Renewable Portfolio/ Clean Energy Standards

Renewable portfolio standards (RPS) are the most prevalent policy instrument for promoting the growth of non-greenhouse gas (GHG)-emitting electricity generation in the US states (Carley et al. 2018). As of 2021, some 30 US states had adopted these policies (Barbose 2021) and an additional seven had adopted "voluntary" RPS policies (Carley et al. 2018), which, while inferior, nevertheless indicate a desire on the part of states whose political economy may be less hospitable to a mandatory RPS policy to move in that direction (Vasseur 2014). Fifty-eight percent of total US retail electricity sales are governed by an RPS policy, with the remainder either occurring in states without an RPS or from electric utilities not subject to the RPS, which tend to be rural electric cooperatives and, in some states, publicly-owned utilities (POUs). Investor-owned utilities (IOUs) are typically subject to the RPS if they operate in states that have adopted one, unless they only serve a small fraction of customers in those states, in which case they may be exempted altogether (Barbose 2021).

Even though, generally-speaking, climate and renewable energy policy adoption is associated with Democrat-controlled state governments, RPS policies have notably been adopted in Republican-controlled states as well, including but not limited to Montana, Missouri and Texas—and in fact, Texas' RPS was one of the earliest and most stringent (Carley et al. 2018). This suggests that RPS policies – more so than other climate policies such as economy-wide GHG targets – are driven by perceived economic opportunity rather than by partisanship or ideology (Lyon 2016). Figure 1 shows the average partisan composition (2000–2016) of the legislatures of the 37 states that have adopted mandatory or voluntary RPS policies to date. While Iowa was the first to adopt an RPS back in 1983 and Virginia was the most recent to do so in 2020, the majority of states with RPS policies adopted them between 2000 and 2016 (Barbose 2021).

Other noteworthy characteristics of state-level RPS policies include the complexity of their design (which will be elaborated upon below) and the number of times they have been amended (likely for political expediency) since their initial adoption. Between 1994 and 2014, some 207 legislative changes were made to state-level RPS laws and many hundreds more were made through the regulatory processes of state-level public utility commissions (PUCs), which are the government agencies with primary jurisdiction over the regulation of electricity (Hoffer 2018). The overall trend of the legislative amendments has been to strengthen the ambitiousness of the RPS policies, which has become more politically feasible as the cost of wholesale renewable electricity relative to wholesale fossil fueled electricity has fallen over the years since initial policy adoption and supply has become greater thanks to tax credits and other incentive-based policies (Barbose 2021).

Where RPS Policies Fit in the Landscape of Policy Instruments

RPS policies have been a *state-level* instrument largely because of US climate and energy federalism, in which electricity regulation has traditionally been the province of state governments (Rabe 2008). However, this may be starting to change as the energy transition has necessitated greater centralization of energy infrastructure and systems planning. President Biden's initial legislative "Build Back Better" proposal included a provision known as the Clean Electricity Performance Program (CEPP), which was loosely based on the RPS model of compelling utilities to achieve specified percentages of clean electricity generation within their portfolios, though the mechanism would have been different—more of a "carrot-based" approach involving incentive payments rather than non-compliance penalties. In any event, this provision was scrapped in favor of a tax credit-based approach taken in the Inflation Reduction Act, which was signed into law on August 16, 2022.

Elsewhere in the world, "renewable energy quotas" are an analogous policy instrument, although early adopters of US state-level RPS policies predated quota policies elsewhere. For instance, the European Union issued a "Renewable Energy Directive" in 2009, which was revised in 2018, but only became legally binding in 2021 (European Commission 2022). Globally, few other jurisdictions seem to have adopted binding renewable energy quotas and, while the United States has been a laggard among advanced capitalist democracies when it comes to policies directly targeting greenhouse gas emissions (e.g. carbon pricing), its many state-level RPS policies represent one way in which the United States has demonstrated leadership, albeit in a piecemeal fashion.

Other electricity sector renewable energy policies in the United States and elsewhere include feed-in tariffs, net metering policies, and several tax code incentives and credits. Feed-in tariffs, such as the Canadian province of Ontario's, are typically an alternative to RPS whereas the other policy instruments just mentioned are typically complementary with RPS. Feed-in tariffs, rather than mandating specified percentages or quantities of renewable electricity as with an RPS, subsidize the interconnection of such electricity to the grid at a fixed per-unit purchasing price for a fixed period, thus minimizing financial uncertainty associated with renewable technology investments (Stokes 2013). While RPS and feed-in tariffs each come with advantages and disadvantages (heavily dependent on the precise policy design), one advantage feed-in tariffs have over RPS is their transmission-dependence, avoiding a problem which sometimes occurs with RPS, whereby utilities receive credit for renewable electricity that is never actually delivered to the grid (Basseches and Ikenze 2022).

Net metering policies, which are separate from RPS but often coexist with RPS, govern the ability of "behind-the-meter" generators of electricity (e.g. rooftop solar owners) to sell back their excess generation to the incumbent utility, including the rate at which they are compensated for doing so. Finally, tax policy instruments can also be used to incentivize renewable electricity generation. At the federal level in the US, the Investment Tax Credit (ITC) and the Production Tax Credit (PTC) have encouraged the pursuit of utility-scale wind and solar projects (US Department of Energy 2022). And at the US state level, 45 states have at least one tax incentive targeting renewable electricity expansion, including personal income tax incentives, corporate income tax incentives, and sales tax incentives (Database of State Incentives for Renewables and Efficiency 2022). All these policies are complementary to, but separate from, RPS.

RPS Policy Design: Features and Dimensions of Variation

There is enormous heterogeneity in RPS policy design (Fischlein and Smith 2013). As Barbose (2012: 3) points out, RPS policies are "never designed the same way in any two states." These differences in policy design are often a function of the interest group politics within a particular state (Stokes 2020). The most fundamental dimension of variation is whether a state's RPS is "voluntary," meaning there are no monetary penalties imposed on utilities if they fail to meet the prescribed quotas, or whether it is mandatory/enforceable, meaning there are (Fischlein and Smith 2013).

The most visible and prominent RPS design feature, which is also the best-accounted-for in the literature, is the ambitiousness of the policy's targets and timelines; that is, within how many years must utilities increase their renewable portfolio by what volume or percentage of electricity generation or load? (Carley et al. 2018). Of course, this is critically important, but a unitary focus on these numbers, while useful for constructing a quantitative dependent variable, obscures a wide range of other design features that research has shown have the potential to greatly undermine RPS effectiveness (Fischlein and Smith 2013). Among the most important are resource and facility eligibility.

Resource eligibility refers to which technologies count as "renewable" under the RPS. While certain technologies, such as wind and solar, are indisputably renewable, others, such as biomass and energy produced from solid waste, are more controversial; these more controversial technologies are, to varying degrees, eligible or ineligible under state-level RPS policies. Certain states, such as Pennsylvania, allow blatantly non-renewable resources such as waste coal, a byproduct of coal mining, to receive credit toward the policy. In Pennsylvania's case, this was rationalized with a rhetorical shift, with that state's policymakers calling their policy an "alternative" portfolio standard rather than a "renewable" one (Glenna and Thomas 2010).

Facility eligibility refers to rules about where and when the renewable electricity may be generated if it is to count toward a utility's RPS obligations. Facility eligibility can be restricted in at least two ways: geographic location and date of operation. Electricity grids transcend state borders, so while liberal rules governing geographic location of origin of the renewable electricity can maximize efficiency when it comes to developing new generation capacity wherever it is most economically viable, politicians may have incentives to restrict geographic facility location to promote *in-state* jobs and economic opportunities rather than have those benefits flow to competing states (Basseches and Ikenze 2022). This highlights yet another way in which climate change is a "wicked problem" (Rabe 2019) to solve with public policy; while the optimal way to mitigate climate change globally is to transition to renewables as efficiently as possible without regard to political borders, political constituencies – such as those of state-level policymakers writing RPS policies – are far more localized.

Another facet of facility eligibility relevant to RPS policy design is the distinction between "new" versus "existing" renewable electricity generation sources. Naturally, due to the principle of "additionality" (Raymond 2010), effective RPS policies should only count renewable electricity generated from facilities that commenced operation *after* the policy's adoption. However, for political expedience, some states have mechanisms to "grandfather in" electricity from facilities that commenced operation *prior* to the date the policy took effect (Fischlein and Smith 2013). In addition to resource and facility eligibility, some states have adopted mechanisms known as "carve-outs" to essentially weight different technologies or facility characteristics differently in order spur concentrated growth in a particular renewable energy sub-sector. For example, since the cost of wind has historically been lower than solar, several states created "solar carveouts" whereby a utility could receive greater credit for adding a megawatt or megawatt hour (MWh) of solar than they would for adding the same quantity of wind (Fischlein and Smith 2013).

Accounting rules for RPS compliance can also vary by state and can be highly consequential when it comes to overall RPS effectiveness (Yin and Powers 2010). For administrative ease, the typical accounting mechanism is a certificate called a renewable energy credit (REC). One REC is generated for each MWh of qualifying renewable electricity generated. However, while some states require that RECs be "bundled" with the physical electrons they represent, others allow for the "unbundling" of RECs, which then can be bought/sold/traded separately, functioning essentially as a financial instrument in a liquid marketplace. This allows any actors inside or outside the regulated scope of a given state's RPS to participate in this marketplace. For example, a utility in a mandatory RPS state that, for whatever reason, determines it does not want to generate its own RECs within that state, may opt to purchase the necessary RECs for compliance from a utility in a different state, perhaps with a voluntary RPS or a less stringent one. Once again, while unbundling RECs may promote economic efficiency, it is easy to see how doing so can undermine a given state's own renewable electricity expansion goals. Credit multipliers can also be used to value RECs differently, perhaps based on their origin or the technology that generated them (Fischlein and Smith 2013).

Another important distinction when it comes to RPS policy design is whether compliance is based on electricity generation *capacity* or whether it is based on *deliverability.* Some states, including Texas as just one prominent example, had such generous economic incentives for *building* new generation that they did so without regard to the availability of transmission and interconnection finance to deliver that generated electricity to the grid, so that it could be dispatchable with rising demand. The statutory and regulatory language of RPS policies can be important in preventing this, by specifying deliverability for RPS compliance rather than just the addition of capacity.

Finally, consistent with emerging research (e.g. Culhane et al. 2021) on the unparalleled policymaking influence of investor-owned utilities (IOUs), RPS policies often contain extraneous and highly technical provisions, distinctive to each state, that have the effect of shifting financial costs/risks associated with RPS compliance away from IOUs and onto ratepayers, including residential, commercial and industrial classes. These can include "cost caps," "offramps," and provisions altering ratemaking procedures in favor of IOUs' shareholders, such as Oregon's "automatic adjustment clause" (Basseches 2020).

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Directions for Future RPS-Related Research

RPS policies are ripe for future research. While existing research is abundant, there is still much we do not know. Furthermore, it seems in the United States that we have entered a new era in which, while state-level climate and renewable energy policy action will remain critical, the federal government is finally beginning to act in a supportive role as well, as signaled by President Biden's historic signing of the Inflation Reduction Act of 2022.

One set of underexplored research questions relates to better understanding the politics that inform the variation in RPS policy design described here. Which interest group actors are responsible for which policy design choices and why? Do their preferences vary from one state to the next and, if so, how, and why? Are their preferences stable over time?

A second set of research questions relates to the all-important issue of policy effectiveness. While connecting particular state-level policy choices to GHG emissions reductions is notoriously difficult given the existence of confounding political and economic variables that may affect this relationship, social science tools can help isolate the impact of discrete policy design choices on discrete outcomes, such as renewable energy generation capacity added in a given state and time period (Yin and Powers 2010). Yet, only a few of the numerous dimensions of policy design have been empirically evaluated in this way.

Finally, a third set of research questions ripe for answers deal with the topic of policy complementarity. Given that RPS policies are just one instrument in a suite of climate and renewable energy policies that have been adopted at the state level, never mind emerging federal and regional policy initiatives, how do these policies work together, or alternatively, undermine one another, when it comes to decarbonization goals? Given the tendency for this policy area to be characterized by highly particularistic, material stakeholder interests, we run the risk of missing the forest for the trees as policymakers – uninformed by social science research – attempt to cater to these interests while pursuing climate messaging that may be detached from the narrower effects of the policies, which may also change over time as the energy transition progresses. As just one example of this, Basseches and Ikenze (2022) have shown how RPS policy design choices can actually undermine efforts to expand international electricity transmission across the US–Canada border. Surely, there are countless other issues of this nature that future research ought to uncover, and ideally, prescribe solutions for.

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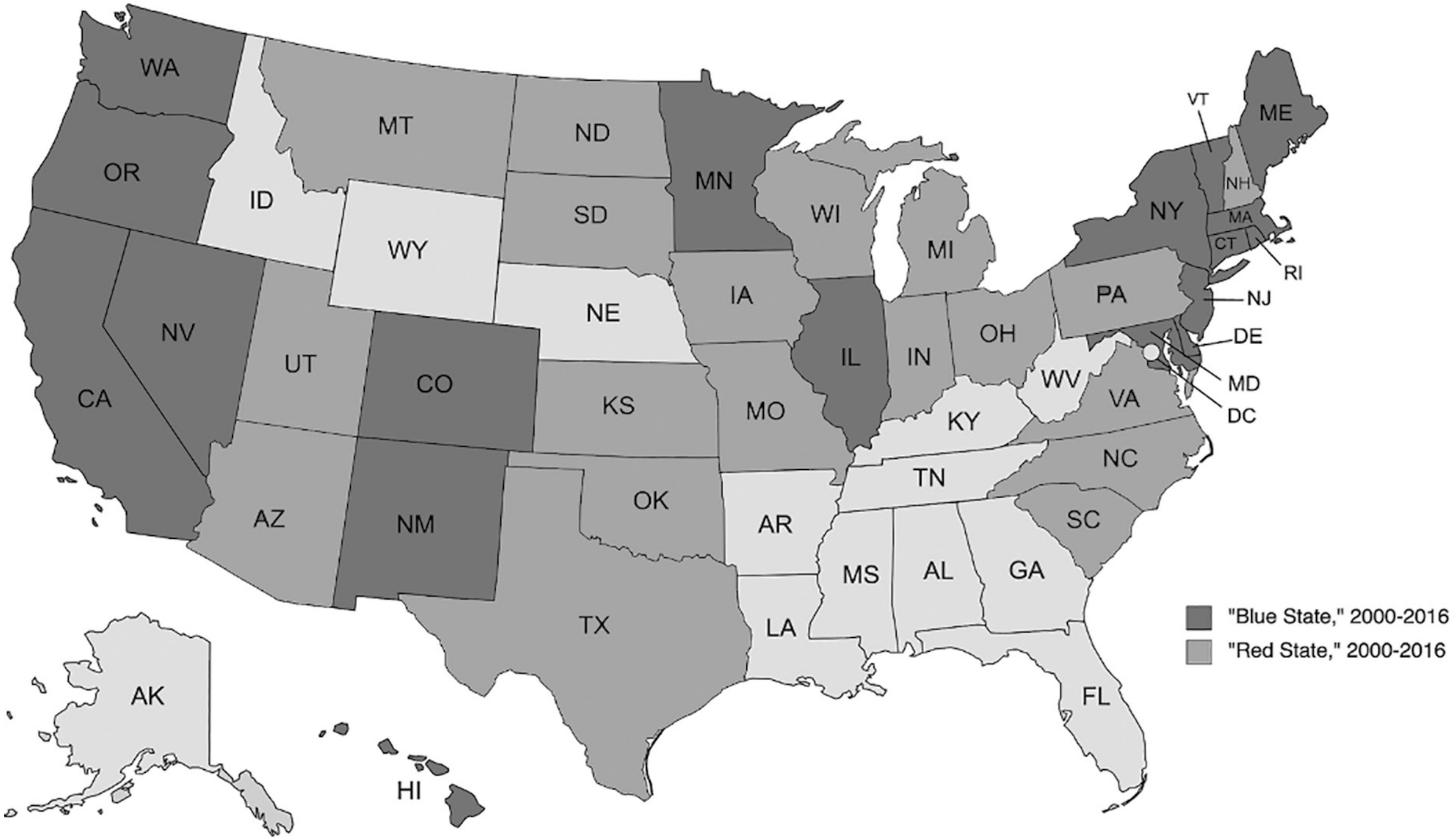

Note: States shaded light gray have not adopted an RPS.

Figure 1 *Average partisan composition of state legislatures of RPS-adopting states, 2000–2016*