NORTH AMERICAN CLIMATE POLICY

The U.S.-Canada (Clean) Electricity Relationship:

Challenges and Opportunities in Policy Design and Coordination

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KEY FINDINGS:

1. Certain elements of renewable portfolio standards (RPS) policy design (e.g., unbundled RECs, resource eligibility restrictions, geographic/deliverability requirements) may be at cross-purposes with the decarbonization strategies that Canada and the U.S. have committed to pursue.

2. Of seven northeastern states, New York has the most permissive RPS policy when it comes to Canadian hydroelectricity, and is the most encouraging of cross-border transmission construction. Massachusetts' RPS policy is discouraging of Canadian hydroelectricity overall, but lawmakers have mitigated these effects through separate legislation.

3. Maine, New Hampshire, and Rhode Island also have RPS policies that are relatively restrictive of Canadian hydroelectricity imports and also discourage cross-border transmission construction.

4. Connecticut and Vermont fall somewhere in between New York and the others.

5. The various RPS policies and their provisions appear to have been designed in a siloed, uncoordinated manner, fulfilling local policy priorities without considering broader implications for international electricity transmission. As a result, they send mixed signals when it comes to the desirability of cross-border hydroelectricity imports.

INTRODUCTION

Both the United States and Canada have made significant commitments to reduce their climate-changing greenhouse gas (GHG) emissions. But importantly, both countries have also adopted the same grand strategy to do so: "electrify everything."

The prescription is straightforward enough. First, green the electricity grid so that it is prepared to take on considerably more demand for electricity that will come when we take the next steps: greening transportation (i.e., electric cars, buses, trains, and their charging stations, etc.), and greening buildings and industrial sectors (i.e., replacing gas furnaces with electric heat pumps, leveraging new technology to reduce the carbon intensity of industry, etc.). In short, building and maintaining a low-carbon electricity grid capable of generating, transmitting, and distributing unprecedented volumes of clean electricity is the linchpin of both countries' strategies upon which success in achieving GHG emissions reduction targets will ultimately depend (Government of Canada 2020; The White House 2021).

However, there is at least one serious problem that has the potential to derail these grand plans. In order to achieve these clean electricity aspirations, while ensuring that demand for and supply of clean electricity remain balanced (as they must, to avoid blackouts), both countries will need to build thousands of miles of new transmission infrastructure. This will be necessary to bring clean electrons from the places they are generated (typically rural areas) to the places they will be consumed in the greatest quantities (typically urban areas) (Bledsoe 2021; Iaconangelo 2021).

Although a political border divides Canada and the United States, electricity routinely crosses this border; electrons are not even required to show a passport! In 2020, about 60,000 gigawatt hours (GWh) of electricity entered the United States from Canada, enough electricity to power about 5.8 million homes (Canada Energy Regulator 2020). The overwhelming majority of this electricity was generated from hydroelectric dams—a zero-carbon, non-intermittent (reliable) technology (as opposed to wind and solar) that accounts for about 60% of Canada's total domestic electricity generation, but only about 6% of the United States' (Vine 2017). While hydroelectricity crosses the border from Canada into the United States at several geographic interconnection points further west, the vast majority of the cross-border transmission occurs from the eastern "hydro provinces" (Macdonald 2020) to the northeastern U.S. states. In 2020, over 22,700 GWh came from Quebec, crossing the border at interconnection points in Vermont, New York, and Maine, over 15,400 GWh came from Ontario, crossing the border at interconnection points in Michigan and New York, and about 1,700 GWh came from New Brunswick, crossing the border in Maine (Canada Energy Regulator 2020).

The vast majority of Canada's hydroelectricity generation comes from facilities that predate any of the serious U.S. and Canadian climate policies that have since been adopted (it is known as "legacy hydro"). Approximately 87% of Québécois hydroelectricity capacity is associated with facilities that began operating prior to 1997, when Massachusetts and Maine became the first northeastern U.S. states to adopt renewable portfolio standards (RPS) policies in an attempt to combat climate change. About 96% of Ontarian hydroelectricity capacity comes from facilities that begin operating prior to 1997, as does nearly 100% of New Brunswick hydroelectricity capacity (Global Energy Observatory 2021).

As Monica Gattinger (2011) has written, the North American electric power sector is "highly integrated and interdependent" (Gattinger 2011:11). And yet, with few exceptions[1], electricity *policy* at the state and provincial levels (where most of the action has been, in

1 An important one being the North American Reliability Corporation, which was set up to ensure continental reliability of electricity provision (Gattinger 2011).

both countries) has lacked thoughtful integration, and this has been especially true in the more recent era of climate policymaking. Instead, it has followed a pattern of what Gattinger calls "sensitized coordination" (Gattinger 2011:3); Canadian governments have "endeavor[ed] to make their American counterparts aware of the benefits of modifying their policies to mitigate negative repercussions for Canada and Canada-U.S. relations" (Gattinger 2011:3), but these American counterparts have not always listened. This is especially true when it comes to the signature renewable energy policies of the U.S. states: RPSs (Carley 2011; Center for Climate and Energy Solutions 2020; Rabe 2007). These RPS policies have drawn concern from Canadian interests because of their tendency to discriminate against non-domestic electricity, thereby "reduc[ing] the competitiveness of Canadian power in U.S. markets" (Gattinger 2011:6).

Although U.S. states may have historically had politically sensible reasons for designing their RPS policies in a manner that would shield local interests from out-of-state (or out-of-nation) competition and encourage local economic development (Rabe 2007), climate change—and specifically the need to *rapidly* green the electricity grid—ought to now lead them to reconsider. At the same time, doing so would seize on the political opportunity of the present moment to spark a new era of "Canada-U.S. green bilateralism" (VanNijnatten and McWhinney 2022).

In considering what sort of coordinated policy regime would be optimal—not from the perspective of the narrow economic interests of a particular U.S. state or Canadian province, but rather from the perspective of maximizing the acceleration of the clean electricity transition and the greening of the continental electricity grid—it is important to consider both economic impacts (costs) and environmental impacts (GHG emissions). In terms of economic impacts, Vine (2017) finds that existing Canadian hydroelectricity exports to New England states reduced wholesale electricity costs in New England and delivered an annual economic benefit of hundreds of millions of U.S. dollars, suggesting increasing exports further would only further reduce costs. In terms of environmental impacts, modeling by Aaron and Vine (2015) shows that if hydroelectricity exports from Canada to Massachusetts were to increase by just 250 megawatts, the latter would reduce its electric sector GHG emissions rate by about 10%.

The most persuasive analyses consider both economic and environmental impacts simultaneously. In doing so, Dimanchev et al. (2020) suggest that the optimal scenario for deep decarbonization of both countries, while also taking into account the goal of minimizing total costs, is indeed to significantly expand transmission capacity between New England and Quebec. However, critically, that new capacity must be used in an increasingly bidirectional manner. That is, hydroelectricity imports from Canada must continue, and even increase, but they must be increasingly counterbalanced by exports of renewable energy from the United States to Canada (as a practical matter, given existing policy incentives, these exports would primarily be wind and solar) (Dimanchev et al. 2020).

While wind and solar are often the preferred technologies of environmentalists because they have a lesser impact on local ecosystems (particularly fish), it is important to consider the advantages that hydroelectricity has over these newer technologies. Not only is hydroelectricity similarly non-emitting[2] but, critically, it is also non-intermittent, ensuring reliable generation irrespective of the weather.[3] This feature gives it "balancing" capabilities unavailable to wind and solar. In addition, hydroelectric dams commonly offer further flexibility due to their storage reservoirs and pumped storage capabilities, enabling essential back-up power during electricity outages or disruptions (Aarons and Vine 2015; Aubin 2021). Indeed, hydroelectricity's balancing capabilities and energy storage functions make it an ideal complement to wind and solar power (Haley 2014).

2 And indeed, on a lifecycle basis, has lower GHG emissions than solar due to the emissions required to manufacture photovoltaic solar panels (Aarons and Vine 2015).

3 A technical term for this is that hydroelectricity is "dispatchable."

In short, to maximize the efficiency of the clean electricity transition on the North American continent, we need a coordinated policy regime on both sides of the international border that will incentivize the construction of cross-border transmission lines with bidirectional capacity. As Haley (2014:786) puts it, we need "a 'supergrid' pathway whereby extensive transmission interconnections are used to incorporate more variable renewable energy [and] provide a market for wind-hydro production and hydro balancing services." As Borenstein and Kellogg (2021:4) point out, the status quo is problematic: "Construction of long-distance, high-capacity transmission lines—which will be essential to address renewables' [such as wind and solar] non-dispatchability limitation—is beset by multi-jurisdiction regulatory and hold-up problems." Currently, these transmission projects require approval from both the federal government and every single state and municipality through which the line passes. This leads to permitting delays that are simply unacceptable given the pace of action necessary to combat the climate crisis (Borenstein and Kellogg 2021).

We see a recent and salient example of these problems when we examine the proposed New England Clean Energy Connect (NECEC) transmission project to bring hydroelectricity from Quebec to Massachusetts, which was recently derailed when Maine voters approved a ballot referendum halting it, following a $99.6M political campaign (Byrne 2021). Previously, plans for a different transmission line project known as the Northern Pass, which was slated to reach Massachusetts by way of New Hampshire, were upended when New Hampshire's Site Evaluation Committee determined that its local impacts were prohibitive (Gheorghiu 2019). In the months leading up to the recent Maine vote, legislation was even introduced in the Maine state legislature to prevent a "foreign entity" (by which proponents were clearly referring to HydroQuebec, the crown corporation utility that secured financing for the project) from contributing money to influence the results of the referendum (Thistle 2021). This is precisely the sort of cross-border conflict that we must seek to avoid and reverse if we are to rapidly green the international electricity grid.

This recommendation is not to dismiss the very legitimate environmental justice-related concerns of local populations, especially Indigenous communities, that have historically opposed such projects. We need policies in place that ensure procedural justice in how siting decisions are made, and that give fair consideration to who is paying for, and who is benefitting from, such projects. In particular, we must ensure adequate compensation for those most directly impacted, just as we do for those who willingly agree to host wind turbines or solar panels on their private property (Bessette and Mills 2021). However, what we cannot afford is the status quo policies that condone blanket NIMBY[4]-ism, rooted in the illusion that a clean energy transition is somehow possible without such transmission lines.

Existing policies also have an important role to play in encouraging the expansion of cross-border transmission, and that will be the focus of the rest of this paper. In both the United States and Canada, energy and climate federalism has meant that it has been states (in the U.S.) and provinces (in Canada) that have dominated the policies in this area (Macdonald 2020; Rabe 2004). Although climate and energy policy have recently become inseparable from one another, historically, energy policy has been the domain of the U.S. states (Bromley-Trujillo et al. 2016; Bryner 2008; Rabe 2004), and in Canada, provincial authority in this area is spelled out explicitly in Canada's constitution (Gattinger 2015). More recently, when the focus has been increasingly on climate explicitly, the Canadian government has demonstrated the will to act but has been limited by constitutional jurisdiction (Gattinger 2015), while the U.S. federal government has been paralyzed by partisan politics and the entrenched

4 Not in My Backyard.

power of the fossil fuel industry (Mildenberger 2020; Thompson, Wong, and Rabe 2020; Turner and Isenberg 2020). Given these realities, this paper will focus squarely on the role of subnational policies in both countries.

After a brief overview of subnational policies on both sides of the U.S.-Canada border, the attention of this paper will focus in greatest depth on the RPS policies of seven northeastern U.S. states: Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. There are a number of reasons for this analytical focus on RPS policies in general, and on these seven northeastern states in particular. First, given the repeal of the U.S. federal Clean Power Plan (CPP) developed by the Obama administration, state-level RPS policies are currently the only significant policy driver of cleaner utility-scale electricity generation in the United States[5], the country of the two which is currently the most fossil fuel reliant (Rowlands 2017; Vine 2017). Second, recently, scholars have been paying increased attention to the *design* of state-level RPS policies, which varies considerably from one state to the next (e.g., Basseches 2020; Carley et al. 2018; Fischlein and Smith 2013; Yin and Powers 2010). As Barbose (2012:3) writes, "[RPS policies] are never designed the same way in any two states." Some of these design elements have important implications for cross-border transmission, yet, to our knowledge, no study published to date has analyzed these implications, which we set out to do here.

As for why the focus on these seven states' RPS policies in particular (of the thirty-seven U.S. states that have adopted an RPS in one form or another), they are the states with the greatest potential to drive cross-border *clean electricity* transmission expansion through their policy decisions (or, alternatively, to discourage it, if their policies are designed poorly). With the exception of British Columbia, hydroelectric power tends to originate from Canada's eastern provinces, while its western provinces—especially Alberta and Saskatchewan—tend to produce more carbon-based electricity (Macdonald 2020). Four of the states under study (Maine, New Hampshire, Vermont, and New York) directly share a geographic border with Canada's eastern "hydro provinces" (Macdonald 2020) while the other three (Massachusetts, Connecticut, and Rhode Island) have the highest unmet electricity demand—unmet in the sense that they currently rely on electricity imports from elsewhere, and, with the right policy design, there is potential for some of those imports to increasingly come from Canadian hydroelectricity rather than fossil fuels produced in other U.S. states.

The remainder of this paper proceeds as follows. First, we map out the existing policy landscape, both north and south of the border, and show how it largely remains silent when it comes to cross-border transmission. Next, we introduce key concepts in RPS policy design and how they have the potential to impact cross-border transmission. We then classify the seven states according to three policy design dimensions in particular: "unbundled" Renewable Energy Credits (RECs), resource eligibility, and geographic/deliverability requirements. We highlight the fact that, in some cases, the states with policies most discouraging of cross-border transmission could benefit the most from it in terms of more rapidly achieving their statutory climate targets. We conclude with a discussion of the implications of this line of research, both for designing effective climate and renewable energy policies, and in light of existing academic literature on the topic.

5 The Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade program in place in the U.S. Northeast, would be another, but does not have implications for Canadian hydropower since it only regulates power plants *within* the United States, in states where they fall under the cap. For more on the mechanics of this policy, see Raymond (2016).

EXISTING POLICY LANDSCAPE

As noted above, both Canada and the United States can be characterized by a regime of climate and energy federalism in which the federal government—despite providing greater rhetorical leadership in the Canadian case than in the U.S. case—has played an absentee role in electricity policy. Instead, both provinces north of the border and states south of the border have shown leadership in this policy area, but this leadership has been highly variable, regionally specific, and largely uncoordinated.

In still fewer cases have Canadian provinces coordinated with U.S. states, with one notable exception being the New England Governors and East Canadian Premiers (NEG/ECP), a partnership established to "develop networks and relationships, take collective action, engage in regional projects, undertake research, and increase public awareness of shared interests" ("About NEG/ECP" 2021). Still, it seems as though this initiative has had limited effect on actual lawmaking, especially since New England state lawmakers were apparently unresponsive to Canadian government lobbying during the process of designing their respective RPS policies (Rowlands 2009). The NEG/ECP could, however, serve as a meaningful structure through which to coordinate future policymaking around transmission expansion.

North-of-the-Border Provincial Policies

As relatively populous "hydro provinces" (Macdonald 2020), Quebec and Ontario have been leaders in subnational climate and renewable energy policies in Canada. Naturally, those provinces with the least to lose and most to gain from such policies—based on their preexisting energy economies—have been those to take the most significant policy action (Macdonald 2020).

Quebec was the first Canadian province to establish a GHG emissions stabilization policy in 1992. Beginning in the mid-2000s, that province (as well as Ontario) also partnered with California and other U.S. states in what had been known as the Western Climate Initiative (WCI). However, when the WCI subsequently collapsed due to a lack of political will in the other U.S. states besides California, Quebec was the only U.S. or Canadian jurisdiction to remain engaged with California, ultimately linking itself to California's cap-and-trade program in 2014 (Basseches Forthcoming; Macdonald 2020).

Ontario, for its part, failed to adopt a durable cap-and-trade program. As Raymond (2020) documents, the Ontario government initially emphasized a carbon revenue strategy focused on climate mitigation coupled with local economic development, but this strategy backfired, leaving it vulnerable to populist attack based on fear of consumer price increases. On the other hand, Ontario *has* taken significant action when it comes to clean electricity policy specifically.

Two policies have characterized Ontario's approach to clean electricity: a coal phaseout and a feed-in tariff program. Regarding the former, this initiative has been pursued/supported by successive Ontarian governments since 2002. Ontario was never a major coal producer relative to Canada's western "carbon provinces" (Macdonald 2020); however, coal did at one point make up a significant share of its electricity generation—roughly 12–28%, with nearly all the rest coming from hydroelectricity—so this coal phaseout policy is still significant. Research suggests that restructuring the province's electricity sector, allowing for increased competition at the level of generation, played a significant role in making this policy politically feasible (Adams et al. 2012).[6]

The other significant electricity sector policy in play in Ontario is a feed-in tariff program, which was instituted in 2009 as part of the province's Green Energy and Green Economy Act (Stokes 2013). Prior to that, an RPS policy

6 Basseches (2020) finds similar restructuring policies in certain U.S. states were similarly instrumental in facilitating clean electricity policy.

had been considered, but fell apart when the Gilchrist government was replaced (Rowlands 2007). While scholars will argue the pros and cons of RPS versus feed-in tariff, each policy instrument has its advantages and disadvantages, and one clear advantage of the feed-in tariff approach is that it is more transmission-dependent than the RPS approach, as we will see when we turn to examine RPS policies in the U.S. states. This is because one of the components of a feed-in tariff program is a long-term contract of 15–20 years that relies on actual electrons being delivered to the grid (Rowlands 2007; Stokes 2013).

In short, another reason why this paper focuses in greater depth on the northeastern U.S. states' RPS policies, rather than on the eastern Canadian provinces' renewable electricity policies, is that this paper is principally concerned with the question of how coordinated policy can improve prospects for cross-border transmission. Although Quebec would undoubtedly benefit from policy that is more transmission-focused, Ontario's feed-in tariff program provides at least a partial policy solution to this challenge. The difficulty will be getting U.S. states to adopt pro-transmission policies, and then coordinating these policies so that they work effectively to promote efficient transmission expansion both north and south of the U.S.-Canadian border.

South-of-the-Border State Policies

The United States federal government has notoriously failed to act on climate, and the electric sector is no exception (Thompson et al. 2020; Turner and Isenberg 2018). There was recently hope that this would change, as the Biden administration strongly backed a program known as the Clean Electricity Performance Program (CEPP), but this provision was stricken from the bill at the request of Sen. Joe Manchin (D-West Virginia), who now appears poised to derail the entire social spending bill known as the Build Back Better Act (Storrow 2021; Teirstein 2021). Historically, after the failure of a federal cap-and-trade bill in 2010, the only U.S. federal-level policy designed to drive changes in the electric sector was an administrative action on the part of the Obama Environmental Protection Agency (EPA) known as the CPP, an initiative that was later repealed by Trump (Thompson et al. 2020). Under the CPP's proposed rules, hydroelectricity imports from Canada were incentivized only indirectly, to the degree they were helpful to individual states in meeting the caps required of them under the CPP (Aarons and Vine 2015).

Importantly, there was an early attempt at a federal-level RPS policy in the early 2000s (which died during the legislative process). During this process, Canadian officials lobbied actively in Washington, D.C. for non-discriminatory treatment of Canadian hydroelectricity imports. When that failed, they similarly lobbied at the state level (Gattinger 2011; Rowlands 2009). However, as we will see, these efforts were largely unsuccessful.

As the literature on U.S. climate policy emphasizes, states have been where the action has been, and nowhere is this more apparent than when it comes to electricity sector policies, with thirty-seven states having adopted RPS policies that specify percentages of a state's electricity load that must originate from renewable sources (Carley 2011; Center for Climate and Energy Solutions 2020; Rabe 2007). While early studies tended to view RPS adoption as a dichotomous outcome variable, focusing on the state characteristics associated with RPS adoption (or not), recent studies have emphasized the significant heterogeneity that exists when it comes to the details of how these policies are designed, and the politics and policy objectives that these design differences reflect (Barbose 2012; Basseches 2020; Carley et al. 2018; Fischlein and Smith 2013; Rountree 2019; Yin and Powers 2010).

The design elements most likely to encourage/discourage transmission expansion with the goal of increasing Canadian hydroelectricity imports and ideally, also, wind and solar electricity exports, are three in particular: 1) whether or not renewable energy credits (RECs) used to calculate compliance with the policy are allowed to be "unbundled" from the underlying electrons they represent, 2) provisions governing resource eligibility (i.e., which technologies count as "renewable"), and 3) geographic limitations on where the RECs must originate from (also sometimes known as "deliverability requirements") (Fischlein and Smith 2013). In the next section, we explain each of these design elements, and how they matter when it comes to enabling/hindering cross-border transmission expansion.

RELEVANT DESIGN ELEMENTS OF STATE-LEVEL RPS POLICIES

Every state with an RPS policy except for three (Iowa, Illinois, and New York) calculates utilities' compliance with the policy on the basis of RECs (Fischlein and Smith 2013). The REC system is a direct analog to pollution allowances in cap-and-trade programs; however, in the case of RPS policies, instead of each allowance representing a unit of carbon dioxide equivalents (CO2e), each REC represents a unit of renewable electricity originating from an eligible source. We will have more to say about "eligible sources" below, but first, we need to explain the distinction between "bundled" and "unbundled" RECs, and why it matters for transmission.

"Unbundled" RECs

"Bundled" RECs cannot be separated from the physical electrons they are associated with. In other words, "bundled" RECs can only be counted toward RPS requirements in a particular state when sufficient transmission to deliver them is in place. By contrast, "unbundled" RECs are those for which their environmental attributes are divorced from the electrons they represent. For example, a given number of "unbundled RECs" can be generated from a given renewable energy facility in any location and then their environmental attributes (i.e., the fact that they were generated from non-fossil sources) can be bought/sold/traded separately, among any actors that are regulated by a state's RPS policy. As a practical matter, this means that RECs can be used to comply with an RPS even when the transmission infrastructure necessary to deliver the physical electricity they represent is absent. In other words, "unbundled" RECs *discourage* the construction of new transmission while "bundled" RECs *encourage* it.

The argument in favor of the use of "unbundled" RECs in RPS policies is that it promotes economic efficiency (Mack et al. 2011), a familiar argument for carbon pricing as opposed to command-and-control regulation (Metcalf 2019). As the argument goes, if the goal is maximizing renewable generation as efficiently as possible without regard to *where* it is generated, then "unbundled" REC markets should be "robust and liquid" (Mack et al. 2011:9). However, if the goal is increasing transmission capacity, with the aim of getting the green electricity where it needs to go as efficiently as possible, then "unbundled" RECs are highly problematic.

Resource Eligibility

Each state's RPS has its own way of defining which electricity generation technologies count as "eligible renewable resources" under the policy. These definitions can be (and routinely are) altered over time as state policymakers seek to incentivize or discourage particular technologies[7] (Barbose 2021). However, resource eligibility is more complicated than simply which technologies count and for how much.

The policy design concept of "resource eligibility" can also include dates after which facilities producing electricity utilizing these technologies must have entered into operation. Another facility-level determinant of resource eligibility pertains to the capacity of the generation facility. RPS policies often state that a facility's generation capacity must fall within certain ranges to have compliance value (Fischlein and Smith 2013). Central to these date-based and/or capacity-based eligibility requirements is the concept of "additionality," a familiar concept for observers of cap-and-trade policy design. In the context of cap-and-trade, "additionality" is a concept that governs carbon offsets policy. According to this principle, regulated parties should only be able to use offsets in lieu of direct compliance if those offsets were generated by actions that would not have occurred but for the policy encouraging them (Raymond 2010).

7 A well-known example of this would be a "solar carveout." Since solar is generally more expensive than wind, policymakers may use a solar carve-out to attempt to overcome this market barrier, and level the so-called playing field (meaning each unit of solar has a higher compliance value than each unit of wind, and thus, there is a greater policy incentive to procure solar compared to wind). In some states, available technologies are listed in different "classes," and each "class" is assigned a different compliance value.

In the context of cap-and-trade, Raymond (2010) points out the problems with this, one of which involves the administrative difficulty of making such determinations with any degree of certainty.

Nevertheless, in RPS policy, dates of operation are used based on the assumption that generation that comes into operation after the adoption of an RPS policy is likely influenced, at least in part, by the policy rather than purely by market forces. Similarly, since it is often less costly to add incremental capacity to an existing facility than to build a new one from scratch, these policies often set limits on the amount of a facility's capacity that can count toward compliance, meant to encourage deliberate capacity expansions rather than simply rewarding the underlying "legacy" capacity of the facility (a practice also known as "grandfathering").

This all makes good enough sense in terms of encouraging *new* sources of renewable electricity generation. However, the problem is when we consider the effect of these provisions when it comes to expanding cross-border transmission of *existing* resources. Readers will recall that most of the hydroelectricity that Canada's "hydro provinces" produce in abundance come from larger, older facilities that predate these northeastern states' RPS policies.[8]

In these cases, strict resource eligibility requirements—either those restricting the compliance value of hydro as a technology or those discounting the value of electricity generated from older facilities—discourages rather than encourages prospects for getting clean electricity where it needs to go as quickly as possible.

Geographic/Deliverability Requirements

Finally, there is the question of where, geographically, RECs must originate from— regardless of whether they are "bundled" or "unbundled"—if they are to fully count under a given state's RPS rules. Jurisdictions often impose such geographic/deliverability requirements in response to lobbying pressure from in-state, organized labor groups, who have an interest in maximizing *local* (as opposed to out-of-state or out-of-country) jobs associated with the construction of new renewable generation facilities (California State Archives 2002). This is all well and good, except for the fact that, as we pursue an "electrify everything" strategy, we need to be concerned not only about how much renewable electricity exists, but whether we can get it to where it is most needed. Geographic/deliverability requirements, similar to "unbundled" RECs, effectively disincentivize cross-border transmission construction because they privilege local generation at the expense of long-distance generation.

8 There are exceptions, such Muskrat Falls, which came online more recently, in 2020, and such new projects must certainly be encouraged, but existing policy already does a good job of that.

EVALUATING THE RPS DESIGN OF SEVEN NORTHEASTERN STATES

The first two of the seven RPS policies we concentrate our analysis in this paper on, Massachusetts' and Maine's, were adopted in 1997; by 2007, all seven states had adopted an RPS. Apart from New York's, these states' RPS policies were adopted by statute, meaning that the state legislatures enacted bills that governors signed.

In New York's case, the policy was adopted by regulation during Republican Governor George Pataki's administration; it has enjoyed support from every New York governor since.

As Table 1 shows, in each state, these policies were revised or amended multiple times since their initial adoption. As Table 1 also shows, state public utility commissions (or their equivalents) are generally the agencies responsible for implementation (and rulemaking), but there are some exceptions, such as in Massachusetts, where the Department of Energy Resources (DOER) implements, and New York, where the New York State Energy Research and Development Authority (NYSERDA) also plays an implementation role.

Table 1: Background Information on Seven Northeastern States' RPS Policies

	Year RPS First Adopted	Statutory or Regulatory?	# of Times Significantly Amended	Years Amended	Implementing Agency(ies)
Massachusetts	1997	Statutory	5	2008, 2010, 2014, 2016, 2018	Department of Energy Resources (DOER)
Maine	1997	Statutory	8	1999, 2004, 2006, 2007, 2009, 2011, 2015, 2019	Public Utility Commission (PUC)
Connecticut	1998	Statutory	7	2004, 2006, 2007, 2012, 2013, 2017, 2018	Public Utilities Regulatory Authority (PURA)
Vermont	2003	Statutory	4	2005, 2010, 2012, 2015	Public Utility Commission (PUC)
New York	2004	Regulatory	4	2010, 2012, 2016, 2020	Public Service Commission (PSC), New York State Energy Research and Development Authority (NYSERDA)
Rhode Island	2004	Statutory	2	2009, 2011	Public Utility Commission (PUC)
New Hampshire	2007	Statutory	6	2008, 2009, 2010, 2012, 2016, 2017	Public Utility Commission (PUC)

While there is too much variation in policy design and content across too many dimensions[9] to provide an unequivocal measure of how encouraging/discouraging each state's policy is (or has historically been) when it comes to cross-border transmission, we wanted to obtain at least a crude sense of how these seven states compare on the key policy dimensions explained above. To perform this analysis, we read each relevant RPS bill and regulation in each state and noted distinctions in provisions pertaining to the three design elements discussed above. We awarded each state a point if its policy *encouraged* cross-border transmission with regard to a particular design element. We subtracted a point if its policy *discouraged* cross-border transmission with regard to a particular design element. In cases where this was unclear, or changed drastically over time, we gave the state a 0, signifying intermediacy.

Massachusetts is a somewhat exceptional case. Realizing how critical Canadian hydroelectricity was to achieving that state's ambitious climate targets, in 2016, the legislature passed and the governor signed a standalone law (separate from the RPS policy) that ordered the state's utilities to diversify their clean electricity portfolios by procuring 1,200 megawatts of additional, firm (non-intermittent) clean electricity (Mass. Gen. Laws Ann. Ch. 25A, § 11F; Massachusetts 2016 House Bill 4568). In fact, it was this law that was directly responsible for the controversial NECEC project discussed above—the one that was recently derailed by the Maine ballot measure (Mohl 2020). We therefore award Massachusetts an extra point in our analysis, on account of this law specifically. Table 2 shows how the seven states' RPS policies (plus Massachusetts' standalone law) compare across these policy design elements.

Table 2: Comparing Design Elements of Seven Northeastern States' RPS Policies

	Unbundled RECs	Resource Eligibility	Geographic/ Deliverability Requirements	Additional Points	Total Score
New York	+1	+1	0	0	**2**
Vermont	-1	0	+1	0	**0**
Connecticut	-1	0	0	0	**-1**
Maine	-1	-1	0	0	**-2**
Massachusetts	-1	-1	-1	+1	**-2**
New Hampshire	-1	-1	0	0	**-2**
Rhode Island	-1	0	-1	0	**-2**

9 Including the dimension of time, since each policy was initially adopted and then amended at different moments in time, as shown in Table 1.

New York is the only state of the seven not to allow the use of "unbundled" tradable RECs for policy compliance (Fischlein and Smith 2013; New York Public Service Commission 2004). The other six states all rely on the New England Power Pool Generation Information System (NEPOOL-GIS) to issue and track "unbundled" RECs, regardless of whether the transmission exists to get the underlying energy to the state (Conn. Gen. Stat. § 16-1; Mass. Gen. Laws Ann. Ch. 25A, § 11F; M.R.S., 35A, § 3210; N.H. Rev. Stat. Ann. § 362-F; R.I. Gen. Laws § 39-26-1 et seq; Vt. Stat. Ann. tit. 30 § 8001 et seq).

In terms of resource eligibility, New York is the most encouraging of the importation of hydroelectricity from Canada. In New York, NYSERDA centrally administers an incentive-based procurement mechanism that ensures utilities will have sufficiently diverse clean electricity portfolios. The baseline percentages that inform NYSERDA's managed resource procurement strategy in no way discriminate against legacy hydroelectricity of the sort that would be imported from Canada. However, there is an incremental ratcheting up of those baselines, and that ratcheting up does impose limited restrictions on legacy hydroelectricity (relative to other technologies), defined as hydroelectricity generation facilities that were operational prior to 2004, the year the New York RPS went into effect (Fischlein and Smith 2013; New York Public Service Commission 2004).

By contrast, Maine, Massachusetts, and New Hampshire have policies that are highly discriminatory against legacy hydroelectricity. In Maine, hydroelectricity whose generation facility predates 2005 can only be counted up to 100 megawatts, but even so, it is relegated to a less preferred class of resources that can only be used to *partially* meet the RPS requirement (M.R.S., 35A, § 3210). In Massachusetts, the statute is even more restrictive; hydroelectricity whose generation predates 1997 can only be eligible up to 5 megawatts and is also relegated to a less preferred class of resources (Mass. Gen. Laws Ann. ch. 25A §11F). In New Hampshire, similarly, such legacy hydroelectricity can only be counted if it is limited to no more than 5 megawatts of capacity (N.H. Rev. Stat. Ann. § 362-F).

The remaining three states (Connecticut, Rhode Island, and Vermont) are more permissive relative to Maine, Massachusetts, and New Hampshire, but still more restrictive than New York. In Rhode Island, no more than 2% of retail electricity sales eligible for the RPS may come from existing (as opposed to new) renewables, regardless of which technology (R.I. Gen. Laws § 39-26-1 et seq.). In Connecticut, large-scale legacy hydroelectricity was fully eligible until 2004, but at that point the statute was revised so as to completely restrict it from counting toward the RPS requirements (Conn. Gen. Stat. § 16-1; Conn. Gen. Stat. § 16-245a et seq.). And in Vermont, the over-time trend seen in Connecticut was reversed. Eligible hydroelectricity was initially capped at 80 megawatts, then liberalized to 200 megawatts, and then, in 2012, the cap was lifted entirely, resulting in the most favorable treatment of Canadian hydroelectricity of the six New England states, but only as of 2012, following nearly a decade of restrictions—lost time from the perspective of transmission construction, which takes years to complete (Vt. Stat. Ann. tit. 30 § 8001 et seq.).

Finally, in terms of geographic/deliverability requirements, Vermont is the most encouraging of cross-border transmission. This is because the policy requires eligible RECs to originate from facilities owned or under contract with Vermont distribution utilities. Logically, a Vermont utility would only enter into a contract with a generation facility capable of delivering electricity to its Vermont customers, and this would require adequate transmission capabilities for Canadian generators to deliver their power to Vermont customers (Fischlein and Smith 2013; Vt. Stat. Ann. tit. 30 § 8001 et seq).

Rhode Island and Massachusetts are the most discouraging in this regard. Rhode Island allows RECs to originate from anywhere tracked by NEPOOL-GIS, which includes unbundled RECs from places far away as well as local, irrespective of the availability of transmission to ensure the underlying electricity is deliverable (Fischlein and Smith 2013; R.I. Gen. Laws § 39-26-1 et seq.). Massachusetts, for its part, has different tiers of REC eligibility, and one of these tiers, "Class I," is further separated according to geographic location, with a portion of the generation needing to be physically located within the state of Massachusetts' borders (Mass. Gen. Laws Ann. Ch. 25A, § 11F). This is good for local economic development, but discourages the use of clean power from Canada as a means of RPS compliance. Finally, Connecticut, Maine, New Hampshire, and New York all use their independent system operator (ISO) territory as the basis for their geographic/deliverability requirements; RECs must originate from a source capable of delivery to the regional ISO, but that does not mean the electricity must actually be delivered, since unbundled RECs can be bought/sold/traded with entities outside the ISO territory (Conn. Gen. Stat. § 16-1; Conn. Gen. Stat. § 16-245a et seq.; M.R.S., 35A, § 3210; New York Public Service Commission 2004; N.H. Rev. Stat. Ann. § 362-F).

Aggregating the positive, negative, and neutral points for each policy design element shown in Table 2, we can observe that overall New York has the RPS policy that is most permissive when it comes to Canadian hydroelectricity, and most encouraging of cross-border transmission construction. By contrast, Maine, Massachusetts, New Hampshire, and Rhode Island all have RPS policies that are relatively restrictive of Canadian hydroelectricity imports and also discourage cross-border transmission construction. The remaining states—Connecticut and Vermont—fall somewhere in between.

DISCUSSION AND IMPLICATIONS

The purpose of this paper is to draw attention to some of the potential policy obstacles to one of the most pressing tasks if both the United States and Canada are to achieve their goals of deep decarbonization through the strategy of "electrify everything" (Government of Canada 2020; The White House 2021): building new transmission infrastructure to dispatch existing clean electricity resources to where they are needed the most.

We do not argue that state-level RPS policies in and of themselves are the problem. Instead, we seek to draw attention to how certain elements of their design (e.g., unbundled RECs, resource eligibility restrictions, geographic/deliverability requirements) may be at cross-purposes with the deep decarbonization strategies these North American superpowers have committed to pursue. Other RPS policy design elements, which have not been our focus here (e.g., aggressive targets and timelines, scope of utility inclusion, quotas and subsidies, enforceable penalties, etc.), but which tend to get comparatively more attention in the existing literature (e.g., Carley et al. 2018; Fischlein and Smith 2013; Yin and Powers 2010), are perfectly compatible with the objective of encouraging new transmission construction. And even the policy elements which we have suggested need to be revisited have historically played an important and positive role in facilitating a clean energy transition.

For example, the principle of additionality—rewarding only action that would not have taken place but for the policy driving it—certainly makes sense in terms of increasing renewable generation capacity, irrespective of its physical location. Furthermore, there is merit to "unbundled" RECs because they may accelerate the pace of developing new resources and technologies (Mack et al. 2011). And since we need diverse renewable portfolios, and we therefore need to lower the cost of relatively expensive technologies if they have fewer negative externalities in terms of climate, quotas and subsidies certainly have been, and continue to be, appropriate policy measures.

Nevertheless, our preliminary evaluation of RPS policies in northeastern U.S. states yields some important observations that policymakers ought to consider moving forward. New York has found a way to design a strong RPS policy that simultaneously encourages cross-border transmission. Yet states like Massachusetts, Connecticut, and Rhode Island, which do not share a direct border with Canada but which, due to their population centers, possess significant demand for large quantities of non-intermittent clean electricity of the sort Canada is already well-equipped to supply, have policies that discourage the importation of those very resources. Moreover, these states have ambitious state-level GHG emissions reduction targets, yet the pathway to meeting them *without* Canadian hydroelectricity is unclear. It is worth asking, then, why these states do not redesign their policies to emulate the New York model.

Providing a definitive answer to this question is beyond the scope of what we do here, as it would involve the construction of political histories of each policy rather than simply making note of each policy's design. However, one hypothesis that could be tested in subsequent research is whether the fact that New York's policy was developed through *executive* rulemaking, rather than legislative statutes, immunized it from certain local political pressures (e.g., organized labor, local economic development, etc.) that led legislators in the other states to adopt more protectionist policies that discriminated against Canadian imports. While there are drawbacks to executive action, such as policy durability (Rabe 2016), New York's RPS has proven remarkably durable, as has RGGI, which was largely designed through executive actions as well (Raymond 2016). What lessons could other states learn from New York?

Moving beyond the particulars of state-level RPS policy design, this paper also offers some important interventions in the academic literature on climate and renewable energy policymaking, particularly, as we ask, in the context of this North American Colloquium (NAC) series, what opportunities may exist for international, North American policy coordination? When it comes to climate policy more generally, studies have tended to emphasize the potential for harmonization and linkage across jurisdictions, and in some cases, they have provided examples of successful linkage (López-Vallejo 2016; Meckling and Jenner 2016; Peterson and Rose 2006; Ranson and Stavins 2016). However, as we have seen in the present analysis, the various RPS policies and their particular provisions appear to have been designed in a siloed, uncoordinated manner, fulfilling local policy priorities without considering the broader implications for things like international electricity transmission. As a result, they send mixed signals when it comes to the desirability of cross-border hydroelectricity imports.

In the context of historical inaction from the U.S. federal government, the proliferation of state-level climate and renewable energy policies, including RPSs, is often celebrated as an example of subnational creativity and innovation (Bromley-Trujillo et al. 2016; Carley 2011; Rabe 2008), and opportunities for regional policy harmonization and linkage have been highlighted (López-Vallejo 2016; Meckling and Jenner 2016; Peterson and Rose 2006; Ranson and Stavins 2016). However, our research reveals a certain "dark side," or at least a drawback, to this feature of North American climate and renewable energy policy. We find that state-level RPS policies, far from being coordinated and coherent, have developed in a siloed, inconsistent manner.

As we embrace the current moment of opportunity for U.S.-Canada bilateral cooperation and coordination on climate, it is perhaps time for the two federal governments to sit down and figure out how coordinated federal electricity policy might be layered on top of the state RPSs, and Ontario's feed-in tariff program, in such a way that it corrects for their mixed signals when it comes to cross-border transmission. We are in a moment now in which we need to think not only about how to incentivize more renewable generation capacity *in general*, but *also* about how to build a continental transmission network capable of getting those resources where they need to go without compromising reliability or energy security. Overcoming the existing policy barriers to realizing that continental "super-grid" has never been more urgent.

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