U.S. Renewable Energy Policy in Context

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<Abstract>

This article introduces and overviews U.S. renewable energy policy. It describes the shape, content, and contours of that policy, including its emphases and functions in both the electricity and transportation sectors of the U.S. economy. To do so, the article builds a conceptual model that can be used to describe national energy policies worldwide. That model highlights six core attributes around which renewable energy policies are built, namely, their: (1) structure and coordination, (2) technological life-cycle stage emphasis, (3) implementing mechanism type, (4) aggressiveness, (5) stability, and (6) market segment focus. Applying that model, the article determines that U.S. renewable energy policy is disaggregated and fragmented, diffusion-centric, quantity-focused, incremental but growing in strength, somewhat cyclical, and heavily focused on large, incumbent, and archetype firms. The article concludes by identifying five key categories of barriers to renewable energy development and deployment, and discussing which of those barriers U.S. policy addresses. By placing U.S. renewable energy policy in this overall context, the article sets the stage for assessments of other nations' policies, as well as comparisons of policies across jurisdictions.

Key words: Renewable energy policy, Clean energy, Climate change, Fossil fuels, Sustainable development

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Ⅰ. Introduction

Energy law, it is said, is a relatively new field.[1] So it is no surprise that in addressing U.S. renewable energy law, the same can be, and often is, suggested.[2] The set of laws, regulations, doctrines, and tools used to promote renewable energy in the United States are relatively recent arrivals on the scene.[3] Increasingly, however, the fields of energy law and renewable energy law are also important－critical not just to how energy-related industries function but to the core challenges of modern times. This is in part because climate change presents massive dilemmas for society, but also because the hope that sustainable development can simultaneously advance environmental protection and economic development is intrinsically intertwined with renewable energy deployment and development.[4] Further, to the extent that environmental law and energy law are

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1) *See, e.g.*, Kenneth A. Manaster, *An Introductory Analysis of Energy Law and Policy*, 22 Santa Clara L. Rev. 1151 (1982).

2) *Id*.

3) *See, e.g.*, Energy Bar Association, *Report of the Renewable Energy Committee*, 29 Energy L.J. 269, 269-273 (2008); Jeanne Marie Zokovitch Paben, *Green Power & Environmental Justice－Does Green Discriminate?*, 46 Tex. Tech L. Rev. 1067, 1089 (2014).

4) *See, e.g.*, Alexandra B. Klass, *Climate Change and the Convergence of Environmental and Energy Law*, Fordham Envtl. L. Rev. 180 (2013); John R. Nolon, *Land Us for Energy Conservation and Sustainable Development: A New Path Toward Climate Change Mitigation*, 27 J. Land Use & Envtl. L. 295 (2012); Hannah Wiseman et al., *Formulating a Law of Sustainable Energy: The Renewables Component*, 28 Pace Envtl.

beginning to merge—or cooperate—much of the synergies between those fields hinge on a transition to a clean energy economy.[5)]

Energy law, of course, is the practical manifestation of energy policy, and so too renewable energy law is comprised of the implementing tools of renewable energy policy. Renewable energy policy in the United States cannot be understood apart from broader U.S. energy policy: U.S. renewable energy policy is both a subset of, and has numerous linkages to, the nation's overall energy policy. Moreover, that policy, as has been extensively documented, functions as part of the nation's overall socio-economic-political milieu, which rests on: (1) a general capitalist presumption of allowing markets to function freely (or as freely as possible); (2) fractured governance where multiple jurisdictions have overlapping and conflicting authority to govern the same activities; and (3) a regulatory system that affords substantial deference to administrative agencies and their real (or presumed) expertise.[6)]

The irony about U.S. energy policy is that the most common criticism of it is that it does not exist.[7)] The criticism is both overused and inaccurate. It is overused in that what observers mean when they say the United States has "no" energy policy differs wildly from one writer to the next; it is more pliable political trope than cutting substantive appraisal.[8)] The criticism is inaccurate in

L. Rev. 827 (2011).

5) *See* Amy J. Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 Utah Envtl. L. Rev. 369, 388 (2011). *See generally* Joseph P. Tomain, Ending Dirty Energy Policy: Prelude to Climate Change (2011).

6) *See, e.g.*, Lincoln L. Davies et al., Energy Law and Policy 19-45 (2014). Of course, utility regulation comprises a large portion of energy law in the United States, and that system is premised on a "regulatory compact" that seeks to strike a compromise between promoting competition and protecting the public, though ultimately the compact arguably strikes that balance in favor of the latter. *See* Richard D. Cudahy & William D. Henderson, *From Insull to Enron: Corporate (Re)Regulation After the Rise and Fall of Two Energy Icons*, 26 Energy L.J. 35, 46 (2005).

7) Todd Ganos, *What Energy Policy?*, Forbes.com, Oct. 19, 2012, http://www.forbes.com/sites/toddganos/2012/10/19/what-energy-policy/ (last visited Feb. 22, 2013); Arnold W. Reitze Jr., *The Role of NEPA in Fossil Fuel Resource Development and Use in the Western United States*, 39 B.C. Envtl. Aff. L. Rev. 283, 284 (2012); Rick Strange, *Weaving a Tangled Web: The Intersection of Energy Policy and Broader Governmental Policies*, 5 Tex. J. Oil Gas & Energy L. 52 (2009-2010).

that the United States clearly does have an energy policy. As Professor Tomain has demonstrated, the dominant paradigm of U.S. energy law and policy is (1) to ensure abundant supplies of energy (2) at low cost through (3) intra- and inter-fuel competition (4) delivered by large, archetype firms (5) primarily using traditional fuel sources (6) in a federalist form of government.[9)]

This dominant paradigm has important implications for U.S. renewable energy policy. For several reasons, it means that, historically and arguably still today, any tool adopted to promote renewables in the United States pushes against the main current. That is, pro-renewables policies are inconsistent with the overall thrust of U.S. energy policy. This is true to the extent that renewables: are less reliable than fossil fuel or other energy resources; cost more than traditional energy production; or are delivered by new entrants rather than incumbent firms.[10)] Further, to the extent that longstanding energy interests have garnered political clout, renewables interests may be seen as industry and political outsiders.[11)]

At the same time, just as the suggestion that there is no U.S. energy policy is false, the notion that the nation lacks a renewable energy policy is myth.[12)]

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8) *See generally* Lincoln L. Davies, *Tracing U.S. Renewable Energy Policy*, 43 Envtl. L. Rep. News & Analysis 10320 (2013) [hereinafter, Davies, *Tracing*].

9) Joseph P. Tomain, *The Dominant Model of United States Energy Policy*, 61 U. Colo. L. Rev. 355 (1990).

10) *See* Frederic Beck & Eric Martinot, *Renewable Energy Policies and Barriers, in* 5 Encyclopedia of Energy, 365, 366-67 (Cutler Cleveland ed., 2004); Jeremiah Doner, Barriers to Adoption of Renewable Energy Technology 19 (2007); *see also* Eric Martinot & Omar McDoom, Promoting Energy Efficiency and Renewable Energy 3-5 (2000); J.P. Painuly, *Barriers to Renewable Energy Penetration: A Framework for Analysis*, 24 Renewable Energy 73, 75-76 (2000).

11) *See, e.g.*, Uma Outka, *Environmental Law and Fossil Fuels: Barriers to Renewable Energy*, 65 Vand. L. Rev. 1679 (2012); *cf.* Ronald Brownstein, *The Renewable Energy Fight*, Nat'l J. (Sept. 14, 2015), http://www.nationaljournal.com/politics/2015/03/18/Renewable-Energy-Fight (observing that the economic impact of renewable energy is dwarfed by the fossil-fuel industry); Chris Martin, *U.S. States Turn Against Renewable Energy as Gas Plunges*, BloombergBusiness (Apr. 23, 2013), http://www.bloomberg.com/news/articles/2013-04-23/u-s-states-turn-against-renewable-energy-as-gas-plunges (noting that lower costs of natural gas make renewable energy appear harder to justify).

12) *See generally* Davies, *Tracing*, *supra* note 8. *But cf.* E. Donald Elliott, *Why the United States Does Not Have a Renewable Energy Policy*, 43 Envtl. L. Rep. News & Analysis 10095 (2013); Todd Ganos, *What Energy Policy?*, Forbes, Oct. 19, 2012,

Beginning in the 1970s, the United States has adopted a rather clear renewable energy policy. Indeed, the nation has now amassed a large body of renewable energy laws to prove it. From the Public Utility Regulatory Policies Act of 1978 (PURPA),[13] which instituted the original version of modern feed-in tariffs (FITs), to state renewable portfolio standards (RPSs),[14] from overall federal tax support, including the production tax credit (PTC)[15] and the investment tax credit (ITC),[16] to emerging climate change regulation, the United States unarguably has an extensive set of laws aimed at promoting the development, deployment, and dissemination of renewable energy technologies.[17]

U.S. renewable energy policy also has followed a discernable path. One set of commentators has traced the history of this policy into three distinct periods.[18] In the first period, beginning with the oil crises of the 1970s and extending into the 1990s, the government devoted substantial research and development (R&D) funds to renewable energy technology and compelled incumbent utilities to purchase power from these resources. This, then, was the PURPA era.[19] In the second

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http://www.forbes.com/sites/toddganos/2012/10/19/what-energy-policy/; Ashira Pelman Ostrow, *Grid Governance: The Role of a National Network Coordinator*, 35 Cardozo L. Rev. 1993, 2007 (2014).

13) Pub. L. No. 95-617, 92 Stat. 3117 (1978).

14) Joshua P. Fershee, *Moving Power Forward: Creating a Forward-Looking Energy Policy Based on a National RPS*, 42 Conn. L. Rev. 5 (2010).

15) 26 U.S.C. § 45.

16) 26 U.S.C. § 48. Another tax support device is the federal tax code's Modified Accelerated Cost Recovery System (MACRS), 26 U.S.C. § 168(e)(3)(B)(vi)(I), which encourages renewables by affording accelerated depreciation treatment for many such technologies. *See, e.g.*, Paul Schwabe et al., Mobilizing Public Markets to Finance Renewable Energy Projects: Insights from Expert Stakeholders, Nat'l Renewable Energy Laboratory 4 (2012), http://www.nrel.gov/docs/fy12osti/55021.pdf.

17) *See generally, e.g.*, K. K. DuVivier, The Renewable Energy Reader (2011); Richard L. Ottinger, Renewable Energy Law and Development: Case Study Analysis (2013); The Law of Clean Energy: Efficiency and Renewables (Michael B. Gerrard, ed. 2011). It bears noting that, because the United States utilizes a federal system of governance, renewable energy policies can be, and are, adopted at both the national and subnational level.

18) Eric Martinot et al., *Renewable Energy Markets and Policies in the United States*, Center for Research Solutions (2005), http://martinot.info/Martinot_et_al_CRS.pdf.

19) *See id*.

period, during the 1990s, focus on competition in the electricity generation sector, utility restructuring at the state level, and sharp drops in natural gas prices led to less emphasis on renewables. This thus was the stagnation period for U.S. renewable energy policy.[20) Finally, in the third period, beginning in the late 1990s, state-based policy innovations, primarily through RPSs but also via net metering rules, public benefit funds, and voluntary green power programs, led to a resurgence in support for renewables.[21) This is the period the United States currently is in.

The fact that the United States has a visible renewable energy policy, manifested in law and traceable through the last four decades of our history, is notable. It is notable because it refutes suggestions that the nation lacks such a policy,[22) and because understanding its contours allows for assessment and revision. If a policy's efficacy and efficiency cannot be measured, it cannot be improved. Even more important, tracing U.S. renewable energy policy allows for the mapping of the policy against the barriers that renewable energy faces. Through that exercise, not only can the policy's effectiveness be better weighed, its gaps can be identified.

This article seeks to provide insight into U.S. renewable energy policy by putting the policy in context. By identifying the overall shape and design of U.S. renewable energy policy, the policy's strengths, weaknesses, coverage, and gaps are identified. In turn, suggestions for augmenting the policy become more apparent, and measurable. Further, tracing the contours and content of U.S. energy policy provides a template for doing so with the renewable energy policies of other nations.

The article makes three primary contributions to the literature. First, it builds a conceptual model for understanding the shape and design of renewable energy policies generally. Second, by applying that model to U.S. policy, it provides a wider lens through which to see that policy. Many commentators to date have emphasized whether renewable energy policies are price- or quantity-centric, or whether they are innovation- or dissemination-focused. This article presents a more

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20) *See id.*

21) *See id.*

22) *See, e.g.*, Elliott, *supra* note 12.

holistic view of U.S. renewable energy policy, demonstrating how the divergent tools used to promote renewables in the country fit together. Third, by comparing the content of U.S. renewable energy policy against the barriers these technologies face today, the article highlights where more emphasis can be placed should policymakers decide to encourage greater deployment of renewables. Specifically, while U.S. renewable energy policy addresses cost, some market barriers, and some deficiencies in funding, it could do much more in all three of those areas—and it effectively fails to address capital access and legal and social barriers to greater renewables use. A national policy that truly aims to encourage renewable energy development will turn its attention to these impediments.

Four parts comprise the balance of this paper. Part II develops the conceptual model for understanding renewable energy policies. Part III overviews the content of U.S. renewable energy policy and describes how that policy fits within the overall conceptual model. Part IV uses this description of U.S. renewable energy policy to identify where gaps remain, identifying which barriers U.S. policy addresses, and which it fails to address. Part V concludes.

Ⅱ. Renewable Energy Policies: Toward a Conceptual Model

Putting renewable energy policies in context requires cataloging the different forms the policies can take. Of course, the list of possible taxonomies is vast. The variety of ways in which a nation might devise a renewable energy policy are myriad, and the categories, classifications, and features that might be used to describe these policies are virtually limitless. Thus, constructing a universal model that might be generalized from policy to policy is important. In turn, tethering such a model to a single nation's policy has only limited utility.

To date, scholarship has tended to focus on two different cutting gates for categorizing renewable energy policies. First, a number of scholars have identified a dividing line between policies that promote the *development* or *innovation* in technologies, compared to policies that encourage the *deployment* or *diffusion* of technologies.[23] For instance, government grants given to develop a new method of carbon capture and sequestration might be seen as innovation-centered. This kind of effort has earned the label of a "technology-push" mechanism, because it aims to nudge technology along to fruition.[24] By contrast, laws like feed-in tariffs (FITs), which encourage greater use of existing technologies such as wind power and solar photovoltaics (PV), are seen as more dissemination-centric, because they seek to coax consumers into further use of desired technologies. These policies thus are known as "market-pull" mechanisms; they attempt to use law to scale up technologies by creating greater market demand for them.[25]

Second, scholars often divide the world of renewable energy policies into two halves depending on the methodology they use to promote renewables. Under this lens, policies are often seen as focused on either *quantity* or *price*.[26] Laws like RPSs that mandate a certain percentage of energy production are quantity-based mechanisms: Rather than telling the market what it must pay for renewables, an RPS sets a governmental goal for renewable energy consumption and gives the market flexibility to determine how to satisfy that target.[27] In contradistinction,

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23) Elizabeth Burleson & Winslow Burleson, *Innovation Cooperation: Energy Biosciences and Law*, 2011 U. Ill. L. Rev. 651, 672, 678 (2011); Joshua D. Sarnoff, *The Patent System and Climate Change*, 16 Va. J.L. & Tech. 301, 326 (2011).

24) *See* Mary Jean Bürer & Rolf Wüstenhagen, *Which Renewable Energy Policy Is a Venture Capitalist's Best Friend? Empirical Evidence From a Survey of International Cleantech Investors*, 37 Energy Pol'y 4997 (2009).

25) *See id*.

26) *See, e.g.*, Marc Ringel, *Fostering the Use of Renewable Energies in the European Union: The Race Between Feed-In Tariffs and Green Certificates*, 31 Renewable Energy 1, 3 (2006) ("[A] dichotomy has appeared: States either re- cur to a price-based feed-in tariff scheme or rely on quantity-based quota systems, the so-called green certificates."); Phillipe Menanteau et al., *Prices Versus Quantities: Choosing Policies for Promoting the Development of Renewable Energy*, 31 Energy Pol'y 799-812 (2003) (stating that renewable energy policies are "either priced-based or quantity-based in their approach"); Peter Meier et al., World Bank Group The Design and Sustainability of Renewable Energy Incentives: An Economic Analysis 9-11 (2015) (categorizing renewable energy incentives as "price incentives" or "quantity incentives"), https://openknowledge.worldbank.org/bitstream/handle/10986/20524/922240PUB0978100Box385358B00PUBLIC0.pdf?sequence=1.

27) *See, e.g.*, Lincoln L. Davies, *Incentivizing Renewable Energy Deployment: Renewable Portfolio Standards and Feed-In Tariffs*, 1 KLRI J. L. & Legis. 39, 56-57 (2011)

laws like feed-in tariffs focus on price rather than quantity. A FIT determines what (premium) price must be paid for renewable energy, and then mandates the purchase of all electricity produced from qualifying renewable resources at that price:[28] Rather than encouraging renewables by dictating the amount of the technology that will be used, a FIT provides a price incentive for market participants to increase use of those technologies in exchange for a financial reward.

These classifications for renewable energy policies are important, and using them yields critical insights into how different policies function.[29] Still, three cautionary notes bear mention. First, these classifications are often—and inaccurately—presented as binary options: Either a policy is a technology-push mechanism or it is a market-pull mechanism, commentators say, but not both. Either it is a quantity-based tool or a price-centric one; there is no in-between. The problem, of course, is that there is clear overlap among these categories. Feed-in tariffs often are used in conjunction with quotas or mandates for a certain percentage of renewable energy production.[30] Likewise, a dissemination policy almost necessarily will encourage innovation in a technology's development in addition to greater use, if for no other reason than the policy will promote competition, and competition inevitably yields innovation.[31] So, it is better to think of renewable energy policies much more as on a continuum in terms of how they might be classified,

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[hereinafter, Davies, *Incentivizing*].

28) *See, e.g.*, David Grinlinton & LeRoy Paddock, *The Role of Feed-In Tariffs in Supporting the Expansion of Solar Energy Production*, 41 U. Tol. L. Rev. 943, 945-56 (2010).

29) *See, e.g.*, Bürer & Wüstenhagen, *supra* note 24.

30) *See, e.g.*, Lincoln L. Davies & Kirsten Allen, *Feed-in Tariffs in Turmoil*, 116 W. Va. L. Rev. 937, 939 (2014).

31) Elizabeth Burleson & Winslow Burleson, *Innovation Cooperation: Energy Biosciences and Law*, 2011 U. Ill. L. Rev. 651, 656; *see also* Lionel Nesta et al., *Environmental Policies, Competition and Innovation in Renewable Energy*, 67 J. Envtl. Econ. & Mgmt. 396, 397 (2014) ("[I]n the case of renewable energy innovation … competition seems to support innovative activities."); Paroma Sanyal & Suman Ghosh, *Product Market Competition and Upstream Innovation: Evidence from the U.S Electricity Market Deregulation*, 95 R. of Econ. and Statistics, 237, 252-53 (concluding that the entry of non-utility generators increased the incentives for the innovation of electrical equipment).

rather than presuming they can be pigeonholed into a single category.

The second cautionary note is that most countries tend not to use a single mechanism to implement their renewable energy policies. Indeed, there are literally dozens of different policy mechanisms a state can use to promote renewables, and many jurisdictions use more than one to achieve their goals.[32] Thus, when considering a state's overall renewable energy policy, it is important to remember that one device might be quantity-focused whereas another may be price-based－and they may be used together.[33] The same holds true for technology-push and market-pull policies. They can be, and often are, used in tandem. In short, it is myopic to consider these categories as either-or options for a single policy, or to see them as exclusionary choices in an overall fabric of renewable energy promotion. In reality, the way these mechanisms function can blur lines, and the way they are chosen can easily cross classifications.

Finally, even a brief examination of the tools that nations actually use to promote renewables makes clear that the methodologies and targets of these policies are not their only relevant attributes. Rather, while much of the literature has focused on technology-push versus market-pull, and cost-based versus quantity-based, divisions, the overall design of renewable energy policies almost necessarily must address scope, modes of governance, and market structure concerns, as well as longstanding policy performance metrics such as efficacy and efficiency. Accordingly, to assess nations' energy policies in the aggregate, it is critical to consider all these factors, not just to focus on methodology and emphasis alone. In general, however, the literature does not take this more holistic perspective into account.

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32) *See, e.g.*, Adam B. Jaffe et al., *Environmental Policy and Technological Change*, Environmental and Resource Economics (2002); Wilson Rickerson et al., Feed-in Tariffs and Renewable Energy in the USA: A Policy Update 1-3 (2008); Eric Martinot et al., *Renewable Energy Markets and Policies in the United States*, Center for Research Solutions (2005), http://martinot.info/Martinot_et_al_CRS.pdf.

33) For an excellent exposition of how these tools might be used together, see Felix Mormann, *Re-Allocating Risk: The Case for Closer Integration of Price- and Quantity-Based Support Policies for Clean Energy*, 27 Elec. J. 9 (Nov. 2014); *see also* Lincoln L. Davies, *Reconciling Renewable Portfolio Standards and Feed-In Tariffs*, 32 Utah Envtl. L. Rev. 311 (2012).

To develop a more holistic model assessing nations' renewable energy policies, then, other factors must be considered. While others might come into play, six are most inclusive of the various axes around which renewable energy policies might be designed. They are the policies': (1) *structure and coordination*, (2) *technological life-cycle stage emphasis*, (3) *implementing mechanism type*, (4) *aggressiveness*, (5) *stability*, and (6) *market segment focus*. Taken together, these characteristics can be used to describe a nation's renewable energy policy, providing insight into its shape and function and allowing comparison across jurisdictions.

Table 1: Renewable Energy Policy Attributes

Attribute	Description and Some Divisions
Structure and Coordination	Federal versus state or local Holistic versus fragmented Coordinated across and between jurisdictions versus uncoordinated
Technological Life-Cycle Stage Emphasis	Innovation-centric versus diffusion-centric Technology-push versus market-pull
Implementing Mechanism Type	Direct spending versus tax expenditures Quantity-based versus price-based
Aggressiveness	Assertive versus meager Mandatory versus voluntary
Stability	Longstanding versus novel Long-lasting versus cyclical
Market Segment Focus	Incumbents versus new entrants Top down versus participative

Table 1 summarizes these attributes and their contours. The remainder of this Part describes each characteristic in more detail.

1. *Structure and Coordination*

The structure and coordination of a renewable energy policy refer to the manner and extent to which the policy is harmonized and organized across different levels of governance.[34] Structure and coordination matter especially where national and subnational entities share governance authority, because without coordination, policies may become fragmented and ineffective, in part because an uncoordinated policy can send mixed messages to the regulated community or otherwise create uncertainty. This attribute thus might be thought of in terms of federalism—that is, in terms of who has control and responsibility for its design and implementation.[35] Is the policy national or subnational, *i.e.*, top-down or more horizontal? To the extent it is subnational, is it uniform across subnational jurisdictions or patchwork depending on how the subnational entities devise or implement it? In short, this element examines the overall shape and scope of the policy.[36]

This characteristic also assesses the degree to which the governmental actors charged with implementing the policy cooperate. Is the policy applied by having regulators work together to achieve mutually beneficial goals, such as is the case for much of U.S. environmental law, including the Clean Air Act and the Clean Water Act?[37] Or does the policy draw bright jurisdictional lines that give one set of regulators authority over one part of its implementation but different regulators power over another part, such as is the case for traditional energy regulation in the United States, including under the Federal Power Act and the Natural Gas Act?[38] This element accordingly can help assess the degree to which a policy is

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34) Felix Mormann, *Enhancing the Investor Appeal of Renewable Energy*, 42 Envtl. L. 681, 726 (2012) [hereinafter, Mormann, *Enhancing*].

35) *See, e.g.*, Hari M. Osofsky & Hannah J. Wiseman, *Dynamic Energy Federalism*, 72 Md. L. Rev. 773 (2013); Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 Vand. L. Rev. 1801 (2012); Daniel A. Lyons, *Federalism and the Rise of Renewable Energy: Preserving State and Local Voices in the Green Energy Revolution*, 64 Case W. Res. L. Rev. 1619 (2014); Benjamin K. Sovacool, *The Best of Both Worlds: Environmental Federalism and the Need for Federal Action on Renewable Energy and Climate Change*, 27 Stan. Envtl. L.J. 397 (2008).

36) *See* Osofsky & Wiseman, *supra* note 35, at 781-801.

37) Clean Air Act, Pub. L. 84-159, 69 Stat. 322 (codified as amended at 42 U.S.C. §§ 7401-7431); Federal Water Pollution Control Act (Clean Water Act), Pub. L. 80-845, 62 Stat. 1155 (codified as amended at 33 U.S.C. §§ 1251-1274); *see also, e.g.*, Robert L. Fischman, *Cooperative Federalism and Natural Resources Law*, 14 N.Y.U. Envtl. L.J. 179 (2005); David E. Adelman, *Environmental Federalism When Numbers Matter More Than Size*, 32 UCLA J. Envtl. L. & Pol'y 238 (2014).

38) Federal Power Act, Pub. L. 114-38, 129 Stat. 437 (codified as amended at 16 U.S.C.

either fragmented or unified.[39)]

Accordingly, consideration of the structure and coordination of a renewable energy policy speaks to both (1) its breadth, that is, its coverage of possible jurisdictions within the nation, and (2) its harmonization, or rather, its uniformity and coordination across those jurisdictions.

2. *Technological Life-Cycle Stage Emphasis*

A policy's emphasis on a technological life-cycle stage refers to what scholars have termed "technology-push" versus "market-pull" devices.[40)] For instance, does a policy promote the invention or innovation of a new technology, such as thin-film solar, or does it encourage greater use of an existing technology, such as wind turbines? While scholars generally refer to these two counterparts as "technology-push" and "market-pull," the more generic term of "life-cycle stage emphasis" is utilized here, because it recognizes that any given policy may not fit neatly into one of those categories. Rather, while technology-push policies may focus on innovation, they may also have some ancillary technology diffusion effects. Likewise, whereas the weight of a market-pull policy is on encouraging greater adoption of an already developed technology, increased use of the technology may promote innovation as well. Thus, the real question is not whether a policy achieves only one of these objectives, but rather, which it emphasizes.

Indeed, observers who assess technology-push (innovation) versus market-pull (diffusion) policies plot the policies' emphasis along a spectrum that traces the full life-cycle of technology development.[41)] Bürer and Wüstenhagen, for instance,

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§12); Natural Gas Act, Pub. L. 102-486, 106 Stat. 2776 (codified as amended at 15. U.S.C. §§ 717 et seq.); *see also, e.g.*, Frank R. Lindh, *Federal Preemption of State Regulation in the Field of Electricity and Natural Gas: A Supreme Court Chronicle*, 10 Energy L.J. 277 (1989).

39) *See, e.g.*, Mormann, *Enhancing*, *supra* note 34, at 715; Amy L. Stein, *The Tipping Point of Federalism*, 45 Conn. L. Rev. 217, 250 (2012).

40) Michael Grubb, *Technology Innovation and Climate Change Policy: An Overview of Issues and Options*, 41 Keio Econ. Stud. 103 (2005).

41) *See, e.g.*, Roberta F. Mann, *Lighting in a Bottle: Using Tax Policy to Solve Renewable Energy's Storage Challenges*, 20 J. Envtl. & Sustainability L. 71 (2013); J.F. Mercure et

explain that the life-cycle has six stages: (1) invention, beginning with basic research and development and then leading to (2) applied research and development, followed by (3) demonstration, (4) pre-commercial use, (5) niche market and supported commercial use, and (6) full commercialization.[42] As a given technology moves through this life-cycle, presumably the amount of governmental intervention required should decrease, and its market should expan d.[43] The idea is to ensure that desired innovations successfully cross the technology "valley of death"－the chasm between invention and commercialization that spans the third, fourth, and fifth stages of the life-cycle.[44]

The question of whether a policy emphasizes innovation or diffusion, then, depends on whether the policy aims at the three pre-commercial stages of development (basic and applied R&D plus demonstration) or instead centers on increasing market penetration (beginning with pre-commercial use and extending through niche markets and full commercialization).

3. *Implementing Mechanism Type*

The type of implementing mechanism refers to the kind of legal tool used to give effect to the policy. Obviously, when assessing a nation's overall renewable energy policy, more than one type of mechanism might be utilized. Likewise, even

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al., *Climate Policy Instruments in the Decarbonisation of the Global Electricity Sector*, 73 Energy Pol'y 686 (2014).

42) Bürer & Wüstenhagen, *supra* note 24, at 5001.

43) *See id.*

44) *See, e.g.*, Michael Shellenberger et. al., *Fast, Clean, & Cheap: Cutting Global Warming's Gordian Knot*, 2 Harv. L. & Pol'y Rev. 93, 108-109 (2008). A more classical theory of the innovation process is Joseph Schumpeter's. "Schumpeter described development as historical process of structural changes, substantially driven by innovation which was divided by him into five types: 1. launch of a new product or a new species of already known product; 2. application of new methods of production or sales of a product (not yet proven in the industry); 3. opening of a new market (the market for which a branch of the industry was not yet represented); 4. acquiring of new sources of supply of raw material or semi-finished goods; 5. new industry structure such as the creation or destruction of a monopoly position." Karol Sledzik, *Schumpeter's View on Innovation and Entrepreneurship*, in Management Trends in Theory and Practice 89, 90 (Stefan Hitmar ed., 2013).

with respect to a single type of renewable energy, multiple policy mechanisms might be leveraged to promote that technology or resource. Thus, it is important to acknowledge that the overall mix of mechanisms may need to be the focal point of analysis, rather than assuming that a single tool may dominate—even though that may sometimes be the case.

While the renewable energy policy world may be divided into technology-push and market-pull methods, both halves of that world include numerous possible tools. With respect to technology-push policies, some of the more popular mechanisms include public research and development funding, government demonstration grants, investment subsidies, tax breaks, tax rebates, incubators, government investment in private funding or venture capital funds, grants for small and medium enterprises (SMEs) in renewable energy, private research and development, and “soft” support measures such as networking events and business plan competitions.[45] These tools thus tend to include different ways the government can infuse money into the development and demonstration of technologies—whether through direct government research, by funding private enterprises to do the work, or through tax expenditures that give credits or other deductions to certain activities.[46]

For market-pull mechanisms, there also are many options for promoting renewables. These devices are the tools that tend to get classified by whether they are quantity- or price-focused. Quantity-focused devices include quotas (such as RPSs or renewable fuel standards), mandates, and voluntary targets (such as renewable portfolio goals), as well as their implementing mechanisms, such as green certificate trading programs.[47] Price-focused devices include purchase and

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45) Bürer & Wüstenhagen, *supra* note 24, at 5001; *see also, e.g.*, Joshua Meltzer, *A Carbon Tax as A Driver of Green Technology Innovation and the Implications for International Trade*, 35 Energy L.J. 45, 53 (2014); IRENA, Evaluating Policies in Support of the Deployment of Renewable Power 7-8 (2012), https://www.irena.org/DocumentDownloads/Publications/Evaluating_policies_in_support_of_the_deployment_of_renewable_power.pdf.

46) *See, e.g.*, Elizabeth Burleson & Winslow Burleson, *Innovation Cooperation: Energy Biosciences and Law*, 2011 U. Ill. L. Rev. 651, 675, 680, 691 (2011); Amy L. Stein, *Renewable Energy Through Agency Action*, 84 U. Colo. L. Rev. 651, 673-74 (2013).

47) *See, e.g.*, Anna Bergek & Staffan Jacobsson, *Are Tradable Green Certificates a Cost-Efficient Policy Driving Technical Change or a Rent-Generating Machine? Lessons*

price mandates (such as feed-in tariffs), commercial tax credits (such as production tax credits or investment tax credits), and residential and commercial programs (such as net-metering or income tax credits).[48] In addition, other devices can be used as market-pull policies for renewable energy, including technology-performance standards, greenhouse gas and other environmental regulations, and tendering, auction, and other public procurement tools.[49] These tools thus tend to include fewer ways in which governments leverage the public fisc to augment renewable energy markets. They can also be classified depending on whether they spread the cost of promoting renewables across consumers, ratepayers, or taxpayers, or use government funds to directly cover the bill.[50]

4. *Aggressiveness*

The question of the aggressiveness of a nation's renewable energy policy is more qualitative than categorical. In short, the question is about how forcefully the policy seeks to promote renewables. Of course, determining how to measure aggressiveness may be complicated.[51] Should the policy be weighed against some kind of internal baseline, such as the nation's predecessor policy, against some other kind of baseline, such as a mid-term realizable potential,[52] or against

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from Sweden 2003-2008, 38 Energy Pol'y 1255, 1256 (2010); Mentanteau et al., *supra* note 26, at 802; Meier et al., *supra* note 26, 911.

48) *See, e.g.*, Steven Ferrey, et. al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 Duke Envtl. L. & Pol'y F. 125, 134-35, 194 (2010); *see also* Beck & Martinot, *supra* note 10, at 370-72; IRENA, *supra* note 45, at 7-8. Likewise, just because a nation's policy is aggressive does not mean it necessarily will be effective, and vice versa.

49) *See, e.g.*, Felix Groba & Barbra Breitschopf, Impact of Renewable Energy Policy and Use on Innovation: A Literature Review 19 (2013).

50) *See, e.g.*, Toby D. Couture et al., Nat'l Renewable Energy Lab, A Policymaker's Guide to Feed-in Tariff Policy Design 102 (July 2010), http://www.nrel.gov/docs/fy10osti/44849.pdf; Ringel, *supra* note 26, at 8.

51) Siemens, *2009 Greening of Corporate America The Pathway to Sustainability – From Strategy to Action* 24 (2009).

52) *See* Int'l Energy Agency, Deploying Renewables: Principles for Effective Policies 61-62 (2008), *available at* http://www.iea.org/textbase/nppdf/free/2008/deployingrenewables2008.pdf.

something else? Or should it be weighed against what other nations are doing and, if so, which nations—only neighbors, only economic competitors, or only those that might be deemed similar in other relevant ways? Likewise, the policy's strength could be measured in terms of its direction—in general, is the arc of the nation's policy trending toward more or less renewables promotion over time?

One obvious metric of a policy's strength is its efficacy.[53] If a nation is transforming its energy system as a result of its policy, that says much about how ambitious its goals and efforts are. At the same time, there are many reasons why a nation might choose a more incremental approach to promoting renewables, including cost containment.[54] In this respect, a renewable energy policy might be deemed highly efficacious—it is achieving precisely the goals it was adopted to pursue—while still only modestly affecting the shape of energy production or consumption within the jurisdiction.

Thus, the question of policy aggressiveness is not only qualitative but also contextual. Measuring it depends not just on the policy's overall influence but on the desired (or attempted) effect as well.

5. *Stability*

Another qualitative metric of a nation's renewable energy policy is its stabilit y.[55] Stability might be measured in two ways—across policies over time and within a policy while the policy is in place.[56] The former might be referred to as inter-policy stability, and the latter as intra-policy stability.[57] Both are important

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53) *See*, *e.g.*, Jonathan A. Lesser & Xuejuan Su, *Design of an Economically Efficient Feed-in Tariff Structure for Renewable Energy Development*, 36 Energy Pol'y 981, 981-82 (2008). Of course, there are myriad other ways to measure policies beyond efficacy and efficiency alone. Among others, these include dynamic efficiency, equity, institutional feasibility, and cost-effectiveness. *See, e.g.*, Pablo del Rio, *The Dynamic Efficiency of Feed-In Tariffs: The Impact of Different Design Elements*, 41 Energy Pol'y 139, 139 (2012); Pablo del Rio & Miguel A. Gual, *An Integrated Assessment of the Feed-in Tariff System in Spain*, 35 Energy Pol'y 994, 998 (2007).

54) *E.g.*, Davies & Allen, *supra* note 30, at 1004.

55) Miguel Mendonca et al., *Stability, Participation, and Transparency in Renewable Energy Policy: Lessons from Denmark and the United States*, Policy & Society J. 15 (2009).

56) Mormann, *Enhancing*, *supra* note 34, at 697.

for the same reason. Investors crave certainty, and without it, the likelihood of renewable energy deployment decreases and the cost of implementing a policy increases.[58] These are basic finance principles. The riskier an investment, the higher return an investor will expect, because of the increased likelihood that some of those investments will fail.[59]

While these principles apply generally, it is well-documented that renewable energy projects need a particularly stable policy environment to thrive.[60] Thus, whether a policy may change, be eliminated, or be replaced by another is a critical factor in describing renewable energy policies. The more itinerant a set of policies is, the less reliable they are perceived to be. Professor Mormann succinctly explains: "[T]he longevity and stability of a policy determine investor confidence in its continued availability. The greater the (perceived) likelihood of a policy's modification, elimination, or replacement by another less favorable policy, the more reluctant investors will be to fund renewable energy projects."[61] Accordingly, a more stable policy appeals to more (and a greater diversity of) investors, has a higher likelihood of engendering renewables acceptance, and may lower implementation costs.[62]

Given this, taking into account the longevity and stability of any nation's renewable energy policy should be key. Hand in hand with the policy's substantive

57) *Id*.

58) Jesse Jenkins et al., Brookings Inst., *Beyond Boom & Bust - Putting Clean Tech on a Path to Subsidy Independence*, 37 (2012); *see also* Cory Karylnn et al., Feed-in Tariff Policy: Design, Implementation, and Policy Interactions (2009), http://www.nrel.gov/docs/fy09osti/45549.pdf.

59) *See* Elisabeth Graffy & Steven Kihm, *Does Disruptive Competition Mean a Death Spiral for Electric Utilities?*, 35 Energy L.J. 1, 18 (2014).

60) Mormann, *Enhancing*, *supra* note 34, at 705, 711; *see also, e.g.*, Jiaqi Liang & Daniel J. Fiorno, *The Implications of Policy Stability for Renewable Energy Innovation in the United States*, 41 Pol. Studies J. 97, 101 (2013); Amy L. Stein, *Renewable Energy Through Agency Action*, 84 U. Colo. L. Rev. 651 (2013); Ryan H. Wiser & Steven J. Pickle, *Financing Investments in Renewable Energy: The Impacts of Policy Design*, 2 Renewable & Sustainable Energy Rev. 361, 361 (1998).

61) Mormann, *Enhancing*, *supra* note 34, at 706.

62) *See id.*; *see also* Karsten Neuhoff, *Large-Scale Deployment of Renewables for Electricity Generation*, 21 Oxford. Rev. Econ. Pol'y 88, 103-05 (2005).

aggressiveness, these two characteristics help describe how seriously a jurisdiction takes its effort to promote renewables.

6. *Market Segment Focus*

A final way to categorize renewable energy policies is according to their target audience—that is, the segment of the market on which they focus.[63] This too might be seen on a spectrum. Does the policy aim to leverage the weight of incumbent players, as RPSs do by compelling regulated utilities to procure renewable power to comply with the laws? Or does the policy aim to promote new entrants into the market, such as feed-in tariffs do, particularly in Europe, by encouraging new competitors and small entities, including individuals, to produce power using renewables? Or is the policy market-neutral, so that it applies uniformly to all market segments and competitors?

Because renewable energy policies can help change the way markets function—including by altering who the key market players are—this trait might also be characterized as the extent to which the policy promotes energy democracy.[64] In that vein, it also may be reflective of the jurisdiction's energy culture. A national renewable energy policy that promotes community and citizen involvement and seeks to use its policy not just to promote renewables but also to decentralize the way energy is produced, delivered, and consumed reflects a certain political emphasis that other policies do not.[65] By contrast, a renewable energy policy that centers primarily on promotion and diffusion of these technologies may be more

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63) *See, e.g.*, Lincoln L. Davies, *State Renewable Portfolio Standards: Is There A "Race" and Is It "To the Top"?*, 3 San Diego J. Climate & Energy L. 3, 51 (2012) [hereinafter, Davies, *Race*]; Martinot et al., *supra* note 18, at 19-24.

64) *See, e.g.*, Benjamin K. Sovacool, *Seven Suppositions About Energy Security in the United States*, 19 J. of Cleaner Production 1147, 1150-51 (2011).

65) Ozgur Yildiz, *Financing Renewable Energy Infrastructures via Financial Citizen Participation – The Case of Germany*, 68 Renewable Energy 677, 677 (2014); Tineke van der Schoor & Bert Scholtens, *Power to the People: Local Communities Initiatives and the Transition to Sustainable Energy*, 43 Renewable & Sustainable Energy Revs. 666, 667, 673-74 (2015); *see also* Center for Social Inclusion, *Energy Democracy*, http://www.centerforsocialinclusion.org/ideas/energy-democracy/ (last visited Sept. 6, 2015).

neutral with respect to energy democracy, or may underscore a tendency in the jurisdiction to treat energy as something that is invisible—a public good that must be ever-present but not grappled with in a meaningful way by the common citizen.

In general, describing a policy's focus on a certain segment of the market—its target audience—will likely apply most directly to renewable energy technology diffusion policies, because those are the policies that center on pulling the technologies from the valley of death to commercialization. Nonetheless, to the extent that governments use their policies to push technology invention and innovation, this metric can be considered in that context as well.

Ⅲ. Applying the Model: Assessing U.S. Renewable Energy Policy

Renewable energy policy in the United States has been called everything from non-existent to inadequate, from burgeoning to insubstantial.[66] One recent assessment suggested that U.S. renewable energy policy may best described as "tentative, cyclical, and subordinate"—tentative in that it remains incremental, cyclical in that it has tended to come and go, and subordinate in that in remains in conflict with, and typically cedes to, the general aims of mainline U.S. energy policy to keep prices down and ensure that supplies are ample.[67]

However it is described, what remains clear about U.S. renewable energy policy is that it does not dominate. The United States simply has not gone all-in on the notion of using renewables to transform the nation's energy system, such as Germany has with its Energiewende.[68] Nor are many aspects of U.S. renewable

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66) *See* Elliott, *supra* note 12; *see also, e.g.*, *Transcript of the First Presidential Debate Between President Obama and Republican Nominee Mitt Romney*, Oct. 3, 2012, *available at* http://www.npr.org/2012/10/03/162258551/transcript-first-obama-romney presidential-debate (referring to policies promoting renewables, Governor Romney said, "I had a friend who said, you don't just pick the winners and losers; you pick the losers. … [T]his is not the kind of policy you want to have if you want to get America energy-secure.").

67) Davies, *Tracing*, *supra* note 8, at 10320.

68) Craig Morris & Martin Pehnt, Energy Transition the German Energiewende 20 (2012).

energy policy coordinated at the national level, as the states have been leaders on many initiatives in recent decades.[69] When approaching the task of understanding U.S. renewable energy policy, then, this merits keeping in mind: In both status and stature, the policy occupies a somewhat tenuous position.

Despite this, the content of U.S. renewable energy policy is vast. To promote renewables in the United States, "[h]undreds of laws are in place (statutes, regulations, and official policies); each emerged from its own historical, economic, political, and technological circumstances, and many of them work at cross purposes to each other."[70] This, of course, is more typical than exceptional for the United States. "The same thing applies to coal and to virtually every other kind of energy source."[71]

That content, moreover, can be divided a number of ways. One leading observer identifies three categories of mechanisms used in the United States: (1) those for both efficiency and renewables, including portfolio standards, carbon prices, tax incentives, nontax incentives such as subsidies, system benefit charges, and urban density promotion; (2) those for renewables alone, including mandatory utility purchases, government procurement, and research and development funding; and (3) those primarily for efficiency and conservation, including technology standards, retrofitting, and the renewable fuel standard (RFS).[72] Others have built a taxonomy of renewable energy policies into four categories—price incentives, quantity incentives, direct support, and indirect support—noting that the United States has measures in place in each category.[73]

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69) *See* Mark Bollinger et al., *An Overview of Investments by State Renewable Energy Funds in Large-Scale Renewable Generation Projects*, Electricity J., Jan.-Feb. 2005; Kevin L. Doran, *Can the U.S. Achieve a Sustainable Energy Economy from the Bottom-Up?: An Assessment of State Sustainable Energy Initiatives*, 7 Vt. J. Envtl. L. 95, 107 (2006); Alexandra B. Klass, *Climate Change and the Convergence of Environmental and Energy Law*, 24 Fordham Envtl. L. Rev. 180, 181 (2013).

70) Michael B. Gerrard, *Introduction and Overview*, *in* The Law of Clean Energy: Efficiency and Renewables, *supra* note 23, at 1, 2.

71) *Id*.

72) *Id*. at 14-18. Of course, some suggest that the RFS is not a renewable energy policy at all, because it relies so heavily on corn to produce ethanol, and thus has tenuous climate and environmental benefits at best. *See, e.g.*, Arnold W. Reitze, Jr., *Biofuels — Snake Oil for the Twenty-First Century*, 87 Or. L. Rev. 1183 (2008).

One way of weighing the content of renewable energy policy is in terms of the nation's energy systems. U.S. energy consumption divides into effectively two secondary systems: electricity, which is used at the residential, commercial, and industrial levels, and transportation, which is dominated by petroleum. For each of these systems, key policies can be identified. For electricity, PURPA, state RPSs, federal tax support,[74] net metering rules,[75] research and development funding, and, now, potentially at least, the Clean Power Plan, have been most important for promoting renewables in the United States. For transportation, the renewable fuel standard widely has been seen as the vanguard policy,[76] although corporate average fuel economy (CAFE) standards clearly also are important in terms of efficiency and greenhouse gas regulation.[77] Given the sheer number of policy tools

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73) Peter Meier et al., *The Design and Sustainability of Renewable Energy Incentives, An Economic Analysis*, World Bank Group, 8-10 (2015); APEC Energy Working Group, Renewable Energy Promotion Policies: Final Report (2012); Bradford S. Gentry, International Investment Agreements and Investments in Renewable Energy 61 (2013). Yet another way of categorizing renewable energy policies is along the axis of whether they are tax- (*e.g.*, investment tax credits, investment allowances, accelerated depreciation, tax holidays, deductions for R&D spending, producer or consumer subsidies, or exemptions or other kinds of deductions or reductions) or nontax- (FITs, mandates, R&D funding, grants and loans, or equipment rebates) based, and again, the United States has virtually all of these in place. Nathalie McGregor & Sebastian James, World Bank Group, Providing Incentives for Investments in Renewable Energy Advice for Policymakers 2 (2011).

74) *See supra* notes 15-16 and accompanying text. On the PTC in particular, see Christopher Riti, *Three Sheets to the Wind: The Renewable Energy Production Tax Credit, Congressional Political Posturing, and an Unsustainable Energy Policy*, 27 Pace Envtl. L. Rev. 783 (2010); Shawna M. Bligh & Chris A. Wendelbo, *Federal Government as Angel Investor for Environment & Energy Projects?*, Nat. Resources & Env't, Summer 2009, at 25, 26.

75) *See, e.g.*, Shannon Baker-Branstetter, *Distributed Renewable Generation: The Trifecta of Energy Solutions to Curb Carbon Emissions, Reduce Pollutants, and Empower Ratepayers*, 22 Vill. Envtl. L.J. 1 (2011); Melissa Powers, *Small Is (Still) Beautiful: Designing U.S. Energy Policies to Increase Localized Renewable Energy Generation*, 30 Wis. Int'l L.J. 595, 633-38 (2012).

76) 26 U.S.C. § 45 (2010); *see also, e.g.*, Bob Neufeld & Rebecca Lynne Fey, *Winners and Losers: The EPA's Unfair Implementation of Renewable Fuel Standards*, 60 S.D. L. Rev. 258 (2015); Timothy A. Slating & Jay P. Kesan, *The Renewable Fuel Standard 3.0?: Moving Forward with the Federal Biofuel Mandate*, 20 N.Y.U. Envtl. L.J. 374 (2014).

77) 49 U.S.C. § 32902(a); 40 C.F.R. § 52 (2010); *see also, e.g.*, Laura Hall, *The Evolution*

on the electricity side of the ledger, there is a temptation in the United States to think of renewables primarily in terms of electricity, but of course that is not the full picture.

No matter what lens is used to consider U.S. renewable energy policy, further insight can be gained by examining it as a whole, rather than focusing on its component parts, as often is the case. Indeed, much interesting work remains to be done juxtaposing renewable energy policies across the globe, not only in terms of weighing efficacy and efficiency but also for insights that such analyses may yield about energy culture, the influence of industry structures on renewable energy promotion, and whether some policies map better with certain kinds of political or social tendencies. Conducting such a broad-ranging analysis is beyond the scope of this article, but the conceptual model developed here may aid in the inquiry.

To provide a greater understanding of U.S. renewable energy policy, this Part applies that model to the policies, laws, and rules in place in the United States. That analysis yields a clear picture of U.S. renewable energy policy. In short, it is fragmented, focused on both innovation and diffusion (though more the latter than the former), heavily quantity-based, incremental, cyclical, and mixed in terms of its market segment emphasis.

1. *Structure and Coordination* – *Fragmentation*

In many ways, the structure of U.S. renewable energy policy may be its most defining feature. The structure is deeply fragmented. This flows from the federalist form of government the Constitution creates, with limited power afforded to Congress and extensive authority reserved for the states.[78] Nonetheless, the impact

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of Cafe Standards: Fuel Economy Regulation Enters Its Second Act, 39 Transp. L.J. 1 (2011); Arnold W. Reitze, Jr., *Controlling Greenhouse Gases from Highway Vehicles*, 31 Utah Envtl. L. Rev. 309 (2011). On the vehicle side of the ledger, the RFS is of course not the only relevant policy tool. Alternative fuel and hybrid tax credits and deductions also are relevant. *See, e.g.*, Staff of the Joint Comm. on Taxation, 111th Cong., Tax Expenditures for Energy Production and Conservation (Comm. Print 2009), *available at* http://www.jct.gov/publications.html?func=startdown&id=3554.

78) *See, e.g.*, United States v. Lopez, 514 U.S. 549 (1995).

of this fragmentation on U.S. renewable energy policy is profound. What persists in the United States is a complex tangle of federal laws, state, and local measures that vary widely from one jurisdiction to the next, and resulting overlaps, gaps, and inconsistencies in how renewable energy policy is applied.[79] Moreover, because energy law in the United States tends to treat different resources under their own regimes, coordination does not only fluctuate across jurisdictions, it can across resources as well.

The fragmentation of U.S. renewable energy policy extends throughout its contours, but the laws that encourage its use for electricity may be most emblematic. Its fractures reach from the federal to the local levels of governance, and affect different segments of the industry in different ways. PURPA, adopted at the federal level, embodies this. While that law's core feature—its mandate that utilities buy electricity from small renewable and cogeneration facilities—applied nationwide initially, the rates that could be recovered for those sales fell within state regulation and thus differed depending on the jurisdiction.[80] Moreover, in the Energy Policy Act of 2005, Congress responded to utilities' longstanding dissatisfaction with PURPA and gave the Federal Energy Regulatory Commission (FERC) authority to lift the statute's purchase obligations in areas where competitive wholesale electricity markets function.[81] Today, the result is that PURPA does not apply at all in large swaths of the country, although where it does remain in effect, it is still a key incentive for renewable energy installations and production.[82]

When other key renewable electricity laws are considered, the fragmentation of

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79) Daniel K. Lee & Timothy P. Duane, *Putting the Dormant Commerce Clause Back to Sleep: Adapting the Doctrine to Support State Renewable Portfolio Standards*, 43 Envtl. L. 295, 361 (2013).

80) 16 U.S.C. § 824a-3; Brent L. Vanderlinden, *Bidding Farewell to the Social Costs of Electricity Production: Pricing Alternative Energy Under the Public Utility Regulatory Policies Act*, 13 J. Corp. L. 1011, 1024 (1988).

81) Energy Policy Act of 2005, tit. XII § 1253(a), Pub. L. 109-58, 119 Stat. 968.

82) See Michael D. Hornstein & J.S. Gebhart Stoermer, *The Energy Policy Act of 2005: PURPA Reform, the Amendments and Their Implications*, 27 Energy L.J. 25, 32 (2006); Richard D. Cudahy, *PURPA: The Intersection of Competition and Regulatory Policy*, 16 Energy L.J. 419, 243 (1995).

U.S. renewable energy policy becomes even more apparent—and pervasive. While PURPA encouraged the development of renewable generators, it left regulation of the overall composition of generation fleets to the states.[83] Thus, beginning in the 1990s, many states began adopting renewable portfolio standards requiring utilities to generate a portion of their power from renewable resources. By definition, this led to a patchwork quilt of regulation, as no two states' RPSs match.[84] Moreover, not all states adopted RPSs, leaving much of the nation covered by these laws but big areas, particularly in the Interior West and the Deep South, unaffected. At the same time states rushed to implement RPSs, they were constrained in what policy choices they could make. Because the Constitution declares federal law supreme,[85] both PURPA and the Federal Power Act effectively prevent states from adopting feed-in tariffs.[86] Accordingly, the policies put in place to encourage renewable electricity vary from state to state, utilize federal rules in some areas but not others, and simultaneously *empower* states to experiment but *constrain* the ways in which they can do so—in short, a microcosm of how U.S. renewable energy functions.[87]

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83) *See, e.g.*, Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190 (1983).

84) *Compare* Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 Conn. L. Rev. 1339 (2010), *with*, Jim Rossi, *The Limits of A National Renewable Portfolio Standard*, 42 Conn. L. Rev. 1425 (2010).

85) U.S. Const., art. VI, cl. 2.

86) *See* Scott Hempling et al., Renewable Energy Prices in State-Level Feed-in Tariffs: Federal Law Constraints and Possible Solutions 5-19 (2010); Michael Doris, *Clean Energy Pricing and Federalism: Legal Obstacles and Options for Feed-in Tariffs*, 35 Environs. Envtl. L. & Pol'y J. 173, 184-187 (2012).

87) One aspect of that microcosm is that territorial battles between states and the federal government emerge, particularly as state efforts bump up against doctrines of federal preemption under the Constitution's Supremacy Clause and limits on state power under the dormant Commerce Clause. A good example of this includes the litigation over California's low carbon fuel standard. *See* Rocky Mountain Farmers Union v. Corey, 730 F.3d 1070 (9th Cir. 2013); *see also* Alexandra B. Klass & Elizabeth Henley, *Energy Policy, Extraterritoriality, and the Commerce Clause*, 5 San Diego J. of Climate & Energy L. 127 (2014). Indeed, these conflicts are a major theme in U.S. energy law more generally. *See* Davies et al., *supra* note 6, at 63.

2. *Technological Life-Cycle Stage Emphasis – Innovation and Diffusion*

Another hallmark of U.S. renewable energy policy is that it targets both the innovation and diffusion stages of the technological development life-cycle. This is key, because it demonstrates that the nation is interested both in finding new energy solutions and in nudging its energy system to take on a different shape and form. Nevertheless, overall U.S. renewable energy policy in recent years has emphasized diffusion more than innovation. This may be in part because the U.S. patent system provides a strong baseline incentive for innovation irrespective of resource specific policies,[88] but the emphasis is clear nonetheless.

With respect to innovation, U.S. R&D funding for renewables is perhaps most relevant. It is also somewhat conflicted: The availability of these funds clearly is important, but many would say they are not aggressive enough. Prior to the energy crises of the 1970s, the government devoted its funds almost exclusively to nuclear power and fossil fuel research, but that emphasis expanded when those crises exposed the fragility of global oil supplies.[89] From 1978 through 2014, the U.S. government expended $22.13 billion on renewable energy R&D and another $19.73 billion on energy efficiency.[90] This is particularly significant because, from 1948 to 1978, the government spent only $0.83 billion on renewables R&D and a mere $0.6 billion on energy efficiency.[91] These figures, however, require some context. Overall, government R&D funding for renewables and energy efficiency has paled in comparison to what the country has devoted to nuclear and fossil fuels. From 1978 through 2014, the government spent 16.7% of Department of Energy funding on renewables R&D and 14.9% on energy efficiency, while it spent 25.6% of those funds on fossil fuel research and 37.8% on nuclear.[92] At

88) *See* Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 Va. L. Rev. 1575, 1580 (2003).

89) Fred Sissine, Cong. Research Serv., Renewable Energy R&D Funding History: A Comparison with Funding For Nuclear Energy, Fossil Energy, and Energy Efficiency R&D (2011).

90) *Id*. at 3.

91) *Id*.

92) *Id*. at 4.

the same time, the amount of funding for renewables and efficiency today has begun to increase. From 2005 through 2014, the percentage of Department of Energy (DOE) funding for those two sources has increased to 18.5% and 15.8%, respectively, with another 14.7% being devoted to electric systems.[93)]

Still, many U.S. renewable energy policies—and much of recent policy innovation—focus on promoting the diffusion of renewable technologies. Indeed, of the marquee policy tools employed by the United States to promote renewables, virtually all are diffusion-centric. This includes, for transportation, both the renewable fuel standard and CAFE standards, and for electricity, PURPA, state RPSs, federal tax support, net metering rules, and, the Clean Power Plan. There is good reason for this. The United States' default to competition rather than central planning promotes price as a core value, so renewable technologies, which often have higher initial capital costs, start at a disadvantage against incumbent facilities whose capital costs were paid off long ago.[94)] Further, in electricity, the intermittency and non-dispatchability of renewable resources present engineering challenges that may require policy intervention to overcome.[95)] By definition, then, as a nation that operates as a participative representative democracy with a fundamentally capitalist economic system, renewable energy policies are likely to focus on the market-pull side of the technology valley of death more so than on the technology-push side.

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93) *Id.*

94) *See, e.g.*, Joseph P. Tomain, *"Our Generation's Sputnik Moment": Regulating Energy Innovation*, 31 Utah Envtl. L. Rev. 389, 391-92 (2011). Indeed, incumbent facilities, particularly the older ones, were built under a cost-of-service regulatory model that helped ensure they would recover their costs plus a reasonable rate of return. The fact that new resources, including renewables, must compete against these existing facilities, many of which paid off their initial capital costs long ago, is a barrier new sources must overcome—and part of why policies to promote them are diffusion-centric.

95) *See* Steven Ferrey, *Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure*, 39 Envtl. L. 977, 986-96 (2009); Jim Rossi, *The Trojan Horse of Electric Power Transmission Line Siting Authority*, 39 Envtl. L. 1015, 1041-42 (2009); *see also* Gunnar Birgisson & Erik Petersen, *Renewable Energy Development Incentives: Strengths, Weaknesses and the Interplay*, Electricity J., Apr. 2006, at 40, 42.

3. *Implementing Mechanism Type – Quantity-Focused*

Also because of the United States' preference for competition over government regulation, many of the mechanisms used to implement the nation's renewable energy policy tend to be quantity-, rather than price-, based. This is also partially a result of the general move over the last several decades in the United States to shift to market-based regulation.[96] That trend has heavily impacted environmental regulation, but it has carried over to energy law as well.[97] Thus, many of the main U.S. renewable energy policy tools use a similar mechanism: They set a mandate or target, and then allow the market to determine how to meet it. This is precisely what the renewable fuel standard, CAFE standards, and state RPSs all do. Of course, there are numerous other policy tools in place used to promote renewables, many of which are not quantity-based. But the prevalence of this device in some of the most critical policies is telling.

Again, electricity provides a good example of how quantity-based mechanisms to promote renewables have gained purchase in the United States while price-centered tools have had more difficulty gaining traction, and have sometimes foundered. PURPA, a price-based tool, was one of the first laws adopted in the United States to promote renewables, and it faced resistance from inception.[98] That resistance resulted in repeated, almost continuous calls for PURPA's repeal—with Congress, as noted, eventually constraining the statute's reach in 2005.[99] This stands in stark contrast to other nations, such as Germany and Spain, that during the same time period were expanding their use of price-based incentives to encourage renewable energy production through their feed-in tariffs (which, somewhat ironically, were effectively evolved versions of PURPA).[100] Likewise, another price-based

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96) David B. Spence, *The Politics of Electricity Restructuring: Theory vs. Practice*, 40 Wake Forest L. Rev. 417, 425-27 (2005).

97) *Id.*

98) Stanley A. Martin, *Problems with PURPA: The Need for State Legislation to Encourage Cogeneration and Small Power Production*, 11 B.C. Envtl. Aff. L. Rev. 149, 149 (1983).

99) *See supra* note 81 and accompanying text.

100) *Cf.* Volkmar Lauber & Lutz Mez, *Three Decades of Renewable Electricity Policies in*

mechanism for promoting renewables in the United States is net metering rules, which allow consumers to receive a discount on their electricity bills for power produced on-site (usually by renewables). As of March 2015, all but six states had net metering rules in place.[101] Still, while these rules could effectively act just like feed-in tariffs, which use clear price signals to encourage renewables installations, they do not function in that way. As their name implies, consumers who produce electricity under net metering rules generally can only receive a discount up to the amount of power they consume—they are compensated for the "net" of their consumption less their production, not for amounts they produce above their consumption.[102] This, then, significantly reduces the strength of the signal these rules send to promote renewable energy deployment. Moreover, virtually every state limits the size of systems that can be used to qualify for their net metering program, and many jurisdictions are now considering whether to continue their programs at all.[103]

By contrast, while price-based tools for renewable electricity have been neutered or otherwise limited, quantity-based mechanisms have taken flight. Perhaps the most important policy tool for renewables in effect in the United States today is the renewable portfolio standard, which, as of March 2015, thirty-seven states plus the District of Columbia had in place in some form.[104] RPSs, moreover, are significant not just because of the number of states that have adopted them, but also because of the rapidity with which they have begun to dominate the

Germany, 15 Energy & Env't 1, 1-2 (2004), *available at* http://www.wind-works.org/cms/uploads/media/Three_decades_of_renewable_electricity_policy_in_Germany.pdf.

101) DSIRE, *Net Metering*, http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2015/04/Net-Metering-Policies.pdf (last visited Sept. 7, 2015) [hereinafter, DSIRE, *Net Metering*].

102) Melissa Powers, *Small Is (Still) Beautiful: Designing U.S. Energy Policies to Increase Localized Renewable Energy Generation*, 30 Wis. Int'l L.J. 595, 634 (2012). Some states do, however, allow consumers to "carry forward" excess "credit" their production has earned them—for example, from summer months with high solar PV output to less sunny winter months.

103) DSIRE, *Net Metering*, *supra* note 101.

104) DSIRE, *Renewable Portfolio Standard Policies*, http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2014/11/Renewable-Portfolio-Standards.pdf (last visited Sep. 7, 2015) [hereinafter, DSIRE, *RPSs*].

renewable energy policy landscape. As of 1993, only one state, Iowa, had an RPS. Ten years later, that tally had increased to fourteen. In the ensuing decade, the number of RPS states exploded to its current level.[105] Today, RPSs are widely seen as the premier policy tool for promoting renewable electricity in the United States. Undoubtedly, they have gained much of that acceptance precisely because they are not price-based. States set their targets, and different technologies are free to compete to supply the mandated amounts of power－a strategy that comports with the free-market, anti-regulation ethos of much of American society. Thus, while wind power has dominated installations made to satisfy RPSs to date,[106] the fact that these laws are on their face technology-neutral often is credited with their success at being adopted into law in the first place.[107]

4. *Aggressiveness – Incremental But Increasing*

Characterizing the aggressiveness of U.S. renewable energy policy is difficult, in part because any such assessment is by definition qualitative and normative, and in part because the policies continue to change. Compared to those nations that are most bullish on renewables, the United States looks somewhat meek－and it is not difficult to find critics within the United States who believe the nation's policy is simply too weak.[108] Compared to its more recent past, however, the United States appears to be making progress. For instance, as noted, the portion of Department of Energy funding devoted to renewables and energy efficiency jumped

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105) Davies, *Race*, *supra* note 63, at 6.

106) Fredric C. Menz & Stephan Vachon, *The Effectiveness of Different Policy Regimes for Promoting Wind Power: Experiences from the States*, 34 Energy Pol'y 1786, 1793 (2006); Ringel, *supra* note 26, at 10.

107) *See, e.g.*, Mormann, *Enhancing*, *supra* note 34, at 692; Barry G. Rabe, Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards 7 (2006). For more on the politics of RPS passage, see Joshua P. Fershee, *When Prayer Trumps Politics: The Politics and Demographics of Renewable Portfolio Standards*, 35 Wm. & Mary Envtl. L. & Pol'y Rev. 53 (2010); Ming-Yuan Huang et al., *Is the Choice of Renewable Portfolio Standards Random?*, 35 Energy Pol'y 5571 (2007); Thomas P. Lyon & Haitao Yin, *Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation*, 31 Energy Journal 131 (2010).

108) *See, e.g.*, Elliott, *supra* note 12, at 10101;Amory B. Lovins, *Soft Energy Technologies*, 3 Ann. Rev. Energy 477 (1978).

substantially in the late 1970s and continues to grow today.[109] Likewise, the percentage of energy consumption in the United States coming from renewables has increased from 284.688 billion kilowatt hours in 1980 to 508.360 billion kilowatt hours in 2012.[110]

Nevertheless, when examining independent implementing tools, the aggressiveness of U.S. renewable energy policy might best be described as incremental. Pronouncements of a goal to reach 80 percent electricity production from renewables may make headlines in Germany, but they generally go unuttered, or are passed off as unrealistic, in the United States.[111] Instead, the most aggressive U.S. RPSs—like Hawaii's, which aims for 100 percent renewable energy production by 2045, or Vermont's, which aims for 75 percent by 2032[112]—are seen as the outlier rather than the norm. Indeed, most RPSs in the United States target 10 to 25 percent of electricity production from renewables, with even some of those facing resistance when they were passed and others acting as voluntary goals rather than mandates.[113] Likewise, federal efforts to adopt a national RPS have repeatedly failed, notwithstanding the fact that more than two-thirds of states have some form of these laws in place.[114] Similarly, on the transport side of our energy system, the U.S. Environmental Protection Agency (EPA) has expressly acknowledged that the renewable fuel standards set by Congress cannot be met, and it has established targets of between 9 and 10 percent for 2014, 2015, and 2016.[115] Even the Clean Power Plan, which the Obama administration has

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109) *See supra* Part III.B.

110) *U.S. Energy Administration, International Energy Statistics*, http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=6&pid=29&aid=2&cid=regions&syid=2009&eyid=2012&unit=BKWH (last visited Sept. 7, 2015).

111) Erneuerbare-Energien-Gesetz [EEG] [Renewable Energy Solutions Act], Apr. 1, 2012, Bundesgesetzblatt, Teil I [BGBl. I] § 1(2) (Ger.).

112) Haw. Rev. Stat. § 269-92 (2015); 30 Vermont Stat. Ann. §§ 8004, 8005. California's official goal is 33 percent, though many in that state's government will acknowledge they are actually aiming higher. Cal. Pub. Util. Code § 399.15 (2014).

113) DSIRE, *RPSs*, *supra* note 104; *see also* Davies, *Race*, *supra* 63.

114) *See* Mary Ann Ralls, *Congress Got It Right: There's No Need To Mandate Renewable Portfolio Standards*, 27 Energy L.J. 451, 452 n.11 (2006).

115) U.S. Envt'l Protection Agency, *Standards for 2014, 2015, and 2016, and the Biomass-Based Diesel Volume for 2017*, http://www.epa.gov/otaq/fuels/

finalized as a key plank in its effort to curb climate change, and which many proponents of renewable energy see as the most significant federal effort on renewables since PURPA, only aims at renewables in part. In order to preserve flexibility and give states leeway in designing their compliance strategies, the Clean Power Plan utilizes three building blocks for reducing climate emissions－and only one is renewables.[116]

5. *Stability* – *Cyclical*

Both in terms of its overall arc and from tool to tool, U.S. renewable energy policy is perhaps best characterized as cyclical in terms of its stability.[117] Support for renewables in the United States raced to a strong start in the 1970s as the nation responded to the global oil crises. That support sustained for some time, but waned by the 1990s as the regulatory focus shifted to restructuring and other concerns.[118] Today, particularly with the prevalence of state RPSs, increased attention on climate change, including issuance of the Clean Power Plan, renewable energy policy in the United States arguably is as strong as it has ever been. Certainly, the vast array of state and local initiatives in place to encourage renewable energy use would seem to indicate as much.[119] At the same time, the history of U.S. renewable energy policy ebbing and flowing raises the question whether it may recede again.

Moreover, individual policy mechanisms certainly have fluctuated－and continue to do so. The example typically given is the federal production tax credit,[120]

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renewablefuels/documents/420f15028.pdf (last visited Sep. 7, 2015).

116) U.S. Envt'l Protection Agency, *Clean Power Plan Final Rule*, http://www2.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule.pdf (last visited Sep. 7, 2015).

117) *See* Martinot et al., *supra* note 18.

118) *See id*.

119) DSIRE, *Summary Tables*, http://programs.dsireusa.org/system/program/tables (last visited Sept. 7, 2015).

120) Harrison Fell et al., Designing Renewable Electricity Policies to Reduce Emissions 9-12 (2012); Michael Mendelsohn & Claire Kreycik, Federal and State Structures to Support Financing Utility-Scale Solar Projects and the Business Models Designed to Utilize

which reduces the tax bill for renewable electricity facilities based on the amount of power they produce.[121] Studies have shown that when the PTC expires, which it has on several occasions in the past two decades, investments in wind facilities plummet.[122] Indeed, "in recent years, the window during which projects could qualify for the PTC has been extended for at most two to three years at a time, and, on four occasions since 1999, the credit has expired before being renewed."[123] This cycle of starting and stopping has clear effects on renewable energy investment, creating "boom-and-bust cycles for the renewable energy industry, constraining consistent growth in renewable energy capacity and complicating project supply chains… By failing to encourage steady, long-term investments in the case of the PTC, U.S. policies have not fostered stable industry growth."[124]

Likewise, other policy tools have experienced similar fluctuations over their lives. PURPA, as noted, had its scope significantly reduced in 2005.[125] Net metering policies, while quite prevalent, remain under active consideration and discussion in more than a dozen states across the nation.[126] The very reason the

Them 3-7 (2012); Martinot, *supra* note 18, at 2.

121) Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. § 2776, *amended by* American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. § 115; American Taxpayer Relief Act of 2012, Pub. L. No. 112-240, 126 Stat. § 2313; *see also* U.S. Dept. of Energy, *Renewable Energy Production Tax Credit (PTC)*, http://energy.gov/savings/renewable-electricity-production-tax-credit-ptc (last visited Sep. 7, 2015).

122) Lisa Chavarria, *Wind Power: Prospective Issues*, 68 Tex. B.J. 832, 834 (2005); *see also* Eric Lantz et al., Implications of a PTC Extension on U.S. Wind Deployment 3 (2014) ("Past PTC expirations have resulted in reductions in year-on-year installations between 73 and 93 %. … "); Ryan Wiser et al., Using the Federal Production Tax Credit to Build a Durable Market for Wind Power in the United States 5 (2007) (noting that frequent expiration of PTC credits have had "negative consequences for the growth of the wind sector"); Joanna Lewis & Ryan Wiser, *Fostering a Renewable Energy Technology Industry: An International Comparison of Wind Industry Support Mechanisms*, 35 Energy Pol. 1844 (2007) ("[T]he on-again, off-again nature of the federal production tax credit has created significant uncertainty in the market.").

123) Council on Renewable Energy, *Strategies to Scale-Up U.S. Renewable Energy Investment*, http://www.acore.org/images/uploads/Strategies-to-Scale-Up-US-Renewable-Energy-Investment.pdf (last visited Sep. 7, 2015).

124) *Id*.

125) *See supra* notes 80-87 and accompanying text.

126) National Conference of State Legislatures, *Net Metering: Policy Overview and State*

Obama administration issued the Clean Power Plan was because federal climate legislation failed to clear Congress; a national RPS was included in many of those bills, including Waxman-Markey, the bill that was widely acknowledged as the best recent chance for national climate legislation.[127] Even state RPSs, as popular as they are, have seen one statute repealed, last year in West Virginia.[128] Thus, while the overall assertiveness of U.S. renewable energy policy may be growing, and while many state measures may be somewhat more stable that federal initiatives like tax credits, the overall status of renewable energy policy in the legal landscape remains somewhat uncertain.

6. *Market Segment Focus – Mixed*

Just as U.S. renewable energy policy addresses both innovation and diffusion, it also aims both to harness the power of industry and to become participative. Overall, its focus may be on large players, but its efforts to make energy more distributed, smaller-scale, and community-based must be recognized.

Key U.S. statutes seek to integrate renewables by altering the existing architecture of the nation's energy systems. This is precisely what PURPA and state RPSs do. The former compels public utilities to buy power from renewables at incentive prices, and the latter sets the percentage targets that utilities must

Legislative Updates, Sept. 26, 2014, http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx; *see also* Larry Hughes & Jeff Bell, *Compensating Customer-Generators: A Taxonomy Describing Methods of Compensating Customer-Generators for Electricity Supplied to the Grid*, 24 Energy Pol'y 1532, 1534-35 (2006); Martinot, *supra* note 18, at 12.

127) *See, e.g.*, Lauren E. Schmidt & Geoffrey M. Williamson, *Recent Developments in Climate Change Law*, Colo. Law., Nov. 2008, at 63; Mary Ann Ralls, *Congress Got It Right: There's No Need To Mandate Renewable Portfolio Standards*, 27 Energy L.J. 451, 452 n.11 (2006). For an account of early national RPS proposals, see James W. Moeller, *Of Credits and Quotas: Federal Tax Incentives for Renewable Resources, States Renewable Portfolio Standards, and the Evolution of Proposals for a Federal Renewable Portfolio Standard*, 15 Fordham Envtl. L. Rev. 69, 131 (2004).

128) 2015 W. Va. Acts 55 (repealing West Virginia's Alternative Renewable Energy Portfolio Act, W. Va. Code § 24-2F (West 2009)); *see also* Donald Bryson & Jeff Glendening, *States Are Unplugging Their Renewable-Energy Mandates*, Wall St. J., Jul. 10, 2015.

meet in doing so. Likewise, the RFS requires gasoline manufacturers and distributors to blend into their fuels renewable energy, usually corn ethanol—again, targeting a very large industry.[129] Net metering rules, voluntary renewable energy purchase programs, and the Clean Power Plan all also set big, incumbent entities in their sights.

At the same time, in some ways U.S. energy policy seeks to promote a more participative energy system, and to change the shape and structure of competition within that system. PURPA, while leveraging the influence of big utilities, was adopted to increase competition in the generation segment of the electricity industry from new entrants.[130] Likewise, net metering rules, while telling utilities what power they must purchase, attempt to get regular citizens involved in power production.[131] And other efforts, like personal and property tax credits, or state rebate programs, aim at encouraging integration of renewables at the individual household or municipal level.

Table 2: U.S. Renewable Energy Policy in the Conceptual Model

Attribute	**Description of U.S. Policy**
Structure and Coordination	Disaggregated and fragmented
Technological Life-Cycle Stage Emphasis	Diffusion-centric but inclusive of innovation as well
Implementing Mechanism Type	Quantity-focused with only small elements of price-based tools
Aggressiveness	Incremental but growing in aggressiveness
Stability	Somewhat cyclical but variable in that regard depending on resource and policy type
Market Segment Focus	Heavily focused on large, incumbent, and archetype firms, though including some elements of energy democracy

129) Energy Policy Act of 2005, Pub. L. 109-58, title XV(a) § 1501, 119 Stat. 1067; *see also* Slating & Kesan, *supra* note 76; Reitze, *supra* note 72.

130) John Burritt McArthur, *Cost Responsibility or Regulatory Indulgence for Electricity's Stranded Costs?*, 47 Am. U. L. Rev. 775, 934 n.40 (1998).

131) *See, e.g.*, *Developing an Environmentally Conscious Energy Plan for New York*, 13 Fordham Envtl. L.J. 469, 487 (2002); Hughes & Bell, *supra* note 126, at 1535; William T. Reisinger, *Public Utilities Law*, 49 U. Rich. L. Rev. 137, 154-55, 2014.

Table 2 summarizes the key attributes of U.S. renewable energy policy, as seen through the lens of the conceptual model built in Part II.

Ⅳ. Putting U.S. Renewable Energy Policy in Context: Barriers, Coverage, and Gaps

While applying the conceptual model of renewable energy policies to the United States has utility in itself, it is also important to consider how the nation's policy addresses—or fails to address—existing barriers to renewable energy development and deployment. Fascinating work is already being done on this front, including pioneering efforts by Felix Mormann to apply finance theory to law and policy analysis.[132] His articles, as well as other efforts being conducted today, help create a roadmap for promoting renewable energy in the United States going forward.[133]

The purpose of this Part is twofold: first, to add to those efforts from the perspective of examining U.S. renewable energy policy as a whole; and second, to match the assessment of that policy developed in Part III against the various barriers that renewable energy development faces in the United States, which in turn may provide a blueprint for conducting similar analyses in other jurisdictions.

This Part proceeds in three steps. It first identifies barriers to renewable energy development in the United States. It then describes the ways in which U.S. renewable energy policy addresses or does not address those barriers. Finally, it identifies where gaps remain.

1. *Barriers*

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132) *See* Felix Mormann, *Beyond Tax Credits: Smarter Tax Policy for a Cleaner, More Democratic Energy Future*, 31 Yale J. Reg. 303 (2014) [hereinafter, Mormann, *Smarter*]; Mormann, *Enhancing*, *supra* note 34; Felix Mormann, *Requirements for a Renewables Revolution*, 38 Ecology L.Q. 903 (2011) [hereinafter, Mormann, *Requirements*].

133) *See generally, e.g.*, Doner, *supra* note 10; Beck & Martinot, *supra* note 10; Reinhard Haas et al., *Efficiency and Effectiveness of Promotion Systems for Electricity Generation from Renewable Energy Sources—Lessons from EU Countries*, 36 Energy 2186 (2011).

Descriptions of barriers to renewable energy development are much like categorizations of renewable energy policies. There are many ways to classify them, and how one does so often depends on the observer's particular perspective. Nonetheless, there tend to be many commonalities in the substance of the barriers identified, even if the particulars of the taxonomies used diverge.

Beck and Martinot, for instance, construct a comprehensive list that includes fourteen individual barriers grouped under three general headings.[134] The first set of barriers relate to the cost and pricing of renewables, which include subsidies for competing fuels, high initial capital costs of renewables, difficulty in risk assessments for fossil fuels, unfavorable pricing rules for renewables (including intermittency and near-load renewables), higher transaction costs for renewables projects, and legal failure to capture environmental externalities.[135] The second set of barriers are legal and regulatory and include the lack of a legal framework for independent power producers, restrictions on siting and construction, transmission access, utility interconnection requirements, and liability insurance requirements.[136] Finally, the third set of barriers identified by Beck and Martinot are market-related. They include lack of access to credit for renewables projects, perceived technology performance uncertainty and risk, and lack of technical or commercial skills or information.[137]

Similarly, Gerrard identifies six key impediments to renewables that fall roughly into three categories: technical challenges, financial hurdles, and legal and regulatory barriers.[138] For technical challenges, he identifies renewable intermittency and scale and timing problems as difficulties for renewable energy development.[139] Intermittency, he notes, is problematic in part because storage is

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134) Fredric Beck & Eric Martinot, *Renewable Energy Policies and Barriers*, 5 Encyclopedia of Energy 365 (2004).

135) *Id*. at 366-67.

136) *Id*. at 367-69.

137) *Id*. at 369-70; *see also, e.g.*, Joshua P. Fershee, *Struggling Past Oil: The Infrastructure Impediments to Adopting Next-Generation Transportation Fuel Sources*, 40 Cumb. L. Rev. 87 (2009-2010).

138) Gerrard, *supra* note 70, at 11-13.

139) *Id*.

expensive but also because transmission is underdeveloped in the United States, and because energy efficiency and demand response programs are inadequate.[140)] For financial hurdles, Gerrard identifies fossil fuel subsidies, capital availability, and the comparatively quick turnover of capital plant in renewables installations.[141)] Finally, for legal and regulatory barriers, Gerrard points to siting and environmental impacts as most problematic.[142)]

By contrast, Margolis and Zuboy attempt to rank non-technical renewable energy development barriers using a meta-analysis of other documents.[143)] Their list of barriers, from most commonly mentioned to least, includes: (1) lack of government policy support; (2) lack of information and consumer awareness; (3) high cost compared to conventional energy; (4) established energy system incumbency; (5) inadequate financing options; (6) failure to account for all costs and benefits of energy choices; (7) inadequate workforce skills and training; (8) lack of adequate codes, standards, and interconnection and/or net-metering guidelines; (9) public perception problems, including aesthetics; and (10) lack of stakeholder/community participation in energy choices.[144)]

Mormann, pointedly, takes a more investor-oriented perspective on the question of impediments to renewable energy development in the United States. He suggests that there are three broad categories of barriers: (1) innovation impediments, (2) barriers to market entry, and (3) non-market barriers to entry.[145)] The first category includes spillover effects (i.e., free-riding problems that lead to under-investment in renewable energy R&D), rate regulation rules that discourage in-house innovation, and difficulties in raising outside funding.[146)] The second category includes fossil fuel subsidies, a lack of product differentiation in electricity, and both physical and

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140) *Id.*

141) *Id.*

142) *Id.*

143) R. Margolis & J. Zuboy, Nontechnical Barriers to Solar Energy Use: Review of Recent Literature, National Renewable Energy Laboratory (Sept. 2006), http://www.nrel.gov/docs/fy07osti/40116.pdf.

144) *Id.* at 1.

145) Mormann, *Requirements*, *supra* note 132, at 912-28.

146) *Id.* at 914-18.

virtual barriers to entry in the electricity generation market (e.g., network interconnection, cost distribution for interconnection, and wholesale market structures).[147] The third category includes permitting processes, which can be lengthy and fragmented; spatial planning; and local acceptability.[148]

These classifications of renewable energy impediments are of course not exhaustive. Other commentators may suggest other classifications, rank the barriers in different order, or note additional hurdles not listed here. Notably, however, there is significant overlap in the impediments each of these observers identifies, suggesting that there is some agreement as to what matters for renewable energy development. Even if these lists do not create unanimous consensus, then, they are a good starting point for assessing which barriers to renewable energy development may be most important in the United States. Table 3 categorizes the barriers identified by the commentators highlighted here according to their commonalities.

Table 3: Renewable Energy Policy Barriers

Barrier Categories	**Examples from the Literature**
Comparative Cost of Renewables	Subsidies for conventional fuels High initial cost of renewables Failure to internalize externalities of conventional fuels High transaction costs for renewables projects
Incompatibility with the Incumbent Energy System and Market	Energy system incumbency Intermittency Non-dispatchability Transmission access Interconnection requirements Unfavorable pricing rules for renewables Lack of product differentiation
Inadequate Access to Credit and Capital	Lack of access to credit markets Perceived technology or performance risks
Social and Legal Barriers	Lack of policy support Siting and construction restrictions Lack of legal frameworks for new sources Lack of technical skills or workforce Environmental impacts (*e.g.*, endangered species) Lack of information and consumer awareness

147) *Id.* at 919-23.

148) *Id.* at 924-28; *see also* Doner, *supra* note 10, at 19; Beck & Martinot, *supra* note 10.

Insufficient Innovation	Inadequate government R&D support Free-riding problems that cause under-investment in renewable energy R&D Rate regulation rules discouraging in-house innovation

As Table 3 shows, the overall barriers to renewable energy development fall into five core categories. These are: (1) comparative cost, including fossil fuel subsidies and incomplete capture of conventional fuel externalities; (2) incompatibility with, or barriers of entry to, the incumbent energy system, including extant market structures, transmission and interconnection access, and renewable energy intermittency and non-dispatchability; (3) inadequate access to, or options for, renewable energy finance, credit, and capital; (4) social and legal barriers, including siting and permitting, workforce skills, and local or special interest resistance (*e.g.*, NIMBYism); and (5) insufficient innovation, including funding for innovation.

2. *Coverage*

Having identified the key impediments to renewable energy development in the United States, it is possible to map against those barriers the ways in which the nation's renewable energy policy addresses them. In this light, U.S. renewable energy policy appears remarkably incomplete. While the policy clearly is substantial, and continues to grow, it grapples only with some of the barriers that renewables face—and even then deals only with portions of the barriers it does address. When critics assert that the United States lacks a renewable energy policy, they thus may be referring to its aggressiveness, or lack thereof.[149] But they may just as well be referencing this fact: that while the policy seeks to encourage renewables, it only begins to do so and leaves large portions of the problems untouched. Whether the nation should go more all-in to promote renewable energy is of course a normative question that inevitably will be answered through the political system. But to the extent that transitioning the extant energy system to

149) *Cf., e.g.,* Ostrow, *supra* note 12, at 2008 n. 67 (recognizing the difference between a national "energy policy" and a "energy plan").

one based on clean energy is critical for addressing climate change, competing industrially in a global market, and promoting sustainability, U.S. policy remains inchoate.

As it stands, U.S. renewable energy policy primarily targets three of the five core impediments to renewable energy development. Most extensively, the policy has sought to address the concern that renewable energy technologies are often higher cost (or higher up-front cost) than conventional resources. This is precisely the aim of the arsenal of diffusion-side (market-pull) policies that Congress and state regulators have put in place. By encouraging more deployment of renewable energy facilities, these policies aim to scale up production, thus capitalizing on economies of size and scope and ultimately driving down the technologies' cost. Accordingly, laws such as PURPA, state RPSs, CAFE standards, and the RFS all target this barrier both directly and indirectly. They do so directly to the extent they mandate use of alternative energy sources, thus taking cost out of the equation. They do so indirectly by helping those technologies lower their costs over time. Similarly, tax incentives such as the PTC help level the playing field by making renewables more cost competitive in the short-term, which also can have long-term impacts.

Notably, environmental regulations also help level the economic playing field for renewables by forcing conventional energy sources to internalize the cost of their pollution. Whether these costs are fully internalized is a separate question, but certainly they have had an impact, as the steady decline in recent decades of U.S. electricity production from coal attests.[150] Heightened production costs from Clean Air Act regulation have been documented as shifting electricity—both in terms of the type of coal used, and from coal as the combustion fuel to other fuels such as natural gas.[151] To the extent that environmental regulation can be seen as part of U.S. renewable energy policy, this is worth noting. To be sure, the recently promulgated Clean Power Plan must be seen at least partially in this light. While

150) *E.g.*, Joseph P. Tomain, *Shale Gas and Clean Energy Policy*, 63 Case W. Res. L. Rev. 1187, 1201 (2013).

151) *E.g.*, Arnold W. Reitze Jr., *Federal Control of Carbon Capture and Storage*, 41 Envtl. L. Rep. News & Analysis 10796, 10814 (2011).

certainly not coterminous, climate regulation and renewables promotion go hand-in-hand. That is precisely why one of three building blocks recognized in the Clean Power Plan is renewables.[152] It is also why the Obama administration has expressly acknowledged that the Plan should promote further renewables development.[153]

The second primary barrier targeted by U.S. renewable energy policy is investment in innovation. As noted, the United States invests heavily in energy research and development, and increasingly so, particularly from a historical perspective, in renewable energy R&D. This is what government funding for renewable energy research, in all its various forms from direct grants to prizes to sponsorship of national laboratories, seeks to promote: new discoveries that may improve or create different ways to generate energy. Of course, renewable energy does not receive the majority of this funding, even when combined with energy efficiency research funds, a fact that only underscores the incremental nature of U.S. policy. Even more important, energy R&D in the United States generally lags well behind other areas, including national defense and health.[154] In short, "[c]ompared to its primary trading partners and competitors, such as Japan, Korea, France, and China, the United States spends the smallest fraction of its gross domestic product on energy RD&D."[155]

In some ways, U.S. renewable energy policy also has sought to erase the barriers that the incumbent electricity system presents. As with environmental regulation, some of these efforts have been in the name of renewable energy

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152) *See, e.g.*, Tomás Carbonell, *EPA's Proposed Clean Power Plan: Protecting Climate and Public Health by Reducing Carbon Pollution from the U.S. Power Sector*, 33 Yale L. & Pol'y Rev. 403, 410 (2015).

153) White House, *Fact Sheet: President Obama Announces New Actions to Bring Renewable Energy and Energy Efficiency to Households Across the Country*, https://www.whitehouse.gov/the-press-office/2015/08/24/fact-sheet-president-obama-announces-new-actions-bring-renewable-energy (last visited Sept. 8, 2015) (stating that President Obama's actions were part of his "commitment to create a clean energy economy for all Americans" and included goals to increase the share of renewable energy to 20 percent by 2030).

154) Mormann, *Requirements*, *supra* note 132, at 944-45.

155) *Id.* at 944.

promotion expressly, while others have been for different purposes, such as advancing competition, with the added benefit of aiding renewables. FERC, for example, has adopted standard rules for generator interconnections, which aim in part to improve renewable energy integration into the network.[156] Likewise, FERC's Order No. 1000 aims to make electricity grid planning more holistic and organized, including coordinating that process with state RPSs.[157] To the extent regional transmission (RTO) and independent system operator (ISO) rules assist in building out transmission to move renewables, which they already have in some wind-heavy regions, those rules also lower the incumbent utility wall against renewables integration[158] (just as FERC Order No. 888 opened up the grid to all competitors, including renewable generators).[159] And, Congress has made at least an initial pass at altering transmission line siting to assist renewables,[160] although those provisions are now largely considered inert.[161] Still, the point is not that

156) Large Generators: Order No. 2003, Standardization of Generator Interconnection Agreements and Procedures, 104 F.E.R.C. ¶ 61,103 (2003), 68 Fed. Reg. 49,846 (2003); Small Generators: Order No. 2006, Standardization of Small Generator Interconnection Agreements and Procedures, Order No. 2006, FERC ¶ 31,180, *order on reh'g*, Order No. 2006-A, FERC ¶ 31,196 (2005).

157) Order No. 1000, Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 18 C.F.R. Part 35 (July 21, 2011); *see also, e.g.*, Sean Farrell, *Federal Energy Regulatory Commission Order 1000: Summary of Issues, Requirements, and How It Affects Texas*, 14 Tex. Tech Admin. L.J. 119, 136 (2012).

158) *See, e.g.*, Illinois Commerce Comm'n v. FERC, 576 F.3d 470 (7th Cir. 2009); Illinois Commerce Comm'n v. FERC, 721 F.3d 764 (7th Cir. 2013), *cert. denied sub nom.*, Schuette v. FERC, 134 S. Ct. 1277 (2014); Illinois Commerce Comm'n v. FERC, 756 F.3d 556 (7th Cir. 2014).

159) Order No. 888, Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, F.E.R.C. Stats. & Regs. ¶ 31,036 (1996), 61 Fed. Reg. 21,540 (1996) (codified at 18 C.F.R. pts. 35, 385) [hereinafter, Order No. 888], *order on reh'g*, Order No. 888-A, F.E.R.C. Stats. & Regs. ¶ 31,048 (1997), *order on reh'g*, Order No. 888-B, 81 F.E.R.C. ¶ 61,248, 62 Fed. Reg. 64,688 (1997), *order on reh'g*, Order No. 888-C, 82 F.E.R.C. ¶ 61,046 (1998), *aff'd in relevant part sub nom.*, Transmission Access Policy Study Group v. FERC, 225 F.3d 667 (D.C. Cir. 2000), *aff'd sub nom.*, New York v. FERC, 535 U.S. 1 (2002).

160) *See* Piedmont Envtl. Council v. FERC, 558 F.3d 304 (4th Cir. 2009); California Wilderness Coal. v. U.S. Dep't of Energy, 631 F.3d 1072 (9th Cir. 2011).

161) *See generally* Santosh Sagar, *A Twenty-First Century Lazarus? The Demise and Possible Rebirth of FERC Backstop Siting Authority*, 37 Ecology L.Q. 693 (2010).

these policies are imperfect; that is inevitable, and certainly captured by the idea that U.S. renewable energy is definitionally incremental. The key point is that U.S. policy has at least begun to address this barrier as well.

3. *Gaps*

While U.S. renewable energy policy is significant, and increasingly so, it also is a work in progress. Thus, just as its coverage is extensive, so too are the gaps it leaves. Indeed, perhaps the greatest deficiency in U.S. renewable energy policy is that it may leave more gaps than it does implement mechanisms to counter renewable energy barriers.

In this regard, the policy's deficiencies are of two types. First, there are some impediments to renewable energy development that U.S. policy simply does not address. Most prominently, there is very little in the way of national policy that seeks to close the gap for renewable energy finance. To be sure, some efforts, including the production tax credit, the investment tax credit,[162] and renewable energy certificates, aim to provide greater revenue streams to renewable energy projects. However, such policy mechanisms might be seen more as efforts to address the comparatively high price of renewables than as direct financing efforts, particularly since part of the problem of insufficient capital for renewable energy projects is that they depend on tax equity. Nor does U.S. policy employ more aggressive―yet readily available―tax devices such as master limited partnerships or real estate investment trusts that could greatly improve renewable energy financ e.[163] Particularly in contrast to policies like feed-in tariffs, which guarantee remuneration to renewable energy projects based on estimated costs, the existing efforts at improving capital access for renewables in the United States seem paltry indeed.[164]

Likewise, U.S. renewable energy policy effectively does not address the many social and legal barriers these technologies face, such as promoting workforce

162) 26 U.S.C. § 48.

163) *See generally* Mormann, *Smarter*, *supra* note 132.

164) *See, e.g.*, Mormann, *Requirements*, *supra* note 132, at 728-33.

skills or addressing local resistance to renewable energy projects. In some ways, the former problem is a chicken-and-egg dilemma, because if the renewable energy market expanded, a more skilled workforce would quickly develop. Still, when the nation promotes other kinds of job training, the absence of such programs for renewable energy is notable. The announcement this year that AmeriCorps will be expanded to include a branch on resilience, including energy efficiency work in Anchorage, Alaska,[165] is truly laudable, but this is at most a beginning—and hardly sufficient to foster rapid growth of renewables nationwide. Moreover, on the question of legal and regulatory barriers for renewable energy siting, U.S. policy is clearly deficient. Siting for energy facilities remains firmly the jurisdiction of the states, so renewable energy developers face a mélange of possible regulations depending on when and where they seek to site their facilities. In other areas of industry, including natural gas pipelines and personal television satellite siting, Congress has stepped in, centralizing siting authority in one federal agency or preempting local regulation to clear the way for growth. For renewables, no such preference is yet law. This is not to say that renewables cannot grow without congressional favoritism. They already are. But the contrast between national treatment for other industries and renewable technologies says much about what U.S. renewable energy policy does and does not value.

The second type of deficiency is that when U.S. renewable energy policy addresses a barrier, it often does so incompletely. For example, numerous laws seek to level the playing field for renewables in terms of price, as noted.[166] But efforts to eliminate fossil fuel subsidies are basically nonexistent. Instead, for practical political reasons, the strategy in the United States typically has been to leave fossil fuel subsidies in place while seeking to add other subsidies for renewables. Likewise, while some electricity market rules help renewables compete with incumbent utilities, efforts to prioritize grid access for renewables, exempt them from balancing responsibilities, or maximize green marketing have received little, if any, serious attention to date.[167] And, when it comes to transportation,

165) *See* AmeriCorps, *Resilience AmeriCorps*, http://www.nationalservice.gov/programs/americorps/resilience-americorps.

166) *See supra* Part IV.B.

the market for petroleum is basically left to function based on competition alone, with any emphasis on renewables relegated simply to the RFS or other minor tax efforts for certain kinds of vehicles, such as electric cars.[168] Transmission is another example. Calls for greater investment in electricity transmission lines long have been repeated and loud, not only to promote renewables but for grid reliability and modernization reasons as well. Nonetheless, the compromise solution that passed Congress has been construed so narrowly by the courts, no one seriously suggests that it has hastened transmission siting.[169]

Thus, in terms U.S. renewable energy policy's assault on the development and deployment impediments that renewables face, the picture is much the same from this vantage as it is when the policy is assessed through the lens of a conceptual model. U.S. renewable energy policy has made some progress. But it is somewhat tentative and incremental. And if a transformation of the energy system is desired, the policy is certainly incomplete.

Ⅴ. Conclusion

Nearly four decades after it began to receive serious attention, U.S. renewable energy policy is stronger than ever—more prominent, more pervasive, and more likely to continue expanding than ever before. At the same time, this policy remains in sharp tension with overall U.S. energy policy, which heavily promotes low energy prices, abundant supplies, and incumbent, archetype firms and conventional fuels. Prospects for the nation's renewable energy policy to break free from this intertwined relationship seem slim, but the growing emphasis—and emerging executive actions—on climate change may help. As it stands, however, much of the innovation and movement in U.S. renewable energy policy over the last decades has arisen from the states. Whether that will change going forward

167) Mormann, *Enhancing*, *supra* note 34, at 948-58.

168) *See, e.g.*, John C.K. Pappas, *A New Prescription for Electric Cars*, 35 Energy L.J. 151, 182-88 (2014).

169) *See* Piedmont Envtl. Council v. FERC, 558 F.3d 304 (4th Cir. 2009).

remains to be seen.

U.S. renewable energy policy is typified by six core traits. It is deeply fragmented in its structure, with both states and the federal government playing a role, and with traditional energy regulators driving its course but environmental policymakers also entering the fray. However, it is holistic in its reach, as it promotes both renewable energy innovation and diffusion of existing technologies, although the policy's overall emphasis is more on the latter than the former. U.S. renewable energy policy also tends to use quantity-based tools rather than price-based mechanisms, although it employs some of both. In terms of aggressiveness, the policy is quite incremental, but it is growing in its overall assertiveness. Just as U.S. energy policy is not the most aggressive, it is also cyclical in its overall arc, waxing and waning depending on the times. Finally, the policy tends to target large entities, including incumbent utilities, refiners, and auto manufacturers, although it does include elements of energy populism and democracy as well.

Much insight might be gained by comparing nations' renewable energy policies against each other. This article constructed a holistic model that provides a template for that comparison, using the six traits of a policy's: structure and coordination; technological life-cycle stage emphasis; implementing mechanism type; aggressiveness; stability; and market segment focus. Surveying some of the key literature, the article also identified five core barriers to renewables, including: their comparative cost; their incompatibility with the incumbent electricity system and market; inadequate access to energy finance; social and legal barriers; and insufficient innovation. Because this article's focus is on the United States, it highlighted which of these barriers U.S. policy addresses and which the policy fails to address, but that exercise of mapping policy content against renewable energy obstacles is easily replicable for other nations.

The way the United States addresses renewable energy barriers is incomplete and fragmented. The nation's policy fails to address two of the key barriers to renewables—inadequate finance and social and legal barriers—really at all. And for those barriers it does challenge, it often does so only partially. The result is plain. Renewable energy in the United States often receives the moniker "alternative energy"—perhaps suggesting that these resources offer an alternative path to the one the nation is on, but perhaps implying that these technologies are fringe, somehow lesser than the conventional resources on which the nation for so long has relied.

It may be that renewables always remain alternative rather than mainstream in the United States. But if climate change, sustainability, resilience, and green growth are to be taken seriously, that view may need to flip. The United States long has prided itself as a leader in innovation and industry. The challenge of climate change, perhaps the most pressing issue of our time, clearly presents the question whether the nation can claim that title again in the context of renewable energy. If the nation's renewable energy policy is any indication, the answer remains quite unclear.

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<국문초록>

미국 신재생에너지 정책의 현황

Lincoln Davies*

본 논문은 미국의 신재생에너지 정책을 소개하고 개괄적으로 설명한다. 이는 관련 정책의 형태와 내용, 그리고 한계를 설명하는 것이며 특히 미국 경제에서 전기와 운송 두 부문에 집중하여 영향을 설명하고 있다. 이를 위해, 본 논문은 전세계 국가들의 에너지정책을 설명하는데 사용될 수 있는 개념적 모델을 설정하였다. 동 모델은 이미 만들어져 있는 신재생에너지 정책들에서 6가지 핵심적인 속성 즉, (1) 구조와 조정, (2) 기술적인 수명주기 단계 강조, (3) 이행 메커니즘의 유형, (4) 적극성, (5) 안정성, (6) 시장중심적 특징 등에 집중하고 있다. 동 모델을 적용한 결과, 본 논문은 미국의 신재생에너지 정책이 분산되어 있으며, 지방분권적이며, 수량 중심적이라고 평가한다. 또한 미국 재생에너지 정책은 조금씩이지만 그 강도가 증가하고 있으며, 다소 순환적이면서 동시에 일부 의무를 받은 대형 회사들에게 과하게 집중되어 발달하고 있다고 판단한다. 본 논문은 신재생에너지의 발전과 전개에 있어 5가지 핵심 장벽 유형을 확인하고 미국 정책이 이 중 어떤 장벽을 해결할 것인지에 대하여 논의하면서 마무리 지었다. 미국 신재생에너지 정책을 이러한 맥락 속에서 평가해 봄으로써, 본 논문은 미국 내 다른 주정부들간의 정책 비교뿐만 아니라, 다른 국가의 재생에너지 정책 평가를 할 수 있는 장을 마련한다.

주제어: 신재생에너지 정책, 청정에너지, 기후변화, 화석연료, 지속가능한 개발

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