investments in new commercial and utility-scale renewable power production facilities are fostered by tax credits (the production tax credit and investment tax credit) and accelerated depreciation benefits.").

[105] *See* NREL ELECTRICITY FUTURES, *supra* note 14, at A-11, tbl. A-1.

[106] *See* 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 7–8, 46–47; *supra* notes 74–81 and accompanying discussion.

[107] *Id.*

[108] Ronald H. Rosenberg, *Making Renewable Energy a Reality-Finding Ways To Site Wind Power Facilities*, 32 WM. M. ENVTL. L & POL'Y R. 635, 663–65 (2008).

[109] *See* Alexa Burt Engelman, *Against the Wind: Conflict over Wind Energy Siting*, 41 ENVTL. L. REP. NEWS & ANALYSIS 10549, 10559–60 (2011) (explaining that many rural areas and small towns lack zoning laws or legal restrictions that would restrict siting).

[110] *See id*. at 57 (discussing importance of PTC).

[111] *Id.* at 58.

RECs or get more tax credits the more power they produce. Moreover, renewable energy developers and investors avoid significant transaction costs by investing in larger facilities.[112] RECs and tax credits thus promote increased renewable electricity production from large installations located in places that are often removed from the site of electricity delivery or consumption.[113]

B. THE RISKS OF LARGE AND REMOTE RENEWABLES

So why should scale and location matter? Presumably, any level of development in an emerging renewable power industry should be perceived as a positive trend. And, to be sure, there are many positive aspects to the development of large renewable power plants. Larger facilities should achieve economies of scale that allow renewable power to compete with fossil fuels.[114] Moreover, the larger the facilities, the better the likelihood that they can provide baseload quantities of power and perhaps displace many of the dirtiest and most inefficient coal power plants.[115] Indeed, development of newer technologies has already allowed for utility-scale renewable power plants that can produce energy more efficiently at lower costs.[116] To be sure, the rapid expansion of the renewable energy industry and the establishment of utility-scale renewable power plants represent an important progression in the industry and one that should continue even as governments provide better incentives for distributed generation.

However, overreliance on large and remote renewable power plants involves significant risk as well. While technology is emerging that could enable renewable power plants to produce power consistently—particularly from solar thermal plants[117]—reliability

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[112] *See* Kline, *supra* note 66, at 404.

[113] While tax credits and RPSs have promoted significant growth, the Department of Energy expects the rate of growth to decline significantly if the tax credits expire, because existing RPSs will not alone sustain the same rate of growth. 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 79, at 58.

[114] *See generally* NAT'L RENEWABLE ENERGY LAB., DOLLARS FROM SENSE: THE ECONOMIC BENEFITS OF RENEWABLE ENERGY 8 (1997), *available at* http://www.nrel.gov/docs/legosti/fy97/20505.pdf.

[115] NAT'L RENEWABLE ENERGY LAB., WIND ENERGY MYTHS 2 (2005), *available at* http://www.nrel.gov/docs/fy05osti/37657.pdf.

[116] *Id.* at 1.

[117] David L. Chandler, *How to Make Solar Power 24/7*, MIT NEWS (July 29, 2011), http://web.mit.edu/newsoffice/2011/concentrated-solar-0729.html.

remains a key concern for renewable energy.[118] Siting challenges will also likely become more profound as more developers seek to locate large renewable power plants outside of urban areas.[119] Aesthetic objections to renewable energy facilities present only one obstacle; the more significant siting challenges will revolve around the impacts of development on imperiled species protected under the Endangered Species Act[120] and the availability of water resources necessary for larger solar thermal projects.[121] Finally, unless policymakers address the physical limitations of the transmission system, renewable energy producers will face the ever-growing hurdle of getting their power onto the grid.[122] All of these problems could affect investors' willingness to continue backing renewable energy.[123] This does not mean that renewable energy development will die out or that developers should abandon their plans for all remote, large renewable power facilities. However, for the renewable energy industry to prosper over the long term, it will need to diversify in size and location.

1. Siting Constraints

Siting constraints limit renewable energy development in some areas and may become more significant as development increases, particularly in optimal renewable resource areas. The United States has great capacity to produce renewable electricity from anywhere in the country, but only areas qualifying as Class 3 or better can produce utility-scale electricity.[124] Consequently, most facility construction has concentrated in these high-quality areas.[125] This concentration, however,

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[118] *See infra* notes 136–154 and accompanying discussion.

[119] *See infra* notes 126–134 and accompanying discussion. *See also* Pursley & Wiseman, *supra* note 25, at 898 n.111 (discussing increasing siting challenges for large renewable energy facilities).

[120] Endangered Species Act, 16 U.S.C. §§ 1531–1544 (2006).

[121] INT'L ENERGY AGENCY, CONCENTRATING SOLAR POWER ROADMAP 1 (2010), *available at* http://www.iea.org/papers/2010/csp_roadmap_foldout.pdf.

[122] *See infra* notes 136–154 and accompanying discussion.

[123] *See* FRANKFURT SCH. - UNEP COLLABORATING CTR. FOR CLIMATE & SUSTAINABLE ENERGY FIN., GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 14 (2012), *available at* http://fs-unep-centre.org/sites/default/files/publications/globaltrendsreport2012final.pdf.

[124] D.L. Elliot et al., *Wind Energy Resource Atlas of the United States*, NAT'L RENEWABLE ENERGY LABORATORY, http://rredc.nrel.gov/wind/pubs/atlas/atlas_index.html (click on "Map Descriptions" under "Chapter 1") (last visited Dec. 23, 2012); SHALINI P. VAJJHALA, SITING RENEWABLE ENERGY FACILITIES: A SPATIAL ANALYSIS OF PROMISES AND PITFALLS 9–11 n.4 (2006), *available at* http://www.science.smith.edu/~jcardell/Readings/Wind/RFF%20-%20Siting%20Renewables.pdf.

[125] *See* Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENVTL. L.J. 241, 267 (2011).

has led to increasing concerns about the impacts on property and aesthetic values.[126] As opposition to large renewable facilities increases, it may become more difficult for facilities to obtain siting authorization. Several states allow local governments to make siting decisions based on local land use laws, which means that public opposition to a particular facility may doom or at least delay the facility's siting application.[127] Although many scholars have proposed different solutions to streamline facility siting,[128] few states have taken steps to streamline the process.[129] Thus, for the foreseeable future, the siting process may constrain development of large-scale facilities in areas with local opposition.

Even if these local siting problems did not exist, other environmental laws will inhibit facility and transmission line siting to some extent. The Endangered Species Act,[130] for example, will directly or indirectly limit development of large facilities in habitats of imperiled species. Sage grouse in the West, desert tortoise in the Southwest, and prairie dogs in the Midwest are all at-risk species that have been displaced by renewable energy development.[131] Managing renewable energy development to protect these species takes time and money, at a minimum.[132] Facilities dependent upon fresh or groundwater for cooling or steam generation will also likely run into problems with water limitations in most western states.[133] Federal and state land management statutes will also limit, at least to some extent, the expansion of transmission lines necessary to accommodate more large-scale renewable facilities.[134] While it is difficult to assess the degree to which these different laws will limit renewable energy development, it seems safe to predict that the tensions in the siting process will only increase as the

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[126] Hannah Wiseman, *Expanding Regional Renewable Governance*, 35 HARV. ENVTL. L. REV. 477, 528 (2011).

[127] Outka, *supra* note 125, at 267–68.

[128] *Id.* at 271.

[129] *Id.* at 273–74.

[130] Endangered Species Act, 16 U.S.C. §§ 1531–1544 (2006).

[131] *See* BUREAU OF LAND MGMT., FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (PEIS) FOR SOLAR ENERGY DEVELOPMENT IN SIX SOUTHWESTERN STATES ES-25 (July 2012), *available at* http://solareis.anl.gov/documents/fpeis/Solar_FPEIS_ExecutiveSummary.pdf.

[132] JAY DONOHUE, ENDANGERED SPECIES ACT ISSUES ASSOCIATED WITH SOLAR DEVELOPMENT IN THE SOUTHWEST ~CASE STUDY: BRIGHTSOURCE ENERGY'S IVANPAH PROJECT~ 8, 19–20 (2010), *available at* http://solar.gwu.edu/Research/ESAandIvanpah_DonohueGWLLM.pdf.

[133] U.S. DEP'T OF ENERGY, CONCENTRATING SOLAR POWER COMMERCIAL APPLICATION STUDY: REDUCING WATER CONSUMPTION OF CONCENTRATING SOLAR POWER ELECTRICITY GENERATION, REPORT TO CONGRESS 11, *available at* http://www1.eere.energy.gov/solar/pdfs/csp_water_study.pdf.

[134] Outka, *supra* note 125, at 259–62.

industry seeks to expand to new areas that may affect new species, new habitats, and new communities unaccustomed to renewable energy development.[135] It is also likely safe to say that the U.S. political system will be unable to resolve these issues on a grand scale, at least for some period of time.

2. Reliability and Transmission Constraints

Reliability concerns and a poor transmission system also threaten continued growth of large renewable electricity facilities. The historical development of the transmission system and the more recent efforts to restructure the electricity sector have resulted in a U.S. transmission system that many experts consider flawed at best and broken at worst.[136] In general, the system suffers from three main problems. First, most transmission lines in operation today use outdated technology that wastes electricity and is prone to blackouts and shortages.[137] Second, certain parts of the transmission system lack adequate capacity to handle sufficient amounts of power during peak demand.[138] Grid managers must therefore intentionally curtail electricity deliveries from certain sources, which makes generation wasteful and expensive.[139] Finally, the transmission system—which IOUs designed around a central power station model—cannot readily accommodate power production from dozens or hundreds of new facilities.[140] These problems have worsened as more generators have come online.

Renewable energy is particularly vulnerable to the grid's dysfunction. The intermittency of some types of renewable energy, especially wind power, makes it difficult to integrate into the electricity grid.[141] To maintain an operational transmission system, grid managers try to schedule transmission line operations based on anticipated supply

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135 *See* Shalini P. Vajjhala, *Siting Difficulty and Renewable Energy Development: A Case of Gridlock?* RES. Winter 2007, at 5.

136 *See* Jim Rossi, *The Trojan Horse of Electric Power Transmission Line Siting Authority*, 39 ENVTL. L. 1015, 1022–25 (2009).

137 Sandeep Vaheesan, *Preempting Parochialism and Protectionism in Power*, 49 HARV. J. ON LEGIS. 87, 94–96 (2012).

138 *Id.* at 102–03.

139 *Id.* at 92, 96–97.

140 *See id.* at 95–96; Rossi, *supra* note 136, at 1023–24.

141 2009 WIND TECHNOLOGIES MARKET REPORT, *supra* note 74, at 64, 73 (discussing challenges of integration).

and demand, but uncertainty regarding electricity production from wind farms makes scheduling difficult.[142] Intermittency also makes wind energy subject to curtailment orders when transmission lines become congested because transmission contracts often give firm electricity producers priority over intermittent electricity producers.[143] Finally, intermittency can increase the costs associated with transmitting power from large renewable electricity facilities.[144]

Inadequate transmission line capacity also affects the development of new renewable energy facilities.[145] Many places in the country that have abundant renewable energy resources either lack transmission lines or adequate transmission capacity.[146] It is also unlikely that IOUs that own existing transmission lines or state regulators that approve transmission line construction will support an expansion in the grid to serve renewable energy facilities.[147] Indeed, expansion of the grid to serve renewable energy development is often against the self-interest of IOUs.[148] Regulators have also resisted transmission line expansion due to the costs and political unpopularity of transmission line siting.[149] Unless policies supporting transmission line expansion emerge, the renewable energy industry will face development constraints.

These transmission and reliability constraints affect the revenues renewable energy producers can earn. First, because intermittent renewable energy producers cannot always guarantee power production and actual power delivery, their electricity has a lower market value than firm power.[150] Second, intermittent electricity is more likely to receive transmission curtailment orders than firm power.[151] Curtailment

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[142] *See* Steven Ferrey, *Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure*, 39 ENVTL. L. 977, 987–93 (2009).

[143] *See* 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 42.

[144] 2009 WIND TECHNOLOGIES MARKET REPORT, *supra* note 74, at 66 (discussing charges for transmitting wind power).

[145] *Id.* at 60, 70.

[146] *Id.*

[147] JOSEPH P. TOMAIN, ENDING DIRTY ENERGY POLICY: PRELUDE TO CLIMATE CHANGE 118 (2011); *see also* Vaheesan, *supra* note 137**,** at 115.

[148] Vaheesan, *supra* note 137, at 115–20.

[149] *Id.* at 120–22.

[150] 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80**,** at 66–68 (discussing charges for wind integration, balancing and other fees); Vaheesan, *supra* note 137, at 108.

[151] 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80**,** at 42–43. This happened in the spring of 2011, when the Bonneville Power Administration issued several curtailment orders to wind power developers with contracts to use Bonneville's transmission lines to deliver power to California. Bonneville, which runs the Columbia River Federal Power System, faced a glut of electricity from the federal dams on the Columbia River, which had become swollen due to a

significantly affects a renewable energy producer's revenue because the producer will often be unable to earn revenue from the electricity sale and, more critically, federal tax credits or the sale of RECs.[152] Third, the intermittency of renewable energy makes it dependent upon backup power which often comes from natural gas.[153] This dependency makes renewable energy itself less valuable because other energy sources must operate in standby mode to provide backup power if an intermittent source suddenly stops producing power.[154] It also, somewhat paradoxically, increases demand for natural gas-based power, which has become a major competitor to renewable energy.[155] Finally, lack of transmission access constrains construction of new renewable energy facilities and thus limits the growth of the industry overall.[156]

3. Economic Risks Presented by Natural Gas

While siting, transmission, and reliability concerns already seem likely to undermine the economic viability of large renewable energy facilities, a new threat to the industry has emerged as natural gas prices have plummeted in the United States. As this section explains, natural gas has pushed wholesale electricity prices to historic lows. Without policies designed to offset these declining prices, renewable energy

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rainy spring and winter, and it issued curtailment orders to prevent wind farms from sending electricity that would impede delivery of hydropower along the same transmission lines. The immediate result of the curtailment orders was a significant loss of revenue for renewable energy companies unable to earn either the tax credits or profits from selling bundled RECs to Californian utilities. While the renewable energy developers successfully challenged Bonneville's curtailment orders before FERC, they nonetheless lost revenue during the period the curtailment orders were in effect. *Id.*

152 *Id.*; *see also supra* notes 69, 88, 97–103 and accompanying discussions.

153 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 71 (discussing the need for "fast-responding generating plants" to backup intermittent wind); *see also* Ralph Vartabedian, *Rise in Renewable Energy Will Require More Use of Fossil Fuels*, LOS ANGELES TIMES (Dec. 9, 2012), http://articles.latimes.com/2012/dec/09/local/la-me-unreliable-power-20121210. Natural gas is not necessarily the only backup resource, as hydroelectric facilities currently also provide backup power. U.S. DEP'T OF ENERGY, 20% WIND ENERGY BY 2030: INCREASING WIND ENERGY'S CONTRIBUTION TO U.S. ELECTRICITY SUPPLY, 79–80, 87 (2008), *available at* www.nrel.gov/docs/fy08osti/41869.pdf. Some studies also explain how large-scale renewable sources could supply backup power for each other. *See* Nathanael Massey, *The Cure to Renewable Energy's Intermittency Problem May Be More Renewable Energy—Study*, GOVERNOR'S WIND ENERGY COALITION (Dec. 13, 2012), http://www.governorswindenergycoalition.org/?p=4165.

154 Vaheesan, *supra* note 137, at 108.

155 *See infra* notes 162–175 and accompanying discussion.

156 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 42.

producers will face significant economic risks when they compete with natural gas on the wholesale market.

Although the costs of developing large renewable energy facilities vary, both wind farms and large-scale solar installations require significant capital investments. For wind farms, costs depend largely on the expense of the turbines. A commercial-scale turbine costs approximately $3.5 million[157] and has an average size of around 90 megawatts.[158] In 2009, total project costs for large wind farms averaged $2,120 per kilowatt hour, and prices showed a steady increase from 2004 through 2009.[159] Large-scale solar facilities are even more expensive. Developers can justify these substantial investments only if they feel confident that they will earn back their investments and generate profit within a reasonable amount of time.[160] The current regulatory landscape, in which tax credits are set to expire and RECs have limited value, has eroded this confidence.[161] Investment in large facilities has become even riskier because falling natural gas prices have affected demand and market prices for renewable power.[162]

First, natural gas prices have driven wholesale electricity prices lower, and thus reduced revenue for many renewable energy producers. In most places in the country, renewable energy developers are independent power producers who sell their electricity on the wholesale market, where they compete with other wholesale electricity providers.[163] Over the past few years, cheap natural-gas wellhead prices have driven wholesale electricity prices lower.[164] While these cheap natural gas rates have likely contributed to a significant decline in coal-based electricity and carbon dioxide emissions,[165] they have also made it more difficult for renewable energy developers to earn sustainable revenues without

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[157] *How Much Do Wind Turbines Cost?*, WINDUSTRY, http://www.windustry.org/resources/how-much-do-wind-turbines-cost (last visited Aug. 15, 2012). Most commercial-scale turbines are 2 megawatts (MW) in size. *Id*.

[158] 2009 WIND TECHNOLOGIES MARKET REPORT, *supra* note 74, at 28–29.

[159] *Id.* at 45.

[160] Mormann, *Investor Appeal*, *supra* note 17, at 705–07 (discussing investment certainty as a key factor for renewable energy investors).

[161] 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 57–59.

[162] *See* ANNUAL ENERGY OUTLOOK 2012, *supra* note 9, at 36.

[163] 2009 WIND TECHNOLOGIES MARKET REPORT, *supra* note 74, at vi.

[164] 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 55 (noting that low shale gas prices may keep wholesale electricity prices low for an indefinite period).

[165] Rachel Nuwer, *A 20-Year Low in U.S. Carbon Emissions*, N.Y. TIMES, Aug. 17, 2012, http://green.blogs.nytimes.com/2012/08/17/a-20-year-low-in-u-s-carbon-emissions/.

subsidies and tax credits.[166] If natural gas prices continue to push wholesale prices down, renewable energy producers will be unable to negotiate favorable electricity sales contracts unless other policies, such as tax credits and RECs, even the playing field.[167]

Natural gas also threatens the viability of large renewable energy facilities because new natural gas plants have essentially saturated the electricity market through the end of the decade.[168] Indeed, the Department of Energy has forecasted that demand for renewable power will remain essentially flat through 2020, when increased RPSs will require more development.[169] Inadequate demand makes investment in large, capital-intensive facilities particularly risky. Natural gas prices have therefore compromised the economic viability of existing and new renewable energy investments.[170]

It is likely, however, that natural gas prices will rise due to increased regulatory requirements and, more importantly, increased exports of liquefied natural gas.[171] However, these price increases will likely take a few years to manifest because permitting and LNG export terminal construction will cause some delay.[172] In the meantime, cheap

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[166] *See* 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 55.

[167] *See id.*

[168] ANNUAL ENERGY OUTLOOK 2012, *supra* note 9, at 90.

[169] *Id.*

[170] *See id.*

[171] *See* U.S. ENERGY INFO. ADMIN., EFFECT OF INCREASED NATURAL GAS EXPORTS ON DOMESTIC ENERGY MARKETS 8 (2012), *available at* http://www.eia.gov/analysis/requests/fe/pdf/fe_lng.pdf ("Increased exports of natural gas lead to increased wellhead prices in all cases and scenarios.") [hereinafter EIA NATURAL GAS EXPORTS]; CHARLES EBINGER ET AL., BROOKINGS INST., LIQUID MARKETS: ASSESSING THE CASE FOR U.S. EXPORTS OF LIQUEFIED NATURAL GAS 33 (2012), *available at* http://www.brookings.edu/~/media/research/files/reports/2012/5/02%20lng%20exports%20ebinger/0502_lng_exports_ebinger.pdf. The natural gas industry disputes the argument that exports will produce price increases. *See Natural Gas: Seven Reasons to Expect Supply Reliability and Price Stability*, AM. NAT. GAS ALLIANCE, http://www.anga.us/media/41022/m44%20-%20price_stability.pdf (last visited Aug. 21, 2012); KENNETH E. MEDLOCK III, JAMES A. BAKER III INST. FOR PUB. POLICY, U.S. LNG EXPORTS: TRUTH AND CONSEQUENCES 32 (2012) ("[E]ven with exports, the price in the U.S. will not likely increase dramatically."). However, it is difficult to imagine how increased exports—and thus increased demand—will allow prices to stay the same. *See* EIA NATURAL GAS EXPORTS, *supra* at 5. It is also hard to believe that U.S. natural gas producers would allow domestic prices to remain steady when global natural gas prices are three times higher than U.S. domestic prices. *See* Richard Bass & Gordon Pickering, *The U.S. Has a Natural Gas Glut; Why Exporting It As LNG Is a Good Idea*, FORBES (Jun. 13, 2012), http://www.forbes.com/sites/energysource/2012/06/13/the-u-s-has-a-natural-gas-glut-why-exporting-it-as-lng-is-a-good-idea (arguing that exports will allow U.S. natural gas "to benefit from higher global prices").

[172] *See* EIA NATURAL GAS EXPORTS, *supra* note 171, at 3, 6.

natural gas prices will suppress wholesale market rates and demand for renewable electricity.[173] At the very least, the next few years will likely involve anemic growth in the renewable sector if natural gas prices stay low.

Thus, the economic forecasts for the renewable industry are filled with great uncertainty and some pessimism. As noted above, it is unclear if the federal PTC will be renewed when it expires at the end of 2012.[174] In addition, in most states, REC values are quite low due to the moderate demands of many states' RPSs.[175] So long as natural gas prices remain low, renewable energy will continue to operate on an uneven playing field for an indefinite time into the future. This uncertainty places the entire renewable energy industry at risk; not only must it struggle with siting challenges, transmission challenges, and upfront costs of developing expensive renewable energy facilities, it is unclear if it can earn revenues that justify the struggles.

III. THE CASE FOR DISTRIBUTED GENERATION

While the landscape for large-scale renewable energy development may appear bleak, the renewable energy industry has untapped opportunity in distributed renewable generation. Distributed renewable sources could help ease the transition of the U.S. power sector away from fossil fuels and toward renewable energy sources, both big and small. Indeed, integrating distributed generation into the existing power system would offer several advantages over the current development trajectory of building large power plants located far away from urban areas where most electricity consumption occurs. A balanced system that combines distributed generation with large, distant electricity generation would mitigate siting concerns, reduce transmission congestion, improve overall reliability of the system without increasing dependence on fossil fuels for backup power, make the electricity system more efficient, and potentially lower electricity costs. While an expansion of distributed generation will require investment in infrastructure to accommodate the integration of more small and localized power production facilities, this investment will enable utilities and ratepayers to avoid other increased costs necessary to expand some

[173] *See supra* notes 162–170 and accompanying discussion.
[174] *See supra* notes 15–16 and accompanying discussion.
[175] *See* 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 54.

transmission lines. Finally, distributed generation could increase profits for both independent power producers and utilities, depending upon the policies employed.

A. SITING ADVANTAGES

The first advantage enjoyed by distributed generation sources is less opposition during the siting process, because their size, versatility, and deployment in urban areas make them less vulnerable to the siting challenges of larger remote sources.[176] Distributed generation can also serve multiple purposes and offer multiple benefits that make them attractive in various areas.[177] Finally, while the development of distributed generation would benefit from clear rules related to siting and ongoing access to the solar or wind resource, distributed generation faces less vulnerability simply because multiple areas can serve as distributed generation locations.[178] In short, the siting advantages of distributed generation make it an attractive energy source.

1. Siting Flexibility

By their very nature, distributed generation sources can operate in a number of different landscapes and thus place less pressure on specific areas or ecosystems. While renewable energy production at any scale requires proper environmental conditions—wind turbines need adequate wind speed, and solar panels cannot function properly if they become too shaded—smaller renewable energy sources can typically function in a broader range of conditions than larger ones.[179] For example, rooftop solar arrays can function in a number of locations with a wide range of solar intensities, unlike utility-scale concentrated solar power systems which have much more precise solar intensity requirements and demand extensive space to operate.[180] Similarly, wind

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[176] *See* Behles, *supra* note 26, at 678; *but see* Uma Outka & Richard Feiock, *Local Promise for Climate Mitigation: An Empirical Assessment*, 36 WM. & MARY ENVTL. L. & POL'Y REV. 635, 659 (2012) (noting that most local land use codes fail to promote distributed generation, and concluding that local regulation may serve as a barrier to distributed generation development).

[177] *See infra* notes 185–194 and accompanying discussion.

[178] Behles, *supra* note 26, at 678.

[179] LOVINS ET AL., *supra* note 20, at 202.

[180] *See Photovoltaic Solar Resource of the United States*, NAT'L RENEWABLE ENERGY LAB., http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg (last visited Sept. 10, 2012) (showing that all states, except Alaska, can produce an average of five kilowatt-hours of power

turbines designed to produce small amounts of power can operate at lower wind speeds than turbines built to provide utility-scale power.[181] Larger facilities' relative lack of locational flexibility makes them especially vulnerable to siting challenges; distributed generation has much less exposure in this regard.[182]

Additionally, the smaller size and design of distributed generation and the potential to locate distributed generation within urban areas typically result in less opposition from neighbors and others concerned about aesthetic impacts.[183] In many urban areas, rooftop solar and wind installations are invisible from the ground level, so concerns about landscape intrusions are minimized. Even where rooftop installations can be seen, they typically generate little to no opposition because rooflines themselves offer little aesthetic advantage over a photovoltaic panel. Indeed, wind turbines located on buildings may offer architectural features that people in urban areas may appreciate, even when similar designs might offend the aesthetics of people interested in looking at an unblemished view of a forest or sea. Perhaps because people do not expect urban areas to be pristine or unspoiled, they may have a greater willingness to allow for urban renewable energy to develop. Whatever the reasons, there is less opposition to urban distributed generation.[184] Even if people do object to certain projects, dispute resolution seems easier with distributed generation.

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per meter squared per day (kWh/m^2/day), and most states can produce at least five kWh/m^2/day using solar photovoltaic systems); *see Concentrating Solar Resource of the United States*, NAT'L RENEWABLE ENERGY LAB., http://www.nrel.gov/gis/images/map_csp_national_lo-res.jpg (last visited Sept. 10, 2012) (showing that about a third of the United States can produce 5 kWh/m^2/day from concentrated solar power).

181 U.S. DEP'T OF ENERGY, SMALL WIND ELECTRIC SYSTEMS, A U.S. CONSUMER'S GUIDE, 11–13 (2007); *Wind Powering America, Residential-Scale 30-Meter Wind Maps*, U.S. DEP'T OF ENERGY, http://www.windpoweringamerica.gov/windmaps/residential_scale.asp (last updated Sept. 12, 2012) (noting that small wind turbines range from 15 to 40 meters in height and require average wind speeds of about 4 meters per second); *Wind Powering America, Utility-Scale Land-Based 80-Meter Wind Maps*, U.S. DEP'T OF ENERGY, http://www.windpoweringamerica.gov/wind_maps.asp (last updated Sept. 12, 2012) (noting that utility-scale turbines range from 80 to 100 meters in height and require average wind speeds of about 6.5 meters per second). Some people argue that small wind turbines—particularly micro turbines designed for urban use—have little overall value because they produce little power at a relatively high cost. *See* Andy Wilson, *Debunking the Myths About Micro Turbines*, SUSTAINABILITY (Jan. 2007), http://www.sustainability.ie/microwind.html.

182 Pursley & Wiseman, *supra* note 25, at 898.

183 *Id.* at 899; *see also* Jonathan Burton & Klaus Hubacek, *Is Small Beautiful? A Multicriteria Assessment of Small-Scale Energy Technology Applications in Local Governments*, 35 ENERGY POL'Y 6402, 6407 (2007).

184 Pursley & Wiseman, *supra* note 25, at 899.

2. Multi-Use and Multiple Benefits

Distributed generation sources can also fit into urban and suburban landscapes in ways that provide multiple benefits.[185] Rooftops that would otherwise sit dormant can become useful renewable energy production sites.[186] Installation of distributed generation can also mitigate urban warming; for example, covering open parking lots with solar arrays converts solar radiation into electricity rather than urban heat and provides shade and protection from the elements.[187] Adding electric car powering stations to the design would add yet another benefit.[188] Indeed, urban areas already have multiple sites ready for creative, multi-purpose distributed generation deployment, which make them attractive sites for renewable energy developers.

Distributed generation could also help put contaminated properties back into use.[189] Many urban areas have large tracts of land that are unsuitable or only marginally suitable for development because of past contamination from industrial pollution.[190] Federal law allows for development to take place on brownfields that have undergone cleanup short of complete remediation, but the required level of cleanup depends, in part, on the type of future property use.[191] As one might imagine, redeveloping contaminated property for homes or schools requires a

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[185] LOVINS ET AL., *supra* note 20, at 288.

[186] *Id.* at 288–89.

[187] *Id.*

[188] Shannon Soesbe, *Mitsubishi Unveils Solar-Powered Vehicle Charging Station*, CLEANTECHNICA (July 23, 2011), http://cleantechnica.com/2011/07/23/mitsubishi-unveils-solar-powered-vehicle-charging-station/.

[189] *See* NAT'L ASS'N OF LOCAL GOV'T ENVTL. PROF'LS, CULTIVATING GREEN ENERGY ON BROWNFIELDS: A NUTS AND BOLTS PRIMER FOR LOCAL GOVERNMENTS 6–8 (2012), *available at* http://www.resourcesaver.com/ewebeditpro/items/O93F24962.pdf; *RE-Powering America's Land: Renewable Energy on Potentially Contaminated Land and Mine Sites*, ENVTL. PROTECTION AGENCY, http://www.epa.gov/oswercpa/docs/repower_contaminated_land_factsheet.pdf (last visited Aug. 29, 2012); *see also* Steven Ferrey, *Converting Brownfield Environmental Negatives into Energy Positives*, 34 B.C. ENVTL. AFF. L. REV. 417, 417 (2007) (discussing ways in which municipal landfills could become energy production sites).

[190] Sariyah S. Buchanan, *Why Marginalized Communities Should Use Community Benefit Agreements as a Tool for Environmental Justice: Urban Renewal and Brownfield Redevelopment in Philadelphia, Pennsylvania*, 29 TEMP. J. SCI. TECH. & ENVTL. L. 31, 36–37 (2010); Jan G. Laitos & Teresa Helms Abel, *The Role of Brownfields as Sites for Mixed Use Developments in America and Britain*, 40 DENV. J. INT'L L. & POL'Y 492, 498 (2011-2012) (estimating there are nearly 1 million abandoned former industrial sites).

[191] ENVTL. PROT. AGENCY, BROWNFIELDS AND URBAN AGRICULTURE: INTERIM GUIDELINES FOR SAFE GARDENING PRACTICES 1–2 (2011) (explaining how cleanup levels vary with proposed use).

significant amount of cleanup, which can make redevelopment prohibitively expensive or time-consuming.[192] Repurposing the property into industrial use means less expense in terms of cleanup, but the decline of manufacturing in the United States has typically reduced demand for urban industrial properties.[193] As a result, potential brownfields have remained contaminated and have sat idle.[194] Distributed generation could put those brownfields to use, thereby ensuring a certain degree of cleanup and making good use of those urban lands. Thus, distributed generation could serve multiple purposes that could yield additional benefits for communities in which the facilities are built.

3. Easier Resolution to Siting Disputes

Finally, negotiations regarding distributed generation siting are potentially easier because of the scale.[195] Typical disputes that arise in urban areas regarding small-scale renewable energy production involve protection of access to the renewable resource from later developments[196] and the legitimacy of homeowner covenants or land use laws prohibiting installation of any renewable energy facilities at all.[197] Private negotiations and local planning decisions can usually address these concerns.[198] While increased renewable distributed generation would benefit from clearer guidelines regarding siting and access to the renewable resource,[199] the consequences of inadequate laws or failed negotiations are far less dire than they would be for larger renewable energy facilities dependent upon more precise environmental conditions.[200] Ultimately, the great strength of distributed generation is

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[192] *Id.*; Laitos & Abel, *supra* note 190, at 496–98.

[193] *See* Catherine J. LaCroix, *Urban Agriculture and Other Green Uses: Remaking the Shrinking City*, 42 URB. LAW. 225, 227–28 (2010); ENVTL. PROT. AGENCY, *supra* note 191; Elizabeth Collaton & Charles Bartsch, *Industrial Site Reuse and Urban Redevelopment: An Overview*, CITYSCAPE, Sept. 1996, at 17, 17–19.

[194] Laitos & Abel, *supra* note 190, at 498.

[195] *See* Pursley & Wiseman, *supra* note 25, at 898–99; Outka, *supra* note 125, at 301 (discussing existing frameworks for brownfields development); *but see id.* at 266 (noting that many states currently provide "one-stop permitting" only for larger sources).

[196] *See* Sara C. Bronin, *Modern Lights*, 80 U. COLO. L. REV. 881, 903–09 (2009) (discussing first-in-time rights for solar installations).

[197] Patricia Salkin, *Facility Siting and Permitting*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 95, 104–05 (Michael B. Gerrard, ed., 2011).

[198] *Id.* (discussing local land use laws that promote distributed generation).

[199] *Id.*

[200] As noted above, larger renewable energy facilities require specific conditions—such as adequate wind speeds or ample solar energy—to produce utility-scale power. *See supra* notes 124–125

that its locational flexibility makes it less vulnerable to siting opposition than larger renewable energy facilities.

B. TRANSMISSION IMPROVEMENTS

Another benefit of distributed generation is its potential to integrate into the existing transmission system. Indeed, distributed generation could help alleviate congestion along the transmission system by supplanting power transmission from remote locations, especially during peak hours.[201] Distributed generation also has the potential to reduce congestion by keeping electricity out of the transmission system entirely and delivering electricity through local distribution lines.[202] Electricity stays out of the system when the power producer and consumer are one and the same.[203] Moreover, distributed solar power could displace the need for peak electricity transmission from remote sources because solar energy production often corresponds to peak energy demand.[204] Distributed generation could thus reduce transmission both by reducing demand (and thus lowering the amount of electricity coming through the grid from remote sources) and by ensuring that

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and accompanying discussion. They also require access to transmission lines, which may not yet exist in areas best suited for large-scale renewable energy production. *See supra* notes 145–149 and accompanying discussion. They also have much higher upfront costs than smaller distributed generation facilities. *See supra* notes 157–162 and accompanying discussion. Accordingly, if a developer of a large renewable energy facility cannot get siting approval, the economic and practical consequences may be severe, since the developer may not be able to simply move its wind farm or solar array to a nearby site. With distributed generation, in contrast, siting flexibility and low costs make the consequences of a single failed siting process less severe. *See also infra* notes 221–224 and accompanying discussion. This is not to say that distributed generation siting laws do not need reform. Indeed, some jurisdictions have laws that effectively prohibit siting of certain types of distributed generation. *Id.* States and local governments should also do much more to create a framework for streamlining distributed generation siting and distribution. *See* Bronin, *supra* note 196. Until governments take up these issues, however, distributed generation still has great potential, because of its locational flexibility. *See* DOE DISTRIBUTED GENERATION, *supra* note 20, at 6-1 to 6-14 (discussing land use impacts and providing examples of siting opportunities in urban areas, on rural lands, and within existing facilities).

201 DOE DISTRIBUTED GENERATION, *supra* note 20, at 3-1 to 3-19.

202 *Id.*

203 *See id.* at 1-7 (noting that most distributed generation systems do not feed electricity back to the grid). A homeowner with photovoltaic arrays or a business with micro wind turbines will be the first and primary user of the electricity. Smaller distributed generation sources—such as those used to power parking meters and streetlights—will also often produce only enough energy for its intended use.

204 *Id.* at 3-18 to 3-19; LOVINS ET AL., *supra* note 20, at 220–25 (discussing how solar outputs correspond to peak demand).

supply stays near the site of production, rather than entering the transmission system.

C. RELIABILITY

Relatedly, distributed generation could improve the reliability of the electricity grid. Although it may seem counterintuitive that adding thousands of small power-producing facilities to the electricity system would increase electricity reliability, distributed generation could increase system reliability for two primary reasons. First, existing storage technology can accommodate small-scale electricity production and thus ensure that electricity produced from renewable sources is available on-demand.[205] Second, diversifying the types and locations of power plants would make the electricity system more flexible and adaptable to shifts in supply and demand.[206]

As noted above, intermittency combined with a lack of electricity storage capacity makes larger renewables dependent upon backup power sources. Smaller sources, in contrast, do not face the same challenges because batteries can readily store the electricity smaller sources produce.[207] In fact, solar-powered street lights and parking meters already have the capacity to store enough energy for use during the night, and many private solar arrays also include battery systems capable of storing power for domestic household use.[208] Larger batteries can store even more power—including power produced from remote renewable energy systems—for deployment when larger intermittent sources go offline or when transmission line congestion makes long-distance transmission risky or inefficient.[209] Distributed storage accompanying distributed generation could thus provide system-wide flexibility and

[205] LOVINS ET AL., *supra* note 20, at 187.

[206] DOE DISTRIBUTED GENERATION, *supra* note 20, at 2-5 to 2-9.

[207] *See* Katie Fehrenbacher, *SolarCity To Install Solar Panel & Battery Combo for Walmarts*, GIGAOM (Aug. 7, 2012), http://gigaom.com/cleantech/solarcity-to-install-solar-panel-battery-combo-for-walmarts/.

[208] *See, e.g.*, *Green Purchasing Case Studies, Solar-Powered SmartMeters Streamline Portland's Parking*, PORTLANDONLINE (June 2011), http://www.portlandonline.com/omf/index.cfm?a=157993&c=44701; *Dual60*, GREENSHINE, http://www.streetlamp-solar.com/dual60.html (last visited Aug. 22, 2012) (describing solar powered street light product).

[209] *See* Fehrenbacher, *supra* note 207 (describing combined battery packs); *see also* Behles, *supra* note 26, at 682–87 (describing storage options and benefits).

storage that would make development of large distant renewable sources easier.[210]

Reliability would also improve with increased investment in a diverse array of distributed generation facilities that would balance overall electricity production from renewable sources.[211] For example, in many areas of the country, wind speeds increase during the night, when solar energy production necessarily ceases.[212] An organized distributed generation system could balance solar and wind production to ensure nearly constant power production without fossil fuels.[213] As other distributed renewable generation technologies develop, they could similarly fit into the system. This, in turn, would lessen reliance on fossil fuels and provide renewable backup power to intermittent sources like wind. Thus, distributed generation can both increase overall system reliability and help accommodate the growth of large renewable sources.

D. COSTS AND RISK MITIGATION

Distributed generation could also increase overall levels of electricity production in the United States at lower costs to ratepayers and society when compared to fossil fuels and even some large renewable energy sources.[214] Several factors contribute to this cost advantage.

First, the cost of generating electricity from fossil fuels is volatile[215] and could climb in the future for a number of reasons, including increased global demand for fossil fuels, increased shipping and transportation costs for the fuels, new regulatory requirements under various environmental statutes, and the retirement of several plants that until recently had been exempt from environmental requirements under grandfathering rules.[216] Although natural gas prices in the United States

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[210] Behles, *supra* note 26, at 682–87.
[211] LOVINS ET AL., *supra* note 20, at 172–79.
[212] *Id.* at 172–73.
[213] *See id.* at 172–79, 245–46.
[214] *Id.* at 262–63.
[215] *Id.* at 144–45.
[216] *See* ANNUAL ENERGY OUTLOOK 2012, *supra* note 9, at 45–50 (discussing different market and regulatory factors that could affect the prices of fossil fuels). The role of grandfathering under the Clean Air Act has long been a significant issue of dispute and criticism. Some of the most important Clean Air Act programs—most notably the New Source Performance Standards, Prevention of Significant Deterioration, and Nonattainment New Source Review—apply only to new or modified sources or regulate new and modified sources much more strenuously than existing sources. *See* 42 U.S.C. §§ 7411 (2010) (New Source Performance Standards), 7470–79

reached historically low rates in early 2012,[217] some energy experts expect natural gas prices to climb as natural gas companies begin to export natural gas; producers may also pass the costs of compliance with environmental regulations onto consumers.[218] While expanded distributed generation will impose additional upfront capital costs upon electricity consumers, experts believe that distributed generation will bend the cost curve down over time due to the lack of fuel costs for most renewable energy systems.[219] Reduced transmission and backup power costs should also make distributed generation more cost-effective over the long term.[220]

Second, investment in distributed generation by existing independent renewable energy developers could allow these companies to continue expansion without facing the same risk exposure that development of larger facilities presents. Upfront costs in photovoltaic solar arrays, for example, have declined dramatically over the past few

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(Prevention of Significant Deterioration), 7501–7509a (Nonattainment New Source Review). This dynamic has incentivized the continued operation of an older, less-efficient coal fleet that often emits high amounts of pollutants. *See* Jonathan Remy Nash & Richard L. Revesz, *Grandfathering and Environmental Regulation: The Law and Economics of New Source Review*, 101 NW. U. L. REV. 1677, 1709–11 (2007) (explaining how exemptions for existing sources may incentivize their continued operation and discourage investment in new power plants). Beginning in 2009, however, the Environmental Protection Agency began developing a series of regulations that would increase regulatory requirements for existing power plants. *See* Mary Beth Houlihan, et al., *2009: A Year of Significant CAA Developments on All Fronts*, 40 ENVTL. L. REP. NEWS & ANALYSIS 10,250 (2010). Some have attributed some recent coal plant closures to these new rules. *See* INST. FOR ENERGY RESEARCH, IMPACT OF EPA'S REGULATORY ASSAULT ON POWER PLANTS: NEW REGULATIONS TO TAKE MORE THAN 34 GW OF ELECTRICITY GENERATION OFFLINE AND THE PLANT CLOSING ANNOUNCEMENTS KEEP COMING. . . 1 (2012), *available at* http://www.instituteforenergyresearch.org/wp-content/uploads/2012/02/Plants-to-be-Closed-by-EPA-Reg-Feb-7-Update.pdf; Press Release, FirstEnergy Corp., FirstEnergy, Citing Impact of Environmental Regulations, Will Retire Six Coal-Fired Power Plants (Jan. 26, 2012), *available at* https://www.firstenergycorp.com/content/fecorp/newsroom/news_releases/firstenergy_citingimpactofenvironmentalregulationswillretiresixc.html.

217 *See U.S. Natural Gas Wellhead Price*, U.S. ENERGY INFO. ADMIN. (Aug. 31, 2012), http://www.eia.gov/dnav/ng/hist/n9190us3m.htm.

218 *See* EIA NATURAL GAS EXPORTS, *supra* note 171, at 6 (explaining how natural gas exports will lead to increased domestic natural gas prices). *See also* Oil and Gas; Well Stimulation, Including Hydraulic Fracturing, on Federal and Indian Lands, 77 Fed. Reg. 27,691, 27,691–92 (proposed May 11, 2012) (codified at 43 C.F.R. pt 3160) (estimating that proposed environmental regulations will cost $37 to $44 million per year); Jim Efstathiou Jr. and Mark Niquette, *Fracking Opens Fissures Among States As Drillers Face Many Rules*, BLOOMBERG (Dec. 22, 2011), http://www.bloomberg.com/news/2011-12-23/fracking-opens-fissures-among-states-as-drillers-face-many-rules.html.

219 *See* LOVINS ET AL., *supra* note 20, at 150.

220 *See id*. at 149–50.

years due to reduced prices for the PV systems themselves.[221] Distributed generation developers can take advantage of these lower costs by pursuing multiple projects simultaneously.[222] Since each project involves less upfront investment and since developers will have multiple projects underway, they face much less risk if a project or two fails.[223] In contrast, the potential economic consequences of failed large developments are orders of magnitude higher.[224] In an age of regulatory uncertainty, diversified investments present better opportunities for renewable energy companies.

Finally, distributed generation can also reduce ratepayer exposure to costs for poor utility investments.[225] Many ratepayers throughout the United States have paid and are continuing to pay for power plants that were never built or, once built, never produced any electricity because energy forecasts overestimated power demand.[226] In April 2012, electricity generation from natural gas equaled that from coal, and the natural gas industry has promised that natural gas rates will remain low in perpetuity.[227] When these promises prove false—as they almost certainly will[228]—ratepayers will likely still be responsible for paying off the costs of building the natural gas plants and related infrastructure, as well as the escalating fuel costs.[229] While distributed generation installations could conceivably also fail, the risk to the ratepayers is much lower because the costs per installation are far lower than traditional, larger sources.[230] Moreover, once the renewable facilities are built, ratepayers will incur no fuel costs.[231] While some might argue that the risks of failure are too remote to factor into the cost calculation,

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[221] Keith Bradsher, *Price Wars Seen Hurting Solar Sector in China*, N.Y. TIMES (Aug. 21, 2012), B4, http://www.nytimes.com/2012/08/22/business/global/chinas-solar-panel-manufacturers-face-trade-and-finance-hurdles.html?_r=0.

[222] *See* LOVINS ET AL,, *supra* note 20, at 99–104.

[223] *See id.* at 131–32.

[224] *See id.*

[225] *Id.* at 115–16.

[226] Melissa Powers, *The Cost of Coal: Climate Change and the End of Coal as a Source of "Cheap" Electricity*, 12 U. PA. J. BUS. L. 407, 417–18 (2010).

[227] *See* EIA TODAY IN ENERGY, *supra* note 1 (showing increase in electricity production from natural gas plants); AM. NAT. GAS ALLIANCE, *supra* note 171.

[228] *See supra* note 218 and accompanying discussion.

[229] Powers, *supra* note 226, at 418–20 (explaining that many states require ratepayers to bear at least some of the costs of failed capital investments).

[230] LOVINS ET AL., *supra* note 20, at 115–16.

[231] *See id.* at 150.

prudent regulators and investors must account for these risks.[232] When they do, distributed generation becomes an economic winner.

E. TECHNOLOGICAL INVESTMENTS

However, a potential downside of distributed generation is that wide-scale promotion of distributed renewable energy sources will require investments in new technologies to store and transfer electricity. In the short term, increased production of distributed generation can proceed with little to no technology improvements. However, if cities and states hope to use distributed generation in the manner this article recommends—as a major component of the electricity sector that can both serve to generate electricity and provide reliability—technological changes will become necessary.[233] Storage technologies, for example, should improve so that batteries (or some eventual replacement for batteries) can store more power for longer periods.[234] Optimally, technological developments will lead to the replacement of current battery systems, which present challenges involving recycling and disposal of spent battery cells.[235] Grid management and distribution technologies will also need upgrades so that electricity managers can respond to small changes in localized demand and production by moving electricity from one house to another.[236] Some grids will require the installation of improved metering devices. Other grids may require operational or physical changes of electricity distribution lines to better enable the conveyance of power from homes back to the grid, since many electricity systems were built to send power in the other direction. In short, the use of distributed generation will force changes that many advocates of a "smart grid" have proposed for years.[237]

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[232] *Id.* at 86–94 (discussing the many uncertainties affecting the electricity sector).

[233] *See* Behles, *supra* note 26, at 683–87.

[234] *Id.*

[235] *See, e.g.*, Andrew P. Morriss & Roger E. Meiners, *Borders and the Environment*, 39 ENVTL. L. 141, 151 (2009).

[236] *See* Fred Bosselman, *The Future of Electricity Infrastructure*, 42/43 URB. LAW. 115, 123–27 (2010-2011) (describing needed technological improvements to the grid); Wilford A. Payne, III, *The Regulatory Pitfalls of Distributive Generation: No Standardization in Accesses or Standby Rate Structures*, 2 FLA. ST. U. BUS. REV. 61, 66–72 (2001) (discussing technological implications of grid connection, but also arguing the challenges are less daunting or expensive than utilities may claim).

[237] *See* LOVINS ET AL., *supra* note 20, at 208, 211–20 (discussing problems with the grid); TOMAIN, *supra* note 147, at 180–81 (discussing necessary changes to the grid).

Although these technological improvements might seem like daunting obstacles, they need to occur whether or not distributed generation becomes a major part of the electricity system.[238] Moreover, many jurisdictions have already implemented programs to improve their grids in ways that will accommodate distributed generation.[239] The addition of distributed generation really just enhances the incentives for these improvements. To the extent distributed generation does place new demands on technological innovation, this is not necessarily a bad thing. With battery storage technology, for example, automobile manufacturers have worked on batteries for the past several decades, and their work has paid off with ever-increasing battery performance.[240] These same technological advancements could apply to electricity, making storage technologies more effective and efficient.[241] The movement toward expanding distributed generation could provide the impetus for implementing long-overdue improvements to the electricity system.

In all, distributed renewable electricity generation has several potential strengths. An easier siting process, lower capital costs, reduced transmission congestion, and increased reliability all make distributed generation an attractive component of the electricity system. Distributed generation also presents an area for growth in the industry, since it could help displace fossil fuels and fill peak energy demand. Indeed, regulators and energy scholars have long touted the benefits of expanding distributed generation. However, as the next two sections explore, most renewable energy policies fail to promote the full potential of distributed generation.

IV. THE LIMITS OF EXISTING DISTRIBUTED GENERATION POLICIES

Although distributed generation offers a number of benefits, it faces several hurdles that renewable energy policies do not yet address. Most notably, the dominant renewable energy policy, net metering, fails to offset the significant upfront capital and transaction costs of building distributed generation facilities.[242] Distributed generation producers must invest in the technology necessary to produce power, negotiate financing

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[238] TOMAIN, *supra* note 147, at 180–81 (discussing necessary changes to the grid).

[239] *Id.*

[240] Jim Witkin, *Building Better Batteries for Electric Cars*, N.Y. TIMES, Mar. 31, 2011, at F4.

[241] Behles, *supra* note 26, at 683–87.

[242] *See infra* notes 279–284 and accompanying discussion; *see also* Joel B. Eisen, *Residential Renewable Energy: By Whom?*, 31 UTAH ENVTL. L. REV. 339, 354–61 (2011).

deals that make the investments financially viable, negotiate arrangements with utilities to ensure the producers receive adequate compensation for their power, and negotiate the consequences of lack of adequate capacity on the system.[243] These financial and transactional costs, while significant for any renewable energy developers, can become prohibitively expensive or complicated when individual homeowners or businesses are the project developers.[244] For distributed generation to become a more meaningful part of the electricity system, state policymakers must consider the barriers to entry existing economic and regulatory conditions have erected. To date, however, most state policies assume that moderate economic incentives will adequately promote distributed generation.[245] As this section explains, that assumption is incorrect.

Moreover, for those states that have recognized the limits of net metering and attempted to use feed-in tariffs to promote distributed generation, legal barriers prevent feed-in tariffs from having a significant impact. Specifically, federal law generally preempts states from establishing incentive rates for electricity sold at wholesale, and the limited exception to this preemption requires significant maneuvering by states to develop effective feed-in tariffs. Finally, even if state policies do succeed in promoting more distributed generation, they will likely face resistance from utilities, which could incur revenue losses and even the loss of their monopoly power. This resistance could undermine efforts to bring distributed generation online. Regulators must therefore reconcile the tensions inherent in promoting distributed generation in utility-dominated electricity systems, as this part explains.

A. THE LIMITS OF NET METERING AND FEED-IN TARIFFS

States have generally used two policies, net metering and feed-in tariffs, to incentivize distributed generation. Net metering laws allow ratepayers to offset their electricity bills by producing their own renewable power and selling it back to the utility.[246] Feed-in tariffs

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243 *See* Payne, *supra* note 236, at 66–72.

244 *Id.*; Eisen, *supra* note 242, at 354–61.

245 *See infra* notes 247–257 and accompanying discussion. *See also* Joel B. Eisen, *Can Urban Solar Become a "Disruptive" Technology?: The Case for Solar Utilities*, 24 NOTRE DAME J.L. ETHICS & PUB. POL'Y 53, 77–84 (2010) [hereinafter Eisen, *Urban Solar*].

246 Steven Ferrey, *Nothing but Net: Renewable Energy and the Environment,* MidAmerican *Legal Fictions, and Supremacy Doctrine*, 14 DUKE ENVTL. L. & POL'Y F. 1, 1–2 (2003).

require utilities to pay incentive rates for power produced from certain types of renewable energy facilities.[247] As this section explains, these policies, as currently conceived, will likely not provide adequate incentives for expansive distributed generation growth by independent actors.

1. Net Metering

Net metering has thus far served as the dominant tool to promote distributed generation in the country.[248] Almost every state has some form of net metering policy,[249] and distributed generation advocates typically turn to net metering as a key policy to promote distributed renewable energy production.[250]

Net metering laws provide an incentive for the installation of renewable electricity facilities by allowing existing utility customers to lower their overall electricity bills and, in some states, earn a profit by selling electricity back to the utility.[251] The term "net metering" refers to the process by which utilities bill customers for their net electricity consumption.[252] Net metering allows consumers to discount the amount of energy they deliver to the grid from their total electricity consumption.[253]

Although net metering requirements vary from state to state,[254] many states limit the size of eligible facilities and often also place an aggregate cap on the amount of energy eligible for net metering in a state.[255] For example, several states limit eligible facilities to systems 25

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[247] Mormann, *Investor Appeal*, *supra* note 17, at 693.

[248] Ferrey, *supra* note 246, at 1–2.

[249] *Net Metering*, DSIRE (Sept. 2012), http://www.dsireusa.org/documents/summarymaps/net_metering_map.pdf (indicating that as of September 2012, 43 states had some type of net metering policy in place).

[250] *See* DSIRE *State Policies Summary*, *supra* note 12.

[251] Ferrey, *supra* note 246, at 16.

[252] *Id.* at 15, n.50.

[253] *Id.* at 15–16. For example, if a homeowner consumed 100 kilowatt-hours of electricity in a month and produced 50 kilowatt-hours of solar power during that same month, the homeowner would pay for only 50 kilowatt-hours of electricity delivered by the utility. If the homeowner produced 100 kilowatt-hours of solar power, the homeowner would owe the utility nothing for that month. Finally, in some states, if the homeowner produced 150 kilowatt-hours of solar power, it would be able to sell the surplus 50 kilowatt-hours of solar power back to the utility at wholesale rates or else apply the surplus electricity credits to another month's utility bill. *See id.* at 16.

[254] *Id.* at 16; DSIRE *State Policies Summary*, *supra* note 12.

[255] Ferrey, *supra* note 246, at 55–65.

kilowatts or smaller in size.[256] Net metering rules also limit participation to utility customers, and many states further limit this participation to residential or commercial customers only.[257] While some states attempt to encourage broader investment in distributed generation through pass-through tax credits and other incentive programs,[258] most states intentionally constrain participation and revenue generation under their net metering programs.[259] As a consequence, although net metering is available in several states, the total amount of distributed generation brought online through net metering programs is quite low.[260] Nonetheless, net metering has several benefits that could, through alterations to existing laws, promote more distributed generation. The next sections discuss the advantages and disadvantages of net metering programs currently used in most states.

a. The Advantages of Net Metering

Net metering offers several benefits to distributed generation advocates. The main advantage of net metering is that it effectively pays distributed energy producers retail electricity rates for producing wholesale power.[261] Net metering has also received approval from the Federal Energy Regulatory Commission ("FERC")[262] and survived judicial review,[263] which makes it a legally reliable tool.

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[256] *Id.*

[257] *Id.*

[258] DSIRE *Financial Incentives*, *supra* note 12.

[259] *See Incentives/Policies for Renewables & Efficiency, Rules, Regulations, and Policies, Net Metering*, DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/incentives/allsummaries.cfm?SearchType=Net&&re=1&ee=1 (last visited Dec. 20, 2012) [hereinafter DSIRE *Net Metering Summaries*].

[260] *See Indiana IURC Notes Success of Net Metering Program,* INTERSTATE RENEWABLE ENERGY COUNCIL, http://www.irecusa.org/2012/04/indiana-iurc-notes-success-of-net-metering-program/ (last visited Aug. 20, 2012) (showing that fewer than 300 customers participate in net metering); *see also Participation in Electric Net-Metering Programs Increased Sharply in Recent Years*, U.S. ENERGY INFO. ADMIN. (May 15, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=6270 [hereinafter EIA *Net Metering Participation*] ("While participation is increasing, electric customers with net metering represented only 0.1% of all customers in 2010.") [hereinafter EIA *Net Metering Participation*].

[261] Ferrey, *supra* note 246, at 1–2.

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

[263] In a dispute between alternative energy producers and an Iowa public utility, the Iowa District Court, acting in its appellate capacity, found that PURPA preempted state regulations authorizing retail rate net metering. The court later vacated this decision after the parties agreed (1) to limit net metering to facilities having a design capability of 500 kilowatts or less, and (2) to allow the alternative energy producers to acquire a billing credit for excess energy produced in lieu of the right to charge the utility retail rates for it. The alternative energy producers also agreed to

Net metering's primary advantage is that it pays participants retail electricity rates for some of the power they consume. An electricity bill charges a consumer a retail price for each kilowatt-hour of power consumed. This price includes the cost of producing or obtaining the actual power, plus the costs of managing and operating the grid, balancing supply and demand, providing other utility operations, and covering the utility's profit, if any.[264] Without net metering, a consumer who also produced electricity would pay full retail price for any power consumed and sell any power it produced at lower wholesale rates.[265] The existence of net metering thus allows a homeowner to earn full retail rates (which are often at least 3 times higher than wholesale rates) for much of the power she produces from her rooftop solar system.[266]

Net metering also benefits from legal certainty. FERC has sanctioned the use of net metering, even though utilities had argued that it improperly forces them to pay retail rates for wholesale electricity sales.[267] Under the Federal Power Act, FERC has exclusive authority over wholesale electricity rates except where states are implementing the Public Utilities Regulatory Policies Act ("PURPA"),[268] in which case states have the authority to set the wholesale rates for certain facilities.[269] Under PURPA, maximum rates for qualifying facilities ("QFs")[270] can equal the "avoided cost" rates utilities would otherwise pay for power they produce or purchase from another producer.[271] When states began developing net metering programs, utilities objected on the basis that any

withdraw their petition for review with the Iowa Supreme Court. *See* MidAmerican Energy Co. v. Iowa Utils. Bd., No. AA3173, 3195, 3196 (Iowa Dist. Ct. 1999); *See also generally* Ferrey, *supra* note 246.

264 Ferrey, *supra* note 246, at 78–79; *see also* LOVINS ET AL., *supra* note 20, at 218–20.

265 *See id*.

266 *Id.* at 79 (noting that retail rates are about three times higher than wholesale rates).

267 *See MidAmerican*, 94 FERC ¶ 62,263; *see also* Ferrey, *supra* note 246, at 3, 78 (critiquing FERC's reasoning).

268 16 U.S.C. § 824a-3(a) (2012).

269 *Id.*; *see also* Fed. Energy Regulatory Comm'n v. Mississippi, 456 U.S. 742, 746–47 (1982) (stating that PURPA merely requires states to consider federally determined standards in setting rates for qualifying facilities).

270 A qualifying facility is either a qualifying small power producer or a qualifying co-generator. 16 U.S.C. § 824a-3(a) (2012). Qualifying small power producers must generate 80 megawatts or less from renewable energy sources. 16 U.S.C. § 796(17)(A) (2006). FERC's regulations further refine the definitions of qualifying facilities. *See* 18 C.F.R. § 292.203-.205 (2012).

271 FERC defines "avoided costs" as "the incremental costs to an electric utility of electric energy or capacity or both which, but for the purchase from the qualifying facility or qualifying facilities, such utility would generate itself or purchase from another source." 18 C.F.R. § 292.101(6) (2012); *see also* Am. Paper Inst. Inc. v. Am. Elec. Power Serv. Corp., 461 U.S. 402, 413 (1983) (upholding this definition).

power sold from a distributed generation producer qualified as wholesale power and thus fell within FERC's jurisdiction or PURPA's avoided cost limitations.[272] FERC, however, concluded that net metering laws could redefine the "sale" of electricity as occurring after deliveries of power to and from a distributed generation facility were netted out.[273] Each delivery of power is not a sale under this rationale; instead, the relevant inquiry is what occurs in the aggregate.[274]

FERC's ruling makes net metering an attractive incentive for distributed generation. If, in the aggregate, a distributed generator produces as much power as she consumes, she can zero out her electricity bill and effectively earn retail electricity rates for her power production.[275] If she produces less power than she consumes, she can discount her self-produced power—again at retail rates—from the amount she owes the utility.[276] Finally, if she produces more power than she consumes, she can earn retail rates on any power produced up to the amount of her consumption.[277] Excess power delivered to the utility will be considered a wholesale sale, subject either to FERC wholesale rates or avoided cost rates set by the state.[278] Under any of these scenarios, the key point is that distributed generators can earn retail rates for a significant amount of the power they produce. This is the primary advantage of net metering.

b. The Limits of Net Metering

Although net metering provides a significant benefit to distributed power producers by allowing them to offset their retail electricity rates, it nonetheless has limits that can impede its effectiveness as a stand-alone renewable energy policy.[279] First, net metering offers rewards to those who have the initial capital to install distributed generation systems and thus serves a limited group of producers. Yet it offers no guarantee that investors will recover their

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[272] *See* Ferrey, *supra* note 246, at 66–68.
[273] MidAmerican Energy Co., 94 FERC ¶ 61,340, ¶ 62,263.
[274] *Id.;* Ferrey, *supra* note 246, at 88–89.
[275] Ferrey, *supra* note 246, at 1–2.
[276] *MidAmerican Energy Co.*, 94 FERC ¶ 62,263.
[277] Ferrey, *supra* note 246, at 1–2.
[278] *See id.*
[279] See T.L. FORSYTH ET AL., NAT'L RENEWABLE ENERGY LAB., THE EFFECTS OF NET METERING ON THE USE OF SMALL-SCALE WIND SYSTEMS IN THE UNITED STATES 12 (2002) ("net metering programs alone seem to offer minimal incentives for consumers").

costs or earn a profit on the power they produce. Second, most net metering programs limit eligibility and thus have only limited impact in many areas. Third, net metering does not always guarantee easy interconnection to the electrical grid or streamline transactions. These limitations make net metering a relatively weak incentive program for broad distributed generation deployment.

First, net metering does not cover the upfront costs of the investment in renewable energy technology or interconnection.[280] Instead, property owners must make the initial upfront investment in renewable technology, negotiate contracts securing delivery of power to the grid, and actually begin producing power before they receive any financial benefits from net metering policies.[281] Although tax breaks and other financial incentives may assist property owners in purchasing the renewable energy technology, net metering itself does not support the development of renewable energy until the system becomes operative. Installation costs for the most common technologies, rooftop solar PV systems, start at $10,000 and range as high as $60,000.[282] Under some net metering programs, the payback period for the system will be between fifteen and seventeen years, if the homeowner has received tax credits offsetting the installation costs.[283] Indeed, without additional incentives, such as direct rebates or tax credits covering the cost of installation, net metering may not provide any economic benefit during the warrantee period of the facility.[284] For many people, the upfront costs of renewable technology are prohibitively expensive. Although net metering rewards customer-producers with retail electricity rates, it may not serve as an adequate independent renewable energy investment incentive for most homeowners.

Second, net metering typically works for only a subset of potential distributed generators. Many states impose limits on net metering that reduce its effectiveness. Some states limit participation in net metering programs to certain customers, such as residential

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280 S. GOUCHOE ET AL., NAT'L RENEWABLE ENERGY LAB., CASE STUDIES ON THE EFFECTIVENESS OF STATE FINANCIAL INCENTIVES FOR RENEWABLE ENERGY 1 (2002).

281 *See* Eisen, *supra* note 242, at 357–58; Payne, *supra* note 236, at 66–72.

282 *See* NICHOLAS BAKER, ECONOMICS OF RESIDENTIAL PV POWER SYSTEMS IN NORTHERN NEVADA (2011) 4–5, *available at* http://www.dri.edu/images/stories/centers/ctrec/Economics_of_Residential_PV__12-21-11.docx; *see also* Eisen, *supra* note 242, at 357 tbl.1 (listing quoted rates for solar PV installations in different cities).

283 Baker, *supra* note 282, at 5 tbl.2.

284 *Id.* at 8 tbl.5.

homeowners and commercial businesses, and thus exclude industrial entities that might have greater incentives and capacity to build distributed generation systems.[285] Many states limit the size of eligible facilities and effectively discourage the development of commercial-scale distributed renewable energy systems.[286] Finally, several states establish a low fixed cap on the aggregate amount of electricity net metering may support.[287] These intentional limits on net metering capacity make net metering programs minimal contributors to distributed generation development.[288] Thus, while net metering benefits participants with higher payments than they could earn through wholesale markets, the payback periods and limitations on participation make many net metering programs weak incentives for broad distributed generation investment.

Third, net metering policies do not necessarily insure easy access to the electricity grid or recovery of net metering payments.[289] While some states have created standard contracts for net metering participants that ease the administrative hurdles of interconnecting distributed generation to the electricity system, many states require net metering participants to negotiate complex interconnection agreements and to secure permits that increase costs and decrease access to the system.[290] On a practical level, these hurdles make net metering unattractive to most people. In fact, studies show that most people who have participated in net metering were considering installing renewable energy systems anyway.[291] Although net metering gave them an additional push, net metering has not alone ushered in widespread adoption of distributed generation.[292] The more complicated and expensive the transaction costs

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[285] DSIRE *Net Metering Summaries*, *supra* note 259 (showing, for example, that the District of Columbia limits net metering to commercial and residential customers, and Idaho limits net metering to commercial, residential, and agricultural customers).

[286] *Id.* (showing, for example, that Alaska and Nebraska establish a 25 kW system capacity limit, and several states establish a 25 kW limit for residential customers and 100-300 kW limits for commercial or other customers).

[287] *Id.* (showing, for example, that Georgia, Idaho, Indiana, Kansas, Kentucky, Michigan, and Nebraska set an aggregate net metering cap of 1% or lower of power demand, although they differ on whether the cap is based on peak or average power demand).

[288] EIA *Net Metering Participation*, *supra* note 260 (noting that only 0.1% of all electric customers utilized net metering in 2010).

[289] GOUCHOE ET AL., *supra* note 280, at v.

[290] Payne, *supra* note 236, at 68–72.

[291] GOUCHOE ET AL., *supra* note 280, at 19.

[292] *Id.*

are, the more unlikely it is that net metering alone will spur broad deployment of distributed generation.

Overall, net metering has had an important, but limited, effect on distributed generation development. In some states, where retail power rates are high and state and federal tax credits assist with upfront investment costs, expansive net metering programs (in combination with other policies) have led to significant increases in distributed generation deployment.[293] In most places, however, net metering has been a weak incentive program.[294]

2. Feed-in Tariffs

In recognition of the limits of net metering, many distributed generation advocates have turned to feed-in tariffs ("FITs"). FITs attempt to address the problems associated with high upfront costs of renewable energy development by providing a guaranteed rate of return on the investment in renewable energy technology and ensuring interconnection to the grid.[295] FITs have become the dominant method of incentivizing renewable energy development in many other countries, most notably Germany.[296] Motivated by the results FITs have achieved in these other countries, some renewable energy advocates have sought to import FITs to the United States.[297] However, while FITs provide many advantages over net metering, they do not readily conform to federal law.

a. The Advantages of FITs

FITs have the potential to incentivize significant development of distributed renewable power. The specific designs of recommended FIT policies vary, but nearly all proposed FITs have a few common elements that distinguish them from net metering programs. First, FITs guarantee full recovery of the investment in the capital project plus a specific rate

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293 EIA *Net Metering Participation*, *supra* note 260 (noting that more than three-quarters of U.S. net metering customers are in California).

294 *See id.*

295 Mormann, *Investor Appeal*, *supra* note 17, at 693.

296 *Id.* n.71; TONY D. COUTURE ET AL., NAT'L RENEWABLE ENERGY LAB., A POLICYMAKER'S GUIDE TO FEED-IN TARIFF POLICY DESIGN v (2010).

297 *See generally* COUTURE ET AL., *supra* note 296*; see also* Wilson H. Rickerson, et al., *If the Shoe FITs: Using Feed-in Tariffs To Meet U.S. Renewable Electricity Targets*, ELECTRICITY J., May 2007, at 74; *see generally* David Grinlinton & LeRoy Paddock, *The Role of Feed-in Tariffs in Supporting the Expansion of Solar Energy Production*, 41 U. TOL. L. REV. 943 (2010).

of return on that investment within a specified period of time.[298] Unlike net metering programs, which may or may not repay the full costs of renewable energy facilities, FITs provide for complete repayment.[299] Second, most FITs set the rate of return high enough to make an investment in renewable energy facilities attractive to a wide array of investors.[300] Third, FITs provide certainty regarding the revenue investors will earn over a period of years.[301] Net metering revenues depend on retail electricity rates, which can decrease depending on economic growth, weather, technological problems, the cost of fuel, and a host of other factors.[302] If these factors result in atypically low electricity costs, net metering will yield a much lower return than the homeowner may have expected. FITs, in contrast, provide investors with a more stable rate of return over a period of years, at the end of which the investor will have recovered its full costs plus a profit.[303] Finally, FITs guarantee renewable energy developers streamlined access to the electricity grid.[304] Collectively, these features make FITs economically and administratively attractive, as evidenced by their success in promoting renewable power in Germany, Spain, and other countries.

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298 COUTURE ET AL., *supra* note 296, at vii.

299 *Id.* at vi–vii.

300 *See id.* at viii.

301 *Id.* at vi–vii.

302 Consumer electricity rates are generally stable over short time periods due to utility regulatory practices that require PUCs to set rates after the conclusion of a rate case. REGULATORY ASSISTANCE PROJECT, REVENUE REGULATION AND DECOUPLING: A GUIDE TO THEORY AND APPLICATION 6 (2011). However, where market conditions change, PUCs will frequently adjust rates to reflect the new market conditions. *See id.* at 5 (discussing fuel adjustment clauses, which allow rates to change with fuel costs). Thus, while a net metering customer will not typically risk exposure to fluctuating rates on a daily, weekly, or even monthly basis, it is likely that rates will change every few years, if not more often. *See* U.S. ENERGY INFO. ADMIN., ELECTRIC POWER MONTHLY WITH DATA FOR JUNE 2012, tbl 5.6.A (2012), *available at* http://www.eia.gov/electricity/monthly/current_year/july2012.pdf (showing fluctuating monthly rates). If retail rates decrease after a net metering customer has installed a distributed generation system and the net metering customer does not have a long-term contract guaranteeing fixed rates, the customer will earn less money per kilowatt-hour and face a longer payback period for the system.

303 COUTURE ET AL., *supra* note 296, at vi–vii.

304 *Id.* at vi.

b. The Limits of FITs

While FITs seem to have worked quite well in Europe to incentivize renewable energy development,[305] they may not meet the same success in promoting renewable energy development in the United States. Most significantly, state efforts to adopt the European FIT model face federal preemption.[306] As explained above, the Federal Power Act generally gives FERC exclusive authority to set wholesale electricity rates. However, if a power producer is a "qualifying facility" under PURPA, states may set the rates so long as they do not exceed a utility's avoided costs.[307] Avoided cost rates, however, may not provide sufficient incentives for widespread investment in renewable energy.[308] Moreover, while FERC has expanded states' discretion in calculating avoided costs,[309] states would still need to take several other actions to make avoided cost rates attractive, as explained below. Thus, while FITs continue to offer promise, they require much more work before that promise is realized.

California's attempts to develop a feed-in tariff illustrate the potential and limitations of FITs within the current regulatory system. In 2009, California passed a law that guaranteed certain efficient combined heat-and-power ("CHP") plants premium rates and interconnection access.[310] In an effort to avoid federal preemption, California's law required utilities to "offer" contracts to eligible CHP facilities.[311] The utilities and other entities challenged the law, arguing that the requirement that utilities "offer" contracts was equivalent to wholesale price regulation.[312] FERC agreed[313] and held (as it has consistently held)

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305 *Id.* at v. The certainty and higher overall profits renewable energy investors can earn have spurred a renewable energy boom in places in Europe that use FITs. Most notably, Germany has used FITs to increase overall renewable electricity generation. *Id.*

306 Cal. Pub. Util. Comm'n, 132 FERC ¶ 61,047 (2010) [hereinafter *CPUC I*]; Cal. Pub. Util. Comm'n, 133 FERC ¶ 61,059 (2010) [hereinafter *CPUC II*]; Cal. Pub. Util. Comm'n, 134 FERC ¶ 61,044 (2011) [hereinafter *CPUC III*].

307 *See supra* notes 268–271 and accompanying discussion.

308 The avoided cost rate is the amount a utility would have spent producing power itself or procuring power from another source. When wholesale electricity rates are low, avoided cost rates will often decline.

309 *CPUC II*, 133 FERC ¶ 61,266–68; *CPUC III*, 134 FERC ¶ 61,160–61, 61,162 (upholding *CPUC II*); *see also infra* notes 317–324 and accompanying discussion.

310 CAL. PUB. UTIL. CODE § 2841(b)(2) (West); CAL. PUB. UTIL. CODE §§ 2841(a)(2), 2841.5, 2842.2 (West); *see also CPUC I*, 132 FERC ¶¶ 61,326–27.

311 *CPUC I*, 132 FERC ¶¶ 61,326–27, 61,331.

312 *Id.* ¶ 61,329.

313 *Id.* ¶¶ 61,337–38.

that the federal government has exclusive jurisdiction over wholesale electricity rates except where QFs are involved.[314] If, however, the facilities covered under the FIT qualified as QFs, FERC noted that states could set avoided cost rates for the facilities.[315] In other words, FERC affirmed that PURPA limits state power over wholesale sales and therefore constrains states' efforts to establish FITs that might establish incentive rates for distributed generation.[316]

A few months later, however, FERC issued a clarification that provides room for states to develop a type of FIT that could conform to avoided cost requirements under PURPA.[317] Specifically, FERC acknowledged that states could establish different categories of avoided costs based on state rules governing renewable energy development, transmission line loss, and other state policies affecting energy efficiency and sustainability.[318] As FERC explained:

> [I]n determining the avoided cost rate, just as a state may take into account the cost of the next marginal unit of generation, so as well the state may take into account obligations imposed by the state that, for example, utilities purchase energy from particular sources of energy or for a long duration. Therefore, the CPUC may take into account actual procurement requirements, and resulting costs, imposed on utilities in California . . .
>
> The Commission has previously found that an avoided cost rate may not include a "bonus" or "adder" above the calculated full avoided cost of the purchasing utility, to provide additional compensation for, for example, environmental externalities above avoided costs. But, if the environmental costs "are real costs that would be incurred by utilities," then they "may be

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[314] *Id.*

[315] *Id.* ¶ 61,338.

[316] *See id.*

[317] *CPUC II*, 133 FERC ¶ 61,059, 61,265 (2010);

[318] *Id.* ¶¶ 61,263 (explaining the CPUC's argument), 61,265–66 (explaining what goes into the avoided cost assessment and noting that states have wide latitude in setting avoided costs), 61,266–68 (approving multi-tiered avoided cost rates that would consider line losses and state policies affecting the cost of power).

accounted for in a determination of avoided cost rates."[319]

Under this ruling, states do not have to tie all avoided cost calculations to prevailing wholesale market rates, which are currently driven by low natural gas prices.[320] Instead, if states have RPSs in place requiring utilities to obtain a certain amount of power from renewable sources, they can calculate avoided costs for renewable energy separately.[321] If the RPSs include specific mandates for distributed generation or solar energy, the avoided cost calculation can narrow in on the costs for those types of power.[322] Additionally, if development of renewable sources will displace some need for transmission line construction, the avoided cost calculation can factor in these savings.[323] In other words, avoided cost does not have to equal the least-cost resource, so long as states can show that the costs being avoided fit within the same pool of energy and so long as the costs are in fact "avoided," rather than externalized.[324]

This ruling gives states that want to push up avoided cost rates many opportunities to do so. However, it also likely requires states to enact a number of other policies to justify their enhanced avoided cost calculations. For example, if a state wants to ensure that distributed generation receives adequate revenue, a state might need to establish a distributed generation carve-out that requires utilities to meet a portion of their RPS obligations with energy or RECs obtained from distributed generation resources. Distributed generation could then become a separate category for avoided cost calculations. Similarly, a state could include in the avoided cost calculation the avoided expenses associated with transmission line congestion and foregone transmission line construction. But this would require the state to gather data and actually do the calculations to justify higher avoided cost rates for distributed

319 *Id.* ¶¶ 61,267–68.

320 *Id.* ¶ 61,266 ("[T]he state may take into account obligations imposed by the state that, for example, utilities purchase energy from particular sources of energy or for a long duration.").

321 *Id.* ¶ 61,266.

322 *See id.*

323 *Id.* ¶ 61,268 ("[I]f the CPUC bases the avoided cost 'adder' or 'bonus' on an actual determination of the expected costs of upgrades to the distribution or transmission system that the QFs will permit the purchasing utility to avoid, such an 'adder' or 'bonus' would constitute an actual avoided cost determination and would be consistent with PURPA").

324 *See id.* ¶ 61,267–68.

generation. The effort involved in revising RPSs and calculating avoided costs could dissuade many states from embarking on this path.

Thus, while both net metering and FITs have the potential to play a role in distributed renewable energy development, they also require substantial changes. Part V of this article recommends some changes states could make to improve both programs and help bring more distributed generation online. These changes, however, will likely not succeed if distributed generation advocates fail to address utilities' broader concerns with distributed generation, as the next section explores.

B. UTILITY OPPOSITION TO DISTRIBUTED GENERATION

Despite the relatively mild impact distributed generation policies have had to date, utilities have nonetheless resisted distributed generation policies and raised arguments that could turn the public away from distributed generation. The utilities' opposition has been particularly robust in California, which has one of the most aggressive net metering programs in the country.[325] One utility in California has criticized net metering as an unfair hidden subsidy that benefits wealthy ratepayers at the expense of poorer customers.[326] Other utilities have sought to limit the use of net metering through interpreting the state's 5 percent cap on net metering in a way that would actually limit net metering to about 3 percent.[327] The arguments raised by the utilities regarding California's net metering program, small as it is, highlight some of the risks of promoting distributed generation. While the California utilities' arguments may not be completely sincere, they nonetheless reflect perspectives that could undermine the broader use of distributed generation throughout the country.

Utilities' arguments fall into three broad categories thus far. First, utilities oppose some policies, such as net metering, for failing to charge distributed generation producers for the costs of interconnection

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[325] FORSYTH ET AL., *supra* note 279, at 3; Ben Higgins, *California's Net Metering at a Crossroads*, CLEANTECHNICA (May 17, 2012), http://www.cleantechnica.com/2012/05/17/californias-net-metering-at-a-crossroads.

[326] *See* Felicity Carus, *Net Metering Battle Heats Up as Utilities Fear "Silent Subsidy"*, PTECH (Apr. 10, 2012), http://www.pv-tech.org/editors_blog/net_metering_battle_heats_up_as_utilities_fear_silent_subsidy.

[327] *See* Steve Leone, *California PUC Rules in Favor of Net-Metering*, RENEWABLEENERGYWORLD (May 24, 2012), http://www.renewableenergyworld.com/rea/news/article/2012/05/california-puc-rules-in-favor-of-net-metering.

and grid management. Utilities argue that this amounts to an unfair charge for utilities that must bear these costs without adequate compensation. Second, utilities have raised populist arguments in which they characterize net metering policies as wealth transfer mechanisms that force poorer ratepayers to subsidize the renewable energy proclivities of wealthier ratepayers. A third argument underlying these other two arises in states with vertically integrated monopolies, who fear loss of their monopolistic powers if distributed generation programs succeed. In these states, policies that support independent producers of distributed renewable electricity run the risk of being seen as policies that could lead to electricity sector restructuring. Electricity sector restructuring, in turn, would diminish the regulatory power of the states and could expose ratepayers to electricity rate increases beyond the states' or the utilities' ability to control. To the extent states and utilities view renewable energy policies as a threat to the regulatory status quo, many will resist their implementation. Using California's net metering program as an example, this section explores the merits and political potency of these arguments.

1. The California Debates

Recently, California's net metering rules generated controversy when the California Public Utility Commission ("CPUC") approved an order to reconcile the treatment of the net metering capacity cap between the state's three investor-owned utilities.[328] Under California's net metering laws, each utility must offer net metering to eligible facilities until the total net metering capacity reaches 5 percent of each utility's "aggregate customer peak demand."[329] However, when the CPUC looked into the utilities' calculations of this 5 percent cap, it discovered they were using different methodologies.[330] In practice, the CPUC found, some of the utilities were likely interpreting peak demand so as to cap net metering capacity at 3 percent or less of aggregate peak demand.[331]

[328] Decision Regarding Calculation of the Net Energy Meter Cap, Decision 12-05-036 (May 24, 2012), http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167591.PDF [hereinafter Net Metering Cap]; *see also* Leone, *supra* note 327.

[329] CAL. PUB. UTIL. CODE § 2827(c)(1).

[330] Steve Leone, *PUC May Decide California's Fight over Net-Metering*, RENEWABLEENERGYWORLD (Apr. 13, 2012), http://www.renewableenergyworld.com/rea/news/article/2012/04/puc-may-decide-californias-fight-over-net-metering.

[331] *Id.*

To correct this problem, CPUC issued an order defining aggregate customer peak demand such that utilities must honor the 5 percent cap and increase the total amount of electricity production eligible for net metering treatment.[332]

In filings before the CPUC and in other public statements, the investor-owned utilities pushed against a revision to their methodologies to calculate peak demand.[333] Although the utilities made various technical arguments, they also made broader policy arguments challenging the use of net metering generally. Specifically, the utilities and their advocates challenged net metering for undercutting the utilities' revenues, unfairly transferring wealth from poor to rich ratepayers, and potentially threatening the utilities' very existence. While these criticisms have several substantive flaws, they also have intuitive appeal that could undermine efforts to expand distributed generation.

2. The Utility Perspective: Undermining the Bottom Line

A primary concern with net metering is that it can potentially reduce utilities' revenues in a number of ways. First, net metering can encourage electricity customers who pay the highest electricity rates to produce their own power to avoid these higher rates.[334] Over time, this could diminish utilities' revenues and thus profits.[335] Second, when net metering requires utilities to pay retail rates for distributed power, it effectively allows independent power producers to receive utility services—including distribution, grid management, and transmission—for free.[336] As more customers take advantage of net metering programs and place a greater strain on these utility services, utilities argue net metering will become economically unsustainable.[337] Third, net metering cuts directly into the utilities' own profits by forcing the utilities to purchase electricity from customers to whom they would normally be

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332 *Id.*

333 *See* Net Metering Cap, *supra* note 328, at 6–9 (summarizing utilities' arguments).

334 *See* NAÏM DARGHOUTH ET AL., DEPT. OF ENERGY, THE IMPACT OF RATE DESIGN AND NET METERING ON THE BILL SAVINGS FROM DISTRIBUTED PV FOR RESIDENTIAL CUSTOMERS IN CALIFORNIA vii, xi, 25 (2010) (explaining how customers who consume more power will earn more revenue through net metering than those who consume less power, because California's rates increase as consumption increases).

335 *Id.*

336 Carus, *supra* note 326.

337 *Id.*; *see also* Herman K. Trabish, *Solar's Net Metering Under Attack*, GREENTECH MEDIA (May 3, 2012), http://www.greentechmedia.com/articles/read/solars-net-metering-under-attack/.

selling power.[338] This third concern is particularly strong in states where utilities continue to produce their own power for retail markets, but it also has resonance in restructured states due to the way in which many utilities earn revenue. This section explores these arguments.

a. Loss of Top-Tier Customers

Net metering potentially threatens utilities by encouraging high-value customers to produce their own power. In most states, electricity customers pay different rates depending on the type of customer they are and the amount of energy they consume.[339] Residential customers typically fall into a different payment block than commercial customers or industrial customers.[340] For most of the existence of the U.S. electricity system, industrial and commercial customers have paid higher electricity rates than residential customers.[341] Some states employ inclining rates that charge customers higher rates the more they consume.[342] States also use time-of-use rates that charge consumers more during peak and intermediate demand periods.[343] Inclining rates and time-of-use rates operate on the same basic assumption, namely that customers will reduce their use during peak periods if price signals encourage them to do so.[344] At the same time, customers who cannot necessarily curtail use during peak and intermediate demand periods—which include most commercial customers and many industrial customers—end up paying peak prices and end up subsidizing lower-tier electricity customers.

Utilities believe that expansive net metering could siphon off many customers who currently pay high electricity rates due to their type and peak energy use.[345] If a commercial customer that normally pays $0.25 per kilowatt-hour during peak demand could instead install a

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[338] THOMAS J. STARRS & HOWARD J. WENGER, POLICIES TO SUPPORT A DISTRIBUTED ENERGY SYSTEM (1999), *available at* http://www.repp.org/repp_pubs/pdf/pv3.pdf.

[339] JOSEPH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW IN A NUTSHELL 177–182 (2d ed. 2011) [hereinafter ENERGY NUTSHELL] (discussing rate design strategies); *id.* at 181–82 (focusing on different classes of ratepayers).

[340] *Id.*

[341] *Id.*

[342] *Id.* at 179–80.

[343] Peter Navarro & Michael Shames, *Electricity Deregulation: Lessons Learned from California*, 24 ENERGY L. J. 33, 44–45 (2003).

[344] *Id.*; *see* ENERGY NUTSHELL, *supra* note 339, at 180.

[345] *See* DARGHOUTH ET AL., *supra* note 334, at vii, xi, 25 (explaining how customers who consume more power will earn more revenue through net metering than those who consume less power, because California's rates increase as consumption increases).

distributed generation system and produce power during peak periods, this would significantly reduce that customer's electricity bills.[346] At a minimum, the customer would avoid paying the retail price. If the state also allows distributed generators to earn revenue for any excess electricity they produce, the customer would avoid paying retail rates for peak demand and potentially also collect peak wholesale rates for its excess energy. Utilities, in turn, would lose revenue from selling power at peak retail rates and owe net producers peak wholesale rates. The same dynamic would hold true during off-peak hours. For utilities that depend on large customers for a significant portion of their revenue, the potential loss of these customers could pose a significant threat.

Some distributed energy advocates have challenged this perception of net metering's impacts. They argue that distributed generation actually should reduce peak demand overall and lower peak energy prices in a market driven by supply-and-demand.[347] Since utilities should not be entitled to earn a profit on peak energy rates under most ratemaking laws,[348] the reduction in peak electricity sales should have no effect on utilities, but should benefit ratepayers.[349] Indeed, they argue, reduced peak energy demand could lead to an overall price reduction as total energy demand declines and thus insulate utilities from paying exorbitant prices during peak periods.[350] This would allow utilities to keep overall electricity prices stable for all customers and thus stabilize utilities' revenues and profits.

Whether utilities or distributed generation advocates are correct regarding the long-term economic impact of these policies depends on a

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[346] *Id.*

[347] *See* STEVEN WEISSMAN & NATHANIEL JOHNSON, THE STATEWIDE BENEFITS OF NET-METERING IN CALIFORNIA & THE CONSEQUENCES OF CHANGES TO THE PROGRAM 2–3 (2012) ("the availability of peak-coincident solar energy . . . can offset the most expensive hours of other forms of generation"); DOE DISTRIBUTED GENERATION, *supra* note 20, at 3-4 to 3-6 (discussing the impact distributed generation may have on peak demand and therefore peak prices). Although the specific impacts on consumers and utilities will vary, the Department of Energy's summary of the studies regarding distributed generation indicates that it can lower peak consumption and, thus, peak prices. *Id.*

[348] *See* ENERGY NUTSHELL, *supra* note 339, at 182–83. Unless a utility is required to build new facilities to accommodate peak demand, most of its peak prices should be considered operating expenses, for which the utility is not entitled to earn a rate of return. *Id.*

[349] WEISMANN & JOHNSON, *supra* note 347, at 8–9.

[350] *Id.* at 2. This impact would be most significant in states where wholesale market prices dominate. *See* DOE DISTRIBUTED GENERATION, *supra* note 20, at 3-5 to 3-7. However, distributed generation could also reduce congestion costs and other operational costs incurred by utilities during peak periods. *See id.* at 3-8 to 3-9.

number of state-specific policies regarding electricity rate regulation and the scope of distributed generation deployment. However, it is likely, based on the current state of electricity regulation, that utilities will face revenue losses through expanded net metering programs. First, although many states have adopted inclining block rates and time-of-use rates to try to reduce peak energy consumption and thus peak prices, these policies do not necessarily decrease peak consumption.[351] Most states, moreover, do not require utilities to decouple their revenues from electricity sales.[352] As a result, utilities are entitled to collect more revenue from peak power producers and have little incentive to promote reduced consumption.[353] Additionally, and perhaps counter-intuitively, strategies that promote increased consumption from large energy users are often politically popular, because they maintain rate structures designed to subsidize residential customers.[354] Thus, the traditional utility regulatory scheme favors increased power production at increased rates from larger customers, and most states have not passed laws that significantly alter this dynamic.

However, net metering programs that promote broad investment in distributed generation could fundamentally change the economic and

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[351] ENERGY INFO. ADMIN, ANNUAL ENERGY OUTLOOK 2007 41 (2006) (explaining that higher prices have not reduced consumption) [hereinafter ANNUAL ENERGY OUTLOOK 2007]. Theoretically, customers will conserve during peak demand periods to avoid paying higher power rates, but studies show that behavioral changes likely require dissemination of much more information than customers currently receive. Stephanie M. Stern, *Smart-Grid: Technology and Psychology of Environmental Behavior Change*, 86 CHI.-KENT L. REV. 139, 145–46 (2011) (explaining how consumers likely need real-time information about electricity rates to promote energy conservation and calling for the development of information technologies). Thus, new rate structures alone will have little impact on electricity consumption rates. *Id.* Moreover, increased use of electronics, computers and air conditioners has extended the duration of peak consumption periods in many places and made it harder for consumers to avoid peak rates. *See* BURKE TREIDLER & MARK MODERA, LAWRENCE BERKELEY LAB., PEAK DEMAND IMPACTS OF RESIDENTIAL AIR-CONDITIONING CONSERVATION MEASURES (1994); Energy Info. Admin., *Share of Energy Used by Appliance and Consumer Electronics Increases in U.S. Homes*, *Share of Energy Used by Appliances and Consumer Electronics Increases in U.S. Homes*, U.S. ENERGY INFO. ADMIN. (Mar. 28, 2011), http://www.eia.gov/consumption/residential/reports/2009/electronics.cfm.

[352] NAT'L ASS'N OF REGULATORY UTIL. COMM'RS, *supra* note 36, at 6. California, however, does require decoupling, so the arguments the utilities have made there about lost revenues have less merit. *Id.*; WEISMANN & JOHNSON, *supra* note 347, at 11–12.

[353] NAT'L ASS'N OF REGULATORY UTIL. COMM'RS, *supra* note 36, at 3("[I]ncreases in sales volumes translate into increased revenues which in turn directly lead into increased profits.").

[354] Trabish, *supra* note 337; *see also Information About Xcel Energy's Seasonal Tiered Rates*, COLO. DEP'T OF REGULATORY AGENCIES, PUB. UTIL. COMM'N, http://www.dora.state.co.us/puc/Tiered_rates_index.html (last visited Aug. 29, 2012) (noting that high-use rates will increase and help pay for decreased low-use rates).

regulatory dynamics for utilities. First, unlike time-of-use rates and other pricing strategies that weakly encourage conservation, net metering rewards power production. Many consumers cannot readily implement conservation measures and thus have little incentive to reduce their power use.[355] Net metering, however, offers consumers retail prices for the power they produce without requiring investments in conservation, and could therefore spur significant investment in distributed generation. Utilities would lose revenue from customers who use net metering to offset retail rates and would face much greater economic exposure than they do through conservation pricing strategies. In addition, if net metering programs allow participation by industries and commercial customers, subsidies from these large users will decline.[356] Thus, under certain conditions, net metering could indeed reduce utilities' profits and upset politically popular rate design strategies.

b. Uncompensated Services

Utilities have also argued that net metering and other distributed generation incentive programs require utilities to provide expanded grid management and distribution services without compensation.[357] Net metering allows utility customers to earn retail electricity rates for distributed generation.[358] Retail rates typically include the cost of the electricity, amortized capital costs plus a rate of return, and the costs of utility services, including services associated with managing the grid, balancing supply and demand, and maintaining system reliability.[359] The electricity itself comprises only a fraction of the retail rates—usually about one-third of the total rates consumers pay.[360] When compared to most wholesale electricity producers, who earn a few cents per kilowatt-hour, distributed generators who earn net metering rates up to $0.25 per kilowatt-hour seem to be making a killing. In the utilities' view, they're making a killing at the utilities' expense.

Net metering advocates challenge this argument by pointing to the costs utilities avoid by taking advantage of their customers' localized

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[355] ANNUAL ENERGY OUTLOOK 2007, *supra* note 351, at 41–44.
[356] Trabish, *supra* note 337 (discussing the distributed generation "death spiral").
[357] Carus, *supra* note 326; Trabish, *supra* note 337.
[358] Ferrey, *supra* note 246, at 1–2.
[359] ENERGY NUTSHELL, *supra* note 339, at 182–85.
[360] Ferrey, *supra* note 246, at 78–79.

energy production.[361] Increased distributed generation allows utilities to forego expensive investments in transmission line construction and improvements.[362] It also could minimize the expense associated with transmission line operation, balancing, and management, which require utilities to attempt to balance supply and demand on extremely complicated, expansive, and frequently congested transmission lines.[363] Thus, distributed generation advocates argue that any incremental expense utilities may spend to accommodate the minimal inputs from distributed generation are more than offset by the benefits utilities will receive from improved transmission operations.

In reality, both sides' arguments likely have merit. Based on the small amount of distributed generation currently deployed, utilities' arguments about uncompensated services are probably exaggerated at this stage. However, for more distributed generation to come online and provide reliability and balancing services for the electricity system as a whole, utilities will need to play an active management role.[364] They will also likely need to invest in upgraded distribution and localized transmission infrastructure.[365] At the same time, expanded distributed generation capacity is expected to relieve pressure on the transmission system and management of transmission services, particularly during peak periods.[366] This dynamic could both benefit and hurt the utilities' bottom lines, depending on the nature of their expenses and how they earn revenue.[367] The underlying uncertainty is likely driving some of the utilities' concerns.

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361 WEISMANN & JOHNSON, *supra* note 347, at 7, 10.

362 *Id.* at 10.

363 STARRS & WENGER, *supra* note 338, at 5B-3.

364 *See supra* notes 233–237 and accompanying discussion.

365 *Id.*

366 STARRS & WENGER, *supra* note 338, at 5B-3, 5B-9.

367 STARRS & WENGER, *supra* note 338, at 5B-5, 5A-6, 5B-9, 5A-26. If the utilities need to invest in new physical infrastructure, then they should be able to include these expenses in their rate bases and earn a rate of return, and thus increased profits, on the expenses. However, if their operating expenses increase, but their capital expenses decline, utilities' profits may decline. *See* ENERGY NUTSHELL, *supra* note 339, at 182–86 (explaining ratemaking formula), 191 (explaining rate of return), 192 (explaining implications of ratemaking formula).

c. Forced Competition

Another concern for utilities and some independent power producers is that net-metering policies unfairly compensate competing distributed power producers.[368] In simplistic terms, this is undoubtedly true. The basic premise behind net metering is that distributed power producers deserve extra compensation to produce power the utilities would otherwise provide. In this sense, net metering subsidizes producers who might not otherwise exist without the financial incentives net metering provides. For those who might wish to see free market principles apply in the electricity system, these policies are unfair and anti-competitive. They are particularly galling to vertically integrated utilities, which are forced to directly compensate their consumers/competitors for the energy they produce.

Of course, free market principles have never applied to the electricity system. Indeed, the system came within state regulation, including rate regulation, because most experts considered it a natural monopoly incapable of supporting competition.[369] Even today, some experts consider electricity transmission and distribution monopolistic.[370] Incumbent utilities have benefited from monopoly regulation for more than a century, and arguments about free markets may ring hollow coming from utilities.[371] In addition, the extensive subsidies supporting fossil fuel plants and nuclear power plants owned by utilities far outweigh the subsidies renewable energy policies offer.[372] Although the total amount of subsidies is difficult to pin down, historical analyses show that subsidies for fossil fuels eclipse the subsidies provided today for renewable energy.[373] Thus, the free market argument seems to have little merit when one considers the structure of the electricity system and the comparative subsidies for different fuel sources. The forced

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[368] *See* STARRS & WENGER, *supra* note 338, at 5A-26, 5A-32; Diane Cardwell, *Solar Panel Payments Set Off a Fairness Debate*, N.Y. TIMES (June 5, 2012) at B1, http://www.nytimes.com/2012/06/05/business/solar-payments-set-off-a-fairness-debate.html?pagewanted=all.

[369] ENERGY NUTSHELL, *supra* note 339, at 171–72, 370–73.

[370] *Id.* at 383–86.

[371] *Id.* at 381–83.

[372] *See* WORLDWATCH INSTITUTE, *supra* note 15.

[373] *See* Jeff Johnson, *Long History of U.S. Energy Subsidies*, CHEM. & ENG'G NEWS (Dec. 19, 2011), http://cen.acs.org/articles/89/i51/Long-History-US-Energy-Subsidies.html.

competition argument does, however, support another argument in opposition to distributed generation policies: namely, the forced competition could create another opportunity for broader restructuring of vertically integrated systems. Part 4 of this section explores that argument in greater detail.

3. The Populist Perspective: Wealth Transfers for the Wealthy

Utilities in California have also challenged net metering as unfair subsidization by the poor to the rich.[374] Under traditional ratemaking rules, utilities are entitled to collect from ratepayers all reasonable costs incurred to provide electricity services, including costs incurred as the result of net metering or other policies.[375] Thus, whenever a state establishes a net metering program, the costs of that system are passed onto ratepayers through electricity rates. Since wealthier customers will typically install distributed generation systems, but the costs of supporting distributed generation are shared among ratepayers, this may appear to be an unfair wealth transfer.[376]

This argument is likely factually incorrect, but it does have intuitive appeal. Wealth transfers are common within electricity rates, but they typically benefit poorer customers.[377] Even among residential customers, several states offer low-income payment assistance and lifeline rates designed to provide affordable electricity services for poor customers.[378] Thus, maintenance of these rate design strategies should mitigate the possibility of wealth transfer. Some observers have also challenged the sincerity of the wealth transfer argument, noting that utilities and their shareholders will actually face the consequences of lost revenue. After all, under traditional ratemaking practices, utilities are entitled to recover all the costs they incur in providing electricity services, including costs associated with building new power plants and transmission lines (for which utilities also receive a rate of return, or profit, on those investments), providing customer service, maintaining

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374 WEISMANN & JOHNSON, *supra* note 347, at 11–12.

375 Steven Ferrey, *Sale of Electricity*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 217, 217 (Michael B. Gerrard, ed., 2011).

376 WEISMANN & JOHNSON, *supra* note 347 at, 11–13 (the authors note, however, that most participants in California's program come from median income homes); *see also* Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 CONN. L. REV. 1339, 1339 (2010).

377 ENERGY NUTSHELL, *supra* note 339, at 181–82.

378 *Id.*

the systems' integrity, and otherwise operating and administering electricity services.[379] One could therefore see ratemaking as a wealth transfer from poor ratepayers to rich utilities and shareholders.

Whatever the merits of the wealth transfer argument, the intuitive appeal of the wealth transfer argument may undermine support for distributed generation policies.[380] Even though broad deployment of distributed generation could lead to lower overall electricity rates, greater reliability, and overall benefits, the idea that ratepayers are subsidizing their wealthier neighbors could generate backlash if it persists.[381] Much as support for unions has waned due to what Wharton economics professor Olivia Mitchell calls "pension envy,"[382] support for distributed generation could wane through subsidy envy. Distributed generation advocates will need to anticipate this potential backlash, by ensuring that utilities feel less threatened by distributed generation policies, by equalizing distributed generation access through policies that rely less on wealthy ratepayers' upfront investments, and by making a strong case at the outset for why the wealth distribution argument is potentially overblown.[383]

4. Threats to Vertically Integrated Monopolies

A final concern utilities may have regarding distributed generation is its potential to erode the monopoly status of utilities and perhaps threaten their operational model. Although some might question whether this could occur, distributed generation has the potential to fundamentally alter electricity systems.[384] With advancements in storage technology, distributed generation may threaten the central power station model that allowed utilities to gain monopoly status in the first place and even diminish the demand for extensive transmission systems.[385] While these scenarios require significant deployment of distributed generation

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379 Ferrey, *supra* note 375, at 217.

380 Eisen, *supra* note 242, at 346–47.

381 Ferrey, *supra* note 375, at 13 (discussing lower rates); *see also* Marty Smith, *Lies My Newspaper Told Me*, WILLAMETTE WEEK (Mar. 14, 2012), http://wweek.com/portland/article-18940-lies_my_newspaper_told_me.html (arguing that solar installation subsidies unfairly benefit the rich).

382 *See* James Surowiecki, *State of the Unions*, NEW YORKER (Jan. 17, 2011), http://www.newyorker.com/talk/financial/2011/01/17/110117ta_talk_surowiecki.

383 *See* WEISMANN & JOHNSON, *supra* note 347, at 11–13.

384 STARRS & WENGER, *supra* note 338, at 5A-32.

385 *Id.* at 5A-32.

systems and scientific advancements that may take decades to emerge, distributed generation could be a fundamental game-changer in electricity systems.[386] Even without these advancements, distributed generation could rekindle debates about electricity restructuring that seemed to subside for much of the last decade.

The idea of electricity restructuring gained hold after PURPA successfully led to the emergence of qualifying facilities owned and operated by nonutility entities.[387] Once FERC realized that electricity generation could support this level of competition, it advocated for additional laws to support even more competition.[388] Congress responded with the 1992 Energy Policy Act, which created a new category of independent power producers authorized to produce and sell electricity and remain exempt from certain regulatory laws.[389] States then entered the deregulatory game; several eastern states enacted restructuring laws, as did Illinois, Texas, and California.[390] Many other states were in the process of restructuring their own electricity systems to require vertically integrated utilities to open generation —and perhaps retail services—to competition until California's electricity crisis in 2000-2001 derailed other states' restructuring efforts.[391] Until recently, it seemed that the restructuring movement had come and gone, resulting in about one-third of the United States operating in restructured markets and the remainder holding onto traditional regulatory systems.[392]

Distributed generation could, if broadly implemented, once again raise the specter of restructuring. Indeed, many distributed generation advocates have promoted it as a way to "democratize the grid" and take electricity services away from utilities.[393] While these arguments may seem far-fetched based on current rates of distributed generation

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386 *Id.*

387 ENERGY NUTSHELL, *supra* note 339, at 379–84; *see* Richard D. Cudahy, *PURPA: The Intersection of Competition and Regulatory Policy*, 16 ENERGY L.J. 419, 422, 438 (1995).

388 ENERGY NUTSHELL, *supra* note 339, at 382.

389 Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (1992); ENERGY NUTSHELL, *supra* note 339, at 387.

390 ENERGY NUTSHELL, *supra* note 339, at 408 (discussing California); *see generally* James M. Van Nostrand, *Constitutional Limitations on the Ability of States To Rehabilitate Their Failed Electric Utility Restructuring Plans*, 31 SEATTLE U. L. REV. 593 (2008) (summarizing other state restructuring strategies).

391 Richard D. Cudahy, *Electricity Deregulation After California: Down but Not Out*, 54 ADMIN. L. REV. 333, 333 (2002).

392 *Id.*; *see also* Van Nostrand, *supra* note 390, at 609–10 (broadly describing states' dissatisfaction with electricity restructuring).

393 *See supra* note 45 and accompanying text.

deployment, few people expected PURPA—and the numerous facilities it helped create—to lead to a fundamental redesign of U.S. electricity policies.[394] In fact, distributed generation arguably has even greater potential to democratize the grid if electricity storage removes some need for reliance on long-distance transmission.[395]

Advocates of distributed generation should therefore consider whether they want to push the grid democratization argument in their advocacy efforts. In states where utilities lack strong public support and state regulators are willing to stand up to utilities and their allies, the idea of grid democratization could potentially bolster public support for distributed generation policies. However, in other states, the potential for distributed generation to undermine utilities' monopolies may weaken whatever support already exists.[396] As the next section explains, several strategies exist that can make distributed generation policies more effective while simultaneously addressing the concerns of utilities and their regulators.

V. REDESIGNING RENEWABLE ENERGY POLICIES TO PROMOTE DISTRIBUTED GENERATION

For distributed generation to become a meaningful component of the U.S. electricity system, several changes must occur to make it economically and technologically viable. Thus far, distributed generation policies have focused on incentivizing *ad hoc* investment in individual installations without considering how to build a regulatory and physical framework to accommodate systemic distributed generation development. Existing policies, moreover, lack adequate scale or incentives to promote broader participation in distributed generation facilities. This section therefore briefly explores how a systemic approach to distributed generation should develop, recommends changes to the existing policies distributed generation advocates usually promote,

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[394] Joseph P. Tomain, *The Past and Future of Electricity Regulation*, 32 ENVTL. L. 435, 451–53 (2002) (discussing "PURPA's Surprise"); *see also* STARRS & WENGER, *supra* note 338, at 5A-14, 5A-32.

[395] STARRS & WENGER, *supra* note 338, at 5A-14, 5A-32.

[396] *See* Van Nostrand, *supra* note 390, at 609–10. As Professor Van Nostrand explains, many states have come to regret their decisions to restructure their electricity sectors, because retail rates have increased after restructuring. *Id.* If utilities can convince consumers or regulators that distributed generation will increase electricity rates, particularly for less wealthy customers, they may be able to undermine initiatives to promote distributed generation.

and explains how utilities can be compensated, instead of undermined, for investing in distributed generation infrastructure.[397]

A. Designing a Comprehensive Plan for Distributed Generation

Distributed generation has great promise to transform the electricity sector. Realization of this promise, however, will require more planning than existing policies offer. Most policies fail to consider the infrastructure necessary to accommodate increased distributed generation. They also typically disregard the services associated with integrating and balancing new power supplies into the existing system. Essentially, most policies focus on generation and disregard the other components of electricity service. For the benefits of distributed generation to be realized, however, a comprehensive plan for its development must exist.

The comprehensive plan would assess several needs that distributed generation could serve. For example, it would evaluate actual and projected electricity demand within a given geographic area. It would then calculate how much power would come from remote renewables and distributed generation, based on existing and future development rates and power generation capacities. It would also evaluate the physical capacity of the existing distribution system to determine what types of physical and operational changes are necessary to accommodate increased distributed generation. The plan would consider the extent to which distributed generation in a given area would serve as backup power for remote, intermittent renewables and ensure that physical and operational systems within that area could serve that need. It would also describe the roles of IOUs, public utilities, and independent power producers and make the state's governance strategy clear. Finally, the plan would include a comprehensive strategy for developing distributed generation in a systematic way. In other words, like any other comprehensive plan, a distributed generation planning process would evaluate needs, figure out the best way to meet those needs, and include an implementation strategy to ensure the needs are met.

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[397] This article will provide a brief introduction to these proposed reforms. In a forthcoming article, I will detail how states should engage in comprehensive energy planning, the respective roles of state, local, and regional governments, the roles of utilities and power consumers, and the strategies for implementing such plans.

Distributed generation advocates may bristle at this comprehensive planning recommendation. Comprehensive planning is time-consuming, complicated, and often gets bogged down as different groups seek to have their interests represented in planning decisions.[398] It could also reveal some of the complexities and costs involved in developing a distributed generation system and perhaps scare policymakers away from necessary reforms.[399] Finally, it has the potential to derail or delay ongoing distributed generation projects during an extended planning process.

While all of these concerns have merit, planning is necessary for distributed generation to realize its full potential. Without a plan, the *ad hoc* approach in use today will continue to deliver meager results.[400] Moreover, planning would not have to delay current distributed generation development, so long as developers and planners realize that some existing investments might require alteration to conform to later developed plans. To the extent planning would delay some project, this impact would likely be more than offset by the improvements a comprehensive plan for distributed generation would offer.

B. IMPROVING POLICIES TO PROMOTE DISTRIBUTED ELECTRICITY PRODUCTION

State policies to promote distributed generation also require reform to expand participation by both independent power producers and utilities. While changes to net metering programs and feed-in tariffs could promote some of this expansion, distributed generation carve-outs in RPSs should also play a role. When coupled with tax credits and policies that invite renewable energy companies to participate in distributed generation development, RPSs could yield meaningful results.

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398 *See* Bradfordville Phipps Ltd. P'ship v. Leon Cnty, 804 So. 2d 464 (Fla. Dist. Ct. App. 1st Dist. 2001) (discussing the time intensity of comprehensive land use planning); *see also* Richard Grosso, *Regulating for Sustainability: The Legality of Carrying Capacity-Based Environmental and Land Use Permitting Decisions*, 35 NOVA L. REV. 711, 757–59 (2011).

399 *See* Grosso, *supra* note 398, at 757–59 (discussing development moratoria during land use planning processes).

400 *See generally* Eisen, *supra* note 242; *id.* at 364–68 (proposing a solar utility as a solution to the problems inherent in an *ad hoc* approach to solar distributed generation deployment).

1. Improvements to Net Metering and Feed-in Tariffs

States should improve net metering and feed-in tariff policies to make distributed generation more profitable and easier to integrate into the grid.[401] Net metering and feed-in tariffs both operate under the model that independent power producers should receive incentive rates for producing electricity and delivering it back to the grid. In net metering programs, the incentive rates result from allowing customers to offset electricity they would purchase at retail rates. While these retail rates are significant, most states' net metering programs have limited effect by design.[402] Moreover, net metering is available only to retail customers[403] and thus excludes independent investors from deploying distributed generation. Additionally, with both net metering and FITs, wholesale rates set the upper limit on the amount distributed power producers can earn for the excess power they sell.[404] Absent federal action lifting the rate caps on net metering or FITs, states should at least make sure avoided cost rates are adequate to attract more investment in distributed generation.

As noted above, states have some room to revise wholesale rates under the power PURPA gives states to set avoided cost rates for QFs.[405] FERC's order regarding California's FIT indicated that all costs the utility would incur in providing electricity could go into the avoided cost calculation.[406] FERC also made clear that states could establish different tiers of electricity requirements to use in calculating avoided costs for a particular type of energy source.[407] This flexibility regarding avoided cost calculations applies both to FITs and net metering (once a net metering customer produces more power than it consumes). Thus, under FERC's interpretation, states could make both programs more economically competitive through tailored avoided cost calculations.[408] Distributed

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401 Mormann, *Investor Appeal*, *supra* note 17, at 728–34.

402 *See supra* notes 280–291 and accompanying discussion.

403 *See supra* notes 246, 251–253, and accompanying discussion. As explained above, net metering operates by allowing retail power consumers to offset their retail power bills by producing some of their own power.

404 MidAmerican Energy Co., 94 FERC ¶ 61,340, ¶ 62,263 (2001); *CPUC I*, 132 FERC ¶ 61,326, ¶¶ 61,326–27 (2010).

405 *CPUC II*, 133 FERC ¶ 61,261, ¶¶ 61,266–68 (2010); *see also supra* notes 317–324 and accompanying discussion.

406 *CPUC II*, ¶ 61,266–68.

407 *Id.*

408 *See supra* notes 317–324 and accompanying discussion. The development of a comprehensive energy plan would assist this process, by establishing clear, long-term mandates.

generation advocates should therefore work with states to make avoided costs more attractive for potential distributed generation producers.

For net metering and FITs to incentivize meaningful investment in distributed generation, states should also expand eligibility to include commercial and industrial sources and raise the cap on allowable facility sizes.[409] This would allow new investors to enter the renewable energy market, provide a better variety of potential renewable energy production sites, and allow the multiple benefits of distributed generation—such as brownfields development—to manifest. By expanding eligibility requirements and increasing avoided cost calculations, states could make net metering and feed-in tariff programs more effective.

Finally, states should ensure that net metering programs and FITs ensure interconnection and grid access without significant transaction costs.[410] Energy experts have long recognized that interconnection constraints limit participation in renewable energy incentive programs.[411] States should therefore establish uniform interconnection requirements and require utilities to make the grid accessible to distributed power producers.

2. Distributed Generation Carve-Outs

Another model states could pursue to promote distributed generation is the development of aggressive distributed generation carve-outs within existing RPSs. A distributed generation carve-out establishes a minimum percentage of power utilities must produce or purchase from specified distributed resources.[412] To enhance development of distributed generation, states could set aggressive, but attainable, targets that increase over time. Utilities would then have the option of meeting their targets by producing the power themselves, purchasing the power from others, or purchasing RECs from distributed generators. It would be relatively easy to change their RPSs to achieve this result.

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409 Mormann, *Investor Appeal*, *supra* note 17, at 729–32 (discussing rates that would vary according to facility size and investment risk).

410 STARRS & WENGER, *supra* note 338, at 5A-34.

411 *See* ENVTL. PROT. AGENCY, EPA CLEAN ENERGY – ENVIRONMENT GUIDE TO ACTION: POLICIES, BEST PRACTICES, AND ACTION STEPS FOR STATES, 5-43 (2006).

412 DSIRE *State Policies Summary*, *supra* note 12 (showing that some states have distributed generation carve-outs); *see also Glossary*, DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/glossary/ (last visited Nov. 17, 2012) (click on Renewable Portfolio Standards) (defining Renewable Portfolio Standard as a program requiring the purchase of a set amount or percentage of energy from renewable sources).

States could further promote distributed generation by assigning multipliers to electricity produced from distributed renewable energy systems. Multipliers reward energy producers with additional RECs when they produce desirable types of power and could help jump-start expanded investment in distributed generation systems.[413]

RPSs could also promote distributed generation because they give utilities the option of producing power themselves, rather than requiring them to purchase it from third parties. This option could diffuse the wealth transfer arguments utilities have raised in opposition to net metering and feed-in tariffs. Under RPSs, if utilities buy power from renewable energy developers, they make the choice to do so and cannot complain as loudly about forced electricity purchases.

Finally, RPSs with distributed generation carve-outs could open the distributed generation industry to greater participation by companies that typically invest in larger renewable energy facilities. RPSs that establish increasing mandates over a long time provide a stable market that investors find attractive. This could make the renewable energy industry more stable and sustainable over the long term. This security could help buffer the uncertainty the industry faces in seeking to develop large, remote renewable energy facilities.

3. Tax Credits and Subsidies

Distributed generation advocates should also pursue continued tax credits and other subsidies for local renewable energy facilities. As the Department of Energy has documented extensively, distributed generation could play a vital role in maintaining electricity reliability, increasing the system's resilience, and supporting other sources of renewable energy.[414] Renewable distributed generation also externalizes far fewer costs than most large sources of power, particularly those from fossil fuels.[415] Yet, because of the subsidies fossil fuels have received[416] and because the full costs of electricity production have yet to be internalized, renewable energy operates at a clear disadvantage. Tax credits and subsidies help balance this dynamic and are critical to a

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[413] Kirsten H. Engel, *Why Not a Regional Approach to State Power Mandates?*, 3 SAN DIEGO J. CLIMATE & ENERGY L. 79, 87 (2011-2012).

[414] *See generally* DOE DISTRIBUTED GENERATION, *supra* note 20.

[415] LOVINS ET AL., *supra* note 20, at 290–307.

[416] *See* Eisen, *supra* note 242, at 345 n.24.

transition to a more sustainable energy system.[417] Thus, in addition to other policy reforms distributed generation advocates may pursue, access to tax credits and subsidies should be a key component of distributed generation policies.

C. PROVIDING INCENTIVES FOR UTILITY PARTICIPATION

Distributed generation advocates should also design and promote policies that reward utilities for supporting distributed generation development. In those states where utilities still operate as vertically integrated monopolies, distributed generation advocates might support policies that promote utility investment in the distributed generation facilities and the infrastructure necessary to support distribution and system reliability. In states that have undergone restructuring, utilities could earn incentive rates for investing in infrastructure and providing services. Making distributed generation economically attractive for utilities could be essential to its expansion.

Incentives, however, may not be enough to spur utilities to invest in distributed generation. Thus, state regulators should adopt a two-pronged strategy to facilitate a transition to a distributed electricity system. First, they should direct utilities to make whatever infrastructure investments are necessary to promote distribution, transmission, and reliability services. These services remain part of utilities' exclusive monopoly franchises, and regulators have clear authority to direct utilities to maintain these services at adequate levels.[418] Ensuring that utilities fulfill this duty to serve is an essential strategy for promoting distributed electricity. Second, state regulators should offer utilities—particularly those in states with vertically integrated systems—opportunities to earn incentive rates on distributed electricity system investments.[419] These incentive rates could make distributed generation much more viable to skeptical utilities used to the central power station model.[420]

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[417] 2011 WIND TECHNOLOGIES MARKET REPORT, *supra* note 80, at 57–58 (noting importance of PTC).

[418] ENERGY NUTSHELL, *supra* note 339, at 172–73.

[419] *See id.* at 195 ("An incentive rate method is a generic term meaning that rates should be set so that producers have a profit incentive.").

[420] Professor Joel Eisen is skeptical that utilities would embrace residential solar development notwithstanding mandates and incentives. Eisen, *supra* note 242, at 59–60. He advocates for the creation of "solar utilities" that independent identities might operate. Eisen, *Urban Solar, supra* note 245. Consistent with this argument, regulators might therefore pursue a third strategy:

Under traditional ratemaking laws, utilities earn a rate of return on capital expenditures necessary to provide electricity services.[421] The rate of return is designed to maintain the utilities' financial integrity and allow them to attract investment.[422] Although the rates utilities receive must be reasonable, the ratemaking process usually has enough flexibility to allow regulators to establish variable rates of return for certain investments.[423] In some states, regulators can also give utilities "incentive rates" that reward utilities for achieving specified goals.[424] These concepts could apply to promote utility investment in distributed generation infrastructure by paying them super-competitive rates for their investments.

Incentive rates could also compensate utilities for providing services necessary to accommodate distributed generation. Under traditional ratemaking laws, utilities are entitled to recover the costs of service through operating expenses, but they may not earn a profit on the services they provide.[425] This dynamic likely makes utilities wary of new models of electricity service that could require them to spend more time, without earning more profit, on increased services. To address these concerns, some states have allowed utilities to earn incentive rates.[426] Adequate support for distributed generation could become a basis upon which utilities can earn incentive rates.

These proposals represent only a sampling of strategies that regulators could employ to promote utility participation in distributed generation. Many other strategies likely exist. Ultimately, whatever strategy is used, distributed generation advocates should consider ways in which utilities are rewarded as partners in promoting local energy development.

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removing utilities' control over distributed generation where the utilities fail to perform their obligations.

421 *Id.* at 182–83.

422 *See id.* at 191.

423 *Id.* at 191–92.

424 *Id.* at 195–97.

425 *Id.* at 182–83, 186–87.

426 *Id.*

VI. CONCLUSION

Distributed generation has the potential to radically alter and improve the current U.S. electricity system. Strategically developed local renewable energy could add resilience to the system, increase its efficiency, lower overall costs, and improve its environmental performance. Distributed generation could also promote a broader transition to renewable energy use by providing backup power for large, remote renewable energy facilities and reducing transmission congestion that can interfere with the delivery of power from wind and concentrated solar facilities. For at least two decades, energy experts have highlighted these and other benefits of distributed generation; it is time for policies to match the promise of this form of electricity production and delivery.

Thus far, most policies designed to promote distributed generation have involved half-measures and baby steps aimed at increasing installation of rooftop solar arrays and other small-scale renewable energy sources. Some policies, like net metering, fail to provide adequate incentives or include limitations designed to constrain the scope and effectiveness of distributed generation. Other policies, like feed-in tariffs, focus on providing adequate incentives for energy producers without considering the impacts on utilities. While these policies have had some moderate effects in promoting renewable energy, they will not lead to a broader transformation of the electricity system.

To transition to broader deployment of distributed generation, advocates should focus on three overarching strategies. First, they should develop a comprehensive plan for the development of localized renewable energy production, delivery, and balancing systems. Second, distributed generation advocates should propose policy changes designed to increase development of local renewable energy production by both independent power producers and, where appropriate, utilities. Finally, they should develop strategies that ensure that utilities receive compensation for integrating distributed generation into the electricity system and providing balancing and reliability services necessary to accommodate locally produced renewable energy. Distributed generation will not flourish until a comprehensive plan to support its deployment and maintenance exists.

Admittedly, these recommendations do not conform to the popular view that distributed generation could democratize the grid. In some places, it may be possible for such grid democratization to take hold and thrive. But in most places in the United States, incumbent utilities play too vital a role in the electricity system to ignore. Bringing these utilities into a distributed generation system could ensure its success and make the U.S. electricity system much more sustainable.