Incentivizing Renewable Energy Deployment: Renewable Portfolio Standards and Feed-In Tariffs

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Abstract

Two legal instruments for promoting renewable energy production—renewable portfolio standards ("RPSs") and feed-in tariffs ("FITs")—are in use across the globe. Many studies pit these policies against each other, treating them as either-or options. Some analyses suggest that FITs have been more effective at increasing use of renewables-powered electricity. At the same time, nations using FITs have continued to modify their laws, and there is some empirical evidence that RPSs are effective at incentivizing renewables deployment. This article explains how FITs and RPSs work, surveys the empirical literature surrounding their implementation, and conceptualizes their mechanics. It suggests that the policy design of both FITs and RPSs are critical to their efficacy. Specifically, each type of law has several critical design parameters. For FITs, these are (1) the tariff price level, (2) price structure, and (3) payment duration. For RPSs, these are (1) the renewables target, (2) compliance speed, (3) jurisdictional reach, and (4) resource eligibility. The article concludes that, if designed properly, RPSs and FITs might be most effective if used in tandem as complementary instruments, rather than seen as mutually exclusive alternatives.

Keywords: Renewable Energy, Feed-In Tariff, Renewable Portfolio Standard, Electricity, Technology-forcing Regulation, Sustainability, Climate Change

Ⅰ. Introduction

In part because of climate change, interest in transitioning to renewable energy is again on the rise.[1] Arguments for increasing the use of renewables, of course, are not new.[2] Nevertheless, these calls have been only partly answered. In the United States, for instance, proportionate renewable energy consumption has barely budged in decades. Since the middle of last century, the percentage of energy consumption in the United States comprised of renewables has not exceeded ten percent even once—and that includes large hydroelectric production, which now is widely seen in the United States as a non-option for expanding renewable electricity production because of its significant environmental impacts.[3] Other nations also have lagged in transforming their energy economies.

To change this picture, governments increasingly are adopting legal devices that seek to promote renewables use. This article analyzes two of the leading devices: renewable portfolio standards ("RPSs") and feed-in tariffs ("FITs").[4] The article provides a conceptual, empirical, and legal overview of these devices. It outlines the comparative benefits of these laws, discusses their use, and highlights important policy design features of each. It concludes that

1. Renewable energy does not just offer climate change benefits. There are many reasons to transition to an economy founded more heavily on renewables. Haddad and Jefferiss have summarized at least six: (1) "[e]nvironmental benefits, including greenhouse gas mitigation;" (2) benefits from a more diverse generation fuel mix, including price and reliability rewards; (3) "readiness" benefits to prepare for possible fossil fuel (or other) supply disruptions or price spikes; (4) economic benefits from potential technology commercialization and exports; (5) long-term energy security and national independence benefits; and (6) "[s]ustainable-energy-path benefits" from reduced reliance on fossil fuels over time. Brent M. Haddad & Paul Jefferiss, *Forging Consensus on National Renewables Policy: The Renewables Portfolio Standard and the National Public Benefits Trust Fund*, 12 ELECTRICITY J. 68 (Mar. 1999).

2. *See, e.g.*, James W. Moeller, *Of Credits and Quotas: Federal Tax Incentives for Renewable Resources, State Renewable Portfolio Standards, and the Evolution of Proposals for a Federal Renewable Portfolio Standard*, 15 FORDHAM ENVTL. L. REV. 69, 83-84 (2004) ("[I]n the aftermath of the oil embargo of 1973 and the energy crisis that followed, and in connection with the 'moral equivalent of war' for U.S. energy independence precipitated by the crisis, the Carter administration and Congress moved to revise tax policy to promote the development, inter alia, of renewable resources for electric power production.").

3. For a relatively recent summary of fuel consumption in the U.S. electric sector, see Lincoln L. Davies, Essay, *Energy Policy Today and Tomorrow—Toward Sustainability?*, 29 J. LAND RESOURCES & ENVTL. L. 71, 78-80 (2009).

4. RPSs are also referred to as renewable energy "quotas" or "renewable obligations."

while governments tend to see these devices as mutually exclusive, they are not. RPSs and FITs are not either-or legal instruments; they can be used together, if there is sufficient political will to do so. However, the policy design of these laws matters, likely significantly, both for their chances of success and in how they are received.

The article proceeds in five parts. Part II provides a primer on these laws, conceptualizing where FITs and RPSs fall in the scheme of possible policy devices for promoting renewables. Part III summarizes where each mechanism is being used, and briefly surveys the literature on their performance. Part IV assesses possible design features, highlighting RPS and FIT policy elements that may be of most importance. That Part then briefly sketches an initial scheme for using FITs and RPSs in tandem. Part V concludes.

Ⅱ. Feed-In Tariffs and Renewable Portfolio Standards—A Primer

FITs and RPSs are effectively mirror images of each other. They both seek to accomplish the same objective—to increase renewables deployment—but they go about achieving that goal in different ways. RPSs mandate what must be achieved and leave how that is accomplished to the market. FITs mandate how the market must act but leave how much is accomplished to the consequences of those actions. RPSs, in other words, aim for clarity in policy goals. FITs target certainty in investment. Both try to get to the same place; each takes a different path to get there.

FITs and RPSs can also be seen from a climate change vantage. Because the laws are viewed at least in part as climate change solutions,[5] their impact on greenhouse gas emissions should be considered. From this perspective, FITs and RPSs might be thought of as the "corresponding . . . puzzle pieces" of direct greenhouse gas regulation.[6] Certainly one cannot expect to solve

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5. There is an increasing risk that this is all they are seen as. It is important, however, not to conflate these policies' various objectives. *See* Peter Radgen et al., *EPS, ETS, Renewable Obligations and Feed in Tariffs—Critical Reflections on the Compatibility of Different Instruments to Combat Climate Change*, 4 Energy Procedia 5814, 5820-21 (2011) ("A clear distinction should be made between emission reduction targets, technology development and market introduction of new technologies.").

6. The Postal Service, Such Great Heights, on Give Up (Sub Pop Records 2003).

climate change by using renewables-promoting legislation alone. Research has shown that renewables are not a "silver bullet" that will solve climate change; an all-hands-on-deck approach is needed.[7] FITs and RPSs do, however, complement efforts to directly limit greenhouse gases emissions; by definition, they seek to reduce the percentage of fossil fuel-fired electricity that society consumes.

Indeed, RPSs and FITs have direct counterparts in climate change legal tools. There are two primary mechanisms offered to counter climate change. First, there are cap-and-trade regimes, which limit the aggregate amount of GHG emissions permitted and then allow those with emissions permits to trade their allowances to meet this emissions ceiling most economically. Second, there are carbon taxes, which put a price on the emission of CO_2, thus forcing the cost of GHG-heavy activities to increase and, consequently, lowering total GHG emissions.[8]

RPSs are akin to cap-and-trade schemes. They set an aggregate target and then attempt to harness the market to achieve that objective. FITs are essentially the inverse of carbon taxes. Rather than saying that a socially negative activity—producing climate change emissions—is not priced highly enough, as a carbon tax does, FITs say that a socially beneficial activity—the production of electricity using renewables—should receive a higher price than it does today.

Because, however, so many different mechanisms have been used over the years to promote renewables, FITs and RPSs are perhaps best understood in that context, rather than the climate change one.[9] Part II.B places these laws in this conceptual milieu. Part II.C offers additional detail on how the two laws function in practice. First, though, Part II.A summarizes the reasons why governments choose to promote renewables at all.

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7. *E.g.*, Rob Socolow & Steven Pacala, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, 305 SCIENCE 968 (2004).

8. For summaries of climate policy innovations in the United States, see generally, for example, Cinnamon Carlarne, *Notes from a Climate Change Pressure-Cooker: Sub-Federal Attempts at Transformation Meet National Resistance in the USA*, 40 CONN. L. REV. 1351 (2008); David Markell & J.B. Ruhl, *An Empirical Assessment of Climate Change in the Courts: A New Jurisprudence or Business as Usual?*, 64 FLA. L. REV. 15 (2012); Arnold W. Reitze, Jr., *Electric Power in a Carbon Constrained World*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 821 (2010); Arnold W. Reitze, Jr., *Federal Control of Carbon Dioxide Emissions: What Are the Options?*, 36 B.C. ENVTL. AFF. L. REV. 1 (2009).

9. *See supra* note 5.

A. Rationales for Technology-Forcing Regulation—The Case of Renewables

Numerous rationales have been offered for promoting renewable energy technologies. To begin, there is a broad critique that energy law and environmental law, in the United States to be sure and often elsewhere as well, are too disconnected—dichotomous when they should be coupled.[10] This is a longstanding criticism, but one that is receiving increasing attention:

> It is clear . . . that energy has great impacts on the environment and thus should be more closely intertwined with environmental law. Energy law, with its economic focus, ironically leaves the environment largely to the side, viewed as one more cost of doing business. Until we move toward a more integrated legal approach, one that is able to combine and harmonize the goals of each area of the law, both our energy landscape and our natural landscape will continue to suffer.[11]

The trend, of course, over the past decades has been for energy law and environmental law to move closer together.[12] Nevertheless, given how far apart the two fields remain, seeking their unification may provide at least one reason for pushing harder on renewables promotion.[13]

Other justifications for promoting renewables rest squarely on what might be referred to as the "holy trinity" of energy regulation.[14] This is, first, eco-

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10. *See, e.g.*, Craig Anthony (Tony) Arnold, *Fourth-Generation Environmental Law: Integrationist and Multimodal*, 35 Wm. & Mary Envtl. L. & Pol'y Rev. 771 (2011); Lincoln L. Davies, *Alternative Energy and the Energy-Environment Disconnect*, 46 Idaho L. Rev. 473 (2010); Amy J. Wildermuth, *Is Environmental Law a Barrier to Emerging Alternative Energy Sources?*, 46 Idaho L. Rev. 509 (2010); Amy J. Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 Utah Envtl. L. Rev. 369 (2011).

11. Wildermuth, *The Next Step*, *supra* note 10, at 388.

12. *See, e.g.*, Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 Conn. L. Rev. 1339, 1345-56 (2010); Jim Rossi, *The Limits of a National Renewable Portfolio Standard*, 42 Conn. L. Rev. 1425, 1447 (2010).

13. Davies, *supra* note 12, at 1391-94; Rossi, *supra* note 12, at 1447-48.

14. The idea has dominated U.S. energy policy for decades, although the religious reference is my own. As Allan Wendt opined to Congress over twenty years ago, "A fundamental objective of U.S. energy policy is to assure an adequate supply of energy at reasonable cost

nomic security; second, resource independence; and third, environmental sustainability. Environmental protection historically has lagged in this trinity of energy regulation goals, and it is most prominently on this score that renewable energy advocates suggest they have something new to offer. As Professor Joseph Tomain has opined, the primary thrust of energy law in the United States has followed a "dominant" paradigm:[15]

> [U.S.] energy policy favors large-scale, high-technology, capital-intensive, integrated, and centralized producers of energy from fossil fuels. These archetype energy firms are favored over alternatives such as small solar or wind firms because energy policymakers believe that the larger firms can continue to realize economies of scale. Policymakers gamble that greater energy efficiencies can be achieved by archetype firms, rather than by alternative firms, through technological innovation, discovery of new reserves, and discovery of new energy sources. This belief may or may not be true. Nevertheless, it persists . . . .[16]

Thus, policies aimed at promoting renewable energy can be seen as seeking to overcome this "dominant model" of energy regulation. They are a different kind of gamble, one that emerging technologies can scale up in a way that makes them both more economical and more reliable, while offering environ-

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while avoiding undue dependence on any single fuel or supplier." E. Allan Wendt, *The Oil Market and U.S. Energy Security*, 86 Dep't St. Bull 51, 53 (statement made before the Senate Committee on Energy and Natural Resources, Mar. 25, 1986); *see also* Michael W. Grainey, *Recent Federal Energy Legislation: Toward a National Energy Policy at Last?*, 12 Envtl. L. 29, 34 (1981) ("Among the Department of Energy's responsibilities are . . . the assurance of an adequate and reliable supply of energy at the lowest reasonable cost."); *National Energy Strategy: A New Start: Before the Subcomm. on Energy and Power, H. Comm. on Energy & Commerce* (1991) (statement of Daniel Yergin noting national energy policy objectives of "cheap energy, secure energy, and clean energy"). For critiques of U.S. energy policy as focusing too heavily on the economic side of this equation, see generally, for example, Joseph P. Tomain, Ending Dirty Energy Policy: Prelude to Climate Change (2011); Amory B. Lovins, Soft Energy Paths: Toward a Durable Peace (1977); Lincoln L. Davies, *Beyond Fukushima: Disasters, Nuclear Energy, and Energy Law*, 2011 B.Y.U. L. Rev. 1937; Irma S. Russell, *The Sustainability Principle in Sustainable Energy*, 44 Tulsa L. Rev. 121 (2008).

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

16. *Id*. at 375.

mental benefits too.

Indeed, renewable energy advocates point out that these technologies can promote each of the three objectives of a holistic energy policy. Their use fosters economic stability, by easing reliance on fossil fuels that many argue are becoming scarcer,[17] or that can be subject to supply disruptions.[18] Likewise, nations that lead on renewables stand to benefit economically from exporting those technologies to others. Renewables also can offer greater energy security, because they are both more widely available and more widely dispersed than fossil fuels: Although they do so to different degrees,[19] the wind blows everywhere, the sun shines everywhere, biomass grows throughout the globe. And renewables clearly foster environmental protection, by reducing air, climate, and water pollution; extending the lifespan of nonrenewable resources; and lessening energy consumption's impact on human health

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17. Non-renewable resources, by definition, become scarcer as they are consumed. In the energy context, the debate has focused primarily on when the world will reach—or whether we already have reached—so-called "peak oil." For recent assessments on this topic, some quite critical, see, for example, Ugo Bardi, *Peak Oil: The Four Stages of a New Idea*, 34 ENERGY 323 (2009); Carlos de Castro et al., *The Role of Nonconventional Oil in the Attenuation of Peak Oil*, 37 ENERGY POLICY 1825 (2009); Brian Gallagher, *Peak Oil Analyzed with a Logistic Function and Idealized Hubbert Curve*, 39 ENERGY POLICY 790 (2011); Marian Radetzki, *Peak Oil and Other Threatening Peaks—Chimeras Without Substance*, 38 ENERGY POLICY 6566 (2010); Aviel Verbruggen & Mohamed Al Marchohi, *Views on Peak Oil and Its Relation to Climate Change Policy*, 38 ENERGY POLICY 5572 (2010). There are, of course, alternate resources to traditional crude oil, including oil shale, tar sands, and, most prominently, natural gas via fracking technologies. The former of these have lagged because of production costs; the latter faces increased environmental scrutiny. *See, e.g.*, U.S. Envtl. Protection Agency, EPA Releases Draft Findings of Pavillion, Wyoming Ground Water Investigation for Public Comment and Independent Scientific Review (Dec. 8, 2011), http://yosemite.epa.gov/opa/admpress.nsf/20ed1dfa1751192c8525735900400c30/ef35bd26a80d6ce3852579600065c94e!OpenDocument; Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115 (2009). In any case, even the most climate-friendly fossil fuel resources are not as benign from a carbon emissions perspective as renewables, which means that policy limits on greenhouse gases may serve as the largest constraints on these fuels' use.

18. *See generally, e.g.*, AMORY B. LOVINS & L. HUNTER LOVINS, BRITTLE POWER: ENERGY STRATEGY FOR NATIONAL SECURITY (1982).

19. *See, e.g.*, Nat'l Renewable Energy Lab., *Concentrating Solar Resources of the United States*, http://www.nrel.gov/gis/images/map_csp_national_lo-res.jpg; Nat'l Renewable Energy Lab., *Photovoltaic Solar Resources of the United States*, http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg; U.S. Dep't of Energy, *Wind Powering America: 80-Meter Wind Maps and Wind Resource Potential*, http://www.windpoweringamerica.gov/wind_maps.asp.

and life.[20]

Where renewables do not promote the traditional energy paradigm is on two fronts: efficiency and price. Though we use only a fraction of the energy that the sun delivers to the planet each day, current renewable technologies are notable for how far they lag behind fossil fuel technologies in terms of energy efficiency. Renewables tend to have lower capacity factors than other electricity generation technologies.[21] In part because of this, the cost of using renewables for electricity generation is generally higher than that of fossil fuels. For instance, the United States Energy Information Administration has estimated that the levelized cost of producing electricity using a new conventional combined cycle natural gas power plant would be $66.1/MWh (in 2009 USD), while the cost of a new conventional coal power plant would be $94.8/MWh.[22] By contrast, new onshore wind power, which historically has come closest to fossil fuels in terms of price, would average about $97/MWh.[23] Photovoltaic solar comes in at 210.7/MWh.[24] Thermal solar averages $311.8/MWh.[25] And biomass runs closer to $112.5/MWh.[26] Moreover, these figures are projected total production costs for new facilities. Older facilities that recouped their initial fixed costs long ago continue to operate "beyond their 'design life' due to their low capital and operating costs," driving their comparative production costs down.[27] In the United States, this includes a

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20. *See, e.g.*, A.K. Akella et al., *Social, Economical and Environmental Impacts of Renewable Energy Systems*, 34 RENEWABLE ENERGY 390, 391 (2009); Union of Concerned Scientists, *Backgrounder: Environmental Benefits of Renewable Energy*, http://ucsusa.wsm.ga3.org/clean_energy/renewable_ energy_basics/environmental-benefits-of-renewable-energy.html.

21. This is especially true when renewables are compared to baseload generation resources like coal and nuclear. *See* Energy Info. Admin., U.S. Dep't of Energy, *Average Capacity Factors by Energy Source*, http://205.254.135.7/cneaf/electricity/epa/epat5p2.html; *see also* Jim Rossi, *The Trojan Horse of Electric Transmission Line Siting Authority*, 39 ENVTL. L. 1015, 1042 (2009).

22. Energy Info. Admin., U.S. Dep't of Energy, *Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011*, http://205.254.135.24/oiaf/aeo/electricity_generation.html.

23. *Id*.

24. *Id*.

25. *Id*.

26. *Id*.

27. Steven Nadel, *Smart Energy Policies Through Greater Energy Efficiency*, 16 NAT. RESOURCES & ENV'T 226, 230 (2002).

large fleet of coal plants that serve as much of the nation's baseload generation.[28]

This disparity in production costs is part of what puts renewables higher in the "merit order," or "dispatch stack," than baseload electric generating resources like coal and nuclear. System operators use these resources only after they have tapped out others because they cost more to run. It also is perhaps the most substantial barrier that renewables face in replacing other resources in utilities' generation fleets. It is, in other words, why laws to promote renewables are needed once governments decide that using these resources is beneficial. Absent another legal mechanism that changes the cost comparison—by forcing a greater internalization of environmental externalities from fossil fuel combustion, for instance—renewables cannot catch up to other technologies.

Laws that promote renewables thus typically cite several justifications for their passage. One is a "market correction" rationale. It is that other laws do not adequately reflect the true cost of production, and therefore government intervention in the market is needed to promote renewables.[29]

Another is an "infant industry" justification. This posits that because fossil fuel technologies were developed in a legal regime that did not force internalization of social costs, they were able to reach economies of scale before renewable technologies could, thus reducing their costs to a point where emerging technologies will never be able to compete. Accordingly, government action is appropriate to push renewables past this initial hurdle, so they can get to a point where they compete on their own economic merit.[30]

In addition, there are "economic advantage" arguments for renewables promotion. These suggest that nations are in competition, and that those countries that succeed first in commercializing renewable technologies stand to

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28. Coal accounted for approximately forty-five percent of U.S. electricity production in 2010. Energy Info. Admin., U.S. Dep't of Energy, *Electricity Explained: Electricity in the United States*, http://www.eia.gov/energyexplained/index.cfm?page=electricity_in_the_united_states#tab1.

29. *E.g.*, Margaret Tortorella, Note, *Will the Commerce Clause "Pull the Plug" on Minnesota's Quantification of the Environmental Externalities of Electricity Production?*, 79 MINN. L. REV. 1547, 1547-49 (1995).

30. *E.g.*, David Zilberman et al., *On the Inclusion of Indirect Land Use in Biofuel Regulations*, 2011 U. ILL. L. REV. 413, 431; *cf.* Gershon Feder & Andrew Schmitz, *Learning by Doing and Infant Industry Protection: A Partial Equilibrium Approach*, 43 REV. ECON. STUD. 175, 175 (1976).

benefit economically by making early technological leaps.[31]

Finally, there is a "societal transformation" rationale. These arguments hinge on the notion that renewables can advance energy law's holy trinity better than extant generation resources do. More specifically, they contend that, economically or environmentally, we are currently on a societal path that is unsustainable—and that additional renewables use will push us in a more sustainable direction.[32] These arguments often note the limited nature of fossil fuels, such as the longstanding debate over whether we are now approaching (or have already reached) "peak" oil production.[33]

B. Technology-Forcing Regulation and Renewable Energy

Regardless of the justification cited, laws to promote renewables traditionally fall into four broad categories, at least in the United States.[34] First and perhaps most prominently, the United States government has devoted substantial funds to promoting the research, demonstration, and development ("RD&D") of renewable technologies. According to Department of Energy statistics, from 1948 through 2006, the federal government spent $26.3 billion on renewables and efficiency RD&D.[35]

Second, the government has used various subsidies, largely in the form of tax credits, to incent renewables use. Most well known on this score is the

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31. *E.g.*, Alan Miller & Adam Serchuk, *The Promise and Peril in a Restructured Electric System*, 12 NAT. RESOURCES & ENV'T 118, 148 (Fall 1997); Matthew O'Hollearn, Note, *The Iowa Power Fund: Making Iowa the Energy Capital of the World*, 14 DRAKE J. AGRIC. L. 221 (2009).

32. *E.g.*, TOMAIN, *supra* note 14; Gary C. Bryner, *The National Energy Policy: Assessing Energy Policy Choices*, 73 U. COLO. L. REV. 341, 342 (2002); John C. Dernbach et al., *Progress Toward Sustainability: A Report Card and a Recommended Agenda*, 39 ENVTL. L. REP. NEWS & ANALYSIS 10275, 10278 (2009); Russell, *supra* note 14.

33. *See generally, e.g.*, KENNETH S. DEFFEYES, HUBBERT'S PEAK: THE IMPENDING WORLD OIL SHORTAGE (2008).

34. For a useful compilation and assessment of laws and policies used to promote renewables in the United States, see generally THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES (Michael B. Gerrard, ed. 2011).

35. *See* KELLY SIMS GALLAGHER, DOE BUDGET AUTHORITY FOR ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION DATABASE FACT SHEET (June 2008), http://belfercenter.ksg.harvard.edu/files/FederalEnergyTechRDSpending19782009request_6_4_2008F.xls Carol Werner, Environmental and Energy Study Institute, *Subsidies: Historic, Current and the Skewing of Market Signals* 2 (July 29, 2005), http://www.eesi.org/files/energy_subsidies_072905.PDF.

"production tax credit" for wind and other renewable energies.[36]

Third, the United States has on occasion required the purchase of renewable electricity at above-market prices. These laws might be referred to "price and purchase" requirements. Most notable here is the Public Utility Regulatory Policies Act of 1978 ("PURPA"),[37] which was put in place in response to the energy crisis of the late 1970s but was gutted significantly by the Energy Policy Act of 2005 ("EPAct 2005").[38]

Fourth, some United States laws mandate the use of certain technologies. The Clean Air Act's oxygenated fuel requirement, for instance, was effectively a mandate for refiners to use either ethanol or the chemical methyl tertiary butyl ether ("MTBE") as a fuel additive in order to make their gasoline burn cleaner.[39] More recently, the federal renewable fuels standard has served as a mandate for biofuels consumption, including ethanol.[40]

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36. 26 U.S.C. § 45.

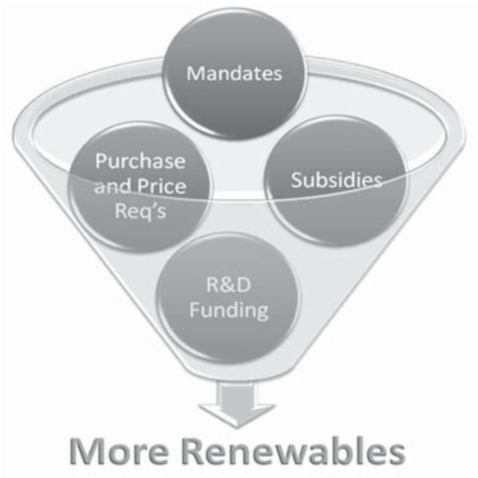
37. Pub. L. No. 95-617, § 2, 92 Stat. 3117, 3119 (codified at 16 U.S.C. § 2601–2645).

38. Pub. L. No. 109-58, 119 Stat. 594. For utilities operating in competitive markets, EPAct 2005 "repeal[ed] the mandatory purchase requirements" instituted by PURPA. 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).

39. 42 U.S.C. §§ 7545(m), 7512a(b)(3); *see* Andrew P. Morriss, *The Next Generation of Mobile Source Regulation*, 17 N.Y.U. Envtl. L.J. 325, 349 (2008); Arthur M. Reitze, Jr., *The Regulation of Fuels and Fuel Additives Under Section 211 of the Clean Air Act*, 29 Tulsa L.J. 485, 506-07 (1994).

40. Energy Independence & Security Act of 2007, Pub. L. No. 110-140, §202, 121 Stat. 1492, 1521-24 (codified at 42 U.S.C. §7545(o) (Supp. II 2009)); *see also* Jay P. Kesan & Atsushi Ohyama, *Understanding U.S. Ethanol Consumption and Its Implications for Policy: A Study of the Impact of State-Level Incentives*, 2011 U. Ill. L. Rev. 435.

Figure 1: Policy Instruments for Promoting Renewable Energy Technologies[41]



Each of these methods of promoting renewables is subject to criticism. RD&D funding, though beneficial, has not materially changed the nation's energy outlook. This may be due in part to the fact that similar funding for nuclear and fossil fuels has dwarfed that for renewables,[42] but it also can be taken as a general indictment of research funding as a renewables promotion device: If the market demand does not exist to drive technological development, it is possible that either the innovation will not occur at all or, at the least, that government is not the right entity to foment it. Likewise, the on-again, off-again nature of the wind production tax credit has been criticized as creating too much uncertainty.[43] And PURPA found itself in Congress'

41. This figure reflects the longstanding use of both command-and-control and market-based regulation. For more scholarship in this area, see generally, for example, David M. Driesen, *Is Emissions Trading An Economic Incentive Program?: Replacing The Command and Control/Economic Incentive Dichotomy*, 55 WASH. & LEE L. REV. 289 (1998); David Gerard & Lester B. Lave, *Implementing Technology-forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls in the United States*, 72 TECHNOLOGICAL FORECASTING & SOCIAL CHANGE 761 (2005); Till Requate & Wolfram Unold, *Environmental Policy Incentives to Adopt Advanced Abatement Technology: Will the True Tanking Please Stand Up?*, 47 EUROPEAN ECONOMIC REVIEW 125 (2003); Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83.

42. *See supra* note 35; Davies, *supra* note 3, at 78-79.

43. AM. WIND ENERGY ASS'N, WIND ENERGY FOR A NEW ERA: AN AGENDA FOR THE NEW PRESIDENT AND CONGRESS 8 (2009), *available at* http://www.newwindagenda.org/documents/Wind_Agenda_Report.pdf; RYAN WISER ET AL., USING FEDERAL PRODUCTION TAX CREDIT TO BUILD

crosshairs because utilities consistently complained that the law forced them to pay too much money for power from "PURPA machines" that did not fulfill the law's goals,[44] just as mandates like the CAA's oxygenate requirement and the renewable fuels standard have been charged with leading to perverse results.[45]

More salient here is where laws like FITs and RPSs fit within this legal rubric. The answer is plain. FITs clearly are the successor to price-and-purchase requirements like PURPA. As Professor Jim Rossi has noted, FITs are "similar to the approach of PURPA avoided costs, [because] such tariffs guarantee a stream of payments for developers of renewable projects."[46] Indeed, under PURPA, utilities were required to purchase electricity from renewables and certain other power producers—deemed "qualifying facilities" or "QFs" under the statute—at a price higher than the market cost of electricity—called the "avoided cost" in PURPA-speak.[47] By forcing the purchase of this power, and ensuring that QFs received an incentive rate for the electricity they produced, PURPA sought to encourage use of these facilities instead of utility-owned generation. FITs work essentially the same way, only rather than using the concept of "avoided costs," they either set the price ahead of time or tether it to a market rate plus an incentive adder.

RPSs also fit into a clear category of renewables-promoting laws. They are an example of technological mandates. RPSs function by setting a goal, or target, of renewables that those subject to the law must use. Although some RPSs in the United States are expressly or effectively voluntary, the vast majority are compulsory.[48] RPSs "work as mandates because they require electricity providers to obtain a minimum percentage of their power from renew-

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a Durable Market for Wind Power in the United States 5 (2007).

44. Hornstein & Stoermer, *supra* note 38, at 31.

45. *See generally, e.g.*, Arnold W. Reitze, Jr., *Biofuels—Snake Oil for the Twenty-First Century*, 87 Or. L. Rev. 1183 (2008).

46. Rossi, *supra* note 12, at 1436; *see also* Jonathan A. Lesser & Xuejuan Su, *Design of an Economically Efficient Feed-In Tariff Structure for Renewable Energy Development*, 36 Energy Policy 981, 982 (2008) ("FITs were first used in the guise of 'avoided cost' payment schemes mandated as part of [PURPA]."); Michael E. Streich, Comment, *Green Energy and Green Economy Act, 2009: A "FIT"-ing Policy for North America?*, 33 Hous. J. Int'l L. 419, 429 (2011) ("PURPA itself had characteristics like those of modern feed-in tariffs . . . .").

47. 16 U.S.C. § 824a-3.

48. *See infra* note 87 and accompanying text.

able energy resources by a certain date."[49] Thus, FITs and RPSs are complements. They both seek to promote use of renewables, but they go about that mission in different ways.

C. The Mechanics of Technology-Forcing Regulation—FITs and RPSs

Because RPSs and FITs differ in how they promote renewables, it is important to understand how each works. Researchers often refer to laws that force or promote specific technologies as either "technology push" or "market pull" measures. The difference is that the former tries to increase the supply of a given technology, whereas the latter tries to heighten demand for it. In other words, "technology pushing" regulation often seeks to bring new technologies out of infancy, while "market pulling" laws typically try to reduce production costs by, for example, moving the technologies from initial demonstration to full-scale commercialization. Professors Bürer and Wüstenhagen explain:

> [P]olicies to promote low-carbon innovation can basically be divided into technology-push and market-pull policies. The basic idea of technology-push policies . . . is to increase the amount of technology 'supply'. The rationale for market-pull policies . . . on the other hand is to increase 'demand' for new technologies and provide firms and consumers with economic incentives to apply them. There is a vivid debate among climate policy scientists and modelers as to which of the two approaches is more adequate to reach long-term mitigation targets . . . .[50]

RPSs and FITs are both "market pull" laws.[51] Each simply uses different

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49. Austin Conner, *Twenty Percent Wind Energy by 2030: Keys to Meeting the DOE's Goal*, 5 ENVTL. & ENERGY L. & POL'Y J. 130, 135 (2010).

50. 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 POLICY 4997, 4998 (2009).

51. Some RPSs "tier" their mandates, or create "set-asides" for specific resources, typically solar. *See, e.g.*, D.C. CODE § 34-1432(c); OHIO REV. CODE § 4928.64(B). These aspects of the laws edge closer to "technology push" measures, though they still operate by creating demand,

methods in its attempt to achieve the common goal of creating greater market demand for renewable energy technologies.[52] Specifically, FITs are a kind of "priced-based" regulation. To heighten demand, they change the price that will be paid for renewables-based electricity. RPSs, by contrast, are "quantity-based" laws. Rather than specifying a price for renewables, they dictate the amount of renewables that must be used and leave price setting to the market.[53]

1. Feed-in tariffs

Feed-in tariffs create demand by increasing the market price for specific technologies. "A feed-in tariff is a law that requires utility companies to pay a specified price for any renewable energy that is fed into the electrical grid."[54] Although feed-in tariffs could be used to promote any kind of technology, including, for instance, other possible climate change mitigation measures such as carbon capture and sequestration, they are usually enacted to promote renewables.

FITs function in two parts. First, the FIT includes a *price guarantee*. Through the FIT, the government sets the price that will be paid for electricity produced using renewable resources. Second, the FIT uses a *purchase obligation*. It requires utilities to purchase that power at the price the FIT sets.[55]

The two countries that are perhaps best known for their FITs are Germany and Spain. Spain's law started small in 1980. Under Law 82/1980 for the Conservation of Energy, Spain's initial FIT guaranteed a price for excess renewable energy supplied to the grid from generators 5 MW or smaller.[56] In

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and thus, are most accurately deemed "market pull" policies.

52. Lesser & Su, *supra* note 46, at 983 ("The basic premise of all renewable energy development policies is that they create demand that otherwise would not exist whatsoever or would not exist at desired levels under current market conditions.").

53. *See, e.g.*, Carlos Battle et al., Regulatory Design for RES-E Support Mechanisms: Learning Curves, Market Structure, and Burden-Sharing, MIT Center for Energy and Environmental Policy Research Working Paper 2011-011, at 2 (May 2011), *available at* http://web.mit.edu/ceepr/www/publications/workingpapers/2011-011.pdf.

54. Brian Jansen, *Community Wind Power: Making More Americans Energy Producers Through Feed-In Tariffs*, 20 KAN. J.L. & PUB. POL'Y 329, 330 (2011).

55. 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).

56. Pablo del Río González, *Ten Years of Renewable Electricity Policies in Spain: An*

1994, Spain extended the scope of this law under Royal Decree 2366/1994.[57] This regulation provided that renewable energy installations "with an installed capacity [of] less than 100 MW could sell their surplus electricity to distributors, which were obliged to buy it, at a price dependent upon electricity prices and other complements."[58] The Spanish law expanded again in 1998, when the government increased the price paid to renewable installations to include a premium on the market price.[59] Implementing regulations for this law also "[g]uaranteed grid access" for renewables producers.[60] Several later changes were then made to the law. Today, the Spanish FIT uses a price that is "tied to . . . the Consumer Price Index" and includes a "cap-and-floor system" that sets both maximum and minimum prices for renewable energy "support levels."[61]

A FIT's operative currency is certainty. Indeed, both of the FIT's regulatory mechanisms provide certainty to the market. A FIT creates price certainty by assuring project developers that they will receive either a set price or, sometimes, a price at some level above the market price. It also creates demand certainty. The FIT does this by guaranteeing that the power produced from eligible facilities will be purchased. This certainty is typically long-term. FIT payments generally are "guaranteed over a long period of time (usually 15 to 20 years), which increases investment security and allows for cost amortisation."[62] This is important because the long-term nature of FITs can induce investor confidence.

FITs have been hailed as the leading policy tool for promoting renewables.[63] "Feed-in tariffs," one recent study observed, "are increasingly considered the most effective policy at stimulating the rapid development of re-

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Analysis of Successive Feed-In Tariff Reforms, 36 ENERGY POLICY 2917, 2918 (2008).

57. *Id*.

58. *Id*.

59. *Id*.

60. *Id*.

61. *Id*. at 2919.

62. David Jacobs, *Fabulous Feed-In Tariffs*, RENEWABLE ENERGY FOCUS, July-Aug. 2010, at 28, 28.

63. *See, e.g.*, COMMISSION OF THE EUROPEAN COMMUNITIES, COMMUNICATION FROM THE COMMISSION: THE SUPPORT OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES 4 (Dec. 7, 2005) ; Helle Tegner Anker et al., *Wind Energy and the Law: A Comparative Analysis*, 27 J. ENERGY & NAT. RESOURCES L. 145, 174 (2009).

newable energy sources . . . ."[64] This is, in large part, because feed-in tariffs tie "payment to a particular project," which in turn removes the risk for that project.[65] Thus, once a developer signs on under a FIT, they know they will be paid for the duration of the contract offered under that tariff. The RPS, however, "ties the payment to an amount of generation," meaning that "projects carry risks in terms of price, volume and market for all generators."[66]

FITs also have been praised for breaking down barriers to small-scale, or "distributed," renewable energy generation. "Feed-in tariffs are effective at promoting community ownership because they eliminate the largest barrier to most community wind projects: finding a power purchaser."[67] Some see this as a beneficial development because distributed generation has potential to increase both the reliability and efficiency of our electricity system. If power is generated closer to where it is consumed, efficiency rises because less power is lost in transporting it from distant, centralized power installations. FITs thus gain importance because many legal impediments remain for distributed generation. As Professor Joel Eisen has observed, "The technology already exists to put solar photovoltaic (PV) panels on millions of homes, but we have paid inadequate attention to getting them there. . . . Overcoming the entrenched position of electric utilities . . . requires government support of firms that will take on the responsibility of offering residential homeowners solar panel systems."[68] Feed-in tariffs can provide some of this support.

2. Renewable portfolio standards

Renewable portfolio standards stand in contrast to FITs. Instead of focusing on investor risk reduction, RPSs zero in on aspirational clarity. They set

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64. Toby Couture & Yves Gagnon, *An Analysis of Feed-In Tariff Remuneration Models: Implications for Renewable Energy Investment*, 38 ENERGY POLICY 955, 955 (2010); *see also* Lesser & Su, *supra* note 46, at 982.

65. C. Mitchell et al., *Risk, Innovation and Market Rules: A Comparison of the Renewable Obligation in England and Wales and the Feed-In System in Germany*, at 20, *available at* http://www.worldfuturecouncil.org/fileadmin/user_upload/Miguel/Bauknecht_Mitchell_Connor__2002__Risk__Innovation_and_Market_Rules_-_A_Comparison_of_the_RO_and_the_EEG.pdf.

66. *Id.*

67. Jansen, *supra* note 54, at 330.

68. Joel B. Eisen, *Residential Renewable Energy: By Whom?*, 31 UTAH ENVTL. L. REV. 339, 340 (2011).

bright targets that must be met. In this way, RPSs offer a different kind of certainty than FITs. RPSs attempt to create certainty in terms of what will be accomplished—that is, in policy goals. RPSs thus might be considered as close to energy planning laws as they are to pure investment incentives.

Like FITs, RPSs also are composed of discrete parts. They have three. First, the RPS sets a *percentage target*. This target is the percentage of renewables that must be met by utilities and others subject to the law. It is typically measured in terms of a fraction of retail electric sales made to end users.[69] Second, RPSs define a *compliance timeframe*. This merely states the "due date" by which those subject to the law must meet the percentage target.[70] Third, RPSs establish a *compliance mechanism*. Most often, RPSs specify that companies can satisfy the law in one of three ways: by building new renewables facilities themselves, by purchasing renewables-generated power from someone else, or by obtaining the rights to renewable energy credits, sometimes also referred to as "renewable energy certificates" or "RECs," that represent power produced from a renewables installation.[71]

An RPS's utilization of renewable energy credits is particularly important because it allows the law to function more efficiently. If, for instance, an RPS stated that every electric producer in the jurisdiction had to meet a mandatory target of 25 percent renewables by 2025 but did not allow for REC use, compliance costs could rise unnecessarily. A small-scale company would need either to build its own facilities or to acquire power from others, who might know they could extract a high price because of the RPS requirement. If, however, RECs were allowed, the small-scale company would not be locked into this choice. It could instead purchase RECs on the open market from other utilities capable of producing more renewable energy at a lower cost. In short, RECs offer utilities "the most efficient way to meet the RPS . . . . The renewably-generated electricity goes into the grid just like electricity generated from any other source. But when energy from a renewable source enters the grid, the RPS administrator certifies that it was generated renewably and awards the generator a REC."[72]

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69. *E.g.*, HAW. REV. STAT. § 269-92(a).

70. *E.g.*, *id*.

71. *See, e.g.*, NEV. REV. STAT. § 704.7821(1); REV. CODE WASH. ANN. § 19.285.040(2)(a). Often, this is accomplished by allowing satisfaction of the RPS using RECs, but specifying that RECs may come from any of these identified resources.

72. Robin J. Lunt, Comment, *Recharging U.S. Energy Policy: Advocating for a National*

RPSs in the United States differ so much in their design characteristics that defining a "typical" RPS is elusive. Specifics aside, North Carolina's law is nevertheless fairly emblematic, structurally at least. It contains all three elements of an archetypal RPS. It states how much renewable energy must be used in percentage terms. It dictates when that target must be met. And it specifies how utilities can comply with the law.

The target and timeframe elements are set forth in Section 62-133.8(b)(1) of the North Carolina General Statutes. That section provides:

> Each electric public utility in the State shall be subject to a Renewable Energy and Energy Efficiency Portfolio Standard (REPS) according to the following schedule:

Calendar Year	REPS Requirement
2012	3% of 2011 North Carolina retail sales
2015	6% of 2014 North Carolina retail sales
2018	10% of 2017 North Carolina retail sales
2021 and thereafter	12.5% of 2020 North Carolina retail sales[73]

Section 62-133.8(b)(2) then establishes how utilities can comply with the law. It lists six options, which in substance conflate to the three identified above. Utilities in North Carolina can "meet the requirements of this section by any one or more of the following:"[74]

> a. Generate electric power at a new renewable energy facility.
> b. Use a renewable energy resource to generate electric power at a generating facility . . . .
> d. Purchase electric power from a new renewable energy facility. . . .
> e. Purchase renewable energy certificates derived from in-State or out-of-state new renewable energy facilities . . . .[75]

The RPS's flexibility should be immediately apparent. While FITs have

Renewable Portfolio Standard, 25 UCLA J. ENVTL. L. & POL'Y 371, 382-83 (2007).

73. N.C. GEN. STAT. § 62-133.8(b)(1) (2010).

74. *Id.* § 62-133.8(b)(2).

75. *Id.*

been lauded for the investor confidence they bestow, RPSs offer their own brand of certainty. They tell the market what the clear goal is for renewable energy production, and then let market participants decide the best way to get there. Because it is the entities already selling electricity that are most likely to have the best access to pertinent market information, including cost data, the RPS's greatest advantage may be that it allows this flexibility. Indeed, even those skeptical of the RPS as an effective policy instrument have praised the regulatory efficiency they can offer.[76]

Ⅲ. FITs and RPSs—Use and Effectiveness

Two basic metrics speak to the efficacy of feed-in tariffs and renewable portfolio standards. First, where these laws have been employed may provide some insight into which invokes more faith in its ability to succeed. This is, however, a rather crude measure. Many factors may account for which policy instrument a jurisdiction chooses, local politics prominent among them. More directly, then, a number of studies have attempted to directly weigh RPS and FIT performance, sometimes comparatively. This empirical data provides important information for jurisdictions considering, or beginning to implement, their own FIT or RPS.

A. FIT and RPS Use

In general, feed-in tariffs appear to be the legal instrument of choice for promoting renewables-based electricity generation,[77] although there are some indications that this tide is shifting. In Europe, both RPSs and FITs have been used, but the FIT is more common. Globally, the feed-in tariff also appears to predominate. The brightest exception to date is the United States, where FITs remain relatively rare and RPSs not only dominate but continue to become more common. One possible explanation for this reluctance to use FITs in the United States is that state governments have been the leaders on renewable energy and climate change legislation, and there are potential

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76. *See, e.g.*, Rossi, *supra* note 12, at 1449.

77. *See supra* note 64.

constitutional ramifications if sub-national governments adopt FITs.[78] Perhaps more likely, RPSs' dominance over FITs in the United States is rooted in political symbolism.[79] Although an RPS may have the same de facto economic effect as a FIT, and might distribute this effect more inequitably than a FIT,[80] the feed-in tariff sounds very much like a tax—an almost certain death knell in the United States, especially in the current political climate.[81] Nevertheless, some United States jurisdictions have adopted FITs, in addition to those nations that have done so abroad.

According to a 2010 study by David Jacobs, at least forty-eight countries have adopted feed-in tariffs worldwide.[82] This figure refers to national feed-in tariffs. In addition, three other nations—Australia, Canada, and the United States—have regional FITs that apply only in some parts of the country. Figure 2 summarizes the nations with FITs, according to Jacobs' survey. Countries in bright green have national FITs. Those in lighter green have regional FITs only. As can be seen, there is a high predominance of FITs in Europe, the second most in Asia, and much less so in Africa and the Americas.

78. For FITs, these are Supremacy Clause preemption problems, *see* Scott Hempling et al, *Renewable Energy Prices in State-Level Feed-In Tariffs: Federal Law Constraints and Possible Solutions*, Technical Report NREL/TP-6A2-47408 (January 2010), http://www.nrel.gov/docs/fy10osti/47408.pdf; *see also* Bradley Motl, Comment, *Reconciling German-Style Feed-In Tariffs with PURPA*, 28 WIS. INT'L L.J. 742 (2011), as opposed to the dormant Commerce Clause dilemmas that state RPSs face. *See infra* note 176 and accompanying text.

79. For fascinating analyses of why states adopt RPSs, including these laws' political drivers, 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 POLICY 5571 (2007); Thomas P. Lyon & Haitao Yin, *Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation*, 31 ENERGY JOURNAL 131 (2010).

80. *Cf.* Rossi, *supra* note 12, at 1433-36.

81. *See* Davies, *supra* note 12, at 1391.

82. Jacobs, *supra* note 62, at 29.

Figure 2: FIT Use Across the Globe[83]

Of the nations with regional FITs, uniformity is lacking on where the laws apply. In the United States, six states (or utilities operating in those states) and one federal power authority have FITs, according to Jacobs.[84] These are California, Hawaii, Michigan, Vermont, Washington, Wisconsin, and the Tennessee Valley Authority.[85] In Canada, New Brunswick and Ontario have FITs. Each of the six Australian states, and both of its territories, has its own feed-in tariff.[86]

In the United States, renewable portfolio standards rule. As of this writing, thirty-seven of the fifty states have an RPS. The District of Columbia also has an RPS, bringing the total to thirty-eight.[87] Figure 3 shows U.S. jurisdic-

83. This figure is based on Jacobs, *supra* note 62, at 29. Jacobs states that India has regional FITs, in addition to the national law.

84. *Id*. at 30.

85. *Id*.

86. *Id*.

87. *See* DSIRE: Database of State Incentives for Renewables & Efficiency, *RPS Policies* (June 2011), available at http://www.dsireusa.org/documents/summarymaps/RPS_map.pptx. DSIRE differentiates between states with renewable portfolio "standards," or mandates, and those with mere renewable portfolio "goals," or "RPGs." *See infra* note 94. Counting this way, DSIRE reports that twenty-nine states, the District of Columbia, and Puerto Rico have RPSs, while eight more states have RPGs. Because I regard a law's compulsoriness as only one element of its possible design, I lump RPSs and RPGs together, thus reaching a total of thirty-seven states plus the District of Columbia. This approach is sensible because an aggressive RPG might send just as strong a signal to renewable developers as a mandatory RPS with a very low target. Empirically, in other words, different elements of RPS design may have similar impacts on renewables deployment; separating RPSs and RPGs as distinct at the outset casts a normative judgment without evidentiary support. Puerto Rico is excluded from my tally because it is

tions with RPSs.

Figure 3: RPS Use in the United States[88]

Adoption of RPSs in the United States is a relatively recent phenomenon. In the early 1990s, very few states had RPSs. Since then, there has been a rush to implement these laws.[89] Notably, many southern states have not adopted RPSs. Some Midwestern states also were slow to adopt the laws, and Wyoming and Idaho, both Intermountain West states, have not enacted RPSs. The most recent state to adopt an RPS is Indiana.[90]

Most states have adopted mandatory RPSs. A significant minority of states, however, have passed laws that are either expressly or effectively voluntary.[91] For instance, Utah's law states that utilities need comply only to the extent it is "cost effective."[92] Likewise, Virginia explicitly acknowledges that its RPS merely erects aspirational goals.[93] Thus, some commentators distinguish between RPS types, referring to mandatory laws as RPSs and voluntary statutes

a U.S. territory rather than a state.

88. Perhaps the best—and most up-to-date—tracking of RPS and related legislation in the United States is DSIRE. *See* The Database of State Incentives for Renewable Energy (DSIRE), http://www.dsireusa.org/. This figure is based on DSIRE's tracking of RPSs in the U.S., *see* DSIRE, *supra* note 87, although analysis of the state laws has been performed independently. For a tracking of U.S. RPSs over time, see Davies, *supra* note 89.

89. *See* Lincoln L. Davies, *State Renewable Portfolio Standards: Is There a "Race," and Is It "To the Top"?*, 3 San Diego J. Climate & Energy L. (forthcoming 2011).

90. Indiana Code § 8-1-37-10.

91. *Compare* Davies, *supra* note 12, at 1386, *with* DSIRE, *supra* note 87.

92. Utah Code Ann. §§ 54-17-602(1)(a), 54-7-12(2)(c)(ii).

93. Va. Code Ann. § 56-585.2(D).

as "renewable portfolio goal[s]" or "RPGs."[94]

B. FIT and RPS Performance

Studies assessing the effectiveness of renewable portfolio standards and feed-in tariffs focus primarily on one of two criteria: renewable electricity installations and renewable energy production. Some studies attempt to isolate the efficacy of one policy or another—the RPS or the FIT—with the bulk of these assessments centering on RPSs. The majority of studies, however, attempt to weigh RPSs and FITs against each other, asking which is best at promoting renewables deployment.

In general, prior research points to feed-in tariffs as the most effective way to promote renewables. "Increasingly, [FITs], rather than minimum percentage requirements for [renewable energy technologies] used in the USA and Great Britain, have been argued to be a superior policy approach for promoting [renewables] . . . ."[95] Such observations are based almost exclusively on the record of success of some European FITs over the last two decades. As Ian Rowlands has noted, "[N]ot only is the greatest level of activity on renewable electricity occurring in countries with feed-in tariffs, but also . . . those countries that have abandoned feed-in tariffs (for example, Italy and Denmark) have subsequently experienced stagnation in their development of renewable electricity capacity."[96]

Thus, one 2005 study analyzed the growth in renewable generating capacity in four countries: Denmark, Germany, the Netherlands, and Spain. Using wind data, the study observed that in 1990, all four countries had similar amounts of renewable electricity production. By 2002, however, the three countries with feed-in tariffs—Denmark, Germany, and Spain—all surpassed the single state with an RPS: the Netherlands. In fact, Germany had almost 16,000 GWh of wind production, Spain had more than 8,000, and Denmark exceeded 4,000, while the Netherlands was stuck at closer to 1,000.[97] The

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94. DSIRE, *supra* note 87. For a summary of why one might consider RPGs and RPSs jointly, see *supra* note 87.

95. Lesser & Su, *supra* note 46, at 982; *see also* Couture & Gagnon, *supra* note 64, at 955.

96. Ian H. Rowlands, *Envisaging Feed-In Tariffs for Solar Photovoltaic Electricity: European Lessons for Canada*, 9 RENEWABLE & SUSTAINABLE ENERGY REV. 51, 56-57 (2005).

97. Marc Ringel, *Fostering the Use of Renewable Energies in the European Union: The*

study concluded, "It can be clearly seen, that the surge of wind power in the EU has clearly taken place in countr[ies] with feed-in tariffs. This implies . . . that the ecological effectiveness is not a decisive motivation for turning to quota models like green certificates."[98]

Butler and Neuhoff reached a similar conclusion in 2008, comparing wind energy installations in Germany and the United Kingdom. They also noted that between 1990 and 2006, German wind installations grew rapidly, while U.K. capacity increased some but not nearly as much. "[I]nstalled capacity of wind energy in Germany has risen from 48 MW in 1990 to . . . 20,622 MW by the end of 2006. In contrast, installed capacity of wind energy in the UK has remained low, increasing from 10 MW in 1990 to 1960 MW by the end of 2006."[99] Thus, "[i]n terms of both absolute capacity, and capacity compared to [the policy's] stated target," Butler and Neuhoff concluded that the German FIT was "more successful" than the U.K.'s policies.[100] Both of these conclusions comport with those of various other studies.[101]

The reason typically given for FIT success is that this legal instrument offers the market signals that investors need: certainty, stability, and risk reduction. "In theory, there should be no . . . difference" between the effectiveness of RPSs that use bidding techniques and FITs.[102] However, the relative efficacy of FITs, made apparent by empirical studies, "can be explained by the attraction of fixed prices, which project developers see as ensuring a safe

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Race Between Feed-In Tariffs and Green Certificates, 31 RENEWABLE ENERGY 1, 11(2006).

98. *Id.* at 10-11.

99. Lucy Butler & Karsten Neuhoff, *Comparison of Feed-In Tariff, Quota and Auction Mechanisms to Support Wind Power Development*, 33 RENEWABLE ENERGY 1854, 1858 (2008).

100. *Id.* at 1859.

101. *See, e.g.*, Reinhard Haas et al., *A Historical Review of Promotion Strategies for Electricity from Renewable Energy Sources in EU Countries*, 15 RENEWABLE & SUSTAINABLE ENERGY REV. 1003, 1026 (2011) (finding that "countries with feed-in tariffs as support scheme achieved higher effectiveness compared to countries with a quota/TGC system or other incentives" in deploying renewables); Janet L. Sawin, *National Policy Instruments: Policy Lessons for the Advancement and Diffusion of Renewable Energy Technologies Around the World*, Thematic Background Paper 3 (2004), prepared for the International Conference on Renewable Energies, Bonn, Germany, *available at* http://www.wind-works.org/FeedLaws/SawinWorldWatchTBP03-policies.pdf ("To date, feed-in—or pricing—systems have been responsible for most of the additions in renewable electricity capacity and generation . . . . The record of quota systems is more uneven thus far, with a tendency of stop-and-go, and boom and bust markets.") .

102. Philippe Menanteau et al., *Prices Versus Quantities: Choosing Policies for Promoting the Development of Renewable Energy*, 31 ENERGY POLICY 799, 811 (2003).

investment with better predictability and a stable incentives framework . . . ."[103] As Sawin puts it, both "quota" systems like RPSs and "pricing" systems like FITs subsidize the price of renewable electricity. "But pricing systems have provided increased predictability and consistency in markets, which in turn have encouraged banks and other financial institutions to provide the capital required for investment."[104]

Indeed, numerous studies have shown that "a long-term and stable policy environment" may be "the key criterion for the success of developing renewable electricity markets."[105] At the Korea Legislation Research Institute's July 2011 conference, *Architecting Better Regulation to Overcome Energy Crisis*, Vestas vice president Jannik Termansen referred to this as the industry's need for "TLC"—not "tender loving care" as the traditional idiom suggests, but rather, "transparent, long-term, and certain" laws and policies. As others have noted, policies aimed at promoting renewables must be "'loud, long, and legal' . . . : loud in the sense that they offer clear price signals and encourage public involvement; long in that they are consistent and predictable; and legal in that they are backed by strong political support and have penalties for noncompliance."[106] FITs can offer this because they typically are designed to guarantee payments on a long-term basis.

Thus, when asked what type of market-pull policies they prefer, a 2009 survey of venture capitalists who invest in green energy funds put feed-in tariffs in the clear lead.[107] Survey respondents were asked to rate twelve different policy instruments on a one-to-five scale, where a rating of one represented "very ineffective" and a five was "very effective."[108] Feed-in tariffs rated the highest of any option, with a mean score of 4.16.[109] By contrast, RPSs came in third to last, with a score of 3.27, while "renewable certificate trading" regimes, which are in essence a form of an RPS, scored second to last at a mean of 3.22.[110] These results are consistent with a more recent sur-

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103. *Id*.

104. Sawin, supra note 101, at 4.

105. Bürer & Wüstenhagen, *supra* note 50, at 4999.

106. *Id*. at 5002.

107. *Id*.

108. *Id*.

109. *Id*.

110. *Id*.

vey by energy researcher Benjamin Sovacool, who found that when asked "if they could choose only one single policy mechanism, which one would be most important?," nearly "two-thirds of respondents chose a feed-in tariff," compared to only "about 10 percent" who named an RPS.[111]

In contrast to studies juxtaposing FITs with RPSs, however, there is a body of research that zeroes in on RPS performance specifically. The results of this research are mixed. Some studies have suggested that state RPSs in the United States either have no effect, or may even have a negative effect, on renewables installations.[112] A recent study by Gireesh Shrimali and Joshua Kniefel perhaps typifies this research.[113] They found that RPSs affect renewables deployment, but vary in whether this effect is positive or negative depending on the resource at issue: "Renewable portfolio standards with either capacity or sales requirements have a significant impact on the penetration of all types of renewables—however, this impact is variable depending on the type of renewable source: it is negative for combined renewables, wind, and biomass; and positive for geothermal and solar."[114]

Others, however, have found a positive correlation between presence of an RPS and renewables growth. For instance, using recent wind installation data, Menz and Vachon concluded that RPSs "are effective in promoting the development of wind capacity."[115] Such findings are consistent with "anec-

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111. Benjamin K. Sovacool, *A Comparative Analysis of Renewable Electricity Support Mechanisms for Southeast Asia*, 35 ENERGY 1779, 1790 (2010). Other studies have suggested that feed-in tariffs also may be more cost effective than RPSs, despite the prevailing view that RPSs own the advantage of utilizing markets for implementation. *See, e.g.*, David Toke, *Renewable Financial Support Systems and Cost-Effectiveness*, 15 J. CLEANER PRODUCTION 280, 283 (2007) ("Compared to Britain or Texas, it may appear that German feed-in tariffs are expensive . . . . [However, once adjusted for capacity factors,] annual payments per kW of installed wind power are 30% lower in Germany compared to the UK."); *see also* Butler & Neuhoff, *supra* note 99, at 1857-58.

112. *See* Magali A. Delmas & Maria J. Montes-Sancho, 39 ENERGY POLICY 2273, 2273 (2011) ("When controlling for the context in which [RPSs] are implemented, we find that RPS[s have] a negative effect on investments in renewable capacity."); *cf.* Sanya Carley, *State Renewable Energy Electricity Policies: An Empirical Evaluation*, 37 ENERGY POLICY 3071, 3071(2009) ("RPS implementation is not a significant predictor of the percentage of renewable energy generation out of the total generation mix," although "for each additional year that a state has an RPS policy, they are found to increase the total amount of renewable energy generation.").

113. Gireesh Shrimali & Joshua Kniefel, *Are Government Policies Effective in Promoting Deployment of Renewable Electricity Resources?*, 39 ENERGY POLICY 4726 (2011).

114. *Id.* at 4726.

115. Fredric C. Menz & Stephan Vachon, *The Effectiveness of Different Policy Regimes*

dotal evidence and numerous case studies" of renewables deployment on the ground,[116] which note that since 2002, sixty percent of non-hydroelectric renewables installations in the United States were in RPS states.[117] In 2007, that figure was seventy-six percent.[118]

Notably, none of these studies took RPS policy design fully into account. They either used a binary variable that counted only whether a state had an RPS, relied on qualitative rather than statistical data, or, in the case of Shrimali and Kniefel, accounted only for the RPS's compulsoriness and target requirement.[119] These studies did not rigorously account for how strong—or how weak—a state's RPS was overall across all metrics, much less how the laws compared against each other. This is critical. Failure to account for RPS policy design risks masking the effect of a law's relative potency, which appears to vary substantially in the United States.[120]

In 2010, Haitao Yin and Nicholas Powers of the University of Michigan conducted a study that took RPS policy design into account. Yin and Powers found that accounting for policy design can change the results of the analysis substantially, because "some seemingly aggressive RPS policies in fact provide only weak incentives, while some seemingly moderate RPS policies are in fact relatively ambitious."[121] Measuring for these policy differences, Yin and Powers observed that RPSs do indeed promote renewables deployment:

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for Promoting Wind Power: Experiences from the States, 34 ENERGY POLICY 1786, 1794 (2006); *see also* Soji Adelaja & Yohannes G. Hailu, Effects of Renewable Portfolio Standards and Other State Policies on Wind Industry Development in the U.S., at 20 (unpublished manuscript 2008) ("[Our] results suggest that adoption and implementation of RPS would have a substantial positive effect on wind capacity installations, compared to states that do not adopt RPS legislation. RPS adoption alone, on average, would result in a 497.88 MW increase in annual capacity installation [increase]."), http://www.landpolicy.msu.edu/modules.php?name=Documents&op=viewlive&sp_id=775.

116. *Id*.

117. RYAN WISER & GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., RENEWABLE PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007, at 12 (2008), *available at* http://eetd.lbl.gov/ea/ems/reports/lbnl-154e-revised.pdf.

118. *Id*.

119. *See* Shrimali & Kniefel, *supra* note 113, at 4731.

120. Davies, *supra* note 12, at 1375-90.

121. Haitao Yin & Nicholas Powers, *Do State Renewable Portfolio Standards Promote In-State Renewable Generation?*, 38 ENERGY POLICY 1140, 1149 (2010).

> Using our new measure, we confirm that, on average, RPS policies have had a significant and positive effect on in-state renewable energy development. These results cast doubt on the argument that the passage of RPS policies has been purely symbolic, or that they have otherwise not been implemented. These findings are masked when differences among RPS policies are ignored.[122]

Yin and Powers' study drives home an essential message. When deciding how to promote renewables, it is not only the type of policy that is important, but also how that policy is written, that matters. Whether this observation can explain the discrepancy in performance of RPSs and FITs from one country to the next is an open question. The broader inquiry of policy design, however, is one that must not go unaddressed in drafting renewables legislation.

IV. FITs and RPSs—Policy Parameters and Design Considerations

The concept of an RPS is simple. The FIT is simpler still. Nevertheless, implementation of these laws demonstrates that their design can quickly become exceedingly complex. This is true for both types of renewables-promotion instruments, though perhaps more so for RPSs than FITs. This Part surveys some of the design considerations for each policy tool. It concludes by suggesting that irrespective of debates about which policy tool is most effective, a new path forward might be forged by using RPSs and FITs complementarily, in tandem.

A. FIT Policy Design

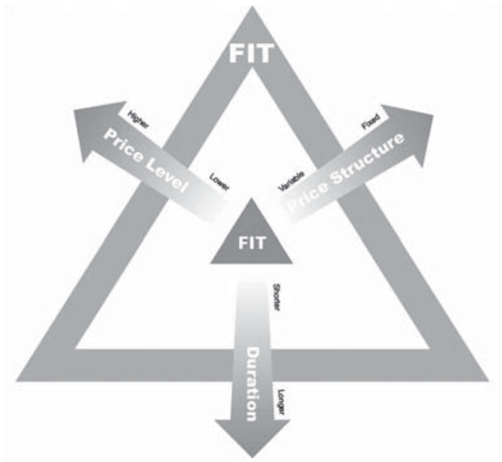
To be considered a feed-in tariff, it generally is presumed that the law must include a mandatory purchase obligation for the market to buy all power that qualifies under the tariff.[123] Conceivably, whether to include such a re-

122. *Id.*

123. Jacobs, *supra* note 62, at 28 ("In order to qualify for being labeled a feed-in tariff, the support instrument in place should consist of at least the following design options: a pur-

quirement could be considered the first policy design element of these laws, though many would argue that failure to include this requirement disqualifies the law from being counted as a feed-in tariff at all. Setting this aside, there are three primary design considerations for FITs: the tariff's price level, its price structure, and its payment length.

Figure 4: Elements of FIT Policy Design[124]



1. Price level

A feed-in tariff's price level is essential. If the price is too low, the FIT will not effectively incent renewables deployment. If it is too high, it risks granting generators windfall profits they do not deserve or, potentially, inciting political pushback against the program itself.[125] Ultimately, setting the FIT price

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chase obligation, and a stable tariff payment which is guaranteed over a long period of time."); *see also, e.g.*, Pierre Bull et al., *Designing Feed-In Tariff Policies to Scale Clean Distributed Generation in the U.S.*, 24 ELECTRICITY J. 52, 53-54 (Apr. 2011); Ringel, *supra* note 97, at 6; Rowlands, *supra* note 96, at 55.

124. This construct of possible FIT designs seeks to mirror the possibilities on the RPS side, as the statutory schemes also are reflections of each other. *See infra* note 155 and accompanying text; *see also supra* Part II. For more on FIT design, see, for example, Pablo del Río, *The Dynamic Efficiency of Feed-In Tariffs: The Impact of Different Design Elements*, 41 ENERGY POLICY 139 (2012); Lesser & Su, *supra* note 46.

125. Lesser & Su, *supra* note 46, at 982.

level is about balancing policy efficacy and efficiency.[126]

Policymakers typically refer to two options for setting a feed-in tariff price. These include a price based on "value" or, instead, one based on "cost."[127] A "value-based" FIT price seeks to reflect the environmental and economic benefits that society reaps from using more renewables.[128] It aims, in other words, "to securitize long-term grid, public health, and environmental benefits that clean distributed generation provide to a specific geographic area and/or location on the grid."[129] A "cost-based" FIT, by contrast, tethers price not to the value added by renewables use but to the cost of production for different types of renewable resources.[130] It seeks to "'fill[] the gap' between current electricity market rates and the installed costs of a given type of [renewable] generation technology," based on what that gap is for each technology.[131]

Either value-based or cost-based FITs can be used to target specific technologies. Indeed, because the cost of power production using renewables varies substantially by resource type, FITs often are written to match the price level of the technology in question. This is because production costs tend to decline with technological maturity, and the very point of a FIT is to push technologies farther along that cost curve. "In the short term, FITs are designed to encourage penetration of currently available [technologies], even though they are not mature enough to be [cost-competitive]. Over the long term, FITs are designed to promote the technological advancement of [technologies] so that they can compete directly without [government intervention]."[132]

2. Price structure

There are numerous ways to structure the price of a FIT. One set of commentators has identified at least seven, lumped into two broad categories of

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126. *Id.* at 981-82 ("Regardless of how policymakers evaluate [the various tradeoffs of a FIT], the policies they implement to encourage accelerated [renewable technology] development should be as economically efficient as possible.").

127. *See* Bull et al., *supra* note 123, at 53.

128. *See id.*

129. *Id.*

130. *See id.*

131. *Id.*

132. Lesser & Su, *supra* note 46, at 985.

"market-dependent" and "market-independent" structures.[133] These classifications are descriptive: Price structures that fall into the former tie the FIT price to a market price. Those of the latter set a price administratively, irrespective of the electricity market.

Each of these pricing structures has advantages and disadvantages. Market-dependent models are more likely to be efficient, because they are less likely to overcompensate renewable power producers. Market-independent structures, on the other hand, have the potential to be more effective at incenting renewables deployment, because they provide the greatest market certainty—the key feature of feed-in tariffs. It is for this reason that some observers have advocated FIT pricing structures that float with the market price, but are bounded by hard ceilings and floors—thus attempting to tap into the efficiency of market-dependent schemes while still providing certainty to investors. As Couture and Gagnon have written, "The problem of over or under compensation for renewable energy projects remains under the premium option as long as the premium offered remains fixed. This is one reason why certain jurisdictions such as Spain are beginning to move away from fixed premiums, and toward variable premium designs."[134]

a. Market-dependent structures

Market-dependent FIT structures include three primary types. First, there is a "premium" price model. This structure sets the FIT price level at a premium "adder" that fluctuates with the market price. Thus, the total FIT price is the market price plus this "adder": The total FIT price fluctuates with the market, but the adder does not change.[135] Although this methodology has been used at various points in Denmark, Germany, and Spain, it has been criticized as being "more costly per-kWh than fixed-price policies."[136]

Second, there is a "variable premium" price, recently adopted by Spain.[137] This is effectively the same as the traditional "premium" price model, only with a twist. Rather than always adding the premium to the market price regardless of what that price is, the premium here is set to ensure a minimum

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133. *See generally* Couture & Gagnon, *supra* note 64.

134. *Id*. at 962.

135. *Id.* at 960.

136. *Id*.

137. *Id.* at 960-61.

level of compensation but to max out if the market price goes too high. Thus, if the market price reaches a certain level, the premium declines to zero. However, if the market price goes too low, the premium increases, so that renewable power producers are always assured a given level of payments.[138]

Finally, some FITs have used a mechanism based on a "percentage of the retail price."[139] This model works just how it sounds. It bases the FIT price on a percentage of what the retail price of electricity is. Because retail prices are higher than wholesale prices, this is seen as awarding a premium to renewable producers, while still tying the price to market behavior. These mechanisms, however, have "fallen into disfavor," in large part because they lead to FIT price volatility and, correspondingly, lower investor security.[140]

b. Market-independent structures

Market-independent pricing mechanisms include at least four options. The first is a simple "fixed price."[141] This can be tied either to the value added by renewables or to their cost of production.[142] Generally, however, investment costs are used. The primary downside of this structure is that it asks regulators to set the level accurately over the life of the FIT. This requires knowledge, time, and prognostication. Further, if policymakers set the price too high, it can lead to windfall profits for renewables developers, creating a possible moral hazard of over-investment in these resources. Especially since earlier years may need higher prices to encourage deployment, but technology costs may well decrease in later years, FIT price-setting can be a perilous process.[143] For this reason, many jurisdictions have begun favoring alternate FIT pricing models.

The second market-independent mechanism is also a fixed price model, but "with full or partial inflation adjustment."[144] The advantage of this model is that it avoids the FIT potentially undercompensating producers in out years if

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138. *Id*.

139. *Id*. at 961.

140. *Id*.

141. *Id*. at 956.

142. *See supra* notes 129-131 and accompanying text.

143. Lesser & Su, *supra* note 46, at 982.

144. Couture & Gagnon, *supra* note 64, at 956.

costs increase. It has been used in France, Ireland, Ontario, and Spain.[145]

Third is the "front-end loaded model."[146] The idea is to encourage investment early on, but to ensure that resource-rich areas, such as those with very strong winds, are not overcompensated. Thus, "higher payments are offered in the earl[ier] years than in the later years, effectively skewing the cash flows in favor of the earlier years of the project's life."[147] Variations of this model have been used in Cyprus, France, Germany, Slovenia, and Switzerland.[148]

Finally, there is a "spot market gap" price model.[149] Effectively, this is the plain "fixed price" structure, only financed differently. In the fixed price model, ratepayers bear the cost of subsidizing renewable power producers no matter what. In the "spot market gap" model, the government pays the subsidy, thus passing costs off to taxpayers. The way this model works is that if the fixed price exceeds the retail spot market costs, renewable power producers receive that difference as a subsidy. If, however, the spot market price exceeds the fixed price, companies receive only the tariff price, even though the retail price of electricity has exceeded what they are receiving.[150] This methodology is now in effect in the Netherlands.[151]

3. Payment duration

The third question of FIT design—how long the tariff guarantees payment—also asks policymakers to balance certainty and efficiency. Most FITs guarantee payment for a period ranging from ten to twenty years.[152] What contract length to choose can be difficult. Longer payment periods are more likely to encourage investment, because funders know that a greater stream of revenues is available. However, longer periods also come with a greater

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145. *Id*. at 956-57.

146. *Id*. at 958.

147. *Id*.

148. *Id*.

149. *Id*. at 959.

150. *Id*.

151. *Id*.

152. *Compare* Jacobs, *supra* note 62, at 28 (noting contract lengths between 15 and 20 years), *with* Bull et al., *supra* note 123, at 53 (observing terms of 10 to 20 years).

risk of overcompensating participants, especially if technology costs drop over time, the very goal the FIT seeks to achieve. The question of contract length is thus analogous to the problem of FIT price level. "[P]olicies enacted today affect current and future R&D behavior, which in turn affects innovation rates and technological progress. Most importantly, these effects may be counterintuitive: increasing FIT rates may, in fact, *reduce* the rate of technological progress."[153] The same can be said for FIT term lengths. Instituting a FIT that guarantees payments for too long of a period risks disincentivizing efforts to bring renewable costs down. Setting the right length of FIT contracts is therefore critical, along with FIT price and pricing structures.

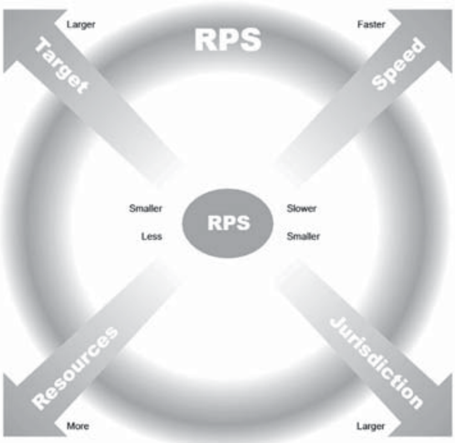
B. RPS Policy Design

RPSs have been written so many different ways, they almost defy categorization.[154] Nevertheless, like FITs, every RPS bears several primary traits. For RPSs, there are arguably four: (1) the ultimate target the law sets, (2) the speed at which the law calls for meeting that target, (3) how widely and deeply the law casts its jurisdictional net, and (4) what resources the law counts. Together, these design factors can impact both how effective and how efficient the RPS is.

153. Lesser & Su, *supra* note 46, at 985.

154. Some U.S. states, for instance, apply varying RPSs depending the type of electric provider. *See, e.g.*, UTAH CODE §§ 54-17-601 et seq.; 10-19-101 et seq. (different requirements for investor-owned utilities, cooperatives, and municipalities). Others create "tiers" of resources that must be used. *See, e.g.*, CONN. STAT. § 16-245a. And this is only the tip of the iceberg. The variety in U.S. state RPSs is so great, it is almost dizzying. *E.g.*, Davies, *supra* note 12, at 1375-90. A single example of but one design element of one state's law—the penalty structure in Maryland's RPS—illustrates the point: It demands algebra to compute how aggressive the penalty is. *See* MD. PUB. UTIL. CODE § 7-705.

Figure 5: Elements of RPS Policy Design[155]



1. Targets

RPS targets can vary considerably. One recent analysis showed that some RPSs set targets very close to or barely above zero, while others, most notably California and Hawaii, now seek to ensure that levels as high as thirty-three and forty per cent of their states' power is generated using renewables.[156] How high an RPS target is can affect the degree to which the RPS might change a jurisdiction's energy landscape. Obviously, a law that seeks to supply a third of the jurisdiction's power using renewables is more likely to incite renewables deployment than a law that aims only for two or three percent.

One factor that may affect RPS performance is not simply how high the target is set, but what the effective amount of that target is. Consider an example. Two states, state A and state B, might both enact RPSs with a twenty percent target. If, however, state B allows the grandfathering of existing renewable electricity but state A does not, state A's *effective* target immedi-

155. This conception of RPS design is my own. On this front, there are virtually as many possibilities as there are laws; one might conceive numerous other ways of parsing RPS policy design. For other discussions of RPS design, see Davies, *supra* note 12, at 1357-63; Davies, *supra* note 89; NANCY RADER & SCOTT HEMPLING, THE RENEWABLES PORTFOLIO STANDARD: A PRACTICAL GUIDE (2001), available at http://www.naruc.affiniscape.com/associations/1773/files/rps.pdf.

156. Davies, *supra* note 89; *see* Cal. S.B.X1-2 (2001), *amending* CAL. PUB. UTIL. CODE § 399.15(b)(2)(B); HAW. REV. STAT. § 269-92(4).

ately becomes much higher. This is especially true if state B has substantial renewable resources that are already consumed in-state—a number of large dams, for example—that also count toward its twenty percent goal. In that case, state B's effective target might actually be zero, or negative even, when on the surface it looks equally ambitious as state A's.[157] The same can be said if state A adopts a mandatory RPS, but state B's is merely a voluntary goal. Again on this score, state A's target is much "harder" than state B's.

This kind of regulatory sleight of hand is what some commentators have referred to as "salience distortion":[158] the facial representation of an aggressive goal that, in fact, is not aggressive at all. Salience distortion thus must be taken into account when measuring RPS vigorousness.[159] There are a number of ways that RPSs might include a large amount of salience distortion. Among others, these include the kind of grandfathering or voluntariness just discussed, along with counting nonrenewables such as clean coal and nuclear technologies,[160] awarding extra credit for some renewable resources,[161] and requiring only the installation of new capacity rather than actual energy production.[162] To some degree, virtually every RPS in the United States includes one of these kinds of salience distortion.[163]

157. One might lodge this criticism against Maine's RPS, which initially looked aggressive in demanding thirty percent renewables, but which also counted substantial existing hydroelectric resources toward that goal. *See* Joshua P. Fershee, *Moving Power Forward: Creating a Forward-Looking Energy Policy Based on a National RPS*, 42 CONN. L. REV. 1405, 1409 (2010); *cf.* Robert J. Michaels, *National Renewable Portfolio Standard: Smart Policy or Misguided Gesture?*, 29 ENERGY L.J. 79, 102 & n.93 (2008). Maine later increased its RPS target to forty percent. *See* 35-A MAINE REV. STAT. ANN. § 3210(3) & (3-A).

158. Daniel Kahneman, *Maps of Bounded Rationality: Psychology for Behavioral Economists*, 93 AM. ECON. REV. 1449, 1468 (2003); Christopher L. Peterson, *Usury Law, Payday Loans, and Statutory Sleight of Hand: Salience Distortion in American Credit Pricing Limits*, 92 MINN. L. REV. 1110, 1114-15 (2008); Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124, 1131 (1974).

159. Davies, *supra* note 12, at 1361, 1387.

160. *E.g.*, INDIANA CODE § 8-1-37-4.

161. *E.g.*, MICH. COMP. LAWS ANN. § 460.1039.

162. *E.g.*, TEX. UTIL. CODE § 39.904. For a fuller discussion of salience distortion in RPSs, see Davies, *supra* note 12, at 1361.

163. Davies, *supra* note 12, at 1387-89.

2. Speed

A related question is not just what the RPS target is, but how fast compliance with that target must be reached. Again, one would think that a faster compliance speed, all else equal, would be more likely to push deployment than a slower requirement. Many RPSs seem to take this approach. Only one RPS adopted in the United States has allowed for more than 20 years for compliance to be reached.[164] A full dozen RPSs, or their amendments, have allowed for 5 years or less.[165] Overall, the average amount of time allotted for compliance in the United States is 10.5 years.[166]

One potential risk of setting a faster time for compliance, however, is that getting too aggressive may doom the law to failure before it even gets off the ground. That is, if an RPS demands compliance in an unrealistic timeframe, it may guarantee noncompliance because utilities simply will not be able to meet what the law asks. In this way, the speed of RPS compliance might be considered analogous to the price level and payment duration features of FITs. Putting in place a fast compliance mandate may have counterintuitive effects: If utilities know they cannot comply with a law, they might not really try. Indeed, there is some evidence that this consideration has come into play. Many RPSs in the United States have been amended numerous times. Of those amendments that increased the RPS's target, more than two-thirds granted additional time—above and beyond what was previously allotted—for reaching compliance.[167] Specifically, the amendments in question increased RPS targets by a mean of 9.9 percent, but they granted an average of 5.9 more years for companies to satisfy the RPS mandates.[168]

3. Jurisdiction

Another question of RPS design is how far to extend the law's jurisdiction. Within this question, there are three embedded issues. First is what utilities

164. Davies, *supra* note 89.

165. *See id*.

166. *See id*.

167. *Id*.

168. *Id*.

the law should apply to.[169] In the United States, there are a number of types of electricity providers. These include traditional investor-owned utilities ("IOUs"), which are in most cases the incumbent providers that historically were regulated, vertically integrated natural monopolies that owned and supplied all elements of electricity production (generation, transmission, and distribution). There are also municipal providers ("munis") and cooperatives ("co-ops"), both of which tend to be smaller than IOUs. Finally, there are now a number of competitive retail electric suppliers, who aim at gaining part of IOUs' market share.[170] Potentially, an RPS could be written to apply to only one of these classes of providers. Most if not all RPSs in the United States apply to IOUs. A number of RPSs include all retail electric providers within their grasp. But some exclude munis, co-ops, or both, while others create separate requirements for these smaller classes of companies.[171] Thus, according to the DSIRE data, RPSs cover almost ninety percent of customer demand in the states where the RPSs apply—a high number to be sure but, clearly, not all customers.[172]

Second, there is a question of geographic jurisdictional breadth. Almost all state RPSs allow for REC use, but a few do not.[173] This device has the potential to make the RPS function more efficiently, but it also risks incentivizing deployment of renewables in a state other than the one that enacted the RPS. That is, if not all states have an RPS, state A's RPS might encourage a utility to build in state C, which does not have an RPS at all, and sell that power back into state A. Because RPSs typically count compliance in terms of electrons consumed, this would be entirely permissible—but not garner state A the benefits it seeks from having facilities built within its borders.[174] For the

169. *See* Davies, *supra* note 12, at 1360-61.

170. For more on retail competition in the electricity sector in the United States, see, for example, U.S. Fed. Trade Comm'n, Competition and Consumer Protection Perspectives on Electric Power Regulatory Reform: Focus on Retail Competition (2001), http://www.ftc.gov/reports/elec/electricityreport.pdf. For more on competition and electricity restructuring generally, see David B. Spence, *Can Law Manage Competitive Markets?*, 93 Cornell L. Rev. 765 (2008).

171. *See* Davies, *supra* note 12, at 1388-89, 1402; Davies, *supra* note 89.

172. DSIRE: Database of State Incentives for Renewables & Efficiency, *Quantitative RPS Data Project*, http://www.dsireusa.org/rpsdata/index.cfm. For this Article, data from DSIRE's June 2011 spreadsheet were used; *see* Davies, *supra* note 89 (discussing this data).

173. Davies, *supra* note 12, at 1378.

174. *Id*. at 1368-70.

same reason, a number of state RPSs include restrictions on where the power used to comply with their RPSs can come from.[175] Although such limitations raise strong constitutional questions,[176] they aim, at least in part, to ensure the efficacy of the law: its promotion of new renewable energy facilities, rather than a mere shifting of green electrons around the grid.[177]

Third, different states use different mechanisms to ensure compliance with their RPSs.[178] This enforcement issue is a matter of jurisdictional design because it dictates how the law will be carried out. Typically, RPSs in the United States give jurisdictional power to the state public utility commission. Many, though certainly not all, of these agencies require advance planning, after-the-fact compliance reports, or some combination of the two.[179] They often but not always have penalty authority if utilities do not comply with the law.[180] However, where this penalty level is set is critical. If it is too low, it creates a perverse incentive: payment of a fine rather than construction of new renewables installations. In fact, some states even refer to their penalties as "alternative compliance payments."[181] For this reason, RPSs might, at least from one perspective, actually be seen as FITs—with their penalty amounts acting as effective tariff levels.

4. Resources

The final, core question of RPS design is which resources count as renewable. On one level, this question is easy. Essentially every RPS in the United

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175. *Id*. at 1379-82.

176. *See, e.g.*, Nathan E. Endrud, Note, *State Renewable Portfolio Standards: Their Continued Validity and Relevance in Light of the Dormant Commerce Clause, the Supremacy Clause, and Possible Federal Legislation*, 45 HARV. J. ON LEGIS. 259, 264-68 (2008); Patrick Jacobi, Note, *Renewable Portfolio Standard Generator Applicability Requirements: How States Can Stop Worrying and Learn to Love the Dormant Commerce Clause*, 30 VT. L. REV. 1079, 1096-1107 (2006); Trevor D. Stiles, *Renewable Resources and the Dormant Commerce Clause*, 4 ENVTL. & ENERGY L. & POL'Y J. 33, 63-64 (2009).

177. Davies, *supra* note 12, at 1368-70.

178. *See id*. at 1359-60, 1362, 1386-89.

179. *See id*.

180. *See id*.

181. *E.g.*, 25A MASS. GEN. L. ANN. § 11F(f).

States counts wind, biomass, methane, and solar photovoltaics.[182] Nearly all count thermal solar installations.[183] And all but one count hydroelectricity.[184] From there, however, the inquiry gets messier. What type of hydroelectric installations count varies wildly from state to state. Some RPSs allow only run-of-river hydro, others require rigorous environmental mitigation measures, and almost all use installed capacity limitations—from as small as 5 MW or less to as large as 200 MW or less. Yet others do not limit hydroelectricity eligibility at all.[185] Add to this a number of states that do not count geothermal resources, even more that do not count ocean or tidal resources, and the picture is muddy indeed.[186]

The more resources that get counted, the more competition the RPS promotes, theoretically at least.[187] However, a new biomass technology that is in its infancy may have a very difficult time competing on price with onshore wind, which is comparatively far in its technological evolution. It is in part for this reason that wind has dominated the addition of new renewables in the United States.[188] It is also why some commentators advocate for FITs instead of, or in addition to, RPSs, because these tariffs can target technologies more specifically, rather than leaving wind to dominate alone.[189]

C. Combining FITs and RPSs: Toward a New Approach?

The debate over how to promote renewables increasingly focuses on a single question: FIT or RPS?[190] Recently, however, a number of commentators

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182. *See* Davies, *supra* note 12, at 1376-79.

183. *See id.*

1184. *See id*.

185. *See id.*

186. *See id.*

187. *See id*. at 1361.

188. WISER & BARBOSE, *supra* note 117, at 13-14.

189. *See, e.g.*, Lesser & Su, *supra* note 46, at 984 ("The largest flaw with a green-tag program . . . is that it discourages development of higher-cost, less mature technologies. Thus, if policymakers wish to provide differential incentives to those technologies, they must use other policy instruments. This is where FITs can provide a significant advantage.").

190. *See, e.g.*, Ringel, *supra* note 97, at 3 ("[A] dichotomy has appeared: States either recur to a price-based feed-in tariff scheme or rely on quantity-based quota systems, the so-called green certificates.").

have suggested that there may be a different path.[191] One possibility is not to see RPSs and FITs as exclusive choices, but rather, as complements. As one study has suggested, there is no need to "take an either-or approach" to RPSs and FITs.[192] "In fact, the two systems serve different purposes and cannot be measured against a common efficiency standard."[193]

In this view of RPSs and FITs, the two policy tools could be used simultaneously to promote the common goal of advancing renewables deployment. The RPS would serve as the overarching regulatory architecture. It would establish the policy goal toward which the laws are working: the percentage of renewables generation the jurisdiction would like to achieve. The RPS also would define which resources are deemed eligible, and would specify how the target would be measured, including to which utilities it applied. The FIT, for its part, would act more as engine than as frame. It would be the primary mechanism used to achieve policy success. It would offer the security and stability investors crave, while still retaining the aspirational clarity an RPS offers. This joint regime could also use RECs to help foster efficiency; those purchasing the power could receive RECs as part of their power purchase agreement, thus encouraging renewables to be deployed in the most cost-effective locations.

Undoubtedly, such a joint RPS-FIT approach would raise a number of implementation questions. Nevertheless, a 2009 study by the National Renewable Energy Laboratory identified no fewer than five benefits that combining FITs with RPSs might offer. These include greater assurance of project financing; a potentially more efficient way of procuring renewable power contracts, because FITs set costs upfront rather than relying on a case-by-cases bidding schemes; stronger guarantees for utilities that they will be able to recover their costs as prudent; greater support for emerging technologies; and, possibly, a "[h]edge against project delays and cancellations" associated with "project siting and access to transmission."[194]

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191. *See, e.g.,* KARLYNN CORY ET AL., FEED-IN TARIFF POLICY: DESIGN, IMPLEMENTATION, AND POLICY INTERACTIONS 9-11 (Mar. 2009), *available at* http://www.nrel.gov/docs/fy09osti/45549.pdf; Wilson H. Rickerson et al., *If the Shoe FITs: Using Feed-In Tariffs To Meet U.S. Renewable Electricity Targets*, 20 ELECTRICITY J. 73, 83-84 (May 2007).

192. Volkmar Lauber, *REFIT and RPS: Options for a Harmonised Community Framework*, 32 ENERGY POLICY 1405, 1405 (2004).

193. *Id*.

194. CORY ET AL., *supra* note 191, at 10-11.

Despite their promise, FITs are not cure-alls. Even used in combination with RPSs, they still require a careful calculation of tariff levels beforehand, a potentially time-consuming, costly, and difficult task.[195] They still risk affording renewables developers unwarranted profits, if the tariff is set too high. And they present nearly as many policy design questions as RPSs. Harmonizing these two legal instruments, then, is no easy task, one that demands thorough analysis and careful attention to detail. It also will be context-specific. "[O]ne of the first questions when a FIT policy is considered in the United States is whether it would replace or conflict with existing RPS policies. While the design details of each policy will determine the answer, it is clear that the two policies can be structured to work together—and can even do so synergistically."[196]

Ultimately, then, the question of how to promote renewables is one of social and political will. FITs are one path, RPSs another. Perhaps, the best way to promote renewables is by a new, third path: combining FITs and RPSs together, and thus, offering both clarity in what the policy direction is and certainty that the course will not change. Although FITs provide greater security for investors because they can guarantee payments from inception, in the end what investors really seek is assurance that the market will not shift under their feet. As Peter Radgen and his colleagues have suggested, policies that promote renewables can "lead to a continuously growing share" of our electricity system, but only if we are able to tolerate the comparably "high cost for the electricity consumer who has finally to cover the full cost of the electricity production . . . ."[197] From a regulatory perspective, this kind of commitment can come only from an unyielding dedication to changing our energy future—not simply from putting facially flashy mechanisms in place for political expediency.

195. *E.g.*, Rowlands, *supra* note 96, at 60 (noting that it can be "'very difficult to find (and to regularly adjust) an optimal tariff level for each of the renewable technologies included in the scheme that avoids excessive profit margins . . . .'" (citation omitted)).

196. CORY ET AL., *supra* note 191, at 8.

197. Radgen et al., *supra* note 5, at 5819.

Ⅴ. Conclusion

Governments seeking to promote renewables have numerous options in selecting a policy instrument. Increasingly, this choice has been cast as one between feed-in tariffs, widely used in Europe and other parts of the world, and renewable portfolio standards, dominant in the United States, the United Kingdom, and a handful of other jurisdictions. Evidence on FIT and RPS performance points in multiple directions. Many studies suggest that FITs have been more effective at promoting renewables, though "there is also the opposite experience. . . . Finland, Greece, and Italy, for example, have not secured significant expansion in renewable electricity capacity," despite their use of FITs.[198] Analyses of RPSs, meanwhile, provide conflicting evidence on whether these laws are effective at all in incenting renewables deployment, although one study that took policy design into account concluded that they are. All this evidence thus points to a single conclusion: It is not just whether a state has an RPS or FIT that matters, but how that law is written.

One possible way of finessing the quarrel over FITs versus RPSs is to avoid seeing the choice as dichotomous. There is no reason why a state cannot choose both. RPSs and FITs, if written properly, can work hand-in-glove, potentially better than either instrument alone. While the evidence for such an approach is lacking, so too is it for what an ideal FIT—or RPS—design is. Good policymaking ultimately requires experimentation, experimentation that, industry would hope, avoids eroding certainty too heavily. For nations that seek to transition to a new energy future, the path is clear. Choose a policy, keep the commitment, and adjust only in ways that assure industry that technological innovation will be rewarded. This may be a FIT, an RPS—or, perhaps, both.

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198. Rowlands, *supra* note 96, at 60.

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