PAYNE INSTITUTE COMMENTARY SERIES: **COMMENTARY**

Empowering or Repressive: Navigating the Complexities of Renewable Portfolio Standards in the US

By Siddhant Kulkarni and Anna Littlefield

Renewable Portfolio Standards (RPS) represent a strategic push by governments to usher in an era of clean, renewable energy. While RPS are not the only policy-mechanisms that incentivize renewable energy, they have been in place for decades across the world. Data from the International Renewable Energy Association (IRENA) shows that worldwide installed renewable energy capacity has almost doubled in the last decade, thanks in part to the RPS policies implemented.

In the US these regulations are particular to individual states and aim to combat increasing greenhouse gas emissions and by extension, climate change. Each state mandates a different minimum percentage of electricity that must be sourced from renewables like solar, wind, geothermal and hydro power. Utility companies can meet RPS benchmarks in two ways: 1) by generating renewable electricity in-house or 2) by purchasing Renewable Energy Credits (RECs) through government initiatives or from other renewable energy providers. RPSs have played a significant role in promoting and driving the development of renewable technologies and infrastructure across the US. States with particularly ambitious goals like New York, California, Hawaii, Vermont, and Colorado have witnessed substantial growth in the number of solar and wind energy installations.

Despite the successful track record of RPS policies, challenges exist in implementing renewable tech nationwide. High infrastructure costs and generative potential that is highly dependent on geography and climate, are significant logistical challenges to deployment. Loopholes in RPS compliance and the environmental and social impacts associated with the construction and operation of renewable infrastructure also complicates the landscape. A recent article in Nature, explores the impact of Renewable Portfolio Standards as part of climate change action, and highlights the discrepancies between states. The figure below from this article, shows both the progress made between 2000 and 2020 and the extreme variability of strong climate policies nationwide.

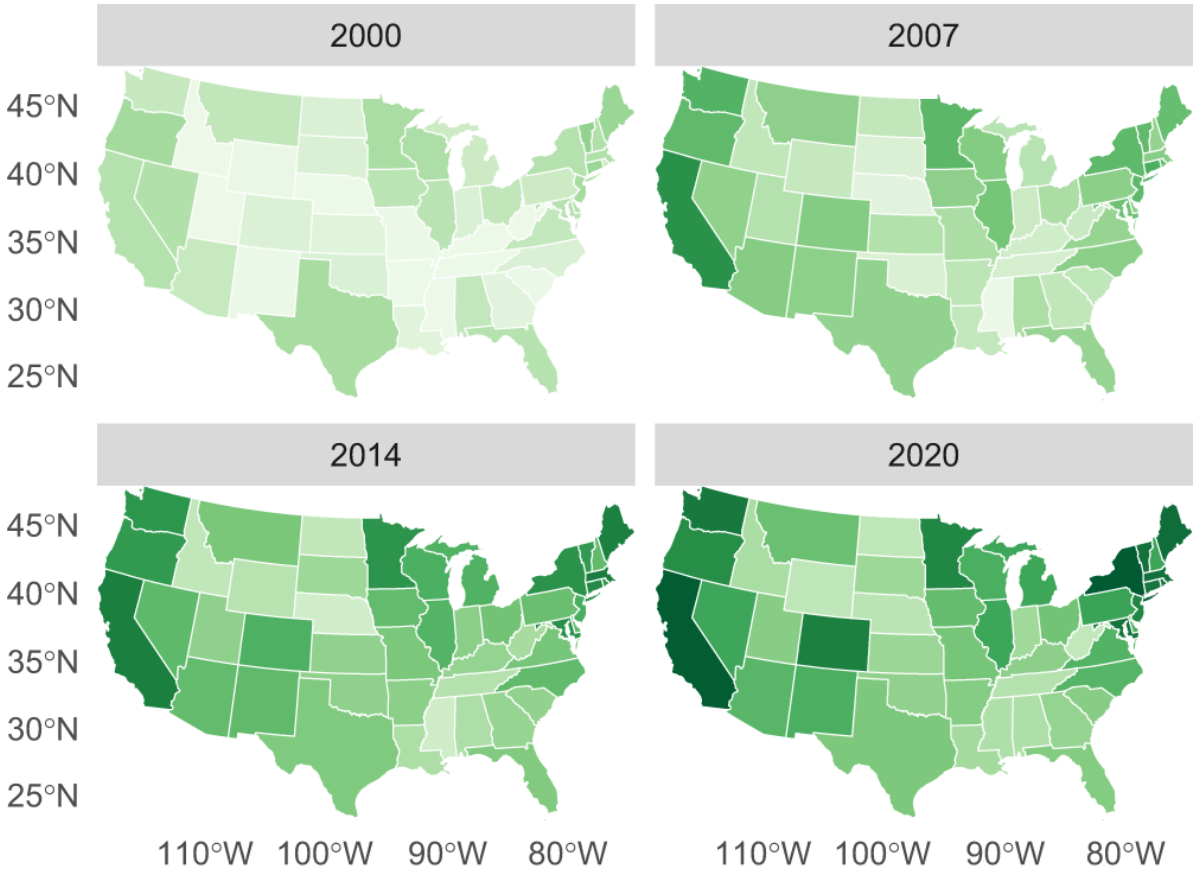

Figure 1: from Nature Communications; States shaded with darker greens have enacted a higher number of climate policies. Spatial data provided by the US census Bureau.

Several states in the US have implemented particularly aggressive RPS policies, with unique goals and timelines. Targets vary substantially as each state proposes a different mix of renewable sources to fulfil the mandate. Outlined below are the timelines associated with RPS policy implementation in California, Vermont, and Colorado, three states with ambitious emissions reduction goals, but with unique geographic and climatic settings, naturally favouring certain renewable sources over others.

California: California's RPS policy was first implemented in 2002 and at the time, set a moderate target of 20% by 2017. However, in 2015, with the passing of Senate Bill 350, that goal increased to an ambitious 50% by 2030. 2018 saw another massive jump to 100% by 2045 (Senate Bill 100). This solidified the state a leader in the renewable energy policy space.

Vermont: In 2005, the Sustainably Priced Energy Development program (SPEED) first established a renewable target for the state. The initial goal was to achieve 20% by 2017. The state established its own RPS policy in 2011, targeting 75% renewable energy by 2032. Going a step further, Vermont also implemented energy efficiency programs to help decrease energy costs and consumption across the state.

Colorado: In 2004, the state made history by becoming the first to establish an RPS policy through a ballot initiative. It required 10% of investor-owned utilities to provide at least 10% of retail electricity through renewable generation. With the passing of Senate Bill 252 in 2013, the RPS target was changed to 30% by 2030. And finally in 2022, the

state overhauled its policies, which came with targets of 80% by 2030 and 100% by 2040. These updated targets were applicable to both investor-owned utilities and municipal/rural cooperative utilities.

The implementation of these standards has seen varying degrees of success but overall positive impacts for these states. Reduced dependence on fossil fuels, a diversification of the energy mix, and economic development in the form of job creation and promotion of domestic energy production, are all correlative with the implementation of these policies. Statistics on the energy mix for these states is provided below:

Colorado: As of 2022, 37% of electricity generation in Colorado is generated through renewable sources, with wind power being the majority contributor. Since 2010, the state's renewable electricity generation capacity has grown 4-fold. The growth of the renewable energy industry also has led to job creation, with over 7,000 people employed in the solar sector just in 2019. In some case, RPS's have also helped lower energy costs: residents with solar panelling passively earn RECs which discount the overall electricity bill. The data presented in Table 1 shows a steady increase in renewable electricity generation since 2010.

Table 1: Renewable Electricity Generation in CO (2010-21)

Year	Total Electricity Generation (MWh)	Renewable Electricity Generation (MWh)	Percentage of Total
2010	50,720,792	3,496,554	6.89%
2011	51,432,554	5,305,130	10.31%
2012	52,556,701	6,134,359	11.67%
2013	52,937,436	7,455,261	14.08%
2014	53,847,386	7,668,312	14.24%
2015	52,393,077	7,727,482	14.74%
2016	54,418,480	10,045,135	18.45%
2017	53,844,002	10,360,155	19.24%
2018	55,386,279	10,896,169	19.67%
2019	56,337,734	12,159,124	21.58%
2020	54,115,011	14,982,168	27.68%
2021	56,838,472	16,950,496	29.82%

Source : https://www.eia.gov/electricity/state/Colorado/xls/co.xlsx

California: In California, establishing RPS's has led to increased investments in the clean energy space, diversified electricity supply and supported job creation. The state is generating enough renewable electricity to power over 5 million households and anticipates increasing this capacity over the next few years. Investment in this sector has incentivized innovation and advancements in renewables' infrastructure leaving the states' population less dependent on a single source of electricity.

Table 2: Renewable Electricity Generation in CA (2010-21)

Year	Total Electricity Generation (MWh)	Renewable Electricity Generation (MWh)	Percentage of Total
2010	204,125,596	10,398,840	5.09%
2011	200,804,842	12,085,350	6.01%

2012	199,518,567	14,934,126	7.48%
2013	200,077,115	20,427,858	10.2%
2014	198,807,622	26,901,738	13.53%
2015	196,703,858	30,628,108	15.57%
2016	196,963,215	35,345,035	17.94%
2017	206,146,520	40,143,330	19.47%
2018	195,465,638	44,131,699	22.57%
2019	201,784,204	45,284,522	22.44%
2020	193,083,537	46,889,385	24.28%
2021	197,165,106	52,882,640	26.82%

Source : https://www.eia.gov/electricity/state/california/xls/ca.xlsx

Vermont: Vermont has one of the most ambitious renewable goal sets in the nation. The state's small size, abundance of solar energy, and hydro/wind power potential positions it favourably for renewable electricity generation. Vermont's RPSs have played an important role in developing renewable electricity projects, the results of which are outlined in Table 3, leading to massive emission reduction and job creation.

Table 3: Renewable Electricity Generation in VT (2011-21)

Year	Total Electricity Generation (MWh)	Renewable Electricity Generation (MWh)	Percentage of Total
2011	6,776,219	407,248	6%
2012	6,611,786	439,522	6.64%
2013	6,884,910	718,840	10.44%
2014	7,031,394	764,064	10.86%
2015	1,982,047	819,007	41.32%
2016	1,911,207	812,077	42.49%
2017	2,141,388	840,198	39.23%
2018	2,178,915	894,041	41.03%
2019	2,289,798	884,405	38.62%
2020	2,156,407	958,395	44.44%
2021	2,107,703	947,482	44.95%

Source : https://www.eia.gov/electricity/state/vermont/xls/vt.xlsx

The data presented here paints an overwhelmingly positive picture, but there are undeniable challenges associated with climate policy. For RPSs, the biggest challenge may exist in the tendency to favour certain types of renewable energy over others, distorting energy markets significantly and discouraging investment in the other renewable sources. Utility companies working towards compliance with the state's RPS policies, will enhance investments in renewable technologies, increasing the demand for Renewable Energy Credits (RECs) which in turn may increase the expense of adhering to government/industry regulations. If this higher cost is offset with increased electricity service prices, consumers are left to bear the burden. Another distortion of the market may occur when renewable energy sources are over-subsidized and non-renewable sources are over-taxed, leading to misallocation of resources and reliability issues. The inconsistent impact of implementing RPS's is explored in a recent study from the University of Nebraska that outlines how their effectiveness is heavily dependent on consumer preferences, supplier costs, and competition in electricity markets.

Despite ongoing debates on the efficacy of Renewable Portfolio Standards and critiques on the potential price increase for electricity services, the enduring advantages of these standards, coupled with the associated innovation in renewable energy outweigh the challenges. The dynamic nature of climate policy that evolves in response to shifting scientific, economic, and political landscapes, makes it inherently challenging to predict the evolution of future standards or benchmarks. However, the data available today suggests that Renewable Portfolio Standards stand to significantly contribute to the reduction of greenhouse gas emissions, the diversification of energy resources, and in fostering economic growth.

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