Evaluating RPS Policy Design: Metrics, Gaps, Best Practices, and Paths to Innovation

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Abstract

As renewable energy support policies continue to evolve, assessing their effectiveness is increasingly important. Today, renewable portfolio standards (“RPS”)—mandates that jurisdictions produce a percentage of their electricity from renewable energy—are one of the two leading policy tools used to promote renewable energy development. While RPSs have received significant scholarly attention, few analyses have focused on RPS policy design. This Article fills this gap in the literature. Specifically, the Article makes three primary contributions: First, it builds a new conceptual model that can be used to evaluate RPS performance. Second, it employs that model to identify which RPS policy design traits are most likely to influence whether these laws succeed or fail. Finally, based on this analysis, the Article extracts lessons about current voids in RPS policy, RPS best practices, and, importantly, ways that RPS policy design can be innovated going forward. In this way, the Article is both conceptual and analytical. It draws on scholarship in regulatory performance, renewable energy law and policy, and innovation and technology diffusion, and it utilizes examples of RPS performance from across the globe—particularly in India, the United Kingdom, and the United States. The Article concludes that RPSs should focus more on reducing investor risk, expanding the types of resources they promote, addressing equity concerns, and removing external barriers to renewable energy development. While RPSs seek to advance a clean energy transition differently from how feed-in tariffs (“FITs”) promote renewables, policymakers may be able to enhance RPS performance by building into RPSs of the future tools used in FITs today.

Keywords: Renewable portfolio standard (“RPS”), renewables obligation (“RO”), renewable purchase obligation (“RPO”), renewable energy credit (“REC”), tradable green certificate (“TGC”), policy design, policy evaluation, feed-in tariff, green growth, clean energy, United States, United Kingdom, India

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Ⅰ. Introduction

Renewable portfolio standards ("RPSs") are one of the most important renewable energy support policies today. These laws, which require that electric utilities procure a given percentage of power from renewable resources, are both ubiquitous and critical. Many of the most economically powerful nations in the world use RPSs, including Australia, China, India, Japan, South Korea, the United Kingdom, and parts of Australia and the United States.[1] RPSs are seen as a key legal lever in the multifaceted effort to forestall climate change, and many jurisdictions cite them as a way to promote green growth.[2] In short, while a panoply of policy devices are available to promote renewable energy, RPSs persist as a leading tool across the globe.

Indeed, RPSs remain significant not only because they are prevalent but because nations contemplating new renewable energy policies almost inevitably consider them. In 2012, for instance, South Korea replaced its feed-in tariff ("FIT") with an RPS.[3] Thus, over the last two decades, RPSs quickly have come to be seen as one of the best available measures for renewable energy promotion. From North America to Asia, from Europe to the Pacific Rim, renewable portfolio standards have relevance.

Most RPS scholarship to date has focused on one of four concentrated areas of inquiry. The literature heavily emphasizes quantitative empirical evaluation of RPS efficacy, typically by looking at RPSs alone or in juxtaposition with FITs, but sometimes also by examining their economic efficiency or impact on

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1. Union of Concerned Scientists, What Are Renewable Electricity Standards, Renewable Electricity Standards Toolkit: A Comprehensive Resource on State-Level Renewable Electricity Standard Policy, http://www.ucsusa.org/clean_energy/res/aboutwhat.html.
2. *See, e.g.*, Sang In Kang et al., *Korea's Low-Carbon Green Growth Strategy* 7 (Org. for Econ. Cooperation & Dev., Working Paper No. 310, 2012), *available at* http://www.oecd-ilibrary.org/development/korea-s-low-carbon-green-growth-strategy_5k9cvqmvszbr-en; Jim Tankersley, *Green Growth Advocate Hopes for Bigger Changes from the Copenhagen Conference*, L.A. Times (Dec. 9. 2009), http://articles.latimes.com/2009/dec/09/world/la-fg-global-climate9-2009dec09.
3. KPMG Int'l,Taxes and Incentives for Renewable Energy 37 (June 2012), *available at* http://www.kpmg.at/uploads/media/Taxes_incentives_renewable_2012_02.pdf.

green growth.[4] Another area of emphasis is disentangling the political economy of RPSs, with a number of excellent studies explaining factors that prompt RPS adoption.[5] A third strain of scholarship, particularly in the United States, focuses on federalism questions, including whether state experimentation or national uniformity is better suited for RPS implementation; related studies assess economic

4. *See, e.g.*, Adesoji Adelaja et al., *Effects of Renewable Energy Policies on Wind Industry in the U.S.*, 2 J. NAT. RES. POL'Y RES. 245 (2010); Jason P. Brown et al., *Ex Post Analysis of Economic Impacts from Wind Power Development in U.S. Counties*, 34 ENERGY ECON. 1743 (2012); Sanya Carley, *State Renewable Energy Electricity Policies: An Empirical Evaluation of Effectiveness*, 37 ENERGY POL'Y 3071 (2009); Magali A. Delmas & Maria J. Montes-Sancho, *U.S. State Policies for Renewable Energy: Context and Effectiveness*, 39 ENERGY POL'Y 2273, 2273 (2011); Miriam Fischlein & Timothy M. Smith, *Revisiting Renewable Portfolio Standard Effectiveness: Policy Design and Outcome Specification Matter*, 46 POL'Y SCI. 277 (2013); Fredric C. Menz & Stephan Vachon, *The Effectiveness of Different Policy Regimes for Promoting Wind Power: Experiences from the States*, 34 ENERGY POL'Y 1786 (2006); Gireesh Shrimali & Joshua Kniefel, *Are Government Policies Effective in Promoting Deployment of Renewable Electricity Resources?*, 39 ENERGY POL'Y 4726 (2011); Haitao Yin & Nicholas Powers, *Do State Renewable Portfolio Standards Promote in-State Renewable Generation?*, 38 ENERGY POL'Y 1140 (2010).

5. *See, e.g.*, Joshua P. Fershee, *When Prayer Trumps Politics: The Politics and Demographics of Renewable Portfolio Standards*, 35 WM. & MARY ENVTL. L. & POL'Y REV. 53 (2010); Ming-Yuan Huang et al., *Is the Choice of Renewable Portfolio Standards Random?*, 35 ENERGY POL'Y 5571 (2007); Thomas P. Lyon & Haitao Yin, *Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation*, 31 ENERGY JOURNAL 131 (2010).

balkanization and federalism concerns that state-level RPSs can raise.[6] Finally, a number of articles provide case study examples of the experience with RPSs in given jurisdictions.[7]

Notably absent from this scholarship is a focus on RPS policy design and evaluation. While, early on, Rader and Hempling provided an extensive handbook for RPS development,[8] and quantitative RPS studies increasingly recognize the importance of accounting for RPS policy attributes,[9] the burgeoning scholarly attention on RPSs has been centered largely elsewhere. Given the prevalence of RPSs in nations as prominent as Belgium, China, India, South Korea, Sweden, the United Kingdom, and the United States, filling this gap in the research has growing importance.

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6. On the possibility of a federal approach, *see, e.g.*, Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 Conn. L. Rev. 1339 (2010) [hereinafter Davies(a)]; Joshua P. Fershee, *Moving Power Forward: Creating a Forward-Looking Energy Policy Based on a National RPS*, 42 Conn. L. Rev. 1405 (2010); Jim Rossi, *The Limits of a National Renewable Portfolio Standard*, 42 Conn. L. Rev. 1425 (2010); Benjamin K. Sovacool & Christopher Cooper, *Congress Got It Wrong: The Case for a National Renewable Portfolio Standard and Implications for Policy*, 3 Envtl. & Energy L. & Pol'y J. 85 (2008). On the dormant Commerce Clause, *see, e.g.*, Nathan E. Endrud, *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 (2008); Kirsten H. Engel, *Why Not a Reasonable Approach to State Power Mandates?*, 3 San Diego J. Climate & Energy L. 79 (2012); Patrick Jacobi, *Renewable Portfolio Standard Generator Applicability Requirements: How States Can Stop Worrying and Learn to Love the Dormant Commerce Clause*, 30 Vt. L. Rev. 1079 (2006); Trevor D. Stiles, *Renewable Resources and the Dormant Commerce Clause*, 4 Envtl. & Energy L. & Pol'y J. 33 (2009).
7. *See, e.g.*, Deborah Behles, *Why California Failed to Meet Its RPS Target*, 17 Hastings W.-N.W. J. Envtl. L. & Pol'y 163, 164 (2011); Ken Costello, *Regulatory Discretion in Implementing Renewable Portfolio Standards: The Case of Hawaii*, Electricity J. 51 (2005); David Hurlbut, *A Look Behind the Texas Renewable Portfolio Standard: A Case Study*, 48 Nat. Res. J. 129, 129 (2008); David G. Loomis & Adrienne Ohler, *Are Renewable Portfolio Standards a Policy Cure-All?: A Case Study of Illinois's Experience*, 35 Wm. & Mary Envtl. L. & Pol'y Rev. 135 (2010).
8. *See generally* Nancy Rader & Scott Hempling, The Renewables Portfolio Standard: A Practical Guide (2001), *available at* http://www.naruc.affiniscape.com/ associations/1773/files/rps.pdf.
9. *See, e.g.*, Adelaja et al., *supra* note 4; Yin & Powers, *supra* note 4.

This Article seeks to add to the literature by providing a framework for assessing RPS policy design through the lens of regulatory performance. The analysis presented here differs from—but complements—existing quantitative studies by augmenting our understanding of how RPSs function. Using a qualitative assessment of RPS policy design, the Article moves beyond quantitative evaluation and offers insights to why and how RPSs function. In doing so, the analysis reveals emerging lessons for potential best practices in RPS implementation, as well as important areas for further RPS policy design innovation. The lessons offered here thus promise value both to countries that already have RPSs in place, such as South Korea and the United States, as well as to those that may consider using them in the future.

The Article offers three primary contributions. First, it builds a new conceptual model for assessing RPS performance, by wedding regulatory assessment theory with RPS policy design. Second, that model offers important insights into where RPS policy design can be improved: RPS "policy design gaps." Third, by utilizing the analysis made possible by the new conceptual model and synthesizing the existing literature on RPSs and renewable energy, the Article yields several lessons for RPS best practices and possible policy innovation.

Four parts comprise the balance of the Article. Part II defines RPSs and describes their function, using the examples of RPSs in the United States, the United Kingdom, and India. Part III constructs the conceptual model for RPS performance assessment and highlights RPS policy design gaps. Part IV extracts potential lessons for best RPS practices and policy innovation. Part V concludes.

II. RPS Defined and Described

To understand RPSs, it is useful to place them in the constellation of renewable energy policy. Renewable energy policy effectively divides into two categories.[10] The dividing line is the "technology valley of death"—the chasm that separates emerging products from fully commercial technologies.[11] Renewable support policies that target technologies before they cross the valley of death are often referred to as "technology-push" measures: They seek to promote invention

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10. Of course, at some level, all renewable energy policies are trying to drive both innovation and diffusion, and some explicitly take on that task. Such policies might be referred to as "hybrid" technology-forcing regulations.

11. *See* Mary Jean Bürer & Rolf Wüstenhagen, *Which Renewable Energy Policy Is a Venture Capitalist's Best Friend?: Empirical Evidence from a Survey of International Cleantech Investors*, 37 ENERGY POL'Y 4997, 4998 (2009).

and innovation of new technologies.[12] Renewable energy policies that focus on technologies as they reach the valley of death or seek to cross it are typically known as "market-pull" tools: They aim to increase the utilization or diffusion of existing technologies and leverage market demand, heightened by state intervention, to scale up the technologies and reduce their costs so they can compete.[13]

RPSs are a type of "market-pull" policy. They seek to increase use of renewable energy technologies. They do this by augmenting demand for the technologies and, in turn, growing their economies of scale and driving down production costs. In other words, RPSs strive to encourage renewable energy technology *diffusion*—in contrast to "technology push" policies, such as research and development grants and subsidies, which aim to foster technological *innovation*.

This Part defines RPSs. Using the examples of the United States, the United Kingdom, and India, it then briefly describes RPS function, demonstrating the breadth of ways these laws can be written and employed.

A. RPSs Defined

Renewable portfolio standards go by many names. Typically referred to in the United States by their acronym, RPSs, they are known around the globe as renewables obligations ("ROs"), renewable purchase obligations ("RPOs"), renewable energy standards ("RESs"), renewable electricity standards ("RESs"), clean energy standards ("CESs"), and renewable energy quotas or quota regimes. Sometimes, if a law functions like an RPS but is voluntary rather than mandatory, it is referred to as a renewable portfolio goal ("RPG").[14]

An RPS can be defined as "a regulatory mandate to increase production of energy from renewable sources such as wind, solar, biomass and other alternatives to fossil and nuclear electric generation."[15] Thus, the RPS's core

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12. *See id.*

13. *See id.*; *see also* Austin Conner, Development, *Twenty Percent Wind Energy by 2030: Keys to Meeting the DOE's Goal*, 5 Envtl. & Energy L. & Pol'y J. 130, 135 (2010).

14. *See, e.g.*, Database of State Incentives for Renewables & Efficiency, *Renewable Portfolio Standard Policies* (Mar. 2013), *available at* http://www.dsireusa.org/documents/summarymaps/RPS_map.pptx [hereinafter DSIRE].

15. *Renewable Portfolio Standards*, National Renewable Energy Lab, (Mar. 16, 2014), http://www.nrel.gov/tech_deployment/state_local_governments/basics_portfolio_standards.html [hereinafter NREL].

is its mandate—its requirement that a certain amount of electricity come from renewable resources.

Typically, an RPS's mandate is expressed as a percentage. For instance, an RPS might require that twenty percent of electricity in the jurisdiction be produced using renewables by 2020. Sometimes, however, the mandate is expressed instead as an amount of renewable electricity generation capacity that must be installed. An RPS might command, for example, that 10,000 megawatts ("MW") of generation be built in the jurisdiction by 2025. In almost all cases, RPSs apply to the utility companies that supply electricity to consumers.[16] This, however, is not universally true. In Sweden, for instance, the RPS applied to final consumers, and in Italy, it applies to electricity producers and importers.[17]

Another common feature of RPSs is a credit trading regime. The production of electricity under an RPS typically, but not always, yields a tradable certificate signifying 1 megawatt-hour ("MWh") of renewable energy. Like RPSs themselves, these credits have many monikers: renewable energy credits ("RECs"), renewable energy certificates ("RECs"), renewable obligation credits ("ROCs"), tradable green certificates ("TGCs"), tradable renewable certificates ("TRCs"), clean energy certificates ("CECs"), and tradable credits. The idea of RECs or TGCs is to lower the RPS's cost by creating a market and thus competitive demand. If parties can comply with the RPS by trading credits for renewable energy production, the theory goes, then the lowest cost facilities will produce the most energy, and others subject to the law will pay them to produce more by purchasing their RECs.[18]

RPSs often are discussed in conjunction with other "market pull" policies that can be used to promote renewable energy. These include feed-in tariffs, tender or bidding regimes, production subsidies, investment tax credits, and production

16. Gireesh Shrimali & Sumala Tirumalachetty, *Renewable Energy Certificate Markets in India—A Review*, 26 Renewable & Sustainable Energy Revs. 702, 706 (2013).

17. *Id*.

18. *See, e.g.*, Pallab Mozumder & Achla Marathe, *Gains from an Integrated Market for Tradable Renewable Energy Credits*, 49 Ecological Econ. 259 (2004); Joseph P. Tomain, *Smart Energy Path: How Willie Nelson Saved the Planet*, 36 Cumb. L. Rev. 417, 449 (2006). The idea of RECs borrows from tradable pollution emission credit markets in environmental law. *See, e.g.*, E. Donald Elliott, *Environmental Markets and Beyond: Three Modest Proposals for the Future of Environmental Law*, 29 Cap. U. L. Rev. 245, 247-48, 251-54 (2001); Paul L. Joskow & Richard Schmalensee, *The Political Economy of Market-Based Environmental Policy: The U.S. Acid Rain Program*, 41 J.L. &Econ. 37, 80-81 (1998).

tax credits.[19] In terms of policy adoption, the feed-in tariff, or "FIT," is the RPS's biggest rival, and it is often treated as such by scholars and policymakers: To promote renewable energy, pick an RPS or FIT but not both.[20] Feed-in tariffs offer renewable energy producers a fixed—typically premium—rate for their energy for a set—usually lengthy (*e.g.*, ten, fifteen, or twenty year)—time period. FITs also generally mandate the purchase of renewable electricity and guarantee connection to the grid.[21] Of course, countries sometimes apply a renewable energy mandate, one of the two key features of an RPS, while using a FIT to meet that mandate. For instance, under European Commission directive 2009/28/EC, each E.U. member country is subject to a renewable energy requirement.[22] However, some countries have chosen to comply with these mandates using FITs, while others have picked RECs. Thus, in common conversation, reference to an RPS typically is synonymous with the device usually used to implement traditional RPSs: RECs or TGCs.

B. RPSs Described

RPSs can be written in countless different ways and take on numerous shapes

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19. *See* Lincoln L. Davies, *Incentivizing Renewable Energy Deployment: Renewable Portfolio Standards and Feed-in-Tariffs*, 1 KLRI J.L. & Legis. 39, 49-51 (2011) [hereinafter Davies(b)]; *see also* 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 (2004).
20. *See*, *e.g.*, Steven Ferrey et al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 Duke Envtl. L. & Pol'y F. 125, 126 (2010); Roger Raufer et al., *Yet Another Market Transition?: Moving Towards Market-Oriented Governmental Support of Wind Power in China*, 24 U. Pa. J. Int'l Econ. L. 577, 579-80 (2003); Marc Ringel, *Fostering the Use of Renewable Energies in the European Union: The Race Between Feed-in Tariffs and Green Certificates*, 31 Renewable Energy 1, 14 (2006); Kwok L. Shum & Chihiro Watanabe, *Network Externality Perspective of Feed-in-Tariffs (FIT) Instruments—Some Observations and Suggestions*, 38 Energy Pol'y 3266, 3267 (2010).
21. *See, e.g.*, Paul-Georg Gutermuth, *Regulatory and Institutional Measures by the State to Enhance the Deployment of Renewable Energies: German Experiences*, 69 Solar Energy 205, 207 (2000).
22. Council Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the Promotion of the Use of Energy from Renewable Sources and Amending and Subsequently Repealing Directives 2001/77/EC and 2003/30/EC.

and forms. There is no model RPS, and no two RPSs are alike. Three countries perhaps typify the variability and breadth of policy difference that RPSs can encompass: the United States, where RPSs first gained strong purchase; the United Kingdom, which has embedded a number of interesting policy innovations in its RPS; and India, which has more recent experience with its RPS system. To demonstrate how RPSs function in their implementation, and to show the diversity these laws embody, each is described in brief.

1. United States

RPSs in the United States are at once prototypical and exceptional. The United States is the RPS's birthplace. "The organization that did the most to develop the RPS was the American Wind Energy Association. It wanted a mechanism that was compatible with deregulated electricity markets ··· [and] that would be acceptable to the US Congress, which, in the late 1990s, was dominated by the Republican Party."[23] What makes U.S. RPSs different from many jurisdictions, however, is that they are not centralized. Whereas many nations employ a single RPS, RPSs in the United States quickly became uniquely subnational: state-based.[24] Thus, at one point, the number of state-level U.S. RPSs was almost triple the number of national-level RPSs in use elsewhere in the world.[25]

In the United States, RPSs caught on quickly. Many states adopted their RPSs as part of the wave of electricity industry restructuring that was sweeping the nation in the 1990s.[26] Thus, in 1993, only one state had an RPS.[27] By 2000,

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23. Greg Buckman, *The Effectiveness of Renewable Portfolio Standard Banding and Carve-Outs in Supporting High-Cost Types of Renewable Electricity*, 39 ENERGY POL'Y 4105 (2011).
24. The state-based nature of U.S. RPSs is easily explainable. It traces to the longstanding bright-line legal divide in U.S. electricity regulation that gives states, not the federal government, primacy over electricity generation fleet composition. *See Pacific Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n*, 461 U.S. 190 (1983).
25. *See* Buckman, *supra* note 23, at 4106, tbl. 1.
26. Karlynn S. Cory & Blair G. Swezey, *Renewable Portfolio Standards in the States: Balancing Goals and Rules*, ELECTRICITY J. 21 (2007).
27. *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. 3, 6 (2011-12) [hereinafter Davies(c)].

eleven other states had joined the RPS circle.[28] Today, three-quarters of the nation is subject to an RPS of some kind: thirty-seven states plus the District of Columbia.[29]

Because each state's law is different, characterizing U.S. RPSs as a whole is difficult. Nevertheless, trends emerge. The laws vary heavily in their ambition. California and Hawaii have the most aggressive RPS targets, at least on their face,[30] with thirty-three percent and forty percent mandates, respectively.[31] Iowa, the first state to adopt an RPS, also has the most meager target: 105 MW.[32] In between exists a wide variety of choices, with several states having picked round number targets of ten, fifteen, twenty, or twenty-five percent, although others have gotten much more specific: Massachusetts' goal is 22.1 percent, and New Hampshire's is 24.8.[33]

The way states measure compliance also varies but tends to cluster around certain alternatives. The vast majority of states require compliance by 2015, 2020, 2025, or 2030, though others use compliance dates of 2021, 2022, 2024, and 2026.[34] For a time, it was en vogue to adopt RPSs with twenty percent targets and compliance dates of 2020. Every state but two—Iowa and Texas—measure compliance in terms of electricity production or consumption percentages (MWh), although Michigan uses a hybrid approach: a ten percent renewable electricity mandate plus utility-specific capacity requirements that add up to 1,100 MW.[35]

A more recent trend in U.S. RPSs is using set-asides, carve-outs, or credit multipliers for certain resources, often solar. These policy innovations share

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28. *See id.*
29. *See* DSIRE, *supra* note 14.
30. The fact that RPSs may appear to impose higher targets than they actually implement sometimes is referred to as the laws' "salience distortion," a term borrowed from other fields. *See* Davies, *supra* note 6, at 1361; *cf.*, *e.g.*, 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).
31. *See* DSIRE, *supra* note 14.
32. *See id.*
33. *See id.*
34. *See id.*
35. *See* DSIRE, *supra* note 14.

a common aim: diversifying the range of renewables supported by the RPS.[36] The idea is to further level the playing field for technologies with higher costs, which otherwise might not be utilized because RPSs inherently favor low-cost resources (*e.g.*, wind). The specifics of these devices, however, as with RPSs themselves, vary from state to state. Some specifically reference solar, but others apply to customer-sited or distributed generation generally.[37] Others still adopt a more populist angle; they promote "community-based" facilities.[38] According to North Carolina State University's Database of State Incentives for Renewables & Efficiency ("DSIRE"), seventeen states now have minimum solar or customer-sited RPS requirements—more than half of the states with mandatory RPSs.[39]

Because U.S. RPSs are subnational, a recurring issue is how states can ensure effectiveness. The problem is what political scientists call "leakage."[40] Leakage is the risk that developers will build—or utilize existing—facilities in a neighboring state, rather than the RPS-adopting state, to satisfy an RPS.[41] The risk is significant, because if utilities satisfy an RPS using installations in a neighboring jurisdiction, the RPS's goal is undermined.[42] To ameliorate this risk, states often build into their RPSs geographic restrictions limiting eligible generation. These requirements vary widely, from express in-state eligibility mandates, to electricity delivery obligations, to regional sourcing conditions.[43] They also are potentially

36. *See* Buckman, *supra* note 23; *see also* Ryan Wiser et al., Supporting Solar Power in Renewables Portfolio Standards: Experience from the United States (2010) [hereinafter Wiser et al.(a)]; Chip Gaul & Sanya Carley, *Solar Set Asides and Renewable Electricity Certificates: Early Lessons from North Carolina's Experience with Its Renewable Portfolio Standard*, 48 Energy Pol'y 460 (2012).

37. *See* DSIRE, *supra* note 14; *see also* Wiser et al.(a), *supra* note 36; Buckman, *supra* note 23; Gaul & Carley, *supra* note 36.

38. *See* DSIRE, *supra* note 14; *see also* Wiser et al.(a), *supra* note 36; Buckman, *supra* note 23; Gaul & Carley, *supra* note 36.

39. *See* DSIRE, *supra* note 14. The states include Arizona, Colorado, Delaware, Indiana, Maine, Maryland, Missouri, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, and Washington, D.C. In addition, ten states offer additional credit for solar electricity: Colorado, Delaware, Michigan, Nevada, Oregon, Texas, Utah, Virginia, Washington, and West Virginia. *Id.*

40. *See, e.g.*, Erwin Chemerinsky et al., *California, Climate Change, and the Constitution*, 37 Envtl. L. Rep. 10, 653-55 (2007).

41. *See id.*

42. *See* Davies(a), *supra* note 6, at 1369.

43. *See id.* at 1379-82; *see also* Engel, *supra* note 6.

problematic. They further fragment RPS implementation, and they jeopardize the laws' viability, because geographic restrictions raise the specter of federal constitutional challenges for state economic protectionism.[44]

Another trend in U.S. RPSs is the frequent, often substantial amendment of the laws. With some regularity, these amendments can be characterized as minor: tweaks, adjustments, course corrections, and refinements in implementation. Many times, however, the changes have been more considerable. As one recent study showed, "[O]f the thirty-seven states with RPSs, twenty states—a remarkable fifty-four percent—have amended their statutes at least once since initial enactment. Ten states—or twenty-seven percent—have amended their RPSs more than once."[45] Most of the substantial amendments have sought to make the laws more potent. About seventy-nine percent of the time, states have increased their ultimate RPS target when amending their laws.[46] Only ten percent of the time have states decreased their targets.[47] However, when amending their targets, states typically also extend their RPS's compliance timeframe—a change states make about sixty-nine percent of the time.[48] Nevertheless, over time, the mean of all U.S. RPS targets has increased from below five percent to just under twenty percent.[49] This makes the overall trajectory of U.S. RPSs readily apparent: Although not universally true, as a policy cohort, their aspirations have become increasingly ambitious.[50]

While U.S. RPSs have tended to become more aggressive over time, substantial variation remains. For instance, although most state RPSs count the same resources as renewable, their definitions of hydroelectricity and biomass vary widely; many states do not credit tidal power; and several states count non-renewable resources, such as nuclear or advanced coal, toward their goals.[51] Likewise, it is standard practice for U.S. RPSs to apply to incumbent utilities,

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44. *See, e.g.*, *Ill. Commerce Comm'n v. FERC*, 721 F.3d 764 (7th Cir. 2013).
45. Davies(c), *supra* note 27, at 60.
46. *See id.* at 64-66.
47. *See id.*
48. *See id.*
49. *See id.* at 58.
50. *See id.* at 57-60.
51. *See* Davies(a), *supra* note 6, at 1375-85. Of course, there is an argument that RPSs are not really appropriate for less mature technologies such as tidal (wave energy), because they are specifically designed for near-market technologies. *See, e.g.*, T.J. Foxon et al., *UK Innovation Systems for New and Renewable Energy Technologies: Drivers, Barriers and Systems Failures*, 33 ENERGY POL'Y 2123 (2005).

but the amount of end-consumers covered by RPSs continues to differ by state. Some RPSs do not apply to all electricity providers, such as municipalities and cooperatives, and others impose special RPS requirements on their traditional investor-owned utilities.[52] Further, the way states enforce their RPSs clearly diverges from jurisdiction to jurisdiction.[53] As but one example, New Mexico imposes an alternative compliance payment ("ACP")—the penalty for failing to comply with its RPS—of $49/MWh for wind and $150/MWh for solar, whereas Maryland uses $15/MWh generally but $45/MWh for solar.[54] Other states cap the total cost impact their RPS can have on ratepayers: a broad range that extends, for example, from just over 1 percent in Illinois and North Carolina to 12.6 percent in New Jersey.[55]

2. United Kingdom

The United Kingdom's RPS—known as its Renewables Obligation ("RO")—traces its roots, perhaps ironically,[56] to its government's support of nuclear energy.[57] In 1990, as the government was privatizing the nation's electricity systems,[58] it sought to continue its promotion of nuclear generation, which "had

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52. *See id.*; Davies(c), *supra* note 27, at 62-64.

53. *See* Davies(a), *supra* note 6, at 1375-85; *see also* DSIRE, *supra* note 14.

54. Buckman, *supra* note 23, at 4111, tbl. 11.

55. Jocelyn Durkay, *State Renewable Portfolio Standards and Goals*, National Conference of State Legislatures (Jan. 16, 2014), http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx.

56. Geoff Kelly, *Renewable Energy Strategies in England, Australia, and New Zealand*, 38 Geoforum 326, 328 (2007). Some have suggested this, though the view clearly depends on one's perspective about nuclear power. To the extent nuclear is seen as a sustainable resource for clean and secure energy production, particularly for its greenhouse gas emissions advantages, the pairing of nuclear and renewables is hardly ironic at all.

57. David Toke & Volkmar Lauber, *Anglo-Saxon and German Approaches to Neoliberalism and Environmental Policy: The Case of Financing Renewable Energy*, 38 Geoforum 677, 681 (2007). Technically, the RO applies to Great Britain—England, Wales, and Scotland—rather than the United Kingdom—which also includes Northern Ireland. Northern Ireland utilizes its own system. Recognizing this distinction, this Article refers to a U.K. RO for convenience only.

58. Toke & Lauber, *supra* note 57, at 681.

proved too difficult to privatize."[59] The government thus adopted the Renewable Non-Fossil Fuel Obligation ("NFFO"), which won passage in part through its inclusion of renewables in its support regime.[60] The NFFO combined a tax on nuclear energy's primary competitor, coal-fired generation, with a purchase quota for non-fossil fuels.[61] Not an RPS, the NFFO was a bidding or "tender" regime. Under it, generators "tendered for the supply of specified quantities of power against quotas for different types" of renewable energy, under targets that increased to 1500 MW in 2000.[62] Renewables thus competed for contracts "according to a competitive bidding system; awards went to the lowest bidder."[63] Winning bidders received guaranteed contracts—early on, for shorter time periods, and toward the end of the NFFO in 1998, for up to fifteen years.[64]

For the United Kingdom,[65] the NFFO was an important policy development, "both novel and innovative" in its support for renewables.[66] Nevertheless, it had limits. The European Commission approved it only until 1998.[67] Some observers criticized it as too complex, particularly when compared to feed-in tariffs.[68] The fossil fuel levy used to support the program added about ten percent to retail electric bills, but until 1996, "the vast majority of this money went to subsidize nuclear power" rather than renewables.[69] The NFFO's short timeframe also created immense pressure for developers to build facilities quickly, which led to a rush for overseas equipment imports, undermining one of the law's objectives of

59. Catherine Mitchell & Peter Connor, *Renewable Energy Policy in the UK 1990-2003*, 32 ENERGY POL'Y 1935, 1936 (2004).

60. Toke & Lauber, *supra* note 57, at 681.

61. Kelly, *supra* note 56, at 328.

62. *Id*.

63. Toke & Lauber, *supra* note 57, at 681.

64. Peter M. Connor, *UK Renewable Energy Policy: A Review*, 7 RENEWABLE & SUSTAINABLE ENERGY REVS. 65, 70 (2003).

65. "The NFFO ··· was the mechanisms for England and Wales, and similar mechanisms, the Scottish Renewables Obligation (SRO) and NI-NFFO existed in Scotland and Northern Ireland respectively." *Id*. at 69.

66. *Id*. at 69.

67. Mitchell & Connor, *supra* note 59, at 1936.

68. *See, e.g.*, Catherine Mitchell, *Future Support of Renewable Energy in the UK—Options and Merits*, 7 ENERGY & ENVIRONMENT 267 (1996).

69. Connor, *supra* note 64, at 69.

promoting domestic industry.[70] Further, the NFFO was not particularly successful at deploying renewables.[71]

Thus, in 1997, on the eve of the NFFO's expiration, the British government announced that it was pursuing ten percent renewable electricity production by 2010.[72] Five years later, in 2002, the government imposed a new mandate via the Renewables Obligation. The RO was a traditional RPS.[73] It specified that licensed electricity suppliers must produce three percent of their supply from renewables in 2002, with that target growing to 10.4 in 2011.[74] The regime was to last for twenty-five years, until 2027.[75] Electricity providers could satisfy their renewables obligation in one of three ways: by relinquishing to the government renewable obligation credits ("ROCs") sufficient to meet their respective obligations; by paying a penalty for noncompliance, known as a "buyout payment"; or through some combination of the two.[76] The RO thus effectively was the NFFO in mirror image. "Where the NFFO effectively contracted capacity for generation at set prices for different renewables, the RO imposed [a renewable energy] quota on bulk power purchasers, who in turn negotiated [renewable energy] prices."[77]

Although the RO was standard-issue RPS in most respects, it also included an important innovation. The RO "recycled" buyout payments back to electricity suppliers.[78] Under this mechanism, electricity suppliers who surrendered ROCs received in return a fraction of all buyout payments made for the year, in

70. *Id*. at 70.

71. Toke & Lauber, *supra* note 57, at 681 ("[O]nly a relatively small proportion of the total contracts that were issued actually resulted in operational schemes. The system seemed to encourage prospective developers to make speculative bids that often proved to be uneconomic …"); *see also* Mitchell & Connor, *supra* note 59, at 1938 ("The NFFO could have been a very good mechanism of support for renewables if there had been a penalty and if the cost-cap had been higher.").

72. Kelly, *supra* note 56, at 328.

73. Connor, *supra* note 64, at 70.

74. *Id*. at 71.

75. *Id*.

76. Catherine Mitchell et al., *Effectiveness Through Risk Reduction: A Comparison of the Renewable Obligation in England and Wales and the Feed-in System in Germany*, 34 ENERGY POL'Y 297, 299-300 (2006).

77. Kelly, *supra* note 56, at 328.

78. Judith Lipp, *Lessons for Effective Renewable Electricity Policy from Denmark, Germany and the United Kingdom*, 35 ENERGY POL'Y 5481, 5489 (2007).

proportion to the percentage of total ROCs they submitted.[79] This had two effects. First, it ensured that renewables developers received an additional revenue stream, on top of payment for the sale of their electricity commodity and the value of ROCs themselves.[80] Second, it acted as a kind of feedback loop to ensure that ROC values would not fall too low: Anytime electricity suppliers chose to make buyout payments rather than producing renewable energy, this sent a signal to the market encouraging renewable energy development because it made renewables development more lucrative.[81]

Despite this innovation, British policymakers opted not to use the RO to directly encourage renewables diversity. Rather, the RO reflected the government's strong commitment to neoliberal economics.[82] It employed a policy of technology neutrality, on the theory that competition among resources would keep policy costs down.[83] Accordingly, policymakers "specifically rejected" a proposal to utilize resource bands within the RO to promote different technologies.[84] The result was predictable. The two resources that dominated RO compliance were already technologically well-advanced and low-cost: onshore wind and landfill gas.

The RO had an immediate impact. "[A]pplications for planning permissions ⋯ soared [following] the introduction of the RO."[85] In 2002 when the RO became effective, renewables comprised 1.9 percent of U.K. electricity production.[86] Only seven years later, in 2009, that figure had grown to 6.6 percent.[87]

The RO, however, did not earn only praise. Renewable electricity production consistently fell short of the RO's official goals. Thus, while U.K. renewable energy shares continued to grow post-2002, the percentage of RO compliance

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79. Mitchell et al., *supra* note 76, at 300.

80. *Id*.

81. *See id*. ("In effect, the green premium raises the price per kWh at which a supplier remains economically indifferent to buying renewables rather than paying the buy-out price.").

82. *See generally* Toke & Lauber, *supra* note 57.

83. *Id*. at 681-82; *see also* Kelly, *supra* note 56, at 329.

84. Connor, *supra* note 64, at 72.

85. Mitchell & Connor, *supra* note 59, at 1939.

86. Geoffrey Wood & Stephen Dow, *What Lessons Have Been Learned in Reforming the Renewables Obligation? An Analysis of Internal and External Failures in UK Renewable Energy Policy*, 39 ENERGY POL'Y 2228, 2229 (2011).

87. *Id*.

consistently hovered between roughly two-thirds and three-quarters of the RO's mandate.[88] The RO also came under criticism that it was not cost-effective.[89] "[T]he British RO ⋯ certainly does not deliver renewable energy any more cheaply than a feed-in tariff," one observer wrote.[90] "Just because we set up a market ⋯ does not mean [it] will be a perfectly competitive market where Adam Smith's 'magic hand' conjures the more resource-efficient outcome."[91] Further, developers' rush to the best siting locations, plus local resistance and planning delays, stalled projects and increased implementation costs.[92] Moreover, the RO failed to diversify the type of firms supplying renewable electricity.[93] Because the risk investors had to absorb under the RO was both manifold and substantial,[94] it tended only to be large, incumbent electricity suppliers—who could finance facilities off their own balance sheets rather than using capital markets—that participated in the regime.[95]

Concerns over the RO's performance thus pushed for revision of the law. An early change came in 2003, when the government boosted the RO's end goal from 10.4 percent by 2010 to 15.4 percent by 2015.[96] This had the salutary effect of lengthening the contract terms of many renewable power purchase agreements.[97] It also was a response to concerns that as renewable energy

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88. United Kingdom Departtment of Energy & Climate Change, *Renewables Obligation: Statistics*, Apr. 23, 2012, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48336/5115-renewables-obligation-statistics.pdf [hereinafter, *RO Stats.*]. The low was in 2003, when renewables comprised only 56 percent of the RO's target. The high was 2010, when production satisfied 72 percent of the RO goal. *Id.*
89. Mitchell et al., *supra* note 76, at 300.
90. *See, e.g.*, Lipp, *supra* note 78, at 5489-90; B. Woodman & C. Mitchell, *Learning from Experience? The Development of the Renewables Obligation in England and Wales 2002-2010*, 39 Energy Pol'y 3914, 3914 (2011).
91. *See, e.g.*, Lipp, *supra* note 78, at 5489-90; Woodman & Mitchell, *supra* note 90, at 3914.
92. *See* Lipp, *supra* note 78, at 5490.
93. *Id.* at 5489.
94. *See generally, e.g.*, Mitchell et al., *supra* note 76.
95. Toke & Lauber, *supra* note 57, at 682; *see also* Mitchell & Connor, *supra* note 59, at 1940; Mitchell et al., *supra* note 76, at 304.
96. Mitchell et al., *supra* note 76, at 299.
97. *See id.*; Lipp, *supra* note 78.

installations approached the initial target, price instability would increase, so the move to heighten the mandate sought to get out in front of this problem. While important, this change, however, was not the end of the reform.

In 2009, the RO was, if not overhauled, amended substantially. Several modifications, the first set of which became effective in 2009 and the second set in 2010,[98] significantly altered both the structure and the implementation of the regime.[99]

First, the revised RO now includes banding to promote a more diverse range of renewables. The 2009 amendments created five different bands of renewable resources: Established 1, Established 2, Reference, Post-demonstration, and Emerging.[100] Each band is based on technology costs, which in turn reflect technological feasibility and stage of development.[101] The awarding of ROCs depends on the band, with resources that have not yet quite crossed the technology valley of death receiving more credit than facilities that are more advanced.[102]

Second, to encourage market participant diversity, the 2009 amendments adopted a feed-in tariff to be used in conjunction with the RO. This tariff is limited to small-scale producers (under 5 MW)[103] and "is applicable to a number of technologies including PV, Wind, Hydroelectric and Anaerobic Digestion."[104] As in other countries, the FIT ensures a fixed level of payment for a guaranteed

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98. The second set of amendments made in 2009 took effect in 2010. *See* Wood & Dow, *supra* note 86, at 2234. Working in the background here was the 2009 E.U. Renewables Directive, which it appeared the U.K. could not meet using only landfill gas and onshore wind.

99. Several additional more minor to those detailed here also were made in 2009. For a summary, see *id.* at 2230-34.

100. *Id.* at 2232.

101. *See id.* at 2230-32.

102. *Id.* at 2232 (noting banding of 0.25 ROCs for resources in the "Established 1" band, 0.5 for "Established 2," 1.0 for "Reference," 1.5 for "Post-demonstration," and 2.0 for "Emerging").

103. *Id.*

104. R. Cherrington et al., *The Feed-in Tariff in the UK: A Case Study Focus on Domestic Photovoltaic Systems*, 50 Renewable Energy 421, 422 (2013). Initially, the U.K. had tried to implement the RO for small scale applications, but the costs made it unjustifiable. This effort created several thousand new ROC providers, but these produced only a tiny number of ROCs, creating administrative costs of about 160% of the provided subsidy provided. The FIT sought to replace this failed regime.

period of time to participating installations. Facilities previously eligible under the RO are allowed to switch to the FIT, under specific conditions governed by the 2009 amendments.[105] Initial FIT rates were generous. For example, PV rates started at 30.7 p/kWh for most facilities and 32.9 p/kWh for microgenerators, but the government subsequently reduced these rates substantially as PV technology costs fell and installations exceeded expectations.[106]

Third, the 2009 amendments sought to strengthen the law by removing the risk that the RO target becomes a development ceiling. This risk exists because once a yearly RPS quota is filled, ROC values should drop since no further credits are needed to satisfy the statutory mandate.[107] To remedy this problem, the 2009 RO added the concept of "headroom."[108] Under this concept, the Secretary of State sets the RO obligation for the coming year using a two-step process. In the first step, the number of ROCs needed to meet the fixed target for the coming year is determined.[109] Then, in the next step, that figure is compared against the amount of renewable electricity the government expects to be generated, plus 10 percent.[110] The 10 percent is the "headroom." The higher of these two figures—the set target or the estimate plus the headroom—becomes the next year's RO.[111]

Fourth, the 2009 amendments assured that new projects will receive a minimum of 20 years of support under the regime.[112] This was done to improve investor confidence. The amendments also extended the length of the program to 2037.[113] In addition, the initial 2009 amendments increased the end RO target to 20 percent, but the subsequent 2009 amendments then removed that number, so that it would not "act as a barrier towards the 2020" renewable electricity target

105. Wood & Dow, *supra* note 86, at 2232.

106. *See* Cherrington et al., *supra* note 104; *see also* Firdaus Muhammad-Sukki et al., Communication, *Revised Feed-in Tariff for Solar Photovoltaic in the United Kingdom: A Cloudy Future Ahead?*, 52 Energy Pol'y 832 (2013); *UK U-turn on Renewables?*, Renewable Energy Focus 20 (2011).

107. Mitchell et al., *supra* note 76, at 303.

108. Wood & Dow, *supra* note 86, at 2232-33.

109. United Kingdom Deparment of Energy & Climate Change, *Calculating the Level of the Renewables Obligation for 2014/2015*, https://www.gov.uk/government/publications/renewables-obligation-level-calculations-2013-to-2014--2.

110. *Id*.

111. *Id*.; *see also* Wood & Dow, *supra* note 86, at 2231-33.

112. Wood & Dow, *supra* note 86, at 2234.

113. *Id*.

of 30-35 percent imposed by EU Directive 2009/28/EC.[114]

Finally, coincident to the RO's reform in 2009, the government in 2008 adopted a new Planning Act that sought to remove longstanding external barriers to renewables: siting and permitting delays. Specifically, this law "aimed to fundamentally change the operation of the planning process in the UK by streamlining and speeding up the decision-making process and avoiding lengthy public inquiries."[115] However, following the Planning Act's adoption, the newly elected coalition government sought reforms, including removing "the centre-piece of the legislation—the Infrastructure Planning Commission (IPC)" and proposing to "move from a single centralised planning structure to a localised system."[116]

3. India

India's RPS might be seen in some ways as bridging the divide between U.S. RPSs and the United Kingdom's RO. Like in the United States, India's RPS—dubbed the Renewable Purchase Obligation ("RPO")—is state-based. Subnational states within India enforce it. However, similar to the United Kingdom's policy innovation of using a feed-in tariff for some resources concurrently with its RO for most renewables, India allows producers to choose whether they will participate in the national renewable energy certificate market or take feed-in tariff payments instead. Thus, in India, FITs and the RPO coexist under the same regime.

India's RPO began in 2003, but it took almost a full decade to develop to its current form. The Electricity Act of 2003 mandated that state electricity regulatory commissions ("SERCs") establish "policies and rules for development of renewable energy in their respective states."[117] Under this mandate, contained in Section 86(1)(e) of the Act, SERCs specified minimum renewable energy production targets, and determined which entities would be subject to the targets.[118] Under Central Electricity Regulatory Commission ("CERC") guidelines, states were supposed to set their RPO targets based on renewable energy potential within the jurisdiction and the RPO's likely impact on consumers, but there were

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114. *Id*. at 2233; *see id*. at 2229.

115. *Id*. at 2237.

116. *Id*.

117. Shrimali & Tirumalachetty, *supra* note 16, at 705. Some sources refer to India's law as a "renewable *portfolio* obligation" rather than a "renewable *purchase* obligation."

118. *Id*.

no federally mandated "minimum RPO requirement[s]."[119] Thus was born India's RPO—a state-based and -enforced regime.

The initial RPO faced many limitations. While the regime applied to the relevant obligated entities ("OEs")—including electricity distribution licensees, open access consumers above 1 MW, and captive power plants above 5 MW[120]—other factors constricted its operation. Many of the state targets came with no enforcement penalties.[121] The range of targets also varied significantly, "from as low as 0.5 percent for Madhya Pradesh to as high as 10% for Tamil Nadu."[122] Further, the 2003 law made eligible only generation from within the jurisdiction to satisfy the state's RPO.[123] This led to perverse effects. "[S]tates with low [renewable energy] potential kept their RPO target[s] at lower level[s]. On the other hand, states which had high [renewable energy] resources also set lower targets" to limit compliance cost impacts on their consumers.[124]

The result was that, under the initial RPO, renewable energy production increased but not as extensively as the government had hoped. From 2001-2002 to 2006-2007, renewable generation capacity in India grew from 1806 MW (1.48 percent of total installed capacity) to 8136 MW (5.26 percent of total installed capacity).[125] Installed capacity, however, lagged significantly behind the nation's renewable energy potential.[126]

Consequently, the government soon took several steps to strengthen the RPO. In 2005, pursuant to the 2003 Act's requirements, the National Electricity Policy of 2005 was adopted. This policy specified that "the share of electricity from nonconventional sources would need to be increased in the total energy

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119. *Id*.

120. *See* Kapil Narula, *Renewable Energy Certificates (RECs) in India—A Performance Analysis and Future Outlook*, 27 Renewable & Sustainable Energy Revs. 654, 655, 657 (2013).

121. Anoop Singh, *A Market for Renewable Energy Credits in the Indian Power Sector*, 13 Renewable & Sustainable Energy Revs. 644, 647 (2009); *see also* Shrimali & Tirumalachetty, *supra* note 16, at 705.

122. Singh, *supra* note 121, at 647.

123. Shrimali & Tirumalachetty, *supra* note 16, at 705.

124. Narula, *supra* note 120, at 655.

125. *Id*.

126. *See* R.M. Shereef & S.A. Khaparde, *Current Status of REC Mechanism in India and Possible Policy Modifications to Way Forward*, 61 Energy Pol'y 1443, 1444 (2013).

mix."[127] The next year, the Tariff Policy 2006 set "a deadline to the SERCs for implementing RPOs."[128] Then, in 2008, the government issued its National Action Plan on Climate Change. This policy established a target of fifteen percent renewable electricity production by 2020,[129] with the national RPO starting at five percent in 2009-2010 and "increas[ing by] 1% every year for the next 10 years."[130]

In 2011, the government transformed the RPO into a more traditional RPS. It added renewable energy certificates to the regime. In March of that year, the Ministry of New and Renewable Energy ("MNRE") launched this new national REC trading regime to address the mismatch between state-level RPO targets and actual production, as well as to better achieve states' RPO targets.[131]

The idea behind India's national REC market was the same as in other RPS regimes: economic efficiency. Under the new national REC scheme, geographic limits on RPO compliance were lifted.[132] Now, states with low renewable energy potential could satisfy their RPO targets by purchasing RECs, and states with high renewable energy potential could reduce compliance costs by selling off excess RECs.[133] "The REC market mechanism was widely touted as the solution to drive investment into renewable generation."[134] To contain program costs but keep the market functional, the Indian REC market also included price floors and ceilings.[135] RECs are "exchanged only in the Power Exchanges PXIL and IEX approved by the Central Electricity Regulatory Commission."[136]

Significant change came following the national REC market's establishment. In anticipation of stricter RPO enforcement—and the concomitant risk of state-

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127. *Id*.

128. Gisèle Schmid, *The Development of Renewable Energy Power in India: Which Policies Have Been Effective?*, 45 ENERGY POL'Y 317, 324 (2012).

129. Shrimali & Tirumalachetty, *supra* note 16, at 702.

130. Shereef & Khaparde, *supra* note 126, at 1444.

131. Shrimali & Tirumalachetty, *supra* note 16, at 703.

132. *Id*.

133. *Id*.

134. *Id*.

135. The ceiling price is referred to as the "forbearance" limit. *See* Rajesh Kumar & Arun Agarwala, *Renewable Energy Certificate and Perform, Achieve, Trade Mechanisms to Enhance the Energy Security for India*, 55 ENERGY POL'Y 669, 671 (2013).

136. *Id*. This decision to use existing functional electricity exchanges was made to facilitate bringing buyers and sellers together in a market place.

owned electricity utilities facing RPO penalties—states set new RPO targets, with many jurisdictions reducing their targets from pre-REC market levels. At the same time, "many states made meeting RPO targets mandatory."[137] For instance, Chhattisgarh's 2009-2010 target was ten percent, but in the wake of the REC market's creation, it established a 2010-2011 goal of 1.5 percent.[138] Likewise, prior to advent of Indian RECs, Himachal Pradesh had a twenty percent RPO target; now, its end target is 10.25 percent.[139]

Moreover, many states—sixteen of twenty-seven—set targets for only the first three years of the REC market's operation. States also diversified how they structured their new REC targets. Nine states established resource-specific carve-out targets—eight states for solar, and one state for both solar and biomass.[140] One of these states, Karnataka, also created different targets for each class of obligated entities: distribution companies, captive customers, and open access consumers.[141]

However, the national REC market found itself off to a shaky start. While one observer concluded that "the introduction of quotas (RPOs) on clean electricity sourcing has had a positive and significant impact" on renewable energy development in India, much more so than "preferential feed-in tariffs,"[142] reviews of the new REC market have been less sanguine. One study observed that in the first year-and-a-half of REC market operation, there was a substantial REC glut, with the amount of RECs redeemed stagnating and the number of RECs issued "continuously rising."[143] Another study revealed that "the number of accredited certificates issued was less than 2.5% of the technical REC demand potential, indicating that the full potential of the REC markets was far from being

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137. Shrimali & Tirumalachetty, *supra* note 16, at 705.

138. *Id.* at 706.

139. *Id.* Shrimali and Tirumalachetty summarize the pre- and post-REC targets by state. *See id.*

140. *Id.* at 714. Under the India RPO, at the national level, the solar RPO and the RPO for other renewable energy resources are not synonymous. Solar RPOs are mandated separately and are not fungible with other RECs.

141. *Id.* at 705.

142. Schmid, *supra* note 128, at 324.

143. Kumar & Agarwala, *supra* note 135, at 675; *see also* Rajesh Kumar & Arun Agarwala, *Energy Certificates REC and PAT Sustenance to Energy Model for India*, 21 RENEWABLE & SUSTAINABLE ENERGY REVS. 315, 318-19 (2013).

realized."[144] Likewise, while some observers suggested that RECs would be "much more attractive" to renewable energy developers than feed-in tariff rates, which remain available,[145] a different analysis found that the market clearing price for RECs "got stuck to the floor price for the last seven trading sessions" running into 2013, in part because SERCs did not penalize any "defaulters of RPO compliance" in fiscal year 2011.[146] "This downward trend of [the] REC market will continue until the respective SERCs adhere to strict RPO compliance and impose penalt[ies] on RPO defaulters."[147] Further, renewable energy developers appeared to favor feed-in tariffs over REC compensation. As of February 2012, only 12.3 percent of renewable energy projects had been accredited by the National Load Dispatch Centre ("NLDC"), the federal agency responsible for REC registration, issuance, and redemption.[148]

Thus, as India moves into the second decade of implementing its RPO, much remains cloudy. Many RPO targets are set on an annual basis, potentially undermining investor confidence in the regime's long-term stability.[149] Some observers have been critical of the REC market in India generally, while others laud its design but point to enforcement failures as crippling its success. Indeed, the mix of renewables in the Indian generation portfolio remains rather non-diverse, with wind, biomass, and small hydro dominating.[150] And the RPO, while appearing to drive renewable energy additions, is undersubscribed. As of 2012, renewable energy comprised 5.5 percent of electricity generation in India. The RPO target, however, was seven percent.[151]

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144. Shrimali & Tirumalachetty, *supra* note 16, at 702; *see also* Kumar & Agarwala, *supra* note 135, at 675.

145. Narula, *supra* note 120, at 658.

146. Shereef & Khaparde, *supra* note 126, at 1448.

147. *Id*.

148. *See* Shrimali & Tirumalachetty, *supra* note 16, at 705.

149. *See Id*, at 708-09.

150. *See* Narula, *supra* note 120, at 644; Kumar & Agarwala, *supra* note 135, at 671. Cogeneration also holds a large share of installed capacity in India—larger than the listed renewables. *See* Narula, *supra* note 120, at 657; Shereef & Khaparde, *supra* note 126, at 1444.

151. Shrimali & Tirumalachetty, *supra* note 16, at 703.

III. RPSs Analyzed and Evaluated—Toward a Conceptual Model

Given the prevalence and persistence of RPSs, determining how to evaluate these laws is critical. India, the United Kingdom, and the United States provide valuable examples of how RPSs function on the ground. Just as important, however, as understanding how RPSs operate is accurately and objectively assessing their function. This Part turns to that task in two ways. The first is conceptual, and the second is analytical.

First, this Part develops a new conceptual model for evaluating RPSs. Despite the myriad design choices policymakers face when adopting an RPS, a holistic, design-centric framework for evaluating RPS performance remains lacking. To address this gap in the literature, this Part constructs a universal model for evaluating RPS performance. The model is intentionally generic, so that disparate jurisdictions can use it to evaluate RPS utility. The model builds in three steps: (1) it defines policy performance metrics applicable to RPSs; (2) it outlines and explains common policy design attributes of RPSs; and (3) it synthesizes the model by assessing which policy attributes are likely to affect each performance metric.

Second, by measuring RPS policy design against the different performance metrics, this Part exposes precisely where RPSs' weaknesses lie. A common critique of RPSs is that they do not measure up to feed-in tariffs.[152] That critique is based on the presumption that FITs and RPSs are equals: Both are market-pull,

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152. *See, e.g.*, Lucy Butler & Karsten Neuhoff, *Comparison of Feed-in Tariff, Quota and Auction Mechanisms to Support Wind Power Development*, 33 Renewable Energy 1854, 1858 (2008); Toby Couture & Yves Gagnon, *An Analysis of Feed-in Tariff Remuneration Models: Implications for Renewable Energy Investment*, 38 Energy Pol'y 955, 956 (2010); C.G. Dong, *Feed-in Tariff vs. Renewable Portfolio Standard: An Empirical Test of Their Relative Effectiveness in Promoting Wind Capacity Development*, 42 Energy Pol'y 476 (2012); 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); Philippe Menanteau et al., *Prices Versus Quantities: Choosing Policies for Promoting the Development of Renewable Energy*, 31 Energy Pol'y 799, 811 (2003); Marc Ringel, *Fostering the Use of Renewable Energies in the European Union: The Race Between Feed-in Tariffs and Green Certificates*, 31 Renewable Energy 1, 14 (2006); Ian H. Rowlands, *Envisaging Feed-in Tariffs for Solar Photovoltaic Electricity: European Lessons for Canada*, 9 Renewable & Sustainable Energy Rev. 51, 56-57 (2005).

pro-diffusion renewable energy support policies. The analysis in this Part clarifies that RPSs are divergent in character from feed-in tariffs. While RPSs share the same end goal with FITs, the *type* of renewable energy transition RPSs promote is different in kind from what feed-in tariffs aim to foment. Thus, while the very design features included in RPSs tend to reinforce, rather than counteract, many of the criticisms these devices endure, understanding that makes clear where the policies can be improved to change the way they perform.

A. Evaluative Criteria for Regulatory Performance

Traditional metrics used to assess regulatory performance are efficacy and efficiency.[153] Efficacy refers to the regulation's accomplishment of the policy aims it advances. It answers the question, "How well does this law work?" Efficiency addresses the economic burden of achieving the law's goals. It responds to the query, "What is the law's cost?" When evaluated using these twin metrics, regulatory performance can be calculated almost mathematically: A regulation that maximizes impact while minimizing cost is a superior policy tool.

Increasingly, however, policy analysts consider other metrics along with efficacy and efficiency. Most common is equity.[154] This criterion assesses a law's distributional impacts. It addresses the inquiry, "Is the effect of the regulation on society fair?" Other factors sometimes used to evaluate regulatory performance tend to be pragmatic in nature, such as the law's institutional feasibility, its impact on government fiscal stability, or broader cost-benefit assessments of a measure's overall societal effect.[155] Although equity is more difficult to quantify than efficacy or efficiency, all these criteria can be used both ex ante and ex post to evaluate regulations—ex ante to determine whether a policy should be adopted, ex post to gauge whether an existing regulation should continue or needs to be amended.[156]

In the case of renewable energy support policy, three factors are almost universally suggested as appropriate regulatory evaluation criteria: efficacy,

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153. *See, e.g.*, Jonathan A. Lesser & Xuejuan Su, *Design of an Economically Efficient Feed-in Tariff Structure for Renewable Energy Development*, 36 ENERGY POL'Y 981, 981-82 (2008).

154. *See infra* note 157 and accompanying text.

155. *See generally* CARY COGLIANESE, MEASURING REGULATORY PERFORMANCE: EVALUATING THE IMPACT OF REGULATION AND REGULATORY POLICY (2012), *available at* http://www.oecd.org/gov/regulatory-policy/1_coglianese%20web.pdf.

156. *See id.*

efficiency, and equity. Thus, in comparing different renewable energy support policies available to Southeast Asian nations, Sovacool names "efficacy," "cost effectiveness," and "equity" as key performance metrics.[157]

Other renewable energy studies extract numerous possible metrics for appraising policy performance. For instance, Sovacool also identifies dynamic efficiency and fiscal responsibility in addition to efficacy, efficiency, and equity.[158] Verbruggen and Lauber add "institutional feasibility" to the standard trinity.[159] And del Rio and Gual list a host of other criteria, including investor risk, distribution of generation, social benefits, and congruence with liberalized markets.[160] To be sure, an almost limitless list of possible criteria could be developed to analyze renewable energy policy tools—particularly considering that legislators and regulators often express multiple, not necessarily consistent aspirations when adopting these laws.[161]

Nevertheless, in constructing the conceptual model for RPS evaluation, four key criteria appear most appropriate: efficacy, efficiency, equity, and net societal benefits. Utilization of these criteria is well justified: It follows the standard literature in regulatory performance evaluation,[162] including the common metrics used to evaluate renewable energy support policies. Further, these broad categories capture within their relatively wide ambit more narrow assessments

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157. Benjamin K. Sovacool, *A Comparative Analysis of Renewable Electricity Support Mechanisms for Southeast Asia*, 35 ENERGY 1779, 1785 (2010); *see also* Aviel Verbruggen & Volkmar Lauber, *Assessing the Performance of Renewable Electricity Support Instruments*, 45 ENERGY POL'Y 635, 635 (2012); (identifying "efficacy, efficiency, equity and institutional feasibility" as the relevant criteria); Pablo del Río & Miguel A. Gual, *An Integrated Assessment of the Feed-in Tariff System in Spain*, 35 ENERGY POL'Y 994, 995, 996, 998 (2007) (addressing "effectiveness," "equity (cost distribution)," and "efficiency, cost-effectiveness and transaction costs").

158. Sovacool, *supra* note 157, at 1785.

159. Verbruggen & Lauber, *supra* note 157, at 639-42.

160. del Río & Gual, *supra* note 157, at 995-98.

161. *See, e.g.*, BARRY G. RABE, PEW CTR. GLOBAL CLIMATE CHANGE, RACE TO THE TOP: THE EXPANDING ROLE OF U.S. STATE RENEWABLE PORTFOLIO STANDARDS 6 (2006), *available at* http://www.pewclimate.org/docUploads/RPSReportFinal.pdf; *see also* RADER & HEMPLING, *supra* note 8, at 4-5 (noting energy, environmental, and economic motivations for promoting renewable energy).

162. COGLIANESE, *supra* note 155, at 18.

sometimes identified in the renewable energy literature. For instance, efficiency considered broadly can include both dynamic efficiency and investor risk, and investor risk itself weighs policy stability, which accounts for institutional feasibility. Finally, use of these primary attributes—in contrast to a long laundry list of very specific metrics—helps ensure that the evaluative model can be used generically across jurisdictions, rather than limited to a single specific context for which it has been custom-designed.

Each metric merits individual elaboration and explanation.

1. Efficacy

Depending on how broadly RPSs' objectives are cast, determining how to measure their efficacy is either intricate and complex or simple and straightforward. RPS advocates notoriously offer a litany of rationales in favor of their adoption—from climate change mitigation to air pollution abatement, from green growth engines to hedges against fossil fuel price volatility.[163] While the political rhetoric behind RPS adoption risks treating RPSs as "sustainability cure-alls,"[164] or "everything to everyone,"[165] the fact that so many different reasons are offered for the laws' enactment necessarily complicates the question of how to measure their success.

One possibility would be to account for every motivation underlying RPS adoption, and then weigh RPS performance against each of those criteria. At the other end of the spectrum, RPSs simply could be taken at their word. The explicit goal of every RPS is a measurable target of renewable energy production. Presumably, if a law meets that target, it is efficacious. Between these two possibilities, some value-based rubric could be used to rank which rationales underlying RPS support matter most; that list then could be ranked and weighted to determine RPS efficacy.

There is a strong argument that the simplest measure of RPS efficacy is also the best. Disentangling the motivations that drive RPS adoption is difficult enough. Matching them against RPS performance, especially in any kind of rank order, would necessarily implicate a kind of legislative mindreading that is fraught with peril, if not impossible altogether. To the extent that formal evaluations of RPS performance are used to update the laws, reliance on stated

163. *See supra* note 161; *see* also Davies(c), *supra* note 27, at 20-22.

164. Loomis & Ohler, *supra* note 7.

165. Davies(c), *supra* note 27, at 21.

motivations for RPS adoption also risks encouraging political gamesmanship.[166] Moreover, most if not all of the rationales typically given for RPS passage—such as job creation and green growth—certainly can be accounted for in a thorough assessment of the laws' overall costs and benefits. Double counting them will only muddy the efficacy analysis.

Thus, the strongest indicator of RPS success should simply be the amount of renewable energy technology deployed. Measuring this as both (1) new installed generation capacity and (2) produced electricity should provide the most holistic picture of the laws' performance. These two metrics serve as cross-checks against each other. To round out the picture, both of these figures can be reviewed in isolation, and as measured against the RPS's specific renewable energy target (*e.g.*, twenty percent of consumed electricity from renewables, or 10,000 MW of installed capacity).[167]

Of course, assessing RPS efficacy is not entirely straightforward. Several other factors must be considered. First, RPSs do not operate in a policy vacuum, so other related laws must be taken into account. In the United States, for example, both measures that seek to support renewables outside of the RPS, such as the Production Tax Credit or PURPA's "avoided cost regime"[168]—as well as regulations that indirectly affect renewables' share of the generation portfolio, such as environmental regulations limiting air pollution[169]— have impacts that

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166. *Cf., e.g.*, Robert L. Glicksman, *From Cooperative to Inoperative Federalism: The Perverse Mutation of Environmental Law and Policy*, 41 Wake Forest L. Rev. 719, 779-80 (2006); Barry G. Rabe et al., *State Competition as a Source Driving Climate Change Mitigation*, 14 N.Y.U. Envtl. L.J. 1, 3-4 (2005).

167. Relying on whether the law hits its target alone risks ignoring other market or regulatory dynamics that, when viewed only through the lens of a percentage of production, can overwhelm what it appears the RPS is doing, even if the RPS has increased the rate of renewable energy growth. *See* Lincoln L. Davies, *Toward an Enduring Future: Assessing Renewable Portfolio Standards as Green Growth Policy in the U.S, in* Climate Change and Green Growth: Legislative Achievements and Prospects (2013).

168. Public Utility Regulatory Policies Act of 1978 ("PURPA"), Pub. L. No. 95-617, §2, 92 Stat. 3117, 3119 (codified at 16 U.S.C. §§2601-2645); *see also* Richard D. Cudahy, *PURPA: The Intersection of Competition and Regulatory Policy*,16 Energy L.J. 419 (1995).

169. *See generally e.g.*, Amy J. Wildermuth, *Is Environmental Law a Barrier to Emerging Alternative Energy Sources?*, 46 Idaho L. Rev. 509, 524, 528 (2010); Amy J. Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 Utah Envtl. L. Rev. 369, 388 (2011).

must be accounted for when weighing RPSs' effects. Likewise in India, the RPO has operated in a policy environment populated by other renewable energy support devices, such as feed-in tariffs, the Jawaharlal Nehru National Solar Mission, the generation based incentive, and accelerated depreciation.[170]

Second, as the descriptions of the experiences in the United States, United Kingdom, and India make clear, RPSs do not come in one shape or size. Thus, their unique attributes need to be considered when measuring performance.[171]

Third, and related, it is important to acknowledge that RPS goals are not always what they seem. The intricate, and intricately varied, nature of RPS design means that the renewable energy targets stated on the face of the statutes often are far more watered down than they appear.[172]

Finally, RPS stability and longevity is critical.[173] Studies repeatedly have shown that the on-again, off-again nature of renewable energy policies dampen investor willingness to participate in a market. There is no reason to think the same will not be true of RPSs. In measuring RPS efficacy, then, all of these factors must be taken into account.

2. Efficiency

Efficiency is commonly defined as regulation's cost-effectiveness. This traditional definition adopts a neoclassical economic perspective. It examines whether the regulation's cost is minimized, either by assessing the device alone or in contrast to other possible regulatory tools. Consequently, it is often referred to as "static efficiency," the most common measure of regulatory efficiency. "Efficiency is mostly gauged in a static context, as electric power supplied to end-users at least cost in the short run."[174]

Increasingly, however, policy analysts take a broader view of efficiency. This perspective is perhaps best captured by the idea of "dynamic efficiency," or a policy's ability to minimize costs in the *long-term*. In the renewable energy context, this concept refers to the idea of innovation. To the extent renewable

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170. *See* Shereef & Khaparde, *supra* note 126, at 1444.

171. Davies(b), *supra* note 19, at 67-68.

172. *See* Davies(a), *supra* note 6, at 1361, 1385-90.

173. *See, e.g.*, Valentina Dinica, *Support Systems for the Diffusion of Renewable Energy Technologies—An Investor Perspective*, 34 ENERGY POL'Y 461 (2006); Ryan H. Wiser & Steven J. Pickle, *Financing Investments in Renewable Energy: The Impacts of Policy Design*, 2 RENEWABLE & SUSTAINABLE ENERGY REV. 361 (1998).

174. Verbruggen & Lauber, *supra* note 157, at 640.

energy policies promote innovation, they may also achieve dynamic efficiency:[175] "Dynamic efficiency [looks] to the long run, meaning that costs in the future are reduced by innovation which in turn is induced by the policy instrument."[176] Thus, in evaluating RPS performance, both static efficiency and dynamic efficiency matter.

Numerous factors might influence an RPS's static efficiency. The literature has identified risk as the top of that list. Because investors who bear greater risk demand greater returns on their investments, higher policy risk tends to drive up implementation costs.[177]

For RPSs, risk might occur both politically and in the market. The political risk is obvious; it is the same risk relevant to RPS efficacy. If a policy is not long-lasting, or is modified too heavily or too often, it can erode investor confidence and thus drive up implementation costs.[178] In the market, RPS risk may bear itself out in terms of demand risk, price risk, and contract risk.[179] The former refers to the inherent unpredictability of future electricity consumer demand. All electricity suppliers face this, but it may be more keenly felt by upstart or smaller renewable energy companies.[180] Price risk exists in RPSs because REC prices by definition vary over time and cannot be determined in advance. Contract risk refers both to the possibility that a purchaser might not be secured for a renewable energy facility's output and to the indeterminacy of the terms that might be negotiated for any such contract that is secured. Contract risk thus also might be seen as a type of transaction cost. The more hoops renewable energy developers have to jump through to secure a power purchase agreement, and the more often they have to do so, the more expensive renewable energy development becomes under the law.

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175. *Id.*

176. *Id.*

177. *See* Toby D. Couture et al., A Policymaker's Guide to Feed-in Tariff Policy Design, (2010), *available at* http://www.nrel.gov/docs/fy10osti/44849.pdf.

178. *See* Andrea Masini & Emanuela Menichetti, *The Impact of Behavioral Factors in the Renewable Energy Investment Decision Making Process: Conceptual Framework and Empirical Findings*, 40 Energy Pol'y 28 (2012); *see also* Dinica, *supra* note 173.

179. Dinica, *supra* note 173.

180. *See, e.g.*, Rolf Wüstenhagen & Emanuela Menichetti, *Strategic Choices for Renewable Energy Investment: Conceptual Framework and Opportunities for Further Research*, 40 Energy Pol'y 1 (2012); Aviel Verbruggen et al., *Renewable Energy Costs, Potentials, Barriers: Conceptual Issues*, 38 Energy Pol'y 850 (2010).

Also relevant to static efficiency is administrative cost. The very premise of RPSs is that they should be efficient because they are easily administrable: Regulators set the level of the renewables mandate, and then the underlying market for RECs or TGCs determines the ultimate value of green power. The reality, however, is that RPSs can be enormously complicated in their design. Potentially, as policy complexity increases, so too may the cost of the law's administration.[181]

An RPS's dynamic efficiency is most likely to increase if the diversity of technologies it promotes increases.[182] As the type of resources promoted multiplies, competition should increase, and competition should drive both innovation and cost reduction.[183] Thus, in weighing RPS policy design, both direct costs and the ability of the law to foster resource diversity should be considered.

3. Equity

RPSs may raise equity concerns in at least three ways.[184] The first relates to who benefits, and who is burdened by, the laws. Typically, RPSs are financed by electricity consumers. The utility subject to the law passes on its costs to ratepayers. Indeed, some RPSs effectively guarantee this cost transfer.[185] Thus, to the extent wealthier parties benefit from an RPS, lower income consumers, who naturally feel a sharper pinch from rate increases, effectively subsidize those wealthier individuals and businesses. This impact can be seen under some FIT systems, where what are effectively government-backed investments have spurred a rush by wealthier individuals to install solar PV on their homes at the

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181. *See, e.g.*, Ryan Wiser et al., Evaluating Experience with Renewables Portfolio Standards in the United States 22 (2004) [hereinafter Wiser et al.(b)].

182. Sovacool, *supra* note 157, at 1785 ("Dynamic efficiency refers to the ability for a policy to promote a diversification of renewable energy sources and technologies. It captures how much a policy encourages the adoption of a basket of renewable energy systems including the most expensive ones.").

183. *See* Verbruggen & Lauber, *supra* note 157, at 640.

184. *See* Clean Energy Ministerial, *Ministerial Roundtable "Renewable Energy for Sustainable Growth and Employment: Pre-Read for Ministerial Roundtable* (May 12, 2014), http://www.cleanenergyministerial.org/Portals/2/pdfs/CEM5-RT-RE-for-Growth-Pres.pdf.

185. *See* Davies(a), *supra* note 6, at 1403.

expense of lower-income ratepayers.[186] It also is a potential equity concern for RPSs.

Second, to the extent electricity is seen as a public good, an equity concern may be how an RPS impacts market structure. If the law promotes ownership of renewables by large, incumbent energy producers, some may see that as less equitable than a regime that promotes more democratic, distributed, populist, participative energy ownership.

Finally, RPSs may raise geographic-based equity concerns. In the United States, for instance, part of the longstanding debate over whether there should be a national RPS hinges on the argument that a federal RPS would amount to an unfair wealth transfer: a tax on renewables-poor states to finance economic development in renewables-rich jurisdictions.[187] Similar arguments are made in the European Union, with some countries resisting a move to an E.U.-wide compliance market, even though it would reduce regulatory costs for their own citizens. To the extent an RPS has these effects, then, this equity concern may arise. Particularly if the populace's income correlates with a jurisdiction's resource wealth, the concern may be especially acute.

4. Net Benefits

Assessing RPSs' net benefits requires clear examination of many metrics that are difficult to measure. Aside from RPSs' direct costs, which should be reflected in the laws' effect on electricity prices and government resources spent on implementation, one of the biggest areas of potential RPS benefits is economic development—or what is sometimes referred to as "green growth."[188]

This comes in two types.[189] First, RPSs might spur general industrial growth, for instance, by encouraging the construction of renewable technology manufacturing facilities. These impacts may be significant, but the calculus of the jobs and revenue they produce must measure their true net effect, including funds that would have gone to other manufacturing operations in the jurisdiction

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186. *See* Lincoln L. Davies & Kirsten Allen, *Feed-in Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 940 (2014).

187. *See, e.g.*, 151 CONG. REC. S6688, at S6682 (daily ed. June 16, 2005) (statement of Sen. Craig).

188. *See, e.g.*, Inhye Heo, *The Political Economy of Policy Gridlock in South Korea: The Case of the Lee Myung-bak Government's Green Growth Policy*, 41 POLITICS & POLICY 509, 513-14 (2013).

189. *See* Clean Energy Ministerial, *supra* note 184, at 14.

even without an RPS.[190] This effect might also be analyzed in connection with its impact on the jurisdiction's trade balance.[191] Second, RPSs can promote job growth related to the installation, maintenance, and upkeep of renewable energy facilities. The promise of this kind of green growth is perhaps why so many politicians across the globe, including in the United States and South Korea, have touted RPSs for their economic benefits.[192]

Environmentally, RPSs have several benefits. One most mentioned is their ability to reduce greenhouse gas emissions. To assess the climate benefits of RPSs, their impact on the generation profile must be taken into account. A new renewable facility that displaces coal offers a more significant climate benefit than one that displaces natural gas generation.[193] Moreover, renewables offer significant benefits by reducing "conventional" pollutants important from a public health perspective, such as NO_x, SO_x, ozone, and fine particulates.

Of course, renewables can impose environmental costs. In many jurisdictions, windmills have roused opposition for their impacts on birds and bats.[194] Resources like PV rely on rare earth elements.[195] Many renewable facilities can be land-intensive, as Uma Outka has astutely assessed, and some consider renewables to be aesthetic eyesores.[196] New installations thus can raise local opposition in the form of familiar "NIMBY" resistance.[197] New transmission lines

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190. *See, e.g.*, Christoph Böhringer et al., *Are Green Hopes Too Rosy? Employment and Welfare Impacts of Renewable Energy Promotion*, 36 ENERGY ECON. 277 (2013); Manuel Frondel, *Germany's Solar Cell Promotion: Dark Clouds on the Horizon*, 36 ENERGY POL'Y 4198, 4202 (2008); Bernhard Hillebrand, *The Expansion of Renewable Energies and Employment Effects in Germany*, 34 ENERGY POL'Y 3484, 3493 (2006).

191. *See* Clean Energy Ministerial, *supra* note 184, at 14.

192. *See, e.g.*, Martin Jänicke, *"Green Growth": From a Growing Eco-Industry to Economic Stability*, 48 ENERGY POL'Y 13, 13-14 (2012).

193. *See* Rossi, *supra* note 6.

194. *See, e.g., Advantages and Challenges of Wind Energy*, U.S. DEPARTMENT OF ENERGY: ENERGY EFFICIENCY AND RENEWABLE ENERGY, https://www1.eere.energy.gov/wind/wind_ad.html.

195. *See Energy Basics,* U.S. DEPARTMENT OF ENERGY: ENERGY EFFICIENCY AND RENEWABLE ENERGY, http://www.eere.energy.gov/basics/renewable_energy/pv_cell_materials.html.

196. *See* Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENVTL. L.J. 241 (2011).

197. *See, e.g.*, JAMES A. HOLTKAMP & MARK A. DAVIDSON, TRANSMISSION SITING IN THE WESTERN UNITED STATES 7-9 (2009),*available at* http://www.hollandhart.com/articles/Transmission_Siting_White_Paper_Final.pdf.

needed to deliver renewable electricity to load centers also have encountered local resistance,[198] and depending on where they are sited, some facilities may raise endangered species concerns.[199]

Finally, RPSs can have important electricity system effects. To the extent that renewables are sited near areas of high electricity demand, they may benefit the grid by reducing energy losses and the need for additional transmission capacity. If renewables are sited far from load centers, however, they also impose direct costs in the form of additional transmission demands. Moreover, because many renewables are intermittent and variable in their electricity production, they impose system balancing costs on grid managers.

B. RPS Policy Design

As the United States, United Kingdom, and India examples demonstrate, RPSs are so diverse that there are almost countless possible ways to categorize them. A common tendency is to focus on the laws' most noticeable attributes—their percentage targets and compliance timetables. A natural question about any RPS is what it requires and how soon that objective must be reached.

However, RPS design is far more complicated than these twin questions. Indeed, prior research has revealed no fewer than twenty policy choices regulators make when they design an RPS.[200] These policy attributes cluster around four core policy design categories: (1) RPS target ambition and structure; (2) compliance speed and exceptions; (3) resource definition and breadth; and (4) administration and jurisdiction. Presumably, the more expansive or aggressive an RPS is on each of these metrics, the more ambitious the RPS is overall.[201] Figure 1 depicts the various policy design categories and the choices regulators face in writing an RPS. The remainder of this sub-Part details each of the relevant possible policy attributes.

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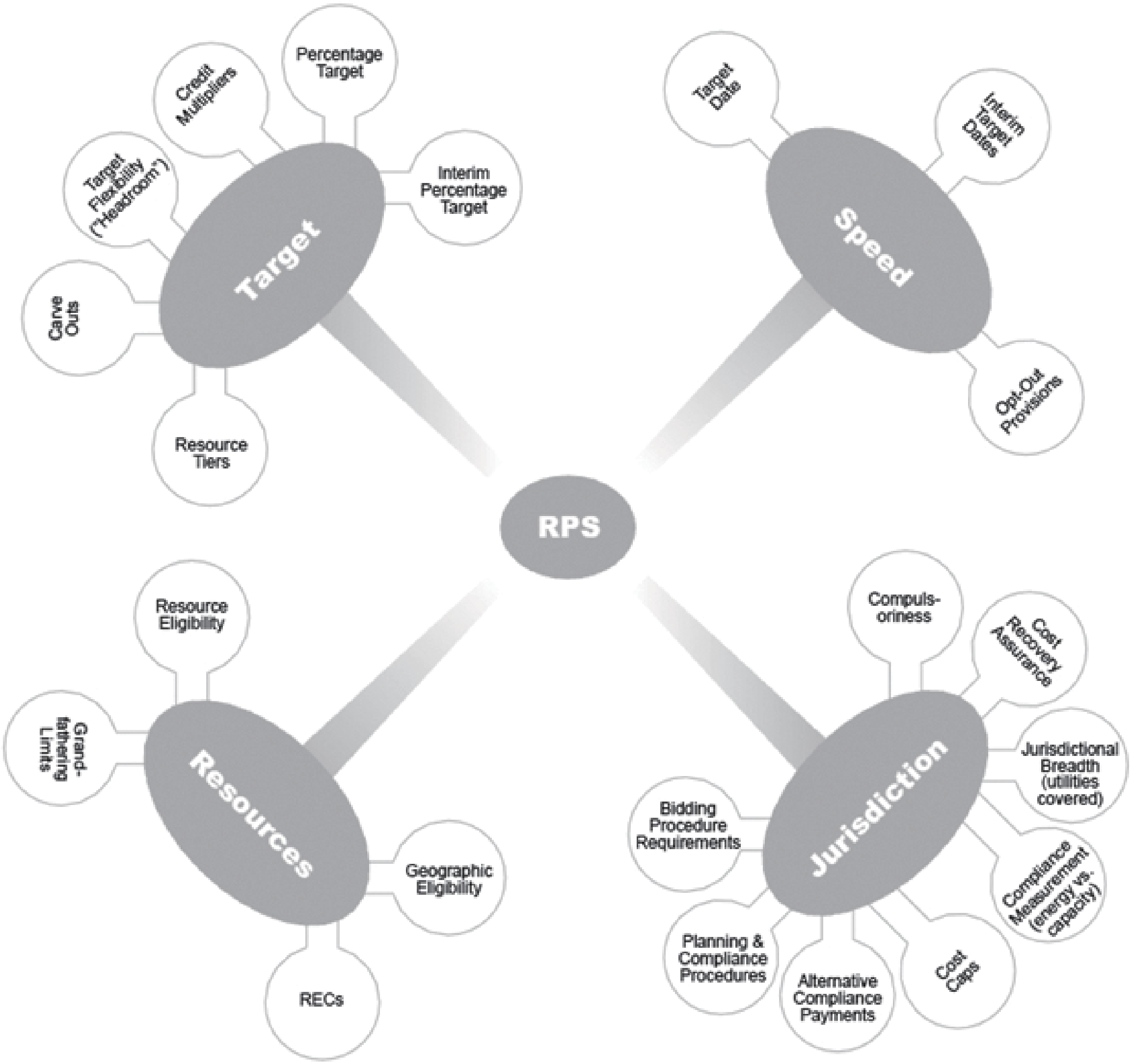
198. *See, e.g.*, Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63 (2011).

199. *See Animal Welfare Inst. v. Beech Ridge Energy LLC*, 675 F. Supp. 2d 540 (D. Md. 2009); *see also, e.g.*,Hari M. Osofsky & Hannah J. Wiseman, *Dynamic Energy Federalism*, 72 MD. L. REV. 773 (2013).

200. *See* Lincoln L. Davies, *Reconciling Renewable Portfolio Standards and Feed-in Tariffs*, 32 UTAH ENVTL. L. REV. 311, 328 (2012) [hereinafter Davies(d)].

201. *See* Davies(a), *supra* note 6, at 1386-87.

Figure 1. RPS Policy Design Options



1. RPS Target Ambition and Structure

While the natural focus of any RPS is its ultimate mandate—33 percent renewable energy, as in California, or 10 percent, as in South Korea[202]—much

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202. DSIRE, *supra* note 14; Do-Yo Kim, *Introduction of RPS and Phase-Out of FIT in Renewable Energy Policy*, INT'L FIN. L. REV. (Aug. 1, 2012), http://www.iflr.com/Article/3072471/Introduction-of-RPS-and-phase-out-of-FIT-in-renewable-energy-policy.html.

else in these laws' ambition and structure warrants consideration. At bottom, the RPS target is just the law's starting point. The rest of its regulatory structure is what either bolsters or dilutes that target, and ensures whether it succeeds or fails. Most closely related to an RPS's end target is whether the law also establishes interim targets. Although some RPSs continue to use a simple "ultimate target" structure, increasingly these laws include a more detailed regime that sets yearly or periodic interim targets to help ensure and smooth the path to final compliance. Thus, many U.S. RPSs include periodic interim targets, and RPO targets in India are determined for every year.

Another question is whether the RPS target should be fixed or, instead, should be more flexible. The United Kingdom's RO demonstrates this option. Its use of the "headroom" concept represents an RPS that utilizes a more flexible target, in an upward direction, to ensure that the target does not become a ceiling. Conceivably, an RPS could be written to utilize flexibility in the opposite direction as well—an effect that RPS cost caps may have if a regulator is more serious about the cost cap than enforcing the target.

In addition, many RPSs now include efforts to promote a broader diversity of renewable technologies.[203] These efforts utilize three primary tools, sometimes in combination. One is the "set-aside" or "carve-out," used most often for solar power, such as in some U.S. and Indian states. A similar mechanism does not carve out a portion of the RPS's mandate for a given resource, but rather, affords additional compliance credit for a targeted resource. This is the credit multiplier. While this device, like a carve-out, has the benefit of bolstering resource diversity, unlike the carve-out, it dilutes the RPS's ultimate target. Finally, some RPSs utilize resource tiers or bands. These can be designed in multiple ways, but two common approaches are (1) to set percentage targets for each tier, utilized in some U.S. states, or (2) to afford credit multipliers for energy produced from the technologies eligible in certain tiers, such as the United Kingdom does under its RO.

2. Compliance Speed and Exceptions

Second only to RPS ambition is speed. By what date must the twenty percent renewables goal be met? As with an RPS's target, this question might be presumed to be straightforward. However, there are at least two additional potential wrinkles here as well.

The first is whether the law includes interim target dates. Typically, this choice

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203. *See, e.g.*, WISER ET AL.(a), *supra* note 36; *See* Buckman, *supra* note 23.

will be answered by whether policymakers decide to utilize interim targets. As seen in India and the United Kingdom, many RPSs now have yearly targets, not just end-of-program targets. Far more complicating for how quickly an RPS is complied with is whether it includes what might best be referred to as an "opt-out provision." These measures act as RPS escape hatches. Where they are triggered, non-compliance with the statute might be forgiven, or at least delayed for a time. Typically, these measures are adopted in an effort to keep down RPS compliance costs.

3. Resource Definition and Breadth

At first blush, how RPSs define resource eligibility might be considered one of the most interesting questions about the laws: Which renewables count? In fact, the answer is hardly revelatory. While RPS eligibility clearly matters, across RPSs, most renewables, such as solar, wind, geothermal, and the like, tend to get counted. How jurisdictions treat hydroelectricity varies widely. And more "exotic" and emerging technologies, like tidal, tend to count less often under the laws, but where they tend to be eligible can generally be easily guessed: where the underlying resources exist.[204]

Some RPSs complicate the eligibility question further, particularly by casting the "R" in "RPS" more broadly than renewables alone. In India, for instance, cogeneration is counted under the RPO.[205] Likewise, in the United States, some states utilize Clean Energy Portfolio Standards or Advanced Energy Portfolio Standards, which the literature typically considers to be RPSs, but that count technologies like nuclear or clean coal toward their objectives.[206]

An arguably more important question is how a given law utilizes RECs or TGCs. There are a host of design questions here, ranging from how to measure the RECs (*e.g.*, 1 MWh versus 1 kWh) to whether they can be banked (*i.e.*, saved for use in later years) and for how long.[207] Additional questions include who owns the RECs (*e.g.*, the producer or the electricity purchaser) and how broadly they can be used (*e.g.*, only within a state, within a region, or anywhere).[208]

Related to RECs are both grandfathering and geographic eligibility. Grandfathering provisions determine how new an installation must be to count

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204. *See Davies*(a), *supra* note 6, at 1376-77.

205. *See* Shereef & Khaparde, *supra* note 126, at 1444.

206. *See* DSIRE, *supra* note 14.

207. *See* Shrimali & Tirumalachetty, *supra* note 16, at 709-10.

208. *See*, *e.g.*, *ARIPPA v. Pa. Public Utility Comm'n*, 966 A.2d 1204 (Pa. Commw. Ct. 2009); American Ref-Fuel Co., No. EL03-133-000, 105 FERC ¶ 61,004 (2003).

for RPS compliance. Do only new facilities built after RPS enactment count, or can preexisting facilities be used, and if so, how far back? The more tightly an RPS restricts grandfathering, the more aggressive its target actually is.[209]

Geographic eligibility refers to where resources must be located to qualify under the law. In the United States, this question is persistent because state-level RPSs seek both to avoid policy leakage and to ensure the laws' social benefits are procured at home.[210]

4. Administration and Jurisdiction

Numerous policy devices can be used to define RPSs' jurisdiction and specify their administration and implementation. An initial question is whether the RPS is compulsory. In the United States, for instance, some RPSs are voluntary rather than mandatory, leading some observers to classify these laws not as RPSs but as "RPGs"—"Renewable Portfolio *Goals*."[211] Another question affecting a law's compulsoriness is the level of its non-compliance penalty. An RPS's use of a high non-compliance penalty—in the United Kingdom called "buyout payments," and in the United States often termed "alternative compliance payments"—may strongly encourage renewables deployment.[212] By contrast, a too-low penalty may act as a brake on development: Rational economic actors would rather pay a low penalty than the comparatively high cost of building new facilities, undermining the RPS's core goal.[213] A related question is what to do with the payments that are made. Should they be recycled back to renewable energy developers, thus potentially strengthening the RPS's effectiveness (as in the United Kingdom), should they be used only to reduce RPS administration costs, or should they simply remain in the government fisc?

Some RPSs employ cost caps—limits on the degree to which an RPS can impact consumer prices.[214] Such measures aim to reduce RPS compliance costs; at the same time, they potentially limit RPS efficacy. Just as a too-low penalty may discourage renewables deployment, so too may a too-low cost cap. It sends a

209. *See* Davies(a), *supra* note 6, at 1403.

210. *See supra* Part II.B.1.

211. *See* DSIRE, *supra* note 14.

212. *See* Shrimali & Tirumalachetty, *supra* note 16, at 707.

213. *See id*.

214. *See* Davies(a), *supra* note 6, at 1403. Certainly, inclusion of such cost caps (as well as alternative compliance payments, which have the same effect) forms part of the political calculus leading up to RPS adoption—precisely because these features limit the program's overall cost.

signal that the RPS target is one of convenience, not necessity.

By contrast, some RPSs have mechanisms built into them to effectively pre-approve the recovery of compliance costs by utilities subject to the laws.[215] These cost recovery assurances aim to ensure the laws' success by signaling policy stability. They are a statement by the adopters that later second-guessing of the RPS's aim will not be tolerated.

Aggressive planning and compliance measures, such as regular reports reviewed and approved by regulators, may drive up the law's implementation costs but might also better ensure its success.[216] Typically, these provisions work in conjunction with the non-compliance penalty structure, and are what are used to trigger penalties.

Just as resource eligibility can vary from RPS to RPS, so too can the way in which these laws apply to electricity providers.[217] The more broadly an RPS applies—for instance, to all electricity providers rather than only traditional, vertically integrated utilities—the more likely the generation portfolio is to change. This is why India's RPO includes not just distribution companies but also open access customers and captive power plants, although the size limitations used to define those customers and plants are obligated entities (>5 MW and >1 MW, respectively) also demonstrates the RPO's non-universal application.

To the extent an RPS mandates standardized bidding procedures for renewable energy acquisitions, this may not only reduce compliance costs but further break up utilities' historical dominance in the electricity sector. Use of such measures is a signal that discrimination against new renewable energy competitors is not allowed, although, again, RPSs' focus on traditional utilities reflects a fundamentally different approach to promoting renewables than FITs, which often encourage smaller installations by new market participants.

Finally, whether an RPS uses installed capacity (MW) or electricity produced or consumed (MWh) as its metric of compliance is a basic difference among laws.[218] The latter ensures that only the actual generation of electricity from renewables counts for RPS compliance. The former promotes construction of new facilities but does not provide regulatory certainty that their power will be purchased.

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215. *See supra* note 185 and accompanying text.

216. *See* Davies(a), *supra* note 6, at 1385-86.

217. *See* N.C. Gen. Stat. § 62-133.8(b)(1) (2012) (applying to investor-owned utilities; different provisions of North Carolina law apply to municipalities and cooperatives).

218. *Compare* Iowa Code § 476.44(2) (2007), *with* 128 Haw. Rev. Stat. Ann. § 269-92(a)(4) (LexisNexis 2003).

C. Synthesis—The Contours and Analytic Power of an RPS Evaluative Model

Any evaluative model of RPS performance should assess all four primary metrics of RPS function—efficacy, efficiency, equity, and net benefits. This sub-Part constructs that model, by tying available RPS policy traits to these four metrics. It also identifies a number of observations about RPS design made apparent by the analytical exercise of matching RPS policy traits with the performance metrics they likely affect.

Several points emerge. First, RPS policy traits, perhaps predictably, focus most heavily on efficacy and efficiency. They deal little with equity. Thus, as RPSs continue to evolve, one appropriate place of emphasis for policymakers may be discerning design innovations that ensure RPSs avoid inequity effects.

Second, RPS policy design also does not directly address the laws' net benefits. Rather, the degree to which an RPS maximizes its societal benefits likely hinges on the laws' effectiveness and cost-effectiveness. Thus, RPS performance likely contains a kind of feedback loop. The same policy traits that promote RPS efficacy and efficiency also likely are tied to the laws' societal benefits.

Third, how well RPS policy design promotes efficacy may turn on the extent to which the laws erode barriers to renewable energy deployment. Significantly, RPS policy design focuses heavily on only one or two of these barriers—cost and incumbency—and much less on the others, including dispatchability and resource integration. Given that feed-in tariffs often have been praised as superior to RPSs, and that feed-in tariffs directly address renewables' dispatchability and integration, this too may be an area of potential policy innovation for RPSs. Put differently, it is not just that RPSs often fail to address these barriers, it is that RPS design traits and innovation often reinforce—rather than counteract—the laws' general efforts. Thus, by building into RPSs design traits that accomplish some of the same objectives that feed-in tariffs attend to, RPSs may become more effective.

Fourth, RPS policy design allows for and even creates a number of kinds of risk that feed-in tariffs eliminate. Innovating RPS policy design to address these risks may make RPSs both more efficacious and efficient.

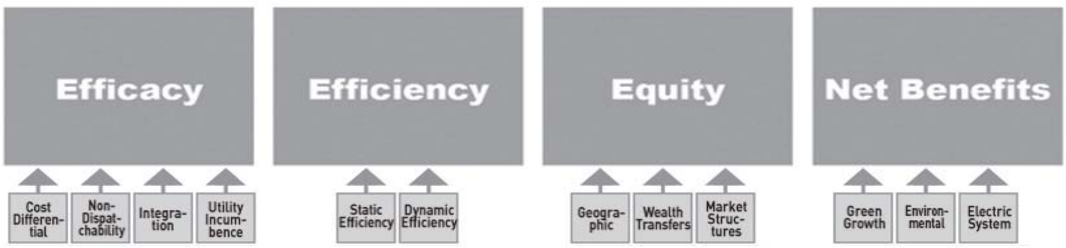
Fifth, RPS design is increasingly complex, and some policy traits potentially work at cross purposes. For instance, while credit multipliers can be used to enhance the diversity of resources RPSs promote, they also dilute the RPS's target. Carve-outs can be employed for the same purpose but complicate RPS operation and thus likely increase administrative cost. Determining how to balance RPS design traits against their likely effects on RPS performance is a key challenge for policymakers.

Finally, while the model constructed here provides a conceptual framework for assessing RPS performance, the model is just that—by definition, conceptual and analytical. Further empirical analysis is necessary to test the model's predictive power, particularly as it links different policy traits to the performance metrics. This is an area rich for future scholarship, and should be used to adjust and refine the model going forward.

Figure 2. RPS Performance Metrics (Evaluative Model – Tier I)

The conceptual model for evaluating RPS performance can be built in three tiers, as depicted in Figures 2-4. The four metrics of RPS performance comprise the first tier. At the second tier, the different components that inform those metrics, such as the four barriers to renewable energy deployment, show the inputs that feed into the efficacy metrics. Finally, the possible RPS policy traits comprise the third tier; the analysis conducted here highlights how each design trait likely impacts the four performance metrics.

Figure 3. RPS Performance Inputs (Evaluative Model – Tier II)



1. Efficacy

It is tempting to conclude that virtually every policy trait influences RPS efficacy, but in actuality, that is likely short of the truth. Certainly most of the policy attributes that address an RPS's target, speed, and jurisdictional breadth will dictate some measure of RPS success. However, many RPS policy design traits simply define the terms of the law, and thus, likely do little to drive RPS success or failure.

Determining RPS efficacy might best be considered through the lens of how different policy design elements address barriers to renewable energy deployment. Studies identifying renewable energy barriers often build extensive lists, with some taxonomies running for several pages even in summary form[219] and many naming no less than ten macro categories of barriers.[220] Others take a slightly more consolidated approach, identifying, for instance, market, technical, institutional, behavioral, financial, and awareness/information barriers as key categories.[221] Some newer investigations focus on narrower aspects of the problem, such as social acceptance of renewable energy technologies.[222]

Most relevant to RPSs, however, are not the myriad reasons why any actual or theoretical renewable energy technology might not be developed or adopted, but rather, which barriers prevent renewable electricity generation facilities from being built and used. This inquiry centers on the difference between renewables and the other generation technologies they compete against.

These differences are well documented and plain. There are four. First and most fundamentally, renewables, despite their low (or zero) fuel costs, long have been more expensive than conventional fossil and nuclear generation—particularly when compared to incumbent facilities that are fully depreciated.[223] Thus, utilities, operating under either longstanding cost-of-service regulation principles or, more recently, competitively in liberalized markets,[224] historically

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219. *See* J.P. Painuly, *Barriers to Renewable Energy Penetration; A Framework for Analysis*, 24 Renewable Energy 73, 79-81 (2001).

220. *See* Simona O. Negro, *Why Does Renewable Energy Diffuse So Slowly? A Review of Innovation System Problems*, 16 Renewable & Sustainable Energy Rev. 3836, 3839 (2012).

221. *See* Sudhakar Reddy & J.P. Painuly, *Diffusion of Renewable Energy Technologies—Barriers and Stakeholders' Perspectives*, 29 Renewable Energy 1431, 1437 (2004).

222. *See* J. West et al., *Renewable Energy Policy and Public Perceptions of Renewable Energy: A Cultural Theory Approach*, 38 Energy Pol'y 5739 (2010); Rolf Wüstenhagen et al., *Social Acceptance of Renewable Energy Innovation: An Introduction to the Concept*, 35 Energy Pol'y 2683 (2007).

223. *See Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2014*, U.S. Energy Information Administration (2014), http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

224. *See, e.g.*, *Federal Power Comm'n v. Hope Natural Gas*, 320 U.S. 591 (1944); *see also, e.g.*, Richard D. Cudahy & William D. Henderson, *From Insull to Enron: Corporate Re(regulation) After the Rise and Fall of Two Energy Icons*, 26 Energy L.J. 35, 108 (2005); Richard J. Pierce, Jr., *Completing the Process of Restructuring the Electricity Market*, 40 Wake Forest L. Rev. 451 (2005); Joseph P. Tomain, *Electricity Restructuring: A Case Study in Government Regulation*, 33 Tulsa L.J. 827, 829 (1998).

have been loath to adopt renewables into their generation portfolios.

Second, many renewables, such as solar and wind, are intermittent and not dispatchable.[225] That is, because such renewables only generate electricity when the sun is shining or the wind blowing, system operators cannot call on them to run whenever they are needed. Accordingly, while the end product that renewables produce—electricity—is fungible with the output of a nuclear plant, renewable generators' comparative utility to grid operators and dispatchers is more limited than, say, a combined cycle natural gas facility that can be easily started up, and rapidly ramped up and down.

Third, many renewable facilities, including those utilizing wind, hydro, geothermal, and solar, are not geographically flexible for siting and construction.[226] Unlike natural gas, coal, or nuclear plants, which can be built close to customer demand or in load pockets to ease transmission constraints, the fuels needed for many renewable facilities are endemic in nature. Their availability is location-specific. As a result, many renewables facilities must be located near their resource base, which can increase both the cost and difficulty of connecting these facilities to the grid. Renewables, in short, face an integration problem.

Finally, because renewable generators have a history of being built by new competitive entrants into the market—or used at the consumer level as distributed generation—utilities may be resistant to their increased use. This trend has been borne out across the globe. Even in Germany, which has transformed its energy profile in recent years under the banner of its *Energiewende* policy,[227] utilities

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225. *See, e.g.*, Steven Ferrey, *Restructuring a Green Grid: Legal Challenges To Accommodate New Renewable Energy Infrastructure*, 39 Envtl. L. 977, 986-96 (2009). The dispatchability problem, of course, can be solved using storage. The problem is that battery storage generally remains uneconomic at this point, though some systems have found other solutions. Pumped storage is one such option.

226. *See, e.g.*, Gunnar Birgisson & Erik Petersen, *Renewable Energy Development Incentives: Strengths, Weaknesses and the Interplay*, Electricity J. 40, 42 (2006).

227. *See, e.g.*, Fed. Ministry for the Env't, Nature Conservation and Nuclear Safety, Renewable Energy Sources in Figures: National and International Development 18 (2013), *available at* http://www.bmub.bund.de/fileadmin/Daten_BMU/Pools/Broschueren/ee_in_zahlen_en_bf.pdf; Jabeen Bhatti, *The Cost of Green: Germany Tussles Over the Bill for Its Energy Revolution*, Time World (May 28, 2013), http://world.time.com/2013/05/28/the-cost-of-green-germany-tussles-over-the-bill-for-its-energy-revolution/.

were slow to get in on the renewable energy business.[228] Of course, the flipside of this observation is that RPSs may be able to leverage incumbent utilities' market strength to promote a clean energy transition,[229] but the fact remains that utility incumbency also can limit the rate and scope of that change.

In terms of barriers, RPSs focus most clearly on reducing technology cost. The very idea of an RPS is that by promoting greater use of renewable technologies, their production costs will decrease, and thus, they will become more competitive with traditional generation.[230] Certainly from a long-run perspective, RPS targets and compliance dates matter for how aggressive an RPS is and, in turn, how likely it is to be successful at driving down costs. Likewise, other policy traits that strengthen RPSs' ability to achieve their objective of renewable energy deployment—interim targets and dates; target flexibility; the laws' compulsoriness; their jurisdictional breadth; their penalty levels; and their use of cost recovery assurances, planning and compliance procedures, and bidding procedures—all may affect the degree to which an RPS drives down renewable technology costs. By contrast, those policy traits that effectively dilute the laws' strength—including credit multipliers, opt-out provisions, narrower jurisdictional breadth, cost caps, and the allowance of grandfathering—may limit the laws' ability to reduce renewable energy costs, at least in the short term.

After cost, RPS policy design is tied most closely to breaking down the barrier of utility incumbency—or "traditional generation" incumbency in jurisdictions, such as the United Kingdom, where the RO arguably has bolstered vertically integrated utility control. The core RPS engine is its attempt to leverage utilities' existing infrastructure and market position to work an energy transition.[231] Thus, an RPS's jurisdictional breadth matters heavily, because this defines which type of electricity providers will be subject to the law. Likewise, grandfathering matters, because if allowed extensively, it necessarily erodes the RPS's ability to foster change. RPS resource tiers, carve-outs, and credit multipliers also are relevant from an incumbency perspective, because they control which type

228. Volkmar Lauber & Lutz Mez, *Three Decades of Renewable Electricity Policies in Germany*, 15 Energy & Env't 599, 601 (2004), *available at* http://www.wind-works.org/cms/uploads/media/Three_decades_of_renewable_electricity_policy_in_Germany.pdf.

229. *See* Davies(d), *supra* note 200, at 354; *cf.* Joel B. Eisen, *Residential Renewable Energy: By Whom?*, 31 Utah Envtl. L. Rev. 339 (2011).

230. *E.g.*, Bürer & Rolf Wüstenhagen, *supra* note 11, at 4998.

231. *See* Eisen, *supra* note 229.

of resources will be used to satisfy the RPS, and thus, potentially the type of company that will enter the market. Large renewables installations, like onshore wind farms, can easily be managed in-house by incumbent utilities, but more distributed resources, like solar PV, are outside the traditional bailiwick of vertically integrated utilities. Of particular note, then, are both bidding procedures and cost recovery assurances. The former seeks to limit utility bias against renewables, by dictating terms for selecting renewable projects. The latter has the salutary effect—in regulated markets at least—of easing possible utility concerns that RPS compliance will not be rewarded. Finally, any measure that strengthens rather than dilutes an RPS's aggressiveness should help on the incumbency front, because a stronger RPS by definition pushes harder to break up existing market structures.

In contrast, RPS design does much less to eliminate the barriers of dispatchability and resource integration. On dispatchability, in fact, RPS design does very little at all. Potentially, use of resource tiers, carve-outs, and credit multipliers could help soften the impact of bringing numerous intermittent resources online at once: for instance, by encouraging both solar and wind, whose availability profiles can complement each other, or by promoting the use of both dispatchable and non-dispatchable renewable generation at the same time.[232] With respect to resource integration, only one RPS policy trait appears relevant—how RPS compliance is measured. If an RPS measures compliance in terms of installed generation capacity, this, by itself, is unlikely to ensure that the new generation will actually get used. By contrast, RPSs that determine compliance based on electricity production ensure that new renewables installations will actually be integrated into the generation stack. Admittedly, this is a far cry from some policies' integration mechanisms—such as feed-in tariffs' mandates that renewables connect to the grid and receive priority status in the generation stack[233]—but the trait is relevant nonetheless.

2. Efficiency

One of the primary reasons policymakers advocate for RPSs over other

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232. *See generally e.g.*, John Blackburn, Institute for Energy and Environmental Research, *Matching Utility Loads with Solar and Wind Power in North Carolina Dealing with Intermittent Electricity Sources* (March 2010), http://www.ieer.org/reports/NC-Wind-Solar.pdf.

233. *See, e.g.*, Volkmar Lauber & Lutz Mez, *Renewable Electricity Policy in Germany, 1974 to 2005*, 26 BULL. SCI., TECH. & SOC'Y 105, 110 (2006).

renewable energy support mechanisms is that, in theory, RPSs should keep compliance costs down.[234] Their use of REC/TGC markets means that the lowest cost renewable resources should prevail in the race to achieve RPS compliance.[235] At least some studies have suggested that this theory does not bear out in reality.[236] Nevertheless, the policy design attributes that dictate how RPSs use RECs may carry the most weight in how well these laws achieve efficiency.

Thus, from a static efficiency perspective, an RPS's use of RECs is its first and most important policy trait. Other design attributes that matter include credit multipliers, carve-outs, and resource tiers, which can diversify but also dilute RECs. Particularly to the extent an RPS seeks to maximize dynamic efficiency, use of resource tiers, credit multipliers, or carve-outs is key: These devices are how an RPS can promote broader panoply of resources than just onshore wind,[237] which, because it is the most cost-competitive renewable resource, is often most closely linked with renewable energy deployment under RPSs.[238]

Cost caps, non-compliance penalties, and cost recovery assurances are efficiency double-edged swords. On one hand, from a static efficiency perspective, these traits may keep compliance costs down, by limiting allowable costs, providing a release valve (if penalties are set lower than resource costs), and lowering utility compliance costs. On the other, from a dynamic efficiency perspective, these policy attributes also could limit RPS long-run cost-effectiveness by delaying the speed at which renewables are deployed, and thus, dampening the incentive for innovation. This is particularly true if cost caps or non-compliance penalties are set too low.

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234. *See, e.g.*, C. Batlle et al., *Regulatory Design for RES-E Support Mechanisms: Learning Curves, Market Structure, and Burden-Sharing*, 41 Energy Pol'y 212, 217 (2012).

235. *See, e.g.*, Richard Schmalensee, *Evaluating Policies to Increase Electricity Generation from Renewable Energy*, 6 Rev. Envtl. Econ. & Pol'y 45, 54-56 (2011).

236. *See, e.g.*, *id.*; Toby Couture & Karlynn Cory, State Clean Energy Policies Analysis (SCEPA) Project: An Analysis of Renewable Energy Feed-in Tariffs in the United States 3 (2009), *available at* http://www.nrel.gov/ analysis/pdfs/45551.pdf; David de Jager & Max Rathmann, *Policy Instrument Design to Reduce Financing Costs in Renewable Energy Technology Projects* 119, 127-28 (2008).

237. Wiser et al.(a), *supra* note 36; Buckman, *supra* note 23.

238. *See, e.g.*, Menz & Vachon, *supra* note 4; Ryan Wiser & Galen Barbose, Renewable Portfolio Standards in the United States: A Status Report with Data Through 2007 12 (2008), *available at* http://eetd.lbl.gov/ea/ems/reports/lbnl-154e-revised.pdf; *see also supra* Part II.

The more complicated an RPS is, the more it may also decrease efficiency by driving up administrative costs.[239] By definition, the more time administrators must spend determining whether utilities have complied with an RPS—and the more time utilities spend deciding how best to comply—the more administration costs should increase. Thus, to some degree, RPSs' use of resource tiers, carve-outs, and credit multipliers may present an efficiency tension: While these traits may promote dynamic efficiency, they may also increase administration costs. Finally, of particular and obvious relevance to administrative costs are the planning and compliance procedures an RPS uses.

3. Equity

RPS policy design inherently nods very little to equity. As noted, use of some RPS policy design traits, such as credit multipliers, carve-outs, and resource tiers, may raise equity concerns, both in terms of how they spread RPS benefits across society and as to how they change market structure. However, addressing equity is neither the primary motivator for, nor likely the chief effect of, those policy attributes. Some RPSs do take efficiency into account in a way that may also promote equity, such as Texas' use of competitive renewable energy zones to ensure siting of facilities in the most resource-rich areas.[240] Such measures, however, are hardly standard protocol in RPS adoption, as the long delay before the United Kingdom engaged in planning and siting reform makes clear.[241] To the extent a nation uses subnational RPSs rather than a federal policy, limits on geographic eligibility also may present equity implications.[242] At bottom, however, the primary message is that most aspects of RPS policy design deal little with equity at all.

4. Net Benefits

Just as it is difficult to accurately attribute societal benefits and costs to RPS operation, tying net benefits to any single RPS policy trait demands remarkable refinement in empirical analysis that exceeds the scope of this paper, and is

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239. WISER ET AL.(b), *supra* note 181, at 22.

240. *See, e.g.*, Kathryn B. Daniel, *Winds of Change: Competitive Renewable Energy Zones and the Emerging Regulatory Structure of Texas Wind Energy*, 42 TEX. TECH L. REV. 157 (2009).

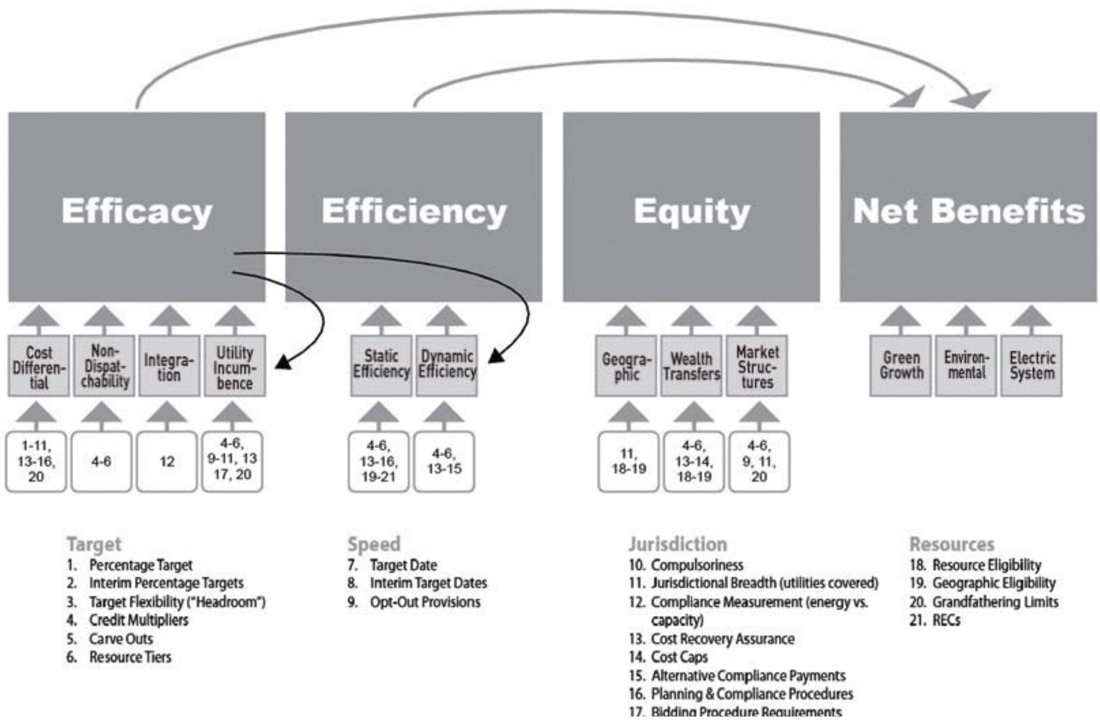
241. *See supra* Part II.B.

242. *See supra* Part III.B.4.

beyond what is normally conducted for RPS analyses. At a broader level, however, it is fair to say that to the extent RPSs benefit society, their ability to do so is tied to efficacy. Thus, those policy attributes that drive RPS efficacy also are likely to most heavily impact RPS net benefits. Likewise, a true calculus of RPS benefits should deduct the cost of administering the law. Consequently, the policy attributes that promote RPS efficiency also should be tied to maximizing the laws' net benefits.

Recognizing this dynamic, Figure 4 (also reproduced in the Appendix) depicts the likely relationships between RPS policy design and the four performance metrics. These relationships are likely complex and multifaceted. It is quite possible that some policy traits will affect more than one metric, and that some policy traits may act synergistically with—or in a way that is countervailing to—other traits. Scholarly exploration of RPS design and performance, particularly using rigorous quantitative empirical techniques, is an area ripe for harvest. Nevertheless, the analytical power of the evaluative model presented here reveals a number of important lessons about RPS policy design and how it might be further innovated going forward.

Figure 4. Potential Impact of RPS Design Traits on Performance
(Evaluative Model – Tier III)



IV. RPS Policy Design Today and Tomorrow—Obstacles and Opportunities

One of the most important things to understand about renewable energy policy design today is that it is evolving as rapidly as renewable energy technologies themselves. The experience with feed-in tariffs often is cited as the core example of this trend, with nations like Germany and Spain repeatedly retooling their laws to keep pace with the changing markets that feed-in tariffs provoke.[243] But the observation holds equally true for renewable portfolio standards, as the experiences of the United States, the United Kingdom, and India make plain.[244] The sheer number of policy design options available for use in RPSs today only underscores the point.[245]

RPS policy design thus presents both significant obstacles and opportunities. How RPSs are designed clearly matters for their performance, as a growing body of literature shows.[246] However, making the right design choices for any RPS is challenging—a balancing act that is both value-laden and contextual to the jurisdiction.[247]

Adopting a forward-looking perspective, this Part addresses both the obstacles and opportunities in RPS policy design. Drawing on the descriptions of functioning RPSs in Part II, the conceptual model built in Part III, and the general renewable energy and RPS literature, it addresses three aspects of RPS policy design: best practices, design gaps, and potential areas for RPS policy innovation.

243. *See* Davies & Allen, *supra* note 186, at 943-59, 967-79.

244. *See supra* Part II.

245. *See supra* Part III.B.

246. *See, e.g.*, Adelaja et al., *supra* note 4; Fischlein & Smith, *supra* note 4; Yin & Powers, *supra* note 4. *Cf.* Gireesh Shrimali et al., *Have State Renewable Portfolio Standards Really Worked? Synthesizing Past Policy Assessments to Build an Integrated Econometric Analysis of RPS effectiveness in the U.S.*, USAEE Working Paper No. 12-099, DIW Berlin Discussion Paper No. 1258 (Oct. 25, 2012), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2166815 (considering RPS design in policy performance). For more on measuring RPS performance, see Int'l Energy Agency, Deploying Renewables 2011: Best & Future Policy Practice, ch. 4 (2011), *available at* http://www.iea.org/publications/freepublications/publication/Deploying_Renewables2011.pdf.

247. *See* Wiser et al.(b), *supra* note 181, at 25.

A. Best Practices

There is no dearth of advice available on how to design RPSs. For instance, the U.S. National Renewable Energy Laboratory lists no less than eight "best practices" for RPS design, including: keeping RPS targets stable, having them "ramp up steadily over time," ensuring their "sufficient duration," applying the target to all electricity providers, clearly defining eligible technologies, "consider[ing]" REC use, fairly allocating compliance costs, and making the program "mandatory and impos[ing] non compliance penalties."[248] Likewise, Wiser et al. assert that to maximize their benefits, RPSs should be cost effective and flexible, predictable, nondiscriminatory, enforceable, consistent with market structures, compatible with other policies, and socially beneficial.[249] For each of these criteria, they suggest numerous best practices that policymakers can use to draft and implement RPSs.[250]

Such recommendations are typically well thought-out and deserve careful consideration. Nevertheless, emerging empirical literature on RPS performance, and the experience of different jurisdictions, offer their own set of baseline design traits that every RPS should include—many but not all of which overlap with other best practices identified by prior observers.

First, RPSs should be compulsory. The experience in India, particularly in its nascent REC market, makes clear that while non-enforceable RPS targets may still influence renewables development, these laws will be far more effective when they are mandatory.[251] Indeed, at least one recent study concluded that the compulsoriness of an RPS may increase its effectiveness by a factor of five.[252] Thus, RPSs should utilize penalties for non-compliance, and those

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248. NREL, *supra* note 15.

249. *See* Wiser et al.(b), *supra* note 181, at 25-29.

250. *See id*. For a more in-depth treatment of RPS design, see Rader & Hempling, *supra* note 8. For more generally on good design of RE support policy, see, for example, Reinhard Haas et al., *Efficiency and Effectiveness of Promotion Systems for Electricity Generation from Renewable Energy Sources—Lessons from EU Countries*, 36 Energy 2186 (2011); Int'l Energy Agency, *supra* note dog 246.

251. *See supra* Part II.C.

252. *See* Adelaja et al., *supra* note 4, at 259 ("[S]tate RPS legislation adoption has been key to the growth of the wind energy industry. In states where such legislation was adopted, the pace of wind industry development picked up considerably and even more so when it is mandatory (mandatory RPS results in five times as much impact, vis-à-vis a voluntary RPS).").

penalties should be high enough to encourage compliance. Otherwise, the law's compulsoriness is destabilized.

Second, RPSs need to be stable and long-lasting. The literature repeatedly has identified policy instability as a significant risk that can dampen renewable energy development.[253] Thus, in India, the indeterminacy of RPO targets going forward has been singled out as a potential sticking point in the nation's REC market.[254] Likewise, industry response to the U.K. RO increased significantly in its early years once the program was extended, and that is precisely why the 2009 amendments lengthened its operation until 2037.[255] Recent scholarship also has found a connection between RPS duration and efficacy.[256]

Third, RPSs should limit, if not avoid altogether, diluting their targets. Undercutting the RPS target undermines the government's support for renewables. Thus, Fischlein and Smith recently found that "more stringent" RPS goals are "positively related to the policy response" at the utility level, and that credit multipliers may dilute RPSs' positive effects.[257] Similarly, Wiser et al. concluded that solar and distributed generation set-asides "have played a significant role in the recent growth of the U.S. solar market," and "arguably [have been] more effective" at promoting solar deployment than credit multipliers.[258] Buckman also notes that part of why the United Kingdom's banding mechanism, which uses credit multipliers, has been effective is because the headroom principle limits the bands' dilution of the RO target.[259]

Fourth, RPSs must carefully balance their targets and the speed with which

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253. *See, e.g.*, Dinica, *supra* note 173, at 467; Wiser & Pickle, *supra* note 173, at 383.

254. Shrimali & Tirumalachetty, *supra* note 16, at 708-09.

255. *See supra* Part II.B.

256. *See* Adelaja et al., *supra* note 4, at 259 ("[T]here is a momentum effect associated with the duration, or timeframe, since the adoption of RPS.").

257. Fischlein & Smith, *supra* note 4, at 302 ("Utilities may be taking advantage of multipliers to produce the types of renewable energy that earn additional credit or to produce renewable energy in-state for extra credit."). For a contrary view, suggesting that RPS stringency may not impact efficacy, see Shrimali, *supra* note 246.

258. WISER ET AL.(a), *supra* note 36, at iii, 34 (From 2005-2009, "65-81% of the annual grid-connected PV capacity additions in the U.S. outside of California occurred in states with active or impending solar/DG set-aside obligations."); *but cf.* Gaul & Carley, *supra* note 36 (finding solar set-asides relatively ineffective at promoting solar energy in North Carolina).

259. *See* Buckman, *supra* note 23, at 4108-09.

they demand compliance. Adelaja et al. have found a positive relationship between RPS efficacy and "shorter time lines for meeting RPS requirements."[260] However, an RPS target deadline that is too fast can lead to ineffectiveness, as the United Kingdom's experience with its RO demonstrates.[261] By the same token, more aggressive RPS targets may better help incentivize renewables deployment,[262] but too ambitious goals may undermine the laws' effectiveness. This appears to be the case in India, where many states have now adjusted their early, higher RPO targets downward given the new regime's compulsoriness.[263]

B. Design Gaps

RPSs often are criticized for failing to provoke the kind of renewable energy transition that feed-in tariffs, at least in some countries, have enabled.[264] Setting aside the difficulty of managing the rapid and deep energy system change that feed-in tariffs can bring,[265] there is merit in considering why FITs and RPSs function differently.

The conceptual model built in Part III sheds substantial light on this question. RPS design simply fails to address many of the barriers to renewables deployment that feed-in tariffs take on. These might be seen as gaps in RPS policy design. Feed-in tariffs, for instance, typically mandate both that utilities purchase the full output of renewable facilities, and allow those facilities to connect to the grid.[266] These requirements directly address the integration and dispatchability barriers to renewable energy. As shown by the conceptual model, however, the only policy design attribute that RPSs typically include to deal with these barriers is measuring compliance by electricity production rather than generation capacity.[267] Similarly, feed-in tariffs go to great lengths to reduce the risks that renewable

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260. *See* Adelaja et al., *supra* note 4, at 259.

261. *See supra* Part II.B.

262. Fischlein & Smith, *supra* note 4; *but see* Adelaja et al., *supra* note 4, at 259 (finding that target ambition does not influence renewables deployment).

263. *See supra* Part II.C.

264. A common comparison in this vein is the renewable energy revolution that is occurring in Germany and the slower growth taking place in the United Kingdom. *See, e.g.,* Mitchell et al., *supra* note 76.

265. *See generally* Davies & Allen, *supra* note 186.

266. *See supra* note 21 and accompanying text.

267. *See supra* Part III.C.

energy developers face. They offer guaranteed contracts, for long time periods, at predetermined prices.[268] RPSs do none of this, instead building risk into their regimes by relying on REC markets to set renewable energy premium payment prices and typically leaving developers on their own to find and negotiate power purchase agreements. Consequently, FITs may be better than RPSs at driving down compliance costs,[269] and also more effective at breaking up electricity market incumbency by offering smaller participants what are effectively government-backed investments at rates of return they will willingly take (but that may not be attractive to larger market players).[270]

Both RPSs and FITs may have substantial equity effects, and neither device appears to pay significant attention to this concern as a general matter. Thus, another area of RPS design that may warrant more attention is how to ensure equitable application and impact. Simply spreading RPS compliance costs across customers according to consumption may regressively affect consumers of lower income[271]—an effect that may be exacerbated by the use of carve-outs, banding, and credit multipliers, which policymakers increasingly use to mitigate RPSs' focus on more established technologies.[272]

Of course, while from one perspective each of these policy design gaps may be counted as potential points of RPS criticism, there is an alternate view. From another perspective, these gaps are not obstacles but opportunities—areas where new policy design innovation in RPSs may be particularly fertile.

C. Areas for Policy Innovation

It may be that RPSs are simply different in kind from other renewable energy support devices, particularly feed-in tariffs. The type of renewable

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268. Some feed-in tariffs use indexed prices, or set baseline prices and encourage program participants to sell in the market. *See, e.g.*, Julieta Schallenberg-Rodriguez & Reinhard Haas, *Fixed Feed-In Tariff Versus Premium: A Review of the Current Spanish System*, 16 RENEWABLE & SUSTAINABLE ENERGY REVS. 293, 293 (2012).

269. *See, e.g.*, COUTURE & CORY, supra note 236, at 3; de Jager & Rathmann, *supra* note 236, at 127-28.

270. FED. MINISTRY FOR THE ENV'T, NATURE CONSERVATION, AND NUCLEAR SAFETY, EEG—THE RENEWABLE ENERGY SOURCES ACT 4, 13-14 (2007), *available at* http://www.folkecenter.dk/mediafiles/folkecenter/pdf/eeg_success _brochure_engl.pdf.

271. *E.g.*, Rossi, *supra* note 6, at 1435.

272. *See supra* Part III.B-C.

energy transition they encourage is both more incremental and more gradual than what aggressive FITs can provoke. RPSs focus on more established, lower cost technologies, especially onshore wind, and the rate at which they achieve change is quite deliberate. As the U.K. data show, the RO has never reached full compliance in its now decade-plus of operation, and it typically is closer to 60-70 percent compliance.[273] Likewise in the United States, the proportion of states reporting 90 percent or higher RPS compliance has fairly consistently fluctuated between 67 and just over 80 percent.[274]

Nevertheless, the RPS's uniqueness need not limit its efficacy. Indeed, the gaps in RPS policy design exposed by the conceptual model highlight at least four clear areas where further policy innovation may improve the laws' performance: risk, external barriers, resource diversity, and renewable energy policy evolution.

1. Risk

Many criticisms of RPSs focus on the device's failure to mitigate risk. Some RPS risk is unavoidable. To the extent RPSs use RECs, price risk is inherent. However, price risk in REC markets can be mitigated, such as by establishing a price floor, as in India,[275] or by utilizing a headroom calculation, which acts as an implicit price floor, as in the United Kingdom.[276] Of course, REC price ceilings—as well as cost caps, common in many U.S. RPSs[277]—increase rather than decrease risk.

Perhaps more critically, RPSs could mitigate risk in other ways they currently do not. For instance, two ways that feed-in tariffs reduce risk is by mandating renewable energy purchases and grid connections. There is no reason why RPSs could not do the same thing and still utilize REC markets to set compliance costs. Especially in RPS systems that use different resource tiers, careful attention to eligibility requirements—perhaps by using a kind of "reference yield" model

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273. *RO Stats.*, *supra* note 88. The low was in 2003, when renewables comprised only 56 percent of the RO's target. The high was 2010, when production satisfied 72 percent of the RO goal. *Id.*

274. *See* Database of State Incentives for Renewables & Efficiency, *Current RPS Data: LBNL RPS Compliance Data Spreadsheet* (May 2013), http://www.dsireusa.org/rpsdata/LBNL_compliance_dataMay2013.xlsx.

275. *See supra* Part II.C.

276. Buckman, *supra* note 23.

277. *See supra* Part II.A.

that ensures only acceptable renewable resources get used[278]—this approach may have much promise. Indeed, at least implicitly, any resource that meets an RPS's definition of eligibility *should* be purchased, up to the RPS's target.

2. External Barriers

Another clear area for RPS innovation is integrating these laws with other measures that reduce external barriers to renewables development. This has been an issue in the United States, where a number of different plans aiming to smooth transmission planning for renewables have been proposed or adopted, including some specifically to facilitate state RPS effectiveness.[279] Likewise in the United Kingdom, the advent of new planning and siting measures has been seen as a key to the reformed RO's effectiveness.[280] In short, where significant external barriers exist, an RPS cannot succeed on its own. Complementary policies that break down those barriers are needed.[281]

3. Resource Diversity

Recent RPS innovations that seek to increase the diversity of resources they promote are noteworthy. As the experience with carve-outs in the United States demonstrates, these new policy tools can be effective.[282] However, the United Kingdom's employment of a feed-in tariff for small facilities—used in conjunction with its general RO—raises numerous intriguing possibilities. At the time the U.K. FIT was adopted, it was predicted that this policy device would yield roughly 45,000 solar installations, with a combined capacity of just under 150 MW by November 2011.[283] Instead, by that date, over 102,000 installations had been made, representing a capacity of 366.10 MW—more than double the

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278. The "reference yield" approach is used under the German FIT for wind facilities. Those facilities sited in areas with insufficient wind velocities receive lower payments. *See* FED. MINISTRY FOR THE ENV'T, NATURE CONSERVATION AND NUCLEAR SAFETY, AMENDING THE RENEWABLE ENERGY SOURCES ACT (2004),*available at* http://www.senes.bas.bg/DE_tariff.pdf.

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

280. *See supra* Part II.B.

281. *See* Rossi, *supra* note 6, at 1437, 1446.

282. *See, e.g.*, WISER ET AL.(a), *supra* note 36, at 3.

283. Muhammad-Sukki et al., *supra* note 106, at 834.

initial projections.[284] The United Kingdom's experience with this relatively unique combination of an RPS and a FIT shows not just that these policies are not mutually exclusive, but also that combining them can have important renewable energy impacts, particularly if a goal is to support small-scale renewable sources.

4. Renewable Energy Policy Evolution

Indeed, going forward, perhaps the most important way that RPS policy design might be innovated is to free these laws from the box in which they are usually placed: as binary, either-or options. As renewable energy technologies evolve, so too should renewable energy policy. What the evidence has shown on RPSs is that the thing they are most effective at is promoting more established, lower cost, large-scale resources, such as onshore wind farms.[285] They are less effective at promoting more nascent technologies, particularly on a distributed or small-scale basis, quite likely because RPSs target large incumbent electricity providers and not individual citizens and local businesses.[286]

Thus, in the future, jurisdictions may wish to explore more tailored, technology-specific, stratified renewable energy support regimes. For instance, a state might adopt an umbrella renewable energy mandate—its RPS—but then use RECs and FITs differentially to promote dissimilar technologies which are at different stages of development. RECs might be used to compensate wind facilities and other more developed technologies, while feed-in tariffs could be used for more near-market technologies and some emergent resources. In turn, as technologies hit specified benchmarks in terms of development or cost reduction, they could be transitioned to REC markets rather than RPSs. Certainly, such a regime would require careful study and planning prior to implementation. The suggestion briefly traced here is merely one possibility. Still, as RPS design becomes increasingly important for nations using these laws, innovation and imagination should have just as strong a role in policy design as they do in technological development.

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284. *Id*. Certainly, the rapid cost decrease that occurred for solar PV from 2008-2013 cannot be discounted as a contributing factor here as well.

285. *See supra* notes 237-38 and accompanying text.

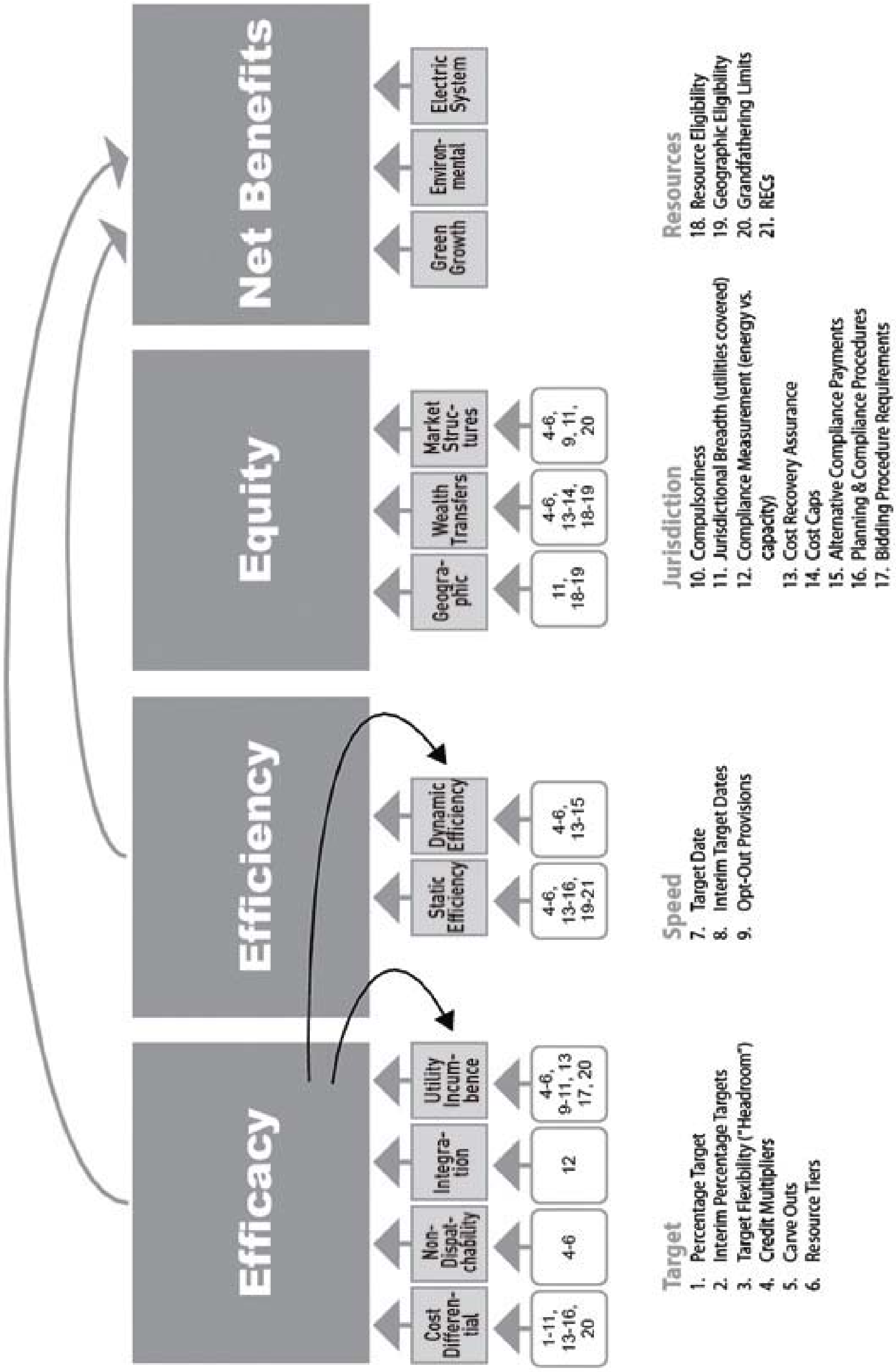
286. *See supra* notes 229, 231 and accompanying text.

V. Conclusion

Design matters. Particularly when grappling with problems as complex and difficult as taking clean technologies to broadscale market use, the design attributes of the policy device employed inevitably will influence outcomes. Much of the scholarly attention given to RPSs to date has focused on whether these laws can outperform feed-in tariffs, or whether they should be abandoned in favor of their price-centered counterparts. The reality, however, is that RPSs are here to stay and are in use across the globe. It is time to turn greater attention to how best to design these important tools for promoting clean energy.

By constructing a new conceptual model for evaluating RPS performance, this Article takes a first step in this direction. It identifies which RPS policy traits likely affect different possible impacts that RPSs may have, and where RPS policy currently fails to solve some of the obstacles these laws have faced. In performing this analysis, the Article both highlights clear best practices that policymakers designing RPSs should use, and marks the way for further innovation to be carried out in RPS policy design. Much work needs to be done; careful quantitative assessments of RPS performance teasing out which policy traits truly matter are critical. In the meantime, from the Pacific Rim to the European continent, RPSs continue to operate around the world. If given heed, the lessons learned from those experiences can only further improve how RPSs are written and implemented.

Appendix – Conceptual Model for RPS Performance Evaluation



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