FACILITATING THE US Renewable TRANSITION: From *Ad Hoc* Integration to Comprehensive Reform

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Introduction

The United States of America is blessed with an abundance of renewable electricity resources. The country could satisfy its electricity needs perhaps sixteen times over through onshore wind power alone,[1] and it could potentially produce more than one hundred times the power it needs from solar energy.[2] Each individual state, moreover, could likely meet all of its energy demand solely from instate renewable resources,[3] and many states would have surplus power to export.[4] The United States also has an advanced and innovative technology sector that has designed key technologies that have made and will continue to

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[1] Xi Lu, Michael B. McElroya, and Juha Kiviluomac, 'Global Potential for Wind-Generated Electricity' (2009) 106 PNAS 10,933, 10,938.

[2] Anthony Lopez, Billy Roberts, Donna Heimiller, Nate Blair, and Gian Porro, 'US Renewable Energy Technical Potentials: A GIS-Based Analysis' (NREL 2014) 20.

[3] Mark Z. Jacobson, Guillaume Bazouin, Zack A.F. Bauer, Christa C. Heavey, Emma C. Fisher, Emma C. Hutchinson, Sean B. Morris, Diniana J.Y. Piekutowski, Taylor A. Vencill, Tim W. Yeskoo, '100% Wind, Water, Sunlight (WWS) All-Sector Energy Plans for the 50 United States' (2014).

[4] Several states already produce renewable electricity for export to other states. The physical interconnection of the US transmission system enables these exports, although intermittent resources face difficulties obtaining affordable access to the transmission system. *See infra* n. 75-83 and accompanying text. Renewable energy exports face other challenges in today's energy market, including slack demand and competition from lower cost natural gas. *See* Judy W. Chang, J. Michael Hagerty, Johannes P. Pfeifenberger, and Ann Murray, 'Nebraska Renewable Energy Exports: Challenges and Opportunities (LB 1115 Study)' (The Brattle Group, 12 Dec 2014). Despite these obstacles, the fact remains that most US states have sufficient wind and solar power capacity to produce a surplus of renewable power.

make renewable electricity cheaper, more available, and more reliable.[5] Government studies have calculated that the United States could obtain 80% of its electricity from renewable sources by 2050,[6] and private studies have argued that a 100%-by-2050 goal is realistic.[7] A transformation of the electricity system (this paper will call it a "renewable transition") is technically feasible. Indeed, the United States added an unprecedented amount of new electricity capacity from renewable sources in the past several years.[8] Yet, as of 2014, renewables accounted for only 13% of the country's electricity production,[9] and non-hydroelectric renewable resources built since the 1970s accounted for less than half of this production.[10] Solar and wind, the resources with the highest growth rates and arguably the greatest potential to supply future US power (and the focus of this article),[11] together provided only about 5% of US power generation by early 2015.[12] In comparison, in 2014

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[5] Jacobson, et al. (n. 3). Wind capacity maps produced by the National Renewable Energy Laboratory (NREL) illustrate how technological improvements can expand renewable power availability. In late 2014, NREL released wind capacity maps demonstrating that nearly every state in the country could produce substantial wind power using 140-meter onshore wind turbines, which have only recently become commercially available. In comparison, 110-meter turbines in use today reduce wind capacity in many states, particularly in the southeast. See US Dept. of Energy, WINDExchange, 'Wind Potential Capacity' (last updated 10 Dec 2014), http://apps2.eere.energy.gov/wind/windexchange/windmaps/resource_potential.asp [hereinafter Wind Potential Capacity].

[6] Nat'l Renewable Energy Lab., 'Renewable Electricity Futures Study' (2012) xviii.

[7] Jacobson, et al. (n. 3).

[8] Jeff St. John, 'U.S. Solar Generation Doubled in 2014, Renewable Output Grew 11%' *The Energy Collective* (12 Mar 2015), http://theenergycollective.com/jeffstjohn/2202001/us-solar-generation-doubled-2014-renewable-output-grew-11.

[9] Energy Info. Admin., 'Energy in Brief, How Much U.S. Electricity is Generated from Renewable Energy?' (14 Apr 2014), http://www.eia.gov/energy_in_brief/article/renewable_electricity.cfm.

[10] Ibid.

[11] St. John (n. 8); Jacobson, et al. (n. 3) (focusing on wind and solar power for future renewable supplies).

[12] In 2014, wind power provided about 4.4% of U.S. power generation, and solar provided about 0.5%. US Dept. of Energy, Energy Info. Admin., 'Electric Power Monthly' (4 Mar 2015).

renewable resources provided 24% of electricity supply in Germany[13] and 40% in Denmark, nearly all of which has come online since the 1990s.[14]

The low penetration of renewable energy in the United States is somewhat surprising, at least when one considers that renewable energy laws have been on the books since the late 1970s.[15] The primary federal and state renewable policies *(Renewable Portfolio Standards (RPSs)*, net metering laws, tax credits, and *the Public Utility Regulatory Policies Act (PURPA))* [16] have played essential roles in supporting renewable energy development, but have also promoted erratic and unreliable growth. [17] As a result of this fitful growth, renewables have provided and likely will continue to provide a much smaller proportion of power than they could.[18] For example, despite lower costs, improved technologies, and increased federal efforts to support renewable power, the Department of Energy released a report in March 2015 that aims for wind to produce only 20% of the nation's power by 2030 and 35% by 2050.[19] While these figures are ambitious compared to the penetration of wind power at the end of 2014, they pale in comparison to US wind power potential[20] (not to

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[13] Stefan Nicola, 'Renewables Take Top Share of German Power Supply in First' *Bloomberg* (New York, 1 Oct 2014) http://www.bloomberg.com/news/2014-10-01/german-renewables-output-tops-lignite-for-first-time-agora-says.html.

[14] Justin Gillis, 'A Tricky Transition from Fossil Fuel, Denmark Aims for 100 Percent Fossil Fuel Energy' *NY Times* (New York, 10 Nov 2014) http://www.nytimes.com/2014/11/11/science/earth/denmark-aims-for-100-percent-renewable-energy.html.

[15] *See* Public Utility Regulatory Policies Act of 1978, Pub. L. 95-617, 92 Stat. 3117, codified in part at 16 U.S.C. § 824a-3 (2012).

[16] Discussed more fully below. *See* also Database of St. Incentives for Renewables & Efficiency, Financial Incentives for Renewable Energy, http://www.dsireusa.org/summarytables/finre.cfm(accessed 15 Dec 2014); Database of St. Incentives for Renewables & Efficiency*,* Rules, Regulations, & Policies for Renewable Energy, http://www.dsireusa.org/summarytables/rrpre.cfm(accessed 15 Dec 2014).

[17] *See* Melissa Powers, 'Sustainable Energy Subsidies' (2013) 43 Envtl L 211; Melissa Powers, 'Small is (Still) Beautiful: Designing U.S. Energy Policies to Increase Localized Renewable Energy Generation' (2012) 30 Wisc Intl Envtl LJ 595.

[18] Union of Concerned Scientists, 'Strengthening the EPA's Clean Power Plan' (2014), http://www.ucsusa.org/sites/default/files/attach/2014/10/Strengthening-the-EPA-Clean-Power-Plan.pdf.

[19] US Dept. of Energy, 'Wind Vision: A New Era for Wind Power in the United States' (2015) xvi.

[20] *See* Lu, McElroya, & Kiviluomac (n. 1); Lopez et al. (n. 2); Wind Potential Capacity (n. 5).

mention penetration rates achieved by other countries, such as Denmark).[21] Similarly, a proposed federal regulation*, the Clean Power Plan*,[22] would set renewable targets that are nearly half of what they could be based on current state policies and development levels.[23] At the very least, the United States suffers from a lack of ambition when it comes to renewable power. For the country to achieve a renewable transition, it will need to aim much higher.

Lack of ambition, however, is not the only problem with US renewable energy policies. Uncertainty has become the norm in the renewable energy industry, and this uncertainty presents hurdles for both independent renewable developers and utilities that must secure adequate power supplies. Persistent political disputes about renewable energy development and policies have infected the industry with instability. Tax policies have become the poster children for this dynamic. Inconsistent federal tax policy has subjected the wind energy industry to a boom-and-bust development cycle that constrains the investment, growth, and stability necessary to support reliable and low-cost wind energy development.[24] The solar energy industry may soon face similar instability when other federal tax credits expire.[25] At a minimum, unpredictable tax policy raises the transaction costs associated with renewable power acquisition;[26] but in many cases, expiring tax credits have caused a collapse in

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[21] *See* Gillis (n. 14).

[22] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (18 June 2014) 79 Fed. Reg. 34,830 [hereinafter Clean Power Plan].

[23] Union of Concerned Scientists (n. 18) 3 fig. 1.

[24] Powers, 'Sustainable Energy Subsidies' (n. 17); Erin Dewey, 'Sundown and You Better Take Care: Why Sunset Provisions Harm the Renewable Energy Industry and Violate Tax Principles' (2011) 52 BC L Rev 1105, 1119 & n.112 (note); Alexandra Klass & Lesley McAllister, 'Subsidizing in Spurts: Our Production Tax Credit Policy, or Lack Thereof' (*CPR Blog* 12 Feb 2013), http://www.progressivereform.org/CPRBlog.cfm?idBlog=CEA8C992-BD12-B999-EF92A40AE2F89CD6(last visited 7 Apr 2013).

[25] Thomas Jensen, 'The Solar Industry's Tax Credit Conundrum' *GreenTechSolar* (Washington 21 July 2014), http://www.greentechmedia.com/articles/read/the-solar-industrys-tax-credit-conundrum; *see also* Camilo Patrignani, 'The Solar Industry Needs to Let Its Federal Tax Credit Die, Says This CEO' *GreenTechSolar* (Washington 13 Jan 2015), http://www.greentechmedia.com/articles/read/the-solar-industry-needs-to-let-its-federal-tax-credit-die-says-this-ceo (arguing that the instability experienced by the wind industry would be worse for the solar industry than loss of the tax credit).

[26] Powers, 'Sustainable Energy Subsidies' (n. 17) 225-26; Merrill Jones Barradale, 'Impact of Policy Uncertainty on Renewable Energy Investment: Wind Power and the PTC' (Working Paper rev. ed. Aug 2009) 5, 6 fig.1, available at http://ssrn.com/abstract=1085063.

renewable energy development.[27] Other policies may be heading in a similar direction. Although experts credit RPSs with promoting substantial growth in the renewable energy industry,[28] their impact is diminishing as utilities come closer to meeting RPS targets.[29] Unless policy makers adopt new RPSs with more aggressive goals for the future, demand for renewable power could drop. Without RPSs to drive demand, with federal tax credits facing expiration,[30] and with increasing uncertainty surrounding net metering laws and PURPA,[31] a sustained transition to renewable power becomes more unlikely.[32]

Unfortunately, US renewable energy policies themselves engender uncertainty by promoting *ad hoc*[33] renewable power development and integration rather than a comprehensive plan for the renewable transition. These policies provide greater autonomy to independent renewable power developers, but the piecemeal development they allow has significant downsides. First, piecemeal renewable power development is inefficient and expensive,[34] and although equipment costs have declined, other "soft costs" remain high.[35] As a result,

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[27] Am. Wind Energy Ass'n, Federal Production Tax Credit for Wind Energy: The American Wind Industry Urges Congress to Take Immediate Action to Pass an Extension of the PTC, available at http://www.awea.org/issues/federal_policy/upload/PTC-Fact-Sheet.pdf. A similar drop-off in wind power development occurred when Denmark suspended its own subsidies without providing alternative policy support. Meyer, N. I. and A. L. Koefoed, 'Danish energy reform: Policy implications for renewables' (2003) 31 Energy Pol'y 597.

[28] Galen Barbose, 'Renewables Portfolio Standards in the United States: An Update' (Lawrence Berkeley Nat'l Lab Dec 2014) 3.

[29] Ibid. 9.

[30] The tax credit that primarily supports wind power development has already expired, although facilities that began construction before January 1, 2015 and are placed into service by December 31, 2016 remain eligible for the credit. Tax Increase Prevention Act of 2014, H.R. 5771 (2d. Sess. 2013); IRS Notice 2015-25 (11 Mar 2015). The tax credits that support commercial and residential solar development will drop or expire at the end of 2016. I.R.C. § 45(a), (b) (2012); I.R.C. § 48 (2012).

[31] *See infra* section III.

[32] Energy Info. Admin., 'Annual Energy Outlook with Projections to 2040' (Apr 2014) IF42-IF43 [hereinafter Annual Energy Outlook]. Most renewable power development has occurred in states that offer a mix of policy supports that include RPSs and tax credits.

[33] "*Ad hoc*" means "for the particular end or case at hand without consideration of wider application." Merriam-Webster, http://www.merriam-webster.com/dictionary/ad%20hoc.

[34] *See* Nick Lawton, 'Shrinking Solar Soft Costs: Policy Solutions to Make Solar Power Economically Competitive' (Green Energy Institute Apr 2014), 8-17.

[35] Ibid. 2-6. Importantly, although hardware costs for solar have declined, the "soft costs" associated with solar development generally have not.

renewable power cannot compete effectively in the current electricity market without policy assistance.[36] Second, piecemeal development and siting of renewable power facilities complicates transmission and distribution gird planning and management, which, in turn, stifles renewable power growth.[37] While distributed power sources could actually improve grid reliability,[38] unplanned expansion of distributed generation could have the opposite effect.[39] Third, while all renewable energy policies face some opposition, programs that promote piecemeal development face increasingly intense (and often unfounded) political opposition for being elitist and unfair.[40] These contentious political debates draw attention away from much more fundamental questions about how the electricity system and utility business models must change to achieve the renewable transition.[41]

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[36] Annual Energy Outlook (n. 32) IF42-IF43

[37] *See infra* notes 220-240 and accompanying text. With relatively low levels of renewable deployment in most places, integration has not yet presented significant challenges to grid reliability. However, individual facilities have struggled to obtain access to transmission lines in various places, and power planners anticipate that increased integration without better planning could present both economic and reliability problems. *See* Krysti Shallenberger, 'Mont. Project Will Send Wind Across Border to Wyo.' *EnergyWire* (20 Mar 2015), http://www.eenews.net/energywire/2015/03/20/stories/1060015412; California ISO, 'Fast Facts: What the Duck Curve Tells Us About Managing a Green Grid' (2013), http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf. Not everybody agrees that the "duck curve" is as significant, however. Jeff St. John, 'Retired CPUC Commissioner Takes Aim at Duck Curve' *GreentechGrid* (24 Mar 2014), http://www.greentechmedia.com/articles/read/retired-cpuc-commissioner-takes-aim-at-caisos-duck-curve.

[38] 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) 2-17.

[39] Herman K. Trabish, 'How California is Incentivizing Solar to Solve the Duck Curve' *Utility Dive* (13 Oct 2014), http://www.utilitydive.com/news/how-california-is-incentivizing-solar-to-solve-the-duck-curve/317437/.

[40] *See* Steven Weissman & Nathaniel Johnson, 'The Statewide Benefits of Net-Metering in California & the Consequences of Changes to the Program' (2012) (responding to these claims); Evan Halper, 'Minority Groups Back Energy Companies in Fight Against Solar Power' *LA Times* (9 Feb 2015), http://www.latimes.com/nation/la-na-solar-race-20150209-story.html; Jon Wellinghoff & James Tong, 'Wellinghoff and Tong: A Common Confusion over Net Metering is Undermining Utilities and the Grid: "Cost-shifting" and "Not Paying Your Fair Share" Are Not the Same Thing' *Utility Dive* (22 Jan 2015), http://www.utilitydive.com/news/wellinghoff-and-tong-a-common-confusion-over-net-metering-is-undermining-u/355388/.

[41] Wellinghoff & Tong (n. 40).

Grid managers and regulators have sought to address the uncertainty in the electricity sector primarily through transmission planning strategies. Since the 1990s, the Federal Energy Regulatory Commission (FERC) has developed a series of regulations and orders designed to ensure that wholesale power producers have open, non-discriminatory access to the transmission system.[42] As more renewable power has entered the mix, FERC has established requirements to facilitate integration of large wind generators, variable energy producers, and small renewable power producers.[43] In addition, FERC has directed transmission operators to develop regional plans for integrating renewable power sources.[44] Other entities have likewise sought to plan for increased renewable energy integration. For example, eastern regional transmission operators have begun to plan for increased renewable power integration,[45] and transmission operators in the West have initiated efforts

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[42] Promoting Wholesale Competition Through Open Access Nondiscriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, Order No. 888, FERC Stats. & Regs. ¶ 31,036, 61 Fed.Reg. 21,540 (1996), clarified, 76 FERC ¶ 61,009 and 76 FERC ¶ 61,347 (1996) (“Order 888”), on reh'g, Order No. 888–A, FERC Stats. and Regs. ¶ 31,048, 62 Fed.Reg. 12,274, clarified, 79 FERC ¶ 61,182 (1997), on reh'g, Order No. 888–B, 81 FERC ¶ 61,248, 62 Fed.Reg. 64,688 (1997), on reh'g, Order No. 888–C, 82 FERC ¶ 61,046 (1998) [hereinafter Order 888]; Open Access Same–Time Information System and Standards of Conduct*,* Order No. 889, FERC Stats. & Regs. ¶ 31,035, 61 Fed.Reg. 21,737 (1996) (“Order 889”), *on reh'g,* Order No. 889–A, FERC Stats. & Regs. ¶ 31,049, 62 Fed.Reg. 12,484 (1997), *on reh'g,* Order No. 889–B, 81 FERC ¶ 61,253 (1997); and Regional Transmission Organizations, Order No. 2000, 65 Fed.Reg. 810 (2000).

[43] Interconnection for Wind Energy, Order 661, FERC Stats & Regs., ¶ 61,353 (2005); Integration of Variable Energy Resources, Order 764, FERC Stats & Regs., ¶ 61,246 (2012); and Small Generator Interconnection Agreements and Procedures, Order 792, FERC Stats & Regs., ¶ 61,159 (2013).

[44] FERC, Facts, Order No. 1000: Final Rule on Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities (Jul. 21, 2011), *available at* http://www.ferc.gov/media/news-releases/2011/2011-3/07-21-11-E-6-factsheet.pdf.

[45] *See* GE Energy Consulting, ‘PJM Renewable Integration Study, Executive Summary Report Revision 03’ (Mar 2014) 3-5 [hereinafter PJM Renewable Integration Study]. The study assumed, for example, that onshore wind farms would be located in designated “best sites,” that offshore wind would provide a significant amount of power, and that solar power would come from centralized plants widely dispersed across PJM’s service territory and smaller distributed solar facilities located in major cities. Ibid; GE Energy Mangement, ‘PJM Renewable Integration Study (PRIS), Final Project Review 07, Stakeholder Meeting of March 3, 2014’ (Mar 2014) 37-40. PJM is regional transmission operator responsible for coordinating electricity transmission in thirteen states in the eastern and Midwestern

to create an energy imbalance market that would facilitate integration of variable renewable resources across the western states.[46] Even with these efforts, grid managers and energy policy makers acknowledge they have much more to do.[47] For example, distribution-level management remains an area in need of much greater attention.[48] Nonetheless, regulators understand the challenges presented by the potential renewable transition and are working to overcome them.

This article proposes that policies to promote renewable power development should change as well. Specifically, renewable energy policies should create long-term goals and strategic plans for increasing renewable energy development and facilitating grid integration and reliability. State-level renewable energy mandates[49] would also allow regulators to design policies that either accommodate the existing utility structure or enable a redesign of the utility model. Expanded RPSs would establish predictable goals that would create investment certainty for renewable energy producers and likely enable increased renewable power integration at lower costs. While other policies, including net metering, PURPA, and tax credits, could continue to support renewable power development, they would work within a larger comprehensive plan. Finally, comprehensive energy plans that map out locations for renewable facility siting would facilitate electricity grid management and help avoid transmission line conflicts and potential reliability concerns that increased integration of renewable power could present. While creating a comprehensive plan would be complicate and contentious, the final plan would facilitate the renewable transition better than piecemeal development.

Part II of this article provides a quick snapshot of renewable energy's place in the current US electricity sector. Next, Part III explains how PURPA, net metering, tax credits, and RPSs have promoted renewable power and yet exposed the renewable power industry to increased uncertainty. Part IV argues that much of this uncertainty results from the policies' promotion of piecemeal development and integration of renewable electricity sources.

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parts of the United States. *See* PJM, 'About PJM' https://www.pjm.com/about-pjm.aspx (last visited Mar. 15, 2015).

[46] National Renewable Energy Lab, 'Transmission Grid Integration, Energy Imbalance Markets,' http://www.nrel.gov/electricity/transmission/energy_imbalance.html (updated 19 Sep 2014).

[47] *See* California ISO (n. 37); Jim Lazar, 'Teaching the Duck to Fly' (RAP Jan 2014).

[48] National Renewable Energy Lab, 'Transmission Grid Integration, Energy Management Systems,' http://www.nrel.gov/electricity/transmission/energy_management.html (updated 19 Sep 2014).

[49] Federal renewable energy mandates are unlikely in the current and foreseeable political climate.

Rather than continue this piecemeal approach, Part V briefly advocates for the creation of long-term renewable energy goals, optimally with comprehensive siting plans, to pave the way for increased stability and investment in the renewable energy sector. Thus, the article concludes that policies that promote planning and certainty offer the best chance for a sustained expansion of the US renewable electricity system.

Renewable Energy's Place in the Current US Electricity System

Renewable electricity has expanded at remarkable rates in the United States in the past decade. From 2000 through to 2014, wind power development grew 25-fold.[50] Solar power deployment alone doubled in 2014.[51] Indeed, in 2014, new renewable power installations exceeded all other sources of new electricity supply.[52] These deployment rates followed several previous years of growth that have allowed solar and wind power to secure a foothold of sorts in the US power system.

This foothold, however, is by no means secure in the current electricity market and regulatory structure. Despite the growth rates witnessed by wind and solar power, forecasts for future expansion are relatively weak on a national level. Based on current policies, national wind power deployment will likely drop by the end of 2016, when federal tax credits fully expire.[53] Forecasts for solar power are a bit stronger due to policy support in some states, but policymakers and solar industry representatives have expressed concerns that the impending expiration of a federal tax credit for solar facilities will stifle growth after 2016.[54] These concerns and projections highlight the fact that renewable power cannot compete in the US electricity system without policies that expressly support renewable

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[50] Wind Power in the United States, *Wikipedia*, http://en.wikipedia.org/wiki/Wind_power_in_the_United_States (last updated 6 Apr 2015) fig (citing verified statistics from the US Department of Energy, Office of Energy Efficiency and Renewable Energy, and the American Wind Energy Association).

[51] St. John (n. 8).

[52] Peter Danko, 'Renewables, Led by Wind and Solar, Provided Half of 2014 US Energy Capacity Additions' *Breaking Energy* (30 Jan 2015), http://breakingenergy.com/2015/01/30/renewables-led-by-wind-and-solar-provided-half-of-2014-us-energy-capacity-additions/ (noting that wind and solar

[53] *See* Annual Energy Outlook (n. 32) IF42-IF43.

[54] Jensen (n. 25).

energy growth and deployment. Indeed, the market and regulatory structure of the US electricity system is still stacked against renewables in a number of ways.[55]

In states where vertically integrated monopolies continue to operate, market-driven competition at the generation level is weak,[56] although independent power producers may provide wholesale power to utilities in certain situations, such as to supply energy during peak periods or to supply energy necessary for compliance with renewable mandates.[57] Moreover, utilities have incentives to limit the wholesale market to protect their monopolies. Independent renewable energy producers, like other independent power producers, are directly competing with these monopolies and thus pose a threat to the utilities' business models and profits.[58] Under most state utility regulation laws, utilities are entitled to earn a profit on capital expenses but not on their operating costs.[59] Power purchases from renewable facilities owned by third parties count as operating expenses for which utilities will not earn a direct profit.[60] Utilities therefore resist buying third parties' power. While all third-party power producers face similar challenges in vertically integrated markets, renewable power producers are often at a further disadvantage due to the intermittent nature of many types of renewable power, particularly wind and solar power.[61] Consequently, without

[55] The US electricity system is owned and operated by a combination of private and public entities. Since the creation of the US electric industry, private vertically integrated monopolies have provided the majority of retail electricity sales in the country. US Energy Info Admin, DOE/EIA-0562(00), 'The Changing Structure Of The Electric Power Industry 2000: An Update' (2000) 5, http://www.eia.gov/cneaf/electricity/chg_stru_update/update2000.pdf. Today, private investor-owned utilities serve about 68.5% percent of US electricity customers, and public utilities and rural electric cooperatives are responsible for about 27.2%. Power production is more competitive, with independent power producers generating about 41% of the nation's power, vertically integrated investor-owned utilities producing about 38%, and public power facility owners producing about 17%. American Public Power Ass'n, '2014-15 Annual Directory and Statistics' (2014) 26, 28, http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf.

[56] Severin Borenstein and James Bushnell, 'The U.S. Electricity Industry after 20 Years of Restructuring' Energy Institute at Haas Working Papers Series (Sep 2014) 9 fig. 2 (independent power producers provide less than 10% of the power in many states).

[57] Ibid.

[58] Powers, Small is Beautiful (n. 17) 601-02.

[59] Ibid.

[60] Ibid.

[61] Ibid.

policies directing utilities to purchase renewable electricity, vertically integrated utilities would not purchase renewable power from third parties.[62]

Utilities could produce their own renewable power in regulated markets, which would eliminate some of the concerns described above. However, this is not a common practice, despite the economic and management benefits these investments offer.[63] A few reasons may explain this dynamic. First, the inherently conservative culture of utilities may make them slow to adopt new technology. Second, some states allow utilities to build their own facilities only when they can do it at a lower cost than competitive bidders.[64] Until utilities acquire more expertise with renewable facility development, their costs will likely be higher than existing renewable power developers. Finally, traditional utility regulation, which usually requires utilities to invest in “least cost” resources, has favored fossil fuels over renewable power.[65] While a shift to “least risk” planning could promote utility investment in renewables, few states have adopted least risk rules.[66] As a result, utilities have built very little of the existing renewable power capacity. While lower costs for renewables have begun to promote a bit more utility investment, utilities are unlikely to turn to renewable power without policies that expressly require more renewable power integration.[67]

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[62] *See* Amelia Schlusser, ‘A Safe Bet: How Least-Risk Resource Planning Policies Promote Renewable Energy’ (Green Energy Institute 2015).

[63] James Montgomery, ‘More Insights into Solar and Utilities: Large-Scale Integration, Self-Ownership, and Net Metering’ *RenewableEnergyWorld.com* (5 June 2013), http://www.renewableenergyworld.com/rea/news/article/2013/06/more-insights-into-solar-and-utilities-large-scale-integration-self-ownership-and-net-metering (reporting the utilities owned 12% of utility-scale solar and 7% of all solar); Powers, Small is Beautiful (n. 17) 601-02 (explaining the economic benefits of utility ownership and investment).

[64] *See* In the Matter of PacifiCorp, dba, Pacific Power & Light Co, Order No. 07-018, Draft 2012 Request for Proposals (OR PUC 2007) (discussing the bidding process).

[65] Schlusser (n. 62) 9-11.

[66] Ibid. 20

[67] Schlusser (n. 62) 25-26; Zachary Shahan, ‘Why Utilities Don’t Invest More in Solar’ *CleanTechnica* (2 Oct 2014), http://cleantechnica.com/2014/10/02/utilities-dont-invest-solar-video/ (arguing utilities are holding out until they can get better returns on their investments); Michael Mendelsohn, ‘Where is All the Utility Investment? Are Utilities Missing an Opportunity to Finance Solar and Storage?’ *NREL* (14 Oct 2013), https://financere.nrel.gov/finance/content/where-all-utility-investment-are-utilities-missing-opportunity-finance-solar-and-storage.

In restructured markets, renewable power facilities face their own competitive hurdles. Without RPSs driving demand, renewable energy must compete with other wholesale power providers, including incumbent fossil fuel-fired power plants. These decades-old power plants often have low capital expenses and low fuel prices,[68] thanks in part to direct and indirect subsidies that make coal-based and natural gas-based power much cheaper than it would be in a truly competitive market.[69] Although the cost of renewable power has declined and may be cost-competitive with fossil fuel plants in certain cases,[70] renewables are still at a disadvantage and depend substantially on other policies, such as tax credits, for their growth.[71] Indeed, even though energy forecasts predict that renewable power generation will grow, forecasts also indicate that natural gas will provide the majority of new power capacity through to at least 2040.[72] Thus, a competitive market does not necessarily favour renewable power—certainly not enough to reach an 80%- or 100%-by-2050 goal. What is more, state policymakers interested in supporting renewable power cannot direct utilities to pay renewable energy facilities incentive rates without potentially running afoul of exclusive federal authority over wholesale rates.[73] Although states have attempted to avoid these "price preemption" dynamics, these efforts have not produced incentives rates that many experts think are necessary to make renewable power competitive in the United States.[74]

Finally, access to the transmission system often presents barriers to independent renewable energy producers. Although federal laws exist to facilitate equitable and non-discriminatory transmission access,[75] congestion, costs, and occasional discrimination still serve as impediments to renewable producers. First, interconnection costs charged to renewable

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[68] Borenstein & Bushnell (n. 56) 20-21, 26,

[69] *See* Jeff Johnson 'Long History of U.S. Energy Subsidies,' *Chem. & Eng'g News* (19 Dec 2011), http://cen.acs.org/articles/89/i51/Long-History-US-Energy-Subsidies.html.

[70] Jacobson, et al. (n. 3).

[71] Energy Info. Admin., 'Renewable Electricity Generation Projections Sensitive to Cost, Price, Policy Assumptions' *Today in Energy* (29 Apr 2014), http://www.eia.gov/todayinenergy/detail.cfm?id=16051.

[72] Annual Energy Outlook (n. 32) MT16-MT17. Under the "reference case," which assumed that tax credits for renewables will expire, natural gas would provide 70% of new capacity. Ibid.

[73] As a general rule, FERC has exclusive authority over wholesale electricity rates. Federal Power Commission v. Southern California Edison Company, 376 US 205 (1964). While PURPA gives states the ability to set rates for QFs (which are a category of wholesale power producers), these rates cannot exceed utilities' avoided costs. *See infra* n. 90-107 and accompanying text.

[74] *See* Jim Rossi, 'Clean Energy and the Price Preemption Ceiling' (2012) 3 San Diego J. Climate & Energy Law 243.

[75] *See*, *e.g.*, *supra* n. 42-44 and accompanying text.

producers, particularly wind farms, are significant.[76] Even smaller, distributed power producers can face high interconnection fees.[77] Second, because renewable power producers must site their facilities where wind or solar resources are optimal, and not necessarily where transmission lines already exist, they often have to build costly spur lines to the existing transmission system.[78] Third, grid management protocols often require wholesale producers to purchase firm transmission rights that intermittent renewable resources often cannot use.[79] Until recently, many transmission operators also required renewable producers to purchase firm transmission rights in hourly increments, even though renewable producers frequently could not use the complete increment (and might in fact be penalized for scheduling transmission services they would not fully use).[80] Although FERC passed regulations requiring transmission operators to sell transmission rights in smaller, 15-minute increments,[81] legal disputes regarding firm transmission rights have persisted.[82] Finally, despite a number of laws designed to prevent discrimination, wind producers have successfully challenged transmission operators' actions for discriminating against wind power,[83] demonstrating that discrimination remains an impediment for renewable producers.

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[76] *See* Stephen M. Fisher, 'Reforming Interconnection Queue Management under FERC Order No. 2003' (2009) 26 Yale J. on Reg. 117 (explaining the interconnection process and fees, which can exceed $100,00 for required interconnection studies). Texas has also proposed charging wind power producers extra to pay for backup power supplies, even though the American Wind Energy Association has produced reports documenting that fossil fuel power plants have more unpredicted outages and place a greater strain on grid reliability than renewable resources do. *See* Michael Goggin, 'Fact Check: Wind's Integration Costs are Lower than Other Energy Sources' *AWEABlog* (25 Jul 2014), http://aweablog.org/blog/post/fact-check-winds-integration-costs-are-lower-than-those-for-other-energy-sources.

[77] Robert E. Burns & Kenneth Rose, PURPA Title II Compliance Manual (2014) 50.

[78] Powers, 'Small is Beautiful' (n. 17) 617-19.

[79] *See* Ken Dragoon, Small Resource Transmission Scheduling: Special Challenges Facing Smaller Generators 6-7 (2014) (explaining problems QFs face when transmission rules require them to secure firm transmission rights in hourly increments).

[80] Ibid.

[81] Integration of Variable Energy Resources, Order 764, FERC Stats & Regs., ¶ 61,246 (2012).

[82] *See* PáTu Wind Farm, LL.C v. Portland General Electric Co., Order Granting in Part and Dismissing in Part Complaint, 150 FERC ¶ 61,032 (2015).

[83] *See* Iberdrola Renewables Inc. v. Bonneville Power Administration, 137 FERC ¶ 61,185 (2011); PáTu Wind Farm, LL.C, 150 FERC ¶ 61,032.

Thus, even though renewable power has grown substantially in the past decade or so, renewable resources remain at a competitive disadvantage. Recognizing these competitive disadvantages, policymakers have employed a number of policies to support renewable electricity development. However, as Sections III and IV explain in greater detail, these policies have not adequately stabilized the renewable electricity sector.

The Effective, Yet Unstable, US Renewable Energy Policies

To offset the competitive and regulatory disadvantages renewable energy faces, policymakers in the United States have used PURPA, net metering, tax credits, and RPSs to promote renewable power development. Collectively, these policies primarily aim to create a more favourable investment environment for renewable power producers through direct and indirect price supports and by creating demand for renewable electricity. On a number of levels, these policies have succeeded in promoting renewable power production and integration. However, this success has come at a price, as the policies have faced increased opposition. This section will explain how the policies operate and identify the major critiques parties have raised against each policy.

The Public Utility Regulatory Policies Act

Since the 1970s, PURPA has supported renewable energy development from small renewable energy producers. Although federal regulations establish the overarching mandates of PURPA, states have broad discretion over PURPA's implementation.[84] As a result of this state discretion and sustained opposition to the purchase mandate, PURPA has served as an uneven and occasionally unreliable tool for promoting renewable energy development in the United States.[85] Nonetheless, PURPA still plays an important role in promoting small scale and distributed generation in many states.

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[84] Fed. Energy Regulatory Comm'n v. Mississippi, 456 US 742, 746–47 (1982).

[85] As a general rule, PURPA works well to promote renewable power where state laws support PURPA implementation. In other states, PURPA has had very little effect. *See* Carolyn Elefant, 'Reviving PURPA's Purpose: The Limits of Existing State Avoided Cost Ratemaking Methodologies In Supporting Alternative Energy Development and A Proposed Path for Reform' (2011) 3, http://www.recycled-energy.com/images/uploads/Reviving-PURPA.pdf. Moreover, even where a state appears eager to support renewable power through PURPA, some renewable resources may fare worse than others. *See* Jessica Wentz, 'Balancing Economic and Environmental Goals in Distributed Generation Procurement: A Critical Analysis of California's Renewable Auction Mechanism (RAM)'

The Mechanics of PURPA

PURPA directs utilities to 1) purchase electricity from "qualifying facilities" (QFs), 2) connect the QFs to the power grid, and 3) pay the QFs specified "avoided cost" rates.[86] PURPA establishes two types of QFs.[87] The first type of QF includes any combined heat and power facility.[88] The second type of QF—and the focus of this article—encompasses "small power producers" from power plants with capacities of 80 megawatts (MW) or smaller that produce electricity from renewable energy sources.[89] Thus, PURPA directs utilities to buy electricity at specified rates from smaller renewable power facilities and to connect these facilities to the grid.

a. Avoided Cost Rates

Electricity rates under PURPA are based on the utilities' avoided costs, or the rates the utilities would otherwise pay to produce their own power or get power from somewhere else.[90] Federal regulations spell out the factors that states should consider when calculating the rates,[91] but states generally have ample discretion to set rates so long as they do not exceed the utilities' avoided costs.[92] While a state may include in its rate calculation the

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(2014) 5 J. Energy & Envtl. L. 30 (discussing ways in which wind power has performed poorly under California's auction program to implement PURPA).

[86] 16 U.S.C. § 824a-3(a), (b) & (d); 18 C.F.R. § 292.101(6) (defining avoided cost rates); 18 C.F.R. § 292.303(c)(1) (requiring interconnection). 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 QF or QFs, 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 US 402, 413 (1983) (upholding this definition).

[87] 16 U.S.C. § 824a-3(a) (2012).

[88] Ibid.

[89] 16 U.S.C. § 796(17)(A) (2006). FERC's regulations further refine the definitions of QFs. *See* 18 C.F.R. § 292.204.

[90] 18 C.F.R. § 292.101(6); 18 C.F.R. §292.304.

[91] The factors include utility estimates of avoided costs, utilities' future energy and capacity needs, the QFs' ability to produce peak power and to displace fossil fuel use, and savings associated with reduced transmission line losses. 18 C.F.R. § 292.304(e).

[92] Cal. Pub. Util. Com'n, 132 FERC ¶ 61,047 (2010) [hereinafter *CPUC I*]. PURPA rates are different than rates provided through feed-in tariffs. While PURPA rates are capped at the amounts the utilities

costs the utility would otherwise pay for transmission line losses or mandatory pollution credits, a state may not include externalities or other costs the utility itself would not incur.[93] States have employed a number of methodologies to calculate avoided costs.[94] Some states use a "proxy unit" method to calculate the costs a utility would incur if it needed to build its own power plant.[95] Some states base avoided costs on avoided marginal costs associated with procuring or producing peak power, and some states link their avoided cost calculations to prevailing market rates the utilities would otherwise pay for power.[96] In times of high electricity prices, whether driven by high fuel costs, high demand, low supply, or other factors, avoided cost rates can be substantial.[97] Conversely, when demand drops and supply is abundant, avoided cost rates are often quite low.[98] PURPA's effectiveness in incentivizing renewable power thus depends substantially on the state of the electricity market as a whole.

Recently, states have begun to calculate resource-specific avoided cost rates to prevent low-cost fossil fuels from driving down overall avoided cost rates.[99] If a state can show that utilities have an obligation to obtain power from a specific resource, such as residential photovoltaic, avoided cost calculations could focus solely on the costs of that resource.[100] To

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would otherwise pay and may or may not incentivize QF investment, feed-in tariffs rates are designed specifically to incentivize renewable power investment.

[93] Cal. Pub. Util. Comm'n*,* 133 FERC ¶ 61,059, 61,267-68 (2010) [hereinafter *CPUC II*].

[94] Elefant (n. 85) 3.

[95] Ibid. 17-18.

[96] Ibid. 18-20.

[97] *See* Frank Graves, Philip Hanser, and Greg Basheda, 'PURPA: Making the Sequel Better than the Original' (The Brattle Group 2006) 11-12 (discussing utility dissatisfaction with avoided costs guaranteed in long-term contracts negotiated based on the presumption that oil and gas prices would remain high, when prices in fact fell).

[98] Ibid. 13. Recognizing that market conditions can change and affect the prices QFs will receive, federal regulations allow QFs to select the time at which the avoided cost calculation is made. Specifically, QFs may opt to receive avoided cost rates based on the time the utility incurred a "legally enforceable obligation" to buy the power or at the time of delivery of the power. 18 C.F.R. § 292.304(d)(1) & (2)(i-ii).

[99] *See CPUC I* 132 FERC ¶ 61,047 (2010); *CPUC II*, 133 FERC ¶ 61,059 (2010); Cal. Pub. Util. Comm'n, 134 FERC ¶ 61,044 (2011); *see also* Powers, 'Small is Beautiful' (n. 17) 643-46 (explaining how states may increase avoided cost rates for specific renewable energy resources, but questioning whether these approaches would produce incentive rates provided under feed-in tariffs).

[100] Powers, 'Small is Beautiful' (n. 17) 643-46.

justify these resource-specific valuations, states likely must also have resource-specific purchase mandates, or RPS carve-outs.[101] And, to ensure that avoided cost rates remain high enough to incentivize investment, the RPS carve-outs should set aggressive mandates. Otherwise, a weak market will cause avoided cost rates to fall.[102]

QFs have three potential procedural avenues to calculate avoided cost rates. First, QFs may ask state regulators to conduct the rate calculations.[103] Second, QFs may instead negotiate bilateral contracts directly with utilities to avoid the hassle associated with administrative cost calculations.[104] QFs may agree to accept prices that are below actual avoided costs in exchange for the certainty provided by long-term contracts.[105] Utilities, in turn, benefit from contracts that establish lower-than-avoided-cost rates and allow utilities to plan for the integration of QFs' power. Third, in recognition that case-by-case cost assessments or contract negotiations may serve as insurmountable barriers for many small QFs, FERC regulations require states to establish one-size, fits-all "standard offer" contracts for any QF with a capacity of 100 kilowatts or smaller.[106] States may also, at their discretion, set standard offer terms that apply to larger facilities.[107] Whether negotiated on a case-by-case basis or secured through the standard offer requirements, contracts under PURPA provide a degree of certainty to QFs and utilities alike.

b. Interconnection Requirements

The interconnection requirements are another important mechanism of PURPA. FERC's regulations obligate utilities to make any interconnection costs that are necessary to provide QFs access to the grid.[108] These regulatory requirements are not very specific, however, and FERC often relies on its general transmission access and integration rules to ensure that

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[101] Ibid. For more about RPS carve-outs, *see infra* n. 172-174 and accompanying text.
[102] *See* Barbose (n. 28) 11 (discussing similar dynamic with RPS credits).
[103] 18 C.F.R. § 292.304(e).
[104] Elefant (n. 85) 3; *see also* 18 C.F.R. § 292.301(b) (noting that QFs and utilities may negotiate contracts to set rates and other terms).
[105] Ibid.
[106] Power Production and Cogeneration Facilities; Regulations Implementing Section 210 of PURPA, 45 Fed. Reg. 12214, 12223 (Feb. 25, 1980); 18 C.F.R. § 292.304(c)(1).
[107] 18 C.F.R. § 292.304(c)(2).
[108] 18 C.F.R. § 292.303(c)(1).

QFs have access to the grid.[109] Even with these rules, interconnection can present challenges for QFs. First, PURPA regulations make clear that QFs may be required to pay interconnection and other fees.[110] While the fees must be non-discriminatory and may only include the costs the utility would not otherwise pay for transmission of its own or a non-QF's power, the incremental costs may nonetheless be significant for some QFs.[111] Second, despite efforts by FERC to remove transmission barriers for small power producers, individual facilities continue to report problems.[112] Although QFs may compel compliance with FERC regulations through administrative and judicial enforcement,[113] the transaction costs associated with remedying transmission impediments are high, particularly for smaller entities.

PURPA Controversies

With the availability of contracts to implement PURPA and with avoided cost rates set at the amounts utilities would already be paying for power, one might think that PURPA would be relatively uncontroversial. Utilities have nonetheless vigorously opposed PURPA's purchase mandate. In the 1990s, for example, utilities argued that PURPA forced them to enter into long-term contracts during the 1980s that locked in high-cost power purchases despite falling power prices.[114] While very few utilities outside of California had actually felt much impact from PURPA at the time,[115] persistent utility complaints ultimately yielded changes to PURPA. In 2005, Congress agreed to a limited repeal of PURPA, which allows FERC to waive PURPA's purchase mandate in competitive electricity markets.[116] Acting pursuant to

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[109] For example, FERC has established procedures and a *pro forma* integration agreement that utilities must use for small generators with capacities below 20 MW. *See* FERC Order 792, Small Generator Interconnection Agreements and Procedures, 145 FERC ¶ 61,159 (2013).

[110] 18 C.F.R. § 292.306. States may waive these fees, however.

[111] Burns & Rose (n. 77) 50.

[112] *See* Dragoon (n. 79) 6-7.

[113] *See* PáTu Wind Farm, LL.C v. Portland General Electric Co., Order Granting in Part and Dismissing in Part Complaint, 150 FERC ¶ 61,032 (2015).

[114] Bob Vandewater 'State Utility Joins Protest of U.S. Policy' *NewsOK.com* (25 May 1995) http://newsok.com/state-utility-joins-protest-of-u.s.-policy/article/2503596.

[115] *See* Deirdre O'Callaghan & Steve Greenwald, 'PURPA From Coast to Coast: America's Great Electricity Experiment' (1996) 10 WTR Nat Resources & Env't 17, 20–21.

[116] Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594, codified at 16 U.S.C. § 824a-3(m)(1)(A)-(C); *see also* FERC regulations implementing PURPA changes, 18 C.F.R. §§ 292.309-

this authority, FERC has waived the purchase mandate for QFs larger than 20 MW in several regions of the United States.[117]

In other markets that lack robust competition, PURPA putatively remains in force for all eligible QFs, but efforts to enforce it have often resulted in litigation and controversy that have eroded PURPA's mandate that utilities buy QFs' power at avoided cost rates. Most significantly, Texas utilities have successfully argued before the U.S. Court of Appeals for the Fifth Circuit that PURPA's purchase mandate does not apply to intermittent power.[118] If this decision stands, utilities will be able to avoid purchasing electricity from wind and solar facilities, because their power production is often intermittent. Some utilities and states have also resisted QFs' efforts to enforce standard offer rates. For example, even though Idaho had established rules making standard offer rates available to facilities with capacities up to 10 MW, the state then refused to allow wind farms to use these rates. The dispute led to several rounds of administrative and judicial litigation[119] and ultimately a settlement between FERC and the state of Idaho.[120] However, Idaho also altered its standard offer rates to apply in the future only to the smallest solar and wind facilities.[121] As a result, all solar and wind facilities larger than 100 kilowatts will have to engage in expensive and contentious negotiations to establish the applicable avoided cost rates.

Despite these challenges, and despite being controversial PURPA remains an important law for renewable energy development. Many states have used PURPA to support renewable power production, and PURPA has been particularly important for small, distributed power

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.314, and Michael D. Hornstein & J.S. Gebhart Stoermer, 'The Energy Policy Act of 2005: PURPA Reform, the Amendments, and Their Implications' (2006) 27 Energy LJ 25.

[117] Pacific Gas & Electric, Order Granting Application to Terminate Purchase Obligation, 135 FERC ¶ 61,234 (2011); Duke Energy Shared Services, Inc., Order Granting Application to Terminate Purchase Obligation and Denying Late Intervention, 119 FERC ¶ 61,146 (2007); Public Service Co. of New Hampshire, 131 FERC ¶ 61,027 (2010).

[118] Exelon Wind. LL.C. v. Nelson, 766 F.3d 380 (5th Cir. 2014).

[119] *See* J.D. Wind I, 129 FERC ¶ 61,148, p. 25 (2009); Grouse Creek Wind Park, LLC, 142 FERC ¶ 61,187 (2013); Idaho Power Co. v. Idaho Public Utilities Com'n, 555 Idaho 780 (Idaho 2013).

[120] Memorandum of Agreement between the Federal Energy Regulatory Commission and the Idaho Public Utilities Commission, *available at* http://www.ferc.gov/legal/mou/mou-idaho-12-2013.pdf.

[121] In the Matter of the Joint Petition of Idaho Power Company, Avista Corporation, and Pacificorp dba Rocky Mountain Power to Address Avoided Cost Issues and to Adjust the Published Avoided Cost Rate Eligibility Cap, Order No. 32176, Case No. GNR-E-I0-04, Idaho PUC (Feb. 7, 2011).

sources. In states without renewable power policies, PURPA provides renewable producers a mechanism for obtaining access to the electricity system.

Net Metering

Net metering laws emerged about five years after PURPA to provide state-level incentives for the installation of renewable electricity facilities.[122] The term “net metering” refers to the process by which utilities bill customers for their net electricity consumption.[123] Net metering allows consumers to discount the amount of energy they deliver to the grid from their total electricity consumption and to pay only for their net consumption. Without net metering, customers would pay retail rates for the power they receive from the utility and earn wholesale rates (which are about one-third the value of retail rates) for the power they deliver to the utility.[124] With net metering, only the net purchase or sale counts.[125] Net metering programs thus allow ratepayers to effectively receive some of their retail electricity services for free.[126] At a minimum, net metering lowers these ratepayers’ overall electricity bills and, in some states, it even allows utility customers to earn a profit.[127]

Net metering programs are common state policies,[128] but states often limit their scope in various ways. States will typically cap the total amount of electricity that is eligible for net metering,[129] and many states restrict participation in net metering programs.[130] The success of net metering, moreover, typically depends on the availability of other programs and subsidies to support renewable power.[131] In states with high retail rates and generous subsidies to offset the upfront costs of renewable facilities, net metering has contributed

[122] *See* Steven Ferrey, ‘Nothing but Net: Renewable Energy and the Environment, MidAmerican Legal Fictions, and Supremacy Doctrine’ (2003) 14 Duke Envtl L & Pol’y F 1.
[123] Powers, ‘Small is Beautiful’ (n. 17) 635.
[124] Ferrey (n. 122) 78–79.
[125] Powers, ‘Small is Beautiful’ (n. 17) 637.
[126] Ibid.
[127] Ferrey (n. 122) at 16.
[128] Database of St. Incentives for Renewables & Efficiency, Net Metering (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).
[129] Ferrey (n. 122) at 55–65.
[130] Ibid.
[131] Powers, ‘Small is Beautiful’ (n. 17) 639.

meaningfully to renewable energy development.[132] In other places, net metering provides only limited support for renewable energy development; indeed, one scholar calculated it could take decades for net metering alone to repay renewable energy producers for their investment.[133] Declining equipment and “soft costs” associated with permitting, customer acquisition, grid integration, and other phases of renewable power development may reduce this recovery period, but to date, the upfront costs of renewable generation facilities are out of reach for most homeowners and many businesses.[134]

Recognizing this, some companies have created third-party leasing programs to facilitate the process. Through these third-party arrangements, private companies install solar panels on private (and sometimes public) property and handle the transactions necessary to get the solar facilities sited and connected to the grid.[135] Property owners use net metering to reduce their electricity bills, and the third-party installers earn revenue through the lease fees paid by the property owners, the sale of renewable energy credits under the state RPSs, and tax credits.[136] The arrangement helps facilitate renewable energy development and may lower associated soft costs.[137] While some states have prohibited third-party leasing entirely and other states have made it economically infeasible,[138] third-party leasing arrangements demonstrate how a combination of policies can promote increased renewable energy development.

However, as third-party arrangements have grown, so has utility opposition to net metering. Utilities argue, with some credence, that net metering allows utility customers to receive expensive utility services—including distribution, grid management, and transmission—for

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[132] Ibid.

[133] Joel B. Eisen, ‘Residential Renewable Energy: By Whom?’ (2011) 31 Utah Envtl L Rev 339, 354–61.

[134] For a discussion of solar “soft costs” and strategies to reduce them, *see* Lawton (n. 34).

[135] Todd Woody, ‘The Next Big Innovation in Renewable Energy Won’t Be Technological’ *The Atlantic* (11 Nov 2013), available at http://www.theatlantic.com/ technology/archive/2013/11/the-next-big-innovation-in-renewable-energy-wont-be-technological/ 281345/.

[136] Kristen Ardani, Dan Seif, Robert Margolis, Jesse Morris, Carolyn Davis, Sarah Truitt, and Roy Torbert, ‘Non-Hardware (“Soft”) Cost Reduction Roadmap For Residential And Small Commercial Solar Photovoltaics, 2013–2020’ (National Renewable Energy Laboratory 2013) 27, available at http://www.nrel.gov/docs/fy13osti/59155.pdf; Lawton (n. 34) 13.

[137] Lawton (n. 34) 13-17.

[138] Evan Halper, ‘Rules Prevent Solar Panels in Many States with Abundant Sunlight’ *LA Times* (9 Aug 2014), http://www.latimes.com/nation/la-na-no-solar-20140810-story.html - page=1.

free.[139] These arguments first gained traction in California, which has one of the more expansive net metering policies in the United States and a great deal of solar power potential.[140] Under California's net metering law, commercial ratepayers with solar facilities as large as 1 MW may participate in net metering programs.[141] Larger commercial customers typically pay higher electricity rates than residential customers, particularly during peak electricity periods.[142] When commercial customers began producing solar power during peak electricity periods, thereby depriving utilities of high-priced sales to their larger customers, utilities cried foul.[143] Utilities argued that net metering could threaten their economic viability if they were forced to provide retail services for free.[144] Similar arguments against net metering have been raised in other states, and some states have begun to charge even residential customers for participating in net metering programs.[145] These charges could eliminate the economic incentives net metering would otherwise provide.[146] If more state policy makers follow suit, net metering's beneficial impact on renewable energy development will further erode.

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

[140] Ibid.

[141] Cal. Pub. Util. Com'n, Net Energy Metering, http://www.cpuc.ca.gov/PUC/energy/DistGen/netmetering.htm (accessed 14 Dec 2014).

[142] Joseph P. Tomain & Richard D. Cudahy, *Energy Law in a Nutshell* (2d ed. 2011) 177–182; Peter Navarro & Michael Shames, 'Electricity Deregulation: Lessons Learned from California' (2003) 24 Energy LJ 33, 44–45.

[143] *See* Herman K. Trabish, 'Solar's Net Metering Under Attack' *Greentech* (Washington DC, 3 May 2012), http://www.greentechmedia.com/articles/read/solars-net-metering-under-attack/. *See also* Naïm Darghouth, Galen Barbose, and Ryan Wiser, Dept. of Energy, 'The Impact of Rate Design and Net Metering on the Bill Savings from Distributed PV for Residential Customers in California' (2010) vii, xi, 25 *see also* Thomas J. Starrs & Howard J. Wenger, 'Policies to Support a Distributed Energy System' (1999), http://www.repp.org/repp_pubs/pdf/pv3.pdf.

[144] Trabish (n. 143). For more on these disputes, *see infra* Section IV.C.

[145] *See, e.g.*, Julia Pyper, 'Wisconsin Regulators Vote to Raise Fixed Charges, Add Solar Fees' *GreenTechSolar* (Washington, 18 Nov 2014), http://www.greentechmedia.com/articles/read/wisconsin-regulators-vote-to-raise-fixed-charges-and-add-solar-fees.

[146] Ibid.

Federal Tax Credits

Since the 1990s, two federal tax credits, *the Production Tax Credit (PTC)* and *the Investment Tax Credit (ITC)*, have played critical roles in assisting renewable energy development in the United States.[147] Despite the importance of federal tax credits, however, they have injected uncertainty into the renewable energy market.[148] This uncertainty drives up the overall cost of renewable power, requires ongoing lobbying efforts to sustain the policies, and undermines the underlying purposes of the tax credits, which are to help build a self-reliant and sustainable renewable energy sector.[149]

Of the two tax credits, the PTC faces the most frequent criticism and political uncertainty. The PTC provides a specified tax credit—worth $.023 at the end of 2014—for each kilowatt-hour of electricity production.[150] The PTC applies to a number of renewable energy sources, but it has been most important to the wind energy industry.[151] The tax credit applies during the first ten years of a facility's operation, and it is available only to facilities that complete construction within specified timeframes.[152] Since the late 1990s, Congress has established short eligibility periods for facilities to qualify for the PTC.[153] The pending expiration dates of the PTC typically spur a frenzy of lobbying efforts in which the wind energy industry and its supporters urge renewal of the PTC, while opponents insist that Congress allow the PTC to expire permanently.[154] Over the years, as the debates regarding the PTC have intensified, Congress has delayed extending it until, and sometimes after, the last possible moment.[155]

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[147] *See* I.R.C. § 45(a), (b) (2012); I.R.C. § 48 (2012).

[148] Powers, 'Sustainable Energy Subsidies' (n. 17).

[149] Ibid, 223-27.

[150] I.R.C. § 45(a), (b) (2012) (setting the PTC at an initial 1.5¢/kWh in 1993 dollars, and allowing for inflation adjustments).

[151] Ibid.

[152] I.R.C. § 45(a)(2)(A)(ii) (2012); *see also* American Taxpayer Relief Act of 2012, Pub. L. No. 112-240, § 407(a)(1), 126 Stat. 2340 (2013) (to be codified at I.R.C. § 45) (requiring eligible facilities to begin construction before January 1, 2014).

[153] Am. Wind Energy Ass'n, 'Federal Production Tax Credit For Wind Energy: The American Wind Industry Urges Congress To Take Immediate Action To Pass An Extension Of The PTC' http://www.awea.org/issues/federal_policy/upload/PTC-Fact-Sheet.pdf; see also Dewey (n. 24) 1119 & n.112 (listing the various extensions of the PTC since its inception).

[154] Powers, 'Sustainable Energy Subsidies' (n. 17) 222-23.

[155] Am. Wind Energy Ass'n (n. 153).

These extensions often last for only a couple of years and thus set the stage for subsequent rounds of debates and lobbying efforts.[156]

The ITC, which is most important to the solar industry, includes similar eligibility deadlines. The ITC gives renewable energy developers a tax credit based on the amount of money they spend building a facility.[157] To qualify for the ITC, developers must place their facilities in service by specified deadlines.[158] The current ITC allows solar developers to receive a tax credit equal to 30 percent of their investment in commercial solar facilities built by December 31, 2016.[159] In 2017, the tax credit will drop to 10 percent.[160] The tax credit for residential solar installations will expire completely at the end of 2016.[161] Energy forecasters expect that solar development will suffer if the tax credit drops as scheduled.[162] Lobbying regarding an extension of the ITC is already underway; however, if experience with the PTC is any guide, one should expect Congress to delay action on the ITC until the last possible moment (if not later).

Neither tax credit program establishes concrete goals regarding the amount of renewable energy development Congress hopes to promote nor links the tax credits to the economic viability of the renewable energy producers. Instead, the tax credits come and go based on the calendar, rather than market maturity or competitiveness.[163] As explored below, this lack of clear policy objectives contributes to the political and economic vulnerability of the renewable energy sector. Not only do the limited eligibility periods force the renewable energy industry to repeatedly appear before Congress hat-in-hand, they also inject uncertainty into utility planning practices. Without clearer targets for renewable power development and use, the boom-bust cycle driven by the federal tax credits will likely increase.

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[156] Ibid.

[157] *See* Roberta F. Mann & E. Margaret Rowe, 'Taxation' in Michael B. Gerrard (ed.) *The Law of Clean Energy: Efficiency and Renewables* (ABA 2011) 145, 149.

[158] I.R.C. §§ 48(a).

[159] Ibid.

[160] I.R.C. § 48(a)(2) (2012).

[161] I.R.C. § 25D(g).

[162] Jensen (n. 25); Christopher Martin, 'Solar Consolidation Expected as Tax Credit Drives Deals' *Bloomberg* (New York, 20 Oct 2014), http://www.bloomberg.com/news/2014-10-21/solar-consolidation-expected-as-tax-credit-drives-deals.html.

[163] Powers, 'Sustainable Energy Subsidies' (n. 17) 222-23.

Renewable Portfolio Standards

RPSs are relatively popular programs in the United States. Twenty-eight states have enacted RPS mandates, and another eight states have voluntary RPS goals.[164] RPSs require electric utilities to obtain a specified percentage of electricity from renewable sources by specified deadlines.[165] To demonstrate compliance with their RPS mandates, utilities must typically acquire Renewable Electricity Credits (RECs), which are certificates representing the “renewable” component of electricity.[166] Each REC typically represents a megawatt-hour of renewable power.[167] Some states allow utilities to buy and sell RECs, while other states limit REC trading.[168] Most states give their utilities flexibility either to produce renewable power and the associated RECs themselves or to purchase RECs from third-party renewable power producers or marketers.[169] This flexibility, combined with the clear mandates of RPSs, allows utilities to plan for increased renewable power integration.[170] Indeed, most renewable power integration and transmission reliability studies rely on RPS

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[164] Database of State Incentives for Renewables & Efficiency, Renewable Portfolio Standard Policies (Sept 2012), http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf. West Virginia repealed its alternative energy mandate in 2015, dropping the number of states with mandatory purchase requirements from twenty-nine to twenty-eight. Naveena Sadasivam, ‘In W.Va., New GOP Majority Defangs Renewable Energy Law That Never Had a Bite’ *InsideClimateNews* (5 Feb 2015), http://insideclimatenews.org/news/20150205/wva-new-gop-majority-defangs-renewable-energy-law-never-had-bite.

[165] Felix Mormann, ‘Enhancing the Investor Appeal of Renewable Energy’ (2012) 42 Envtl L 681, 691. Database of State Incentives for Renewables & Efficiency, Incentives/Policies for Renewable Energy, Rules, Regulations, and Policies, http://www.dsireusa.org/incentives/allsummaries.cfm?SearchType=RPS&&re=1&ee=0 (accessed 7 Dec 2012) (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).

[166] *See* Edward A. Holt & Ryan H. Wiser, ‘The Treatment Of Renewable Energy Certificates, Emissions Allowances, And Green Power Programs In State Renewables Portfolio Standards’ (Lawrence Berkeley Nat’l Lab 2007) (noting that tradable renewable energy certificates “widen[] the geographic scope of eligible renewable energy projects”); Edward Holt, Jenny Summner & Lori Bird., ‘The Role Of Renewable Energy Certificates In Developing New Renewable Energy Projects’ (Nat’l Renewable Energy Lab 2011) 11.

[167] Jon Hamrin, ‘REC Definitions and Tracking Mechanisms Used by State RPS Programs’ (Clean Energy States Alliance 2014) 2.

[168] Powers, ‘Small is Beautiful’ (n. 17) 611-13.

[169] Ibid.

[170] Holt & Wiser (n. 166).

mandates to calculate the total amount of power the transmission system will need to integrate.[171]

RPSs also often include design elements to encourage production of certain types or sizes of renewable power sources. For example, some states include "carve-outs" that require a certain percentage of renewable power to come from solar, wind, or distributed generation.[172] Well-crafted carve-outs can mitigate concerns that RPSs primarily incentivize construction of large, remote renewable facilities that may exacerbate transmission congestion.[173] Carve-outs can also create separate markets for specific REC categories, and thereby increase the economic viability of more expensive renewable resources, including residential solar.[174] Thus, RPSs can offer regulators and renewable energy advocates strategies to promote certain types of renewable energy development, including small-scale development, while also providing predictability that enables better planning.

Despite these benefits, RPSs have their own limitations. First, without specific design elements aimed at promoting distributed and solar power, they primarily incentivize large wind power development.[175] While this is a benefit in many respects, a balance between wind and solar power, spread out over larger geographical areas, may improve reliability and lower costs as more renewable energy is integrated into the power system.[176] Second,

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[171] *See* PJM Renewable Integration Study (n. 45).

[172] Nev. Rev. Stat. § 704.7821 2.(a)(1) (2009) (creating carve-outs for solar); Me. Rev. Stat. Ann. §3402(2)(C), as enacted by PL 2007, c. 661, Pt. A, §4 (creating carve-outs for wind power generally, as well as coastal and offshore wind).

[173] Powers, 'Small is Beautiful' (n. 17) 611-13.

[174] Ibid. 662-63; *CPUC II*, 133 FERC ¶ 61,059 (2010).

[175] *See* Ryan Wiser & Galen Barbose, 'Renewables Portfolio Standards in the United States: A Status Report With data Through 2007' (Lawrence Berkeley Nat'l Lab 2008) 13, *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, Stephen Lacey, and Frede Hvelplund, 'Stability, Participation and Transparency in Renewable Energy Policy: Lessons from Denmark and the United States' (2009) 27 POL'Y & SOC'Y 379, 381, *available at* http://www.sciencedirect.com/science/article/pii/S144940350900006X.

[176] *See* PJM Renewable Integration Study (n. 43) 12; Amory B. Lovins, E. Kyle Datta, Thomas Feiler, Karl R. Rábago, Joel N. Swisher, André Lehmann, and Ken Wicker, Small is Profitable: The Hidden Economic Benefits of Making Electrical Resources the Right Size (2002) 220-23; 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) 2-17.

although interstate REC trading is a purported benefit of RPSs, the lack of uniformity between states policies has at times complicated the REC trading process.[177] To rectify these problems, some scholars have called for a national RPS,[178] although the political climate in Washington D.C. makes any such program unlikely. Third, several states have designed RPSs in ways that violate the "dormant Commerce Clause," a doctrine that prohibits states from discriminating against interstate commerce or engaging in economic protectionism.[179] For example, some states have unlawfully limited RPS eligibility only to instate renewable resources,[180] and others have rewarded instate resources with additional RECs that out-of-state facilities cannot receive.[181] By and large, these discriminatory laws have been changed due to threatened or filed lawsuits.[182] However, some more aggressive lawsuits challenging RPSs remain active.[183] While most legal observers believe the RPSs will withstand the legal challenges, an element of uncertainty hangs over these policies.[184]

Surprisingly, however, political opposition to RPSs is less of a threat. By and large, RPSs have proven quite resilient, and attempted repeals of RPSs have had limited success.[185] In

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177 Hamrin (n. 167) 1-4 (summarizing similarities and differences between state programs).

178 *See, e.g.,* Lincoln L. Davies, 'Power Forward: The Argument for a National RPS' (2010) 42 Conn. L. Rev. 1339, 1339.

179 *See* C & A Carbone, Inc. v. Town of Clarkstown, 511 U.S. 383, 390 (1994); City of Phila. v. New Jersey, 437 U.S. 617, 628–29 (1978). States are also prohibited from imposing an "undue burden" on interstate commerce. Pike v. Bruce Church, Inc., 397 U.S. 137, 142 (1970).

180 *See* Ill. Commerce Com'n v. FERC, 721 F.3d 764, 776 (7th Cir. 2013) ("Michigan's first argument—that its law forbids it to credit wind power from out of state against the state's required use of renewable energy by its utilities—trips over an insurmountable constitutional objection. Michigan cannot, without violating the commerce clause of Article I of the Constitution, discriminate against out-of-state renewable energy."); Kate Konschnik & Ari Peskoe, 'Minimizing Constitutional Risk: Crafting State Energy Policies that Can Withstand Constitutional Scrutiny' (Nov 2014) 2-4.

181 *See* Ariz. Admin. Code § R14–2–1806(D)–(E); *see also* William Griffin 'Renewable Portfolio Standards and the Dormant Commerce Clause: The Case for In-Region Location Requirements' (2014) 41 B.C. Envtl. Affairs L. Rev. 133 (discussing other in-state renewable incentives).

182 Konschnik & Peskoe (n. 179) 2-4.

183 *See* Energy and Environmental Legal Institute v. Epel ___F.Supp.3d___, 2014 U.S. Dist. LEXIS 64285 (D. Colo., May 9, 2014), *appeal filed* 14-1216 (10th Cir., June 3, 2014).

184 *See generally*, Konschnik & Peskoe (n. 179) 2-11.

185 Maria Gallucci, 'Renewable Energy Standards Target of Multi-Prong Attack' *InsideClimateNews* (19 Mar 2013), http://insideclimatenews.org/print/24712.

2014, Ohio decided to freeze its renewable energy mandates for two years.[186] More recently, West Virginia repealed its alternative energy mandate, although some commentators have argued this repeal means little, since the state's "alternative energy" sources included fossil fuels and dirty fuel sources such as tires.[187] Despite these setbacks, observers believe that strong public support for renewable energy will make efforts to repeal RPSs difficult in most places, partly because RPSs have created markets for new constituencies, including farmers who receive royalties from wind power producers and workers at wind turbine manufacturing facilities.[188] Indeed, Ohio's freeze has received criticism from within and outside of the state, in part because of the economic losses it has caused.[189] Finally, unlike the federal tax credits with built-in expiration dates, RPS repeals require lawmakers to act affirmatively. The inertia that protects existing laws helps to insulate them from rollback efforts.[190] However, ALEC has made energy policy a priority for 2015,[191] and additional RPS repeal efforts may follow. Nonetheless, if past repeal efforts are a signal, it seems unlikely that opponents of renewable electricity will succeed in repealing most RPS mandates.

The greatest threat to RPS programs may actually lie in their own relative lack of ambition. In many states, RPS mandates are relatively weak, requiring utilities to obtain as little as

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[186] Gallucci, 'Ohio Gov. Kadish to Sign "Freeze" on State Clean Energy Mandate by Saturday' *Int'l Bus Times* (11 Jun 2014), http://www.ibtimes.com/ohio-gov-kasich-sign-freeze-state-clean-energy-mandate-saturday-1598602.

[187] Sadasivam (n. 164); W. Va. Code § 24-2F-3(3) (electricity produced by advanced coal technology, natural gas, coalbed methane, waste coal, and burning tires qualified for the standard).

[188] Brad Plumer, 'State Renewable-Energy Laws Turn Out to Be Incredibly Hard to Repeal' *Washington Post* (Washington 8 Aug 2013), http://www.washingtonpost.com/blogs/wonkblog/wp/2013/08/08/state-renewable-energy-laws-turn-out-to-be-really-hard-to-repeal/.

[189] Gwynne Taraska & Alison Cassady, 'The Economic Fallout of the Freeze on Ohio's Clean Energy Sector' (Center for American Progress 2015), https://www.americanprogress.org/issues/green/report/2015/03/10/108251/the-economic-fallout-of-the-freeze-on-ohios-clean-energy-sector/. It may be easier to calculate these losses with an RPS than with other programs that lack clear renewable targets.

[190] Dewey (n. 24) 1122.

[191] Tom Hamburger, 'Fossil-Fuel Lobbyists, Bolstered by GOP Wins, Work to Curb Environmental Rules' *Washington Post* (7 Dec 2014), http://www.washingtonpost.com/politics/fossil-fuel-lobbyists-bolstered-by-gop-wins-work-to-curb-environmental-rules/2014/12/07/3ef05bc0-79b9-11e4-9a27-6fdbc612bff8_story.html.

10% of their electricity from renewable sources by 2015.[192] Based on the amount of renewable capacity added to the US power supply since 1990, almost all RPS quotas can be satisfied with existing supplies.[193] Thus, without more ambitious RPS mandates, demand for new renewable power facilities may weaken. Some states have in fact initiated efforts to increase their RPS requirements.[194] Part V of this article argues that US renewable energy advocates should follow this lead and focus on strengthening RPSs. Without stronger RPSs and strategic plans to develop and integrate more renewable power into the grid, renewable energy development will proceed in a much slower, costlier, and messier fashion, as the following section describes.

The Benefits and Limitations of *Ad Hoc* Renewable Power Development

With expiring tax credits looming and RPS targets nearly met, the US renewable energy industry has reached a critical point. Energy forecasts predict that investment in renewable power will drop, perhaps precipitously, without an effective policy response.[195] Indeed, in California, where utilities have already met most of their RPS requirements, renewable energy developers report they are already facing financing challenges for larger projects due to a lack of demand.[196] Separately, an Oregon utility proposed obtaining no new renewable resources until after 2020, because it had satisfied its RPS goals and did not forecast that the state would adopt new ones.[197] Based on projections from Lawrence Berkeley National Laboratory, it appears that many utilities could follow a similar course.[198] The renewable energy boom of the past several years could, without the correct policy response, become a bust.

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[192] *See* Warren Leon, 'The State of State Renewable Portfolio Standards' (2013) 4 fig.1.

[193] Ibid. (noting that compliance with existing RPSs would require an additional 3.5 gigawatts of electricity supply annually between 2013-2020). In comparison, new renewable electricity additions ranged from 6-13 gigawatts per year between 2008-2013. *See* Galen Barbose, 'Renewables Portfolio Standards in the United States: A Status Update,' a presentation to the National Conference of State Legislatures (2 May 2013), http://www.cleanenergystates.org/assets/2013-Files/RPS/BarboseRPS-Presentation-NCSL-Spring-2013.pdf.

[194] Julie Cart, Gov. 'Brown's Renewable Energy Plan Could Boost Solar, Wind Industries' *LA Times* (7 Jan 2015), http://www.latimes.com/local/california/la-me-renewable-goals-20150108-story.html.

[195] Annual Energy Outlook (n. 32) IF42-IF43.

[196] Cart (n. 194).

[197] Schlusser (n. 62) 25-26 (discussing the proposed resource plan for Pacific Power).

[198] Barbose (n. 28) 9 (showing that renewable power currently under development will meet or exceed RPS demand in three US regions and nearly meet demand in another two).

To address this looming crisis, renewable energy advocates could work to extend or expand the existing suite of renewable electricity policies. In so doing, however, these advocates will be promoting a continuation of piecemeal, *ad hoc* siting, development, and integration of renewable power. Although this approach has to date yielded substantial growth of renewable power, this section argues that continued piecemeal growth will make the renewable transition more expensive, inefficient, technically challenging, and politically contentious than it otherwise could be. This section will begin with an explanation of how the current US policies tend to promote *ad hoc* renewable development. It will then explain the benefits and downsides of a piecemeal approach to renewable power development. Ultimately, the section concludes that, while *ad hoc* development offers some benefits, it will delay the necessary transition to a renewable electricity system.

The Ad Hoc Nature of US Renewable Electricity Policies

The policies discussed above all support *ad hoc* renewable energy development, in that they promote piecemeal, site-by-site development of renewable energy facilities. Moreover, aside from RPSs, US renewable power policies typically do not set quantitative targets for renewable power acquisition. In terms of renewable power siting, all four policies tend to promote developer-driven, piecemeal decision-making. PURPA, for example, allows QFs to choose where they will build and then to force utilities to buy their power. Indeed, under PURPA, a utility may be forced to purchase power from QFs located outside of its service territory.[199] Net metering rules, by definition, apply within each utility's service territory, but they rarely include more specific siting requirements. RPSs sometimes include location requirements linked to transmission access,[200] but states must be careful to not use location specifications that would run afoul of the dormant Commerce Clause.[201]Federal tax credits apply regardless of location. Collectively, although some general geographic restrictions may exist under net metering and RPSs, developers have broad discretion to select where they will build their facilities.

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[199] Turner Falls Ltd. P'ship, 55 FERC ¶ 61487 (1991); Connecticut Valley Elec. Co., Inc. v. FERC, 208 F.3d 1037 (D.C. Cir. 2000).

[200] *See* California Public Utility Commission, 33% RPS Procurement Rules, http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/33RPSProcurementRules.htm (last modified 17 Jun 2013).

[201] *See* Konschnik & Peskoe (n. 179) 2-4.

With the discretion most policies afford, commercial developers wisely make their investment and siting decisions based on resource availability (i.e., the amount of wind or sun), existing transmission capacity, and the market signals they receive. Most wind development, for example, has occurred in places with strong wind resources, available capacity on the transmission system, and access to RPS markets that require utilities to buy wind power or RECs.[202] The timing and amount of wind development follows the market signals sent by tax credits and RPSs. Likewise, most residential solar power development has occurred in locations that have net metering laws, tax credits that offset upfront costs, and third-party leasing operations. With the right market signals, developers can usually figure out where and when they should build to get the best return for each project.

To date, this developer-driven process has largely succeeded in bringing new resources online with relatively few hiccups. However, this *ad hoc* system carries risks as well as benefits. Parts B and C of this section explore some of these benefits and downsides of the US piecemeal development approach.

The Benefits of Ad Hoc Development

As explained above, *ad hoc* development has led to unprecedented growth of renewable power in the United States, lower costs, improving technology, lower pollutant emissions, and overall increased public support for renewable electricity. The current approach has facilitated the creation of a robust renewable energy industry that includes a number of new actors and new business models that are leading to utility reforms that would likely not have emerged otherwise. Likewise, increased renewable power production has prompted long-overdue changes in the transmission system that could lead to better development and management strategies. These developments make a 100% renewable power target more viable than it has ever seemed.

It is doubtful that many of these changes would have developed without the mix of policies discussed in this paper. PURPA enabled the initial creation of QFs and signaled to regulators that renewable power could supply some US power. Without the results achieved under PURPA, it is unclear whether politicians would have taken further steps to promote renewable power. Yet as they did, and as these policies began to operate together, they

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[202] Ryan Wiser & Mark Bolinger, '2011 Wind Technologies Market Report' (U.S. Dep't Of Energy 2012) 3.

revealed how a mix of policies can promote much more renewable growth. The combination of tax credits and RPSs, for example, was necessary to incentivize a meaningful buildup of wind power.[203] Third-party leasing models for distributed solar would not work without some combination of tax credits, RECs, and net metering. Had these policies not promoted successful independent renewable power production, moreover, it is highly unlikely that either the deregulated market or regulated utilities would have independently invested in renewable energy.

These policies have also initiated reforms in the utility sector that could fundamentally change the electricity grid and, in some places, the utility business model. Increased development of renewable power systems has led to several FERC orders requiring transmission operators to accommodate renewable power integration.[204] Of these, FERC's order requiring regional transmission planning may become the most important if it results in more strategic transmission system design and operation.[205] At the distribution side, growth in distributed generation sources has prompted efforts to develop a "smart" grid that can accommodate increasing numbers of distributed sources and fluctuating loads.[206] Storage technology has also advanced to provide backup supplies for renewable sources.[207] Finally, some states have begun to reconsider the fundamental responsibilities of electric utilities and have initiated efforts to transform the utilities into "wires" companies that would bear primary responsibility for managing the renewable transition.[208] Without independent renewable power production, few, if any, of these changes would have occurred.

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[203] Wiser & Bolinger (n. 202).

[204] *See* Alexandra B. Klass & Elizabeth J. Wilson, 'Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch' (2012) 65 Vand L Rev 1801, 1813-25.

[205] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 136 FERC P 61,051 (July 21, 2011); Klass & Wilson (n. 204) 1823-25.

[206] *See* Joel B. Eisen, 'Smart Regulation and Federalism for the Smart Grid' (2013) 37 Harv Envtl L Rev 1.

[207] *See* Andrew H. Meyer, 'Federal Regulatory Barriers To Grid-Deployed Energy Storage' (2014) 39 Colum. J. Envtl. L. 479.

[208] *See* Nate Larsen, 'New York's REV: Regulatory Reforms' *Charged Debate* (26 Feb 2015), http://greenenergyinstitute.blogspot.com.es/2015/02/new-yorks-rev-regulatory-reforms.html; Nate Larsen, 'GEI Submits Comments to Hawaii PUC Regarding HECO Company Plans' *Charged Debate* (17 Oct 2014), http://greenenergyinstitute.blogspot.com.es/2014/10/gei-submits-comments-to-hawaii-puc.html.

Thus, it is clear that US policies to support renewable power have had profound impacts on the electricity system. Even though non-hydro renewable resources account for less than 5% of US power, renewable power capacity has increased at an unprecedented rate.[209] To be sure, the piecemeal approach to renewable development has succeeded on many levels.

The Downsides of Ad Hoc Development

Despite these important successes, the *ad hoc* approach will not produce the renewable transition this paper envisions. First, piecemeal development is expensive and inefficient. Second, even with the transmission planning efforts of FERC, *ad hoc* development complicates grid integration. Finally, piecemeal development can incite intense political opposition. To date, most of these challenges have been manageable. However, for the renewable transition to occur, policy makers will have to overcome or avoid many of the problems presented by *ad hoc* renewable power production.

<u>Expense and Inefficiency</u>

Piecemeal renewable power development is often inefficient and expensive.[210] Studies have documented how incremental development raises the costs of nearly every phase of a solar project, including equipment procurement, site selection, customer acquisition, permitting, installation, inspection, and interconnection.[211] When solar developers concentrate on facility installation within a single neighborhood, or when communities or developers engage in bulk equipment purchases, their costs typically decline.[212] A similar dynamic applies to wind development, with the costs of distributed wind power about double that of commercial wind farms.[213]

While the major US policies aim to make renewable energy development more affordable, they do not necessarily aim to lower costs. Rather, they provide financial support to offset the higher costs of renewable power. In so doing, they may actually drive up the costs of renewable energy development. Intermittent subsidies under the PTC illustrate this dynamic

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[209] Electric Power Monthly (n. 9).

[210] *See* Lawton (n. 34) 8-17 (discussing costs of solar development).

[211] Ibid.; Ardani (n. 136).

[212] Lawton (n. 34) 31-35.

[213] ICF International, 'The Cost and Performance of Distributed Wind Turbines, 2010-25, Final Report' (2010) 1-2, http://www.eia.gov/analysis/studies/distribgen/system/pdf/appendix-b.pdf.

most clearly, as short eligibility periods create a boom-bust cycle of development that drives up the costs of wind power facility development.[214] During the booms, equipment costs, labor costs, rents and royalties become more expensive.[215] While some individuals and companies are likely engaging in arbitrage during the development booms, many in the wind energy industry are trying to use the boom periods as hedges against the development busts that follow when the eligibility periods expire. The intermittent PTC thus promotes sub-optimal, but understandable, development decisions. These dynamics, however, have made it difficult for the wind energy industry to attract stable investment and to secure cheap capital.[216] The lack of access to capital, in turn, has made the wind energy industry even more reliant upon the unpredictable PTC. [217]

Piecemeal renewable power development may further drive up costs by creating unnecessary stranded assets. [218] Common wisdom holds that intermittent renewable resources require backup fossil fuel resources (most commonly, natural gas plants) to ensure reliability. However, wind farm aggregation and proper solar array alignment can mitigate many reliability concerns and displace the need for backup gas plants.[219] *Ad hoc* renewable power development increases the likelihood that new natural gas plants will come online to provide backup power. If those gas plants ultimately become obsolete as strategic renewable development occurs, customers may end up paying for the plants regardless.

This economic uncertainty does not have to be an inherent element of the renewable transition. Although transitioning the electricity sector will require investment for new generation resources and transmission and distribution infrastructure, the transition could reduce customers' exposure to fluctuating fuel prices, carbon prices, and other costs associated with burning fossil fuels. But for these benefits to be realized, the US needs to go beyond its *ad hoc* approach to renewable energy development.

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[214] Powers, 'Sustainable Energy Subsidies' (n. 17) 223-25.

[215] Ibid.

[216] Mormann (n. 165) 687.

[217] Annual Energy Outlook (n. 32) IF42-IF43 (predicting low growth in the wind power sector if Congress does not extend the PTC).

[218] Schlusser (n. 62) 14.

[219] PJM Renewable Integration Study (n. 43).

Grid Integration

Piecemeal development and siting of renewable power facilities also complicate transmission and distribution planning and management, which, in turn, stifles renewable power growth.[220] Although FERC has attempted to mitigate some of these problems, grid integration remains a challenge that *ad hoc* development exacerbates. Difficulties arise, moreover, with both large, remote renewable facilities and distributed power facilities.

A lack of transmission capacity has stifled or delayed wind power growth in the West and Midwest,[221] and piecemeal development may exacerbate this problem. Many of the best wind resources in the West and Midwest are in rural areas with small populations that historically had little need for transmission capacity, and despite the economic advantages of building wind farms in those areas, limited transmission has prevented wind power development.[222] One obvious solution to this is to develop more transmission lines,[223] but uncertainty associated with piecemeal development creates a chicken-or-egg dilemma for transmission line developers: they cannot reasonably invest in new, expensive transmission lines if they cannot guarantee that new wind producers will use the lines. Wind producers, in turn, cannot build wind farms in locations without adequate transmission infrastructure. Existing renewable policies do not address these limitations. In fact, even if new transmission lines are sited quickly, tax credits will have already expired and RPS mandates may already be fulfilled. This timing mismatch highlights one significant limitation of *ad hoc* renewable policies.

Even where transmission capacity is normally adequate, congestion can interfere with wind generators' operations and revenues. In Oregon, a high-profile dispute illustrates the

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[220] *See supra* notes 91-97 and accompanying text. *See* also Krysti Shallenberger, 'Mont. Project Will Send Wind Across Border to Wyo.' *EnergyWire* (20 Mar 2015), http://www.eenews.net/energywire/2015/03/20/stories/1060015412; California ISO, 'Fast Facts: What the Duck Curve Tells Us About Managing a Green Grid' (2013), http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf. Cf Jeff St. John, 'Retired CPUC Commissioner Takes Aim at Duck Curve' *GreentechGrid* (24 Mar 2014), http://www.greentechmedia.com/articles/read/retired-cpuc-commissioner-takes-aim-at-caisos-duck-curve.

[221] Klass & Wilson (n. 204) 1811-12; Shallenberger (n. 220).

[222] Ibid.

[223] Ibid.

potential vulnerability wind producers face when transmission policies are unclear.[224] For a period of time, Oregon was an optimal place for new wind farms. Federal and state tax credits made development economically viable, the transmission system operated by the Bonneville Power Administration had plenty of available space, and Oregon wind producers could easily deliver their power to California to qualify for that state's lucrative RPS.[225] Several new wind farms came on line and signed contracts with Bonneville securing their firm transmission rights.[226] In 2011, however, Bonneville curtailed generation at many wind farms to accommodate increased transmission needs of the region's hydropower system during an especially rainy and snowy year.[227] As a result, wind farms were unable to earn tax credits from the PTC or to sell RECs, at estimated costs of at least $2.15 million.[228] Since then, wind producers, Bonneville, and other stakeholders have been involved in litigation regarding the right curtailment policies and who should pay when curtailment happens.[229] If the renewable policies had taken the possibility of transmission congestion into account, it is possible that the dispute would have cost much less money and been resolved much sooner.[230]

Distributed power sources—which could actually improve grid reliability[231]—are not immune to the potential consequences of poor planning.[232] In California, which has by far the most distributed solar, *ad hoc* development has produced challenges associated with the "duck

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[224] *See* Timothy P. Duane & Kiran H. Griffith, 'Legal, Technical, and Economic Challenges in Integrating Renewable Power Generation into the Electricity Grid' (2012-2013) 4 *San Diego J Climate & Energy L* 1.

[225] Ibid. 4-5, 17-20.

[226] Iberdrola Renewables Inc. v. Bonneville Power Administration, 137 FERC ¶ 61,185 (2011).

[227] Duane & Griffith (n. 224) 25-26 (explaining Bonneville's rationale).

[228] Ibid. 33.

[229] Ibid.

[230] Most economic losses were from the facilities' inability to meet eligibility requirements under the PTC and California's RPS. Essentially, both programs require power to actually be delivered to the transmission system before a facility can earn tax credits or RECs. Ibid. 33. If the policies themselves included an exception to this eligibility requirement that would allow properly sited, functional facilities to earn credits for power they could have produced but for a curtailment order, they would have mitigated some of the concerns at issue in the *Iberdrola* dispute.

[231] 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) 2-17.

[232] Trabish (n. 39).

curve."[233] In essence, California faces operational and economic challenges due to an overabundance of solar resources during the middle of the day when power consumption is relatively low and a dearth of solar power as power consumption rapidly increases later in the day, when temperatures rise and home air conditioners come on.[234] This overabundance/under-abundance problem could have significant economic and environmental consequences, if high-cost, polluting natural gas plants are paid to stay in standby mode during the middle of the day and then to ramp up operations as solar production drops off.[235] Yet, energy experts believe that the duck curve dilemma has some relatively easy and cheap solutions that smarter planning could provide. For example, if more solar panels were oriented to the southwest and west, solar energy production would continue later into the day and offset the need to ramp up as many fossil fuel plants.[236] Had California electricity planners embedded this solution into their renewable energy policies at the outset, they could have ensured proper orientation of the solar panels. Instead, they are now offering incentive rates for better oriented facilities.[237]

Finally, grid reliability and planning can be undermined by policies that concentrate renewable power development in specific, limited locations.[238] Plans for integrating renewable energy into the transmission system highlight the benefits of geographical diversity of renewable facilities.[239] Geographical diversity allows renewable power sources to back each other up and thus displace the need for backup fossil fuel plants.[240] Geographic diversity also reduces potential transmission congestion.[241] To date, however, US renewable power policies have not taken these advantages into account. This makes transmission planning and integration more complicated than they should be.

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[233] Ibid.

[234] Lazar (n. 47) 2.

[235] Trabish (n. 39).

[236] Lazar (n. 47) 7-8.

[237] Trabish (n. 39).

[238] *See* Duane & Griffith (n. 224) 4-5, 17-20 (discussing risks of concentrating wind power in one location).

[239] PJM Renewable Integration Study (n. 45).

[240] Ibid.

[241] Ibid.

Political Instability

While all renewable energy policies face some opposition, programs that promote piecemeal development have faced increasingly intense political opposition that often inaccurately presents renewable energy as elitist and unfair.[242] Piecemeal development allows opponents to target specific facilities supported by specific policies to create inaccurate portrayals of renewable policies. Finally, policies that incrementally threaten utilities increase uncertainty and utility opposition to renewable power, without directly addressing questions about the future role of utilities in the renewable transition.

The net metering disputes illustrate how political opposition can paint a distorted picture of renewable energy. As described above, utilities fear that net metering will lower utilities' revenues. But in the media and before regulators, they have attacked net metering for shifting the costs of renewable power development onto the poor. They argue that if wealthier utility customers can lower their own electricity bills by installing renewable energy systems, the costs of managing the electricity system will shift to customers who cannot afford to install their own renewable facilities.[243] In effect, they suggest that poor (and often non-white) customers will be forced to subsidize wealthy, white ones.[244] Although empirical studies have refuted these arguments,[245] the contention that net metering produces a "reverse Robin Hood" effect in which the poor subsidize the rich,[246] has had profound

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[242] *See* Weissman & Johnson (n. 40); Halper (n. 40); Wellinghoff & Tong (n. 40).

[243] Wellinghoff & Tong (n. 40). This cost shift is not a necessary result of declining utility revenues. Regulators could instead decide to award utilities and their shareholders less revenue, rather than to shift costs to ratepayers to keep utilities' profits at their existing levels.

[244] Ibid.

[245] A study of Nevada's net metering program revealed that it had actually returned a $36 million benefit to customers who did not participate in net metering. Energy & Environmental Economics, 'Nevada Net Energy Metering Impacts Evaluation' (Nevada PUC Jul 2014) 8 tbl 2, http://puc.nv.gov/uploadedFiles/pucnvgov/Content/About/Media_Outreach/Announcements/Announcements/E3%20PUCN%20NEM%20Report%202014.pdf?pdf=Net-Metering-Study. A California study found that customers who use net metering still pay on average 103% of their costs and thus, by definition, are not being subsidized by other ratepayers. The study also noted that these net metering customers had previously paid on average 133% of their full cost of service and had been subsidizing others. Energy & Environmental Economics, 'California Net Energy Metering Ratepayer Impacts Evaluation' (CPUC Oct 2013) 10 tbl 5, http://www.cpuc.ca.gov/NR/rdonlyres/75573B69-D5C8-45D3-BE22-3074EAB16D87/0/NEMReport.pdf [hereinafter California NEM Ratepayer Evaluation].

[246] Wellinghoff & Tong (n. 40).

political impact. Moreover, when images of solar arrays on expensive houses are presented along with inflammatory rhetoric, the political messaging can be difficult to overcome, even if it is incomplete or inaccurate.

A similar dynamic has played out with tax credits. Opponents of federal tax credits have frequently criticized them for “picking winners and losers,”[247] violating free market principles,[248] and simply for costing too much and thus wasting taxpayers’ money.[249] Although there are a number of viable critiques against these facile arguments, defending the PTC has proven to be politically challenging.[250] In part, this is because opponents of the subsidy have been able to isolate data regarding the program’s direct costs[251] and discount the disparate data about the program’s direct and indirect benefits.[252] It is also easy for opponents to cherry-pick examples of failed projects to suggest they represent programmatic flaws, even when the programs themselves succeed.[253] The anecdotes are almost always more exciting and memorable than the data, and policies that promote piecemeal development are particularly vulnerable to these types of anecdotal attacks.

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[247] Nicolas Loris, ‘Wind PTC: There’s No Free Lunch’ *The Foundry: Conservative Policy News Blog* (21 June 2012), http://blog.heritage.org/2012/06/21/wind-ptc-theres-no-freelunch.

[248] Ibid.

[249] Jason Stverak, Op-Ed., ‘The Truth About Wind Energy Subsidies: They Blow,’ *Forbes* (19 Dec 2012), http://www.forbes.com/sites/realspin/2012/12/19/the-truth-about-windenergy-subsidies-they-blow.

[250] *See generally* Powers, ‘Sustainable Energy Subsidies’ (n. 17).

[251] See, e.g., Robert L. Bradley Jr., Op-Ed., ‘Where Federal Energy Subsidies Really Go’ *Forbes* (15 Aug 2011), http://www.forbes.com/sites/realspin/2011/08/15/where-federal-energysubsidies-really-go.

[252] Powers, ‘Sustainable Energy Subsidies’ (n. 17) 215-19.

[253] *See* Jeff Brady, ‘After Solyndra Loss, US Energy Loan Program Turning a Profit’ *NPR* (13 Nov 2014), http://www.npr.org/2014/11/13/363572151/after-solyndra-loss-u-s-energy-loan-program-turning-a-profit. Solyndra was a solar panel company that defaulted on a $535 million loan guaranteed by the Department of Energy under a federal loan program. President Obama had visited the Solyndra facility before it defaulted to tout the loan program, so when Solyndra went belly-up, the President’s political opponents pounced, attacking the President, the company, and the program as a whole. Three years later, when the program began to yield profits, media coverage was tepid. Indeed, Solyndra is still considered a scandal by many. Denise Robbins, ‘Will the Right-Wing Media Ever Stop Obsessing Over Solyndra?’ *Media Matters* (23 Feb 2015), http://mediamatters.org/blog/2015/02/23/will-the-right-wing-media-ever-stop-obsessing-o/202635.

Finally, policies that promote piecemeal renewable power integration increase uncertainty in the electricity sector and make it more likely that utilities will fight each piecemeal change, to the detriment of renewable power development. Utility opposition to PURPA and net metering illustrates this dynamic. Both policies require utilities to purchase third parties' power and may potentially displace utilities' own power production.[254] These policies thus threaten existing monopolies and revenues.[255] While renewable power advocates may view these changes positively, unplanned economic losses could undermine the transition to renewable energy, because utilities may have fewer resources to invest in transmission lines, distribution infrastructure, and other resources necessary to accommodate renewable power.[256] In order to maintain profit margins, utilities could choose to operate dirtier coal-fired power plants with lower marginal costs rather than cleaner, more expensive plants. Alternatively, utilities could successfully lobby for recovery of their stranded costs associated with the power displacement and thus drive up the indirect costs of renewable power. In short, the incremental displacement of existing power resources by renewable resources could drive up both the political and economic costs of renewable power, and thereby undermine the renewable transition.

This is not to say that *ad hoc* development has failed. To the contrary, both solar and wind power have become more affordable, and some market forecasts for renewable power development are quite bullish.[257] However, most investors continue to assign a risk premium to renewable energy,[258] and this risk premium is likely to remain in place until the renewable power industry can grow steadily. The contentious political debates regarding individual policies or individual projects draw attention away from much more fundamental questions about how the electricity system and utility business models must change to accommodate new sources of power and achieve the renewable transition.[259] It is unlikely that the US renewable transition can happen without incumbent utilities playing a role, and economically viable utilities will facilitate increased renewable energy integration better than bankrupt

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[254] Powers, 'Small is Beautiful' (n. 17) 654-55, 656-58; Borenstein & Bushnell (n. 56) 33-34.

[255] Powers, 'Small is Beautiful' (n. 17) 654-55, 656-58

[256] Borenstein & Bushnell (n. 56) 33-34.

[257] *See* Kenneth Bossong, 'Too Conservative? EIA Projects Renewables to be 16-27 Percent of U.S. Electricity Supply by 2040' *RenewableEnergyWorld* (29 Apr 2014), http://www.renewableenergyworld.com/rea/news/article/2014/04/too-conservative-eia-projects-renewables-to-be-16-27-percent-of-us-electricity-supply-by-2040.

[258] *See* Jensen (n. 101).

[259] Wellinghoff & Tong (n. 40).

ones.[260] Policies should therefore begin to spell out the role that utilities will play, rather than primarily promote piecemeal power development that provokes intense political fights that will undermine the renewable transition.[261]

Expanding and Stabilizing Renewable Power Growth with RPSs and Strategic Plans

To avoid the problems associated with piecemeal renewable power development, policy advocates and policy makers should promote the creation of long-term, ambitious renewable power mandates, coupled with strategic plans for energy facility siting and grid integration. Policies should also define the roles of utilities in the future electricity system. Although the creation of these plans would undoubtedly be complicated and contentious, the plans would, once established, provide certainty necessary to facilitate the renewable transition. This section will briefly outline the elements of a comprehensive strategy.[262]

First, comprehensive planning should begin with long-term, ambitious targets for renewable power use. RPSs offer a policy solution that has enabled and could continue to promote sustained and predictable expansions of renewable electricity development. RPSs send clear messages to utilities and investors alike that reduce investment risks and allow utilities to plan for renewable power integration. Indeed, of the policies examined in this article, RPSs have likely promoted the greatest amount of renewable power investment, and they have the potential to achieve much more. Studies examining the impacts of different renewable energy policies concluded that RPSs, in combination with federal tax credits, have had the greatest success in promoting renewable electricity development and acquisition.[263] Costs associated with RPS compliance, moreover, appear to be relatively low.[264] By establishing demand for renewable power, RPSs send clear signals to renewable

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[260] *See* Borenstein & Bushnell (n. 56) 31-33.

[261] Ibid. 33-34.

[262] Due to space limitations, this article will not discuss comprehensive planning in detail. I plan to provide more detailed recommendations in a future article.

[263] Ryan Wiser & Galen Barbose, 'Renewables Portfolio Standards in the United States: A Status Report with Data through 2007' (Lawrence Berkeley Nat'l Lab 2008) 13 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).

[264] J. Heeter, G. Barbose, L. Bird, S. Weaver, F. Flores-Espino, K. Kuskova-Burns, and R. Wiser, 'A Survey of State-Level Cost and Benefit Estimates of Renewable Portfolio Standards' (NREL 2014) v-vi.

energy developers and financial institutions that a market will exist for their products. These market signals help to spur investment and to keep costs down.

RPSs also allow transmission operators to plan for renewable energy integration and thus add certainty to an otherwise potentially volatile transition.[265] In fact, when entities responsible for transmission system reliability estimate the impacts of renewable integration, they typically base their calculations on RPS mandates.[266] From a practical perspective, it is hard to imagine what else they could use to calculate the potential degree of renewable integration, since other policies do not establish predictable quantities of renewable integration. From a policy perspective, moreover, having a common set of figures helps ensure that transmission studies are accurate and comparable.[267]

Second, renewable energy advocates and policy makers should go beyond establishing RPSs and start engaging in comprehensive energy planning to facilitate an even smoother and swifter transition to renewable energy development. For example, if a state were to adopt an 80%-by-2050 RPS, the state should then develop a strategy for achieving that target. That strategy should identify the optimal energy mix between distributed solar, utility-scale solar, wind power, and other renewable sources. The strategy should also identify optimal development sites for specific types of renewable power, as well as areas excluded from development for environmental, archaeological, social, or other reasons. Site selection for renewable facility development should be based on the quality of the renewable resource, actual and potential access to the grid, and ensuring balance in the electricity system. Last, the plan should incorporate the feedback of transmission operators and

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[265] *See* Starrs & Wenger (n. 82) 5B-5, 5A-6, 5B-9, 5A-26. *See* also Tomain & Cudahy (n. 88) 182–86 (explaining ratemaking formula), 191 (explaining rate of return),192 (explaining implications of ratemaking formula).

[266] PJM Renewable Integration Study (n. 45); North American Electric Reliability Corp., Potential Reliability Impacts of EPA's Proposed Clean Power Plan: Initial Reliability Review (2014), *available at* http://www.nerc.com/pa/RAPA/ra/Reliability Assessments DL/ Potential_Reliability_Impacts_of_EPA_Proposed_CPP_Final.pdf [hereinafter "NERC Reliability Study]; Jürgen Weiss, Bruce Tsuchida, Michael Hagerty, and Will Gorman, 'EPA's Clean Power Plan and Reliability: Assessing NERC's Initial Reliability Review' (The Brattle Group 2015), http://www.brattle.com/system/news/pdfs/000/000/790/original/EPA%E2%80%99s_Clean_Power_Plan_and_Reliability_-_Assessing_NERC's_Initial_Reliability_Review.pdf?1424391397 [hereinafter Brattle Group Study].

[267] See, for example, Clean Power Plan (n. 22), NERC Reliability Study (n. 266); Brattle Group Study (n. 266).

regulators to ensure that the transmission system expands as necessary to accommodate new renewable facilities, to enable better integration of electricity storage, to promote energy efficiency, and to maintain grid reliability as more flexible resources enter the system. In short, the comprehensive planning should address renewable facility siting, balance, and grid integration in a systematic and strategic manner.

Finally, regulators should determine the roles that utilities and independent power producers will play in the future electricity system and develop a regulatory structure in accordance with those established roles. Some states may decide that utilities should maintain their vertically integrated structures and produce most of their own renewable power.[268] In these locations, existing electricity regulations related to procurement and ratemaking would govern utilities' investments in renewables and transmission infrastructure.[269] Other states may decide that independent renewable power producers should produce electricity and utilities should have responsibility for the transmission and distribution systems.[270] These states would need to develop strategies both for restructuring their electricity systems and for supporting independent renewable power development. To support independent production, states might expand net metering, set resource-specific avoided cost rates under PURPA, increase state subsidies for renewable producers, and support an active REC market. States would also likely need to reform the utility regulatory model to ensure the utility remains economically viable and thus capable of performing its grid management functions. While these types of strategic planning would be a substantial undertaking, they would nonetheless establish much clearer objectives for all parties in the future.

Some readers may understandably balk at this proposal for centralized, strategic planning. To be sure, developing it will be challenging on multiple levels, particularly from a political perspective. In states that did not previously restructure their utilities, efforts to change the regulatory model would receive intense opposition. In states with substantial fossil fuel resources, centralized planning aimed at a renewable transition is unlikely to occur.

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[268] States could and should not restrict all independent renewable power production, however. Federal laws that promote independent production, including PURPA and any remaining tax credits, would continue to apply. It would also likely be impractical for states to attempt to limit all renewable power development to regulated utilities.

[269] For an argument that utilities should not be allowed to build their own renewable resources, *see* Troy A. Rule, Essay, 'Unnatural Monopolies: Why Utilities Don't Belong in Rooftop Solar Markets' (forthcoming 2015) 52 Idaho L Rev.

[270] *See* Larsen (n. 208) (discussing ongoing reforms in New York and Hawaii).

However, a number of states have demonstrated their support for renewable power development and may have the political climate to support the type of strategic planning this section envisions. Even if states were to allow the role of utilities to remain up in the air, many states would have the capacity to set aggressive, long-term targets for renewable integration and to use existing land use planning laws to guide renewable siting. Progress in these two areas alone would ameliorate many of the problems associated with piecemeal renewable power development by creating long-term demand for renewable power and facilitating grid integration. These improvements would do much more than continued reliance piecemeal policies.

Conclusion

The United States is quickly approaching an inflection point for renewable policy design, as tax credits near expiration, RPS targets near completion, and disputes regarding net metering and PURPA continue to arise. Although the current mix of policies has done a great deal to promote renewable power development and potentially alter the electricity system, a broader transition to renewable power requires much more certainty than US policies currently provide. US renewable power advocates should therefore begin to promote a comprehensive approach to renewable policymaking. This approach would set aggressive long-term targets for renewable energy use, strategically plan for renewable power facility siting and integration, and potentially revisit the role of utilities in an electricity system powered by renewables. While this level of planning is undoubtedly ambitious, it will likely accomplish more than the piecemeal approach the United States has used thus far.