A Collaborative for Greater Coordination and Integration Among the Electric Grids of Eastern Canada and the Northeastern United States

Assessment and Recommendations

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Submitted to
the Assessment Advisory Committee of the
Northeast Electrification and Decarbonization Alliance (NEDA)
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I. Introduction and Background

Eight separately operated balancing areas make up the eastern Canadian and northeastern U.S. electric grid.[1] System operators, regulators, and policymakers recognize that greater coordination of grids — however defined across a broad continuum of operations, investment, market, and planning activities — can yield significant economic, reliability, and environmental benefits to the region.[2] While progress in this region has been made over the past 50 years, primarily in the form of increased interties and bulk power trading, deep and strategic coordination that broadens the geography of day-ahead and real-time operations, takes advantage of greater regional load diversity, encourages more integrated planning, and facilitates deeper penetration of non-emitting, variable resources has so far been elusive.

In recent years, most of the Eastern provinces and Northeastern states have set themselves ambitious greenhouse gas emissions reduction targets. Numerous analyses have shown that the goals are achievable, but that they will depend in large measure on the decarbonization of electricity and the electrification of most fossil fuel combustion in the building and transportation sectors. Since the costs of decarbonization can vary widely between power systems with differing generation and transmission resources, it follows that increased operational and planning integration and deep investment in renewable energy generation, transmission, and end-use energy efficiency will be central elements in lower-cost scenarios. And with such coordination should come increased system reliability, resilience, cost savings, and opportunities for grid modernization.

These conditions prompted the Northeast Electrification and Decarbonization Alliance (NEDA), an informal association of electric industry representatives, government officials, and academics mostly from eastern Canada and the northeastern United States, to commission a report to examine the implications of greater integration of the electric grids on the achievement of provincial and state decarbonization objectives. That report, *Northeast Decarbonization: The opportunities and challenges of regional electricity sector integration for high renewable penetration*, was completed in June 2019.[3] It found that there could be substantial economic and environmental benefits issuing from greater integration, but that there are substantial barriers — mostly political, social, and institutional but also technical. It concluded by calling for "additional dialogue, sharing of information and data, and further technical and economic studies on the gains of and approaches to greater integration."[4]

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[1] They are the system operators and vertically integrated utilities that operate the systems in New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Ontario, Quebec, New England, and New York.

[2] See, for example, Williams, Dr. James H., et al., *Deep Decarbonization in the Northeastern United States and Expanded Coordination with Hydro-Québec*, Sustainable Development Solutions Network in collaboration with Evolved Energy Research and Hydro-Québec, April 2018; and Dimanchev, Emil, et al., *Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower*, Massachusetts Institute of Technology, CEEPR WP 2020-003, February 2020.

[3] NEDA's mission is to "[promote] collaboration among jurisdictions in the North American Northeast to achieve deep reductions in greenhouse gas emissions through almost 100% renewable energy systems." Pineau, Pierre-Olivier, and Simon Langlois-Bertrand, *Northeast Decarbonization: The opportunities and challenges of regional electricity sector integration for high renewable penetration*, NEDA, 19 June 2019, p. 2. This report can be found in Appendix D. In April 2020, The Transition Accelerator formally published the report and made it available to the public. That version can be found at https://transitionaccelerator.ca/northeast_decarbonization/.

[4] Pineau and Langlois-Bertrand, 2019, p. 30.

Recognizing that a mere call for action was unlikely, by itself, to spur action, NEDA engaged The Transition Accelerator, in collaboration with the Regulatory Assistance Project (RAP) and Raab Associates, to evaluate the extent and nature of interest in pursuing deeper coordination of the regional electrical systems — that is, to investigate where joint action might offer the most promise and best return for the broad set of affected institutions and stakeholders on both sides of the border. Our purpose was not to analyze the value or means for greater coordination among the eight balancing areas. Rather, it was to determine whether there is sufficient institutional and key stakeholder support in the region for an extended multistakeholder, multijurisdictional collaborative process dedicated to developing a comprehensive blueprint for such coordination and grid integration. And, were we to find that there is such support, we would then make recommendations for further action with respect to the scope, structure, analytic requirements, and next steps for a collaborative process to enhance coordination and grid integration throughout the region.

The assessment began in March 2020. We benefited from the insights and feedback of an advisory committee convened to assist us — to act as a sounding board against which we tested our approach, findings, and conclusions — and to which this report is submitted. (The names and affiliations of the advisory committee members can be found in Appendix A.) We conducted the assessment primarily through a series of in-depth interviews of policymakers, system operators, utilities, market participants, advocacy groups, and other stakeholders. The assessment team acted with complete independence from the stakeholders that we interviewed (or any other potential stakeholders, for that matter). Also, to inform our thinking, we developed short case studies on six similarly complex stakeholder engagement processes in North America and Europe.

The report consists of four parts, including this introduction. Section II provides detailed summaries of the interviewees' responses to our questions and highlights key findings based on those summaries. On the basis of those findings, Section III offers an extensive set of recommendations for further action. The last section contains several appendices.

Our central finding is this: There exists among the key stakeholders in eastern Canada and the northeastern United States strong support for a broad-based collaborative effort to promote increased electric grid integration and coordination, so as to obtain all the economic and environmental benefits that such integration and coordination is likely to yield.

Our second finding is that a collaborative cannot begin, much less succeed, unless three preconditions are met. One, it must have the support of the affected provincial and state governments. Two, it must have access to adequate data to support the analytical and modeling activities that will be essential to it. And three, it must have sufficient resources to sustain the overall effort (i.e., project management, facilitation, analytics and modeling, travel, and logistics).

We close Section III with a discussion of the host of collaborative design decisions, having to do with both process and substance, that will need to be made very early on. We set them out and make detailed recommendations on each. We then conclude with additional recommendations on immediate next steps.

II. Assessment

In this section, we summarize the interviewees' responses to our questions. The first subsection deals with the subject matter on which a collaborative might focus. The second looks at the process of a collaborative — how it might be organized, who convenes it, and how and for how long it functions.

A. Subject Matter

1. Introductory Question: Coordination, Integration, and Achievement of the Clean Energy and Climate Goals

Introductory question: To what degree are the clean energy and carbon goals, mandates and policies in your state/province/region facilitated by broader and deeper system integration and coordination between the northeastern U.S. and Canada (and are they achievable without such integration and coordination)?

A large majority of the interviewees, in both Canada and the United States, felt that their provincial and state clean energy and carbon goals can be met without greater integration and coordination among the region's balancing areas. But the vast majority also felt, some more strongly than others, that greater integration and coordination will enable the jurisdictions to meet their goals more quickly, more efficiently, and at significantly lower cost than by going it alone (or "paddling their own canoes," as one interviewee put it).

The nature of coordination and integration was not specified in the question. This would be delved into in detail with the next three questions. This was a threshold question whose objective was to uncover the general impressions of these potential stakeholders and shape the conversation that followed. Still, in their answers the interviewees revealed the outlines of the kinds of coordination and integration they see as necessary to achieving their climate goals.

Most spoke in terms of integrating variable renewable energy resources into their systems and of how a larger geographic footprint for grid operations will make this easier and less expensive. They noted that optimizing system operations and investment across a larger area, thereby making more low-cost resources available (including Canadian hydro as a form of both generation and storage) and taking advantage of greater load diversity, will increase efficiency, reduce total costs, and improve reliability. Many interviewees pointed out that a key to this type of integration is increased interties — transmission — between balancing areas, both north and south and east and west. Several pointed out that the benefits will be especially apparent as electrification of the transportation and heating sectors accelerates.

Several interviewees were less sanguine about the prospects for decarbonization in the absence of regional grid integration and coordination. They couldn't say for sure. One interviewee spoke more definitively: stating that the goals cannot be achieved without greater coordination, and that will only come when the costs of doing so (primarily transmission investment for access to clean, low-cost energy resources on both sides of the border) are shared fairly among those who benefit. Another interviewee in Canada said that, without increased grid integration and coordination, Ontario is likely to see its greenhouse gas emissions increase over the next decade.

With greater coordination comes greater complexity, several interviewees said, and analysis will be needed to determine whether that complexity is worth its cost. Several interviewees pointed out that one particular challenge will be integrating market-based systems with vertically integrated ones, especially as it pertains to price formation for short-term energy exchanges and balancing services. Others noted the need for, and the difficulties of, coordinating policy at the political level. In their view, there has never been meaningful policy coordination among the Northeast states or between states and the Canadian provinces. This is partly because clean energy policy is also seen as a local economic growth driver. But several interviewees felt that greater alignment of the jurisdictions' emissions and energy goals — a shared push for deep decarbonization — would help overcome the barriers to grid integration. One interviewee pointed out the peculiar dynamic in Canada where the provincial utilities tend to discourage federal government involvement in cross-border electricity trade. Consequently, province-to-state relationships are essential.

Several interviewees warned that, despite the obvious benefits of greater integration and coordination, there will invariably be some stakeholders who are wary of it. For instance, a couple of our U.S. interviewees noted that increased access of relatively low-cost provincial hydro resources to the New York and New England markets will be seen as a threat by some U.S. generators. And some Canadian interviewees observed that there will likely be concerns in Canada that increasing exports of hydropower within Canada and to the states will cause prices in exporting provinces to rise.

In this vein, several interviewees stated that one element of greater integration among the region's balancing areas should be some form of carbon pricing. This, they said, would address concerns about recovery of the full value of clean energy investment and production, and could allow for the comparison of all northeastern U.S. and eastern Canadian resources on an apples-to-apples basis. The interviewees acknowledged that carbon pricing was controversial and unlikely to gain traction in the near term. They did not think, however, that it should stand in the way of a genuine effort to achieve greater grid integration and coordination. Making progress of any kind is important, according to them and the vast majority of our interviewees.

2. Questions 1 and 2: Areas of Greatest Potential Impact

Question 1:

- *Given a long-term horizon, many forms of electricity system integration/coordination between and among the northeastern U.S. states and eastern Canadian provinces are possible, including (A) operations, (B) wholesale power market design, and (C) resource planning and investment (e.g., generation, transmission, and distributed energy resources). Which do you believe will be most beneficial and why?*
- *What do you see as the major pros and cons of greater electricity system integration/coordination between the northeastern U.S. and Canada?*

Question 2: The NEDA process could examine a broad range of options for greater regional integration and coordination including: (A) operations, (B) wholesale power market design, and (C) resource planning and investment (e.g., generation, transmission, and distributed energy resources). What's essential for NEDA and what's optional for this process to look at, and/or should they be sequenced — why?

Question 1 asked the interviewees to describe the kinds of system integration or coordination that would be most beneficial for the region and gave examples of possible approaches. Question 2 asked the interviewees to identify what form or forms of integration a potential NEDA collaborative process should devote itself to. Given the significant overlap of subject matter in these questions, we address them together here.

Resource Planning and Investment

The vast majority of the interviewees felt that resource planning and investment offer the greatest opportunity for regional benefit from greater integration and coordination. This conclusion was shared widely among the system operators, transmission owners, government representatives, consumer advocates, and non-governmental organizations (NGOs).

The interviewees also shared, for the most part, a common idea of what "resource planning and investment" means. It relates first and foremost to transmission and regional interties. These are the "key," as one interviewee put it, "to delivering clean supply to load and maximizing consumer benefit." Another described it as the "enabler of market diversity." Most interviewees see transmission investment as critical to least-cost achievement of jurisdictional decarbonization goals. This means that it is transmission that can enable two-way power flows to take advantage of greater load diversity and storage (including that of Canadian hydro) to more cost-effectively integrate variable renewable resources into the system.

Related to this was a concern, shared widely on both sides of the border, that an absence of some kind of regional resource planning is an impediment to more economically efficient and environmentally preferred investment and system operation. Disappointment with the U.S. Federal Energy Regulatory Commission (FERC) Order 1000 process, which is intended to provide a means by which U.S. state policy is incorporated into regional transmission planning, was expressed several times. Several interviewees also spoke about U.S. state planning efforts that are driven in part by parochial concerns (jobs, economic development) and thus disconnected from the planning of other states. In Canada, there is a more ad hoc coordination of transmission planning between provinces, with regulatory approval required for interprovincial projects from the Canada Energy Regulator (CER, a successor in 2018 to the National Energy Board). One respondent spoke of the challenges presented by historic electrical system boundaries that were not established to minimize total system costs or greenhouse gas emissions across political boundaries and noted that there was ample opportunity to harmonize the existing and fractured systems.

The interest in regional resource planning and investment was not limited to transmission assets. Interviewees spoke of the need for better generation planning and siting efforts, especially with respect to clean energy resources. Among interviewees in jurisdictions with vertically integrated utilities, this was expressed in the language of integrated resource planning. Those in balancing areas served by competitive wholesale markets spoke of market design reforms and public policy as drivers of clean energy investment.

Market Design

Several aspects of market design were touched on. While there was acknowledgment that broadening the geographic scope of a market is likely to produce savings (by increasing the availability of low-operational-cost resources), no one sees it as a practical near-term step. We did not detect interest in the creation of competitive wholesale markets in areas where they do not now exist. But there was a strong sense that increased energy exchanges (both in frequency and volume)

between balancing areas, made possible by adding transmission capacity and allowing for out-of-area resources to provide balancing services (among other things), would produce significant benefits.

Still, numerous interviewees spoke to the shortcomings of the current markets and of the value in addressing them. In New England there is real concern with the current capacity market and with recent FERC actions related to it. Two interviewees thought that a broader regional capacity market could address those issues and produce a more rational deployment of generation. One person commented that market rules currently fail to "value the unique temporal challenges of hydro dispatch." But most interviewees posited that a NEDA process should focus first on planning and investment and that market design challenges, which were seen as largely political in nature, should follow in a subsequent NEDA phase or resolve themselves in a different forum.

One specific element of market design that several interviewees mentioned was carbon pricing. Those interviewees generally saw carbon pricing as necessary to drive the kinds of investment states and provinces need to meet their clean energy and climate mandates; several observed how the patchwork of approaches to incentivizing decarbonization, as well as current low prices on carbon in the region, did not facilitate the attainment of these same objectives across the region. A couple of interviewees mentioned the importance of economywide, rather than power sector-only, carbon pricing. Some also see carbon pricing as a potential pathway to resolving the capacity market debates in New England. But a couple of interviewees noted that there doesn't appear to be much appetite in New England for carbon pricing beyond the Regional Greenhouse Gas Initiative (RGGI) and what might be contemplated by the Transportation and Climate Initiative (however, stakeholders and the states are taking this up again in the New England Power Pool [NEPOOL] process).

Operations

As for operations, the majority of interviewees felt that, though there is room for improvement, the technical challenges facing greater integration were not particularly daunting. A number of interviewees felt that greater coordination of operations and markets will flow naturally from the expanded transmission investment that comes out of some kind of a regional planning process. One example that several interviewees provided concerns scheduling. Scheduling frequency between New York and Canada (Ontario and Quebec) is currently hourly, but discussions are underway to bring it down to 15 minutes, as it is between New York, Independent System Operator-New England (ISO-NE), and PJM. Five-minute scheduling would be even better to support efficient two-way power flow, according to a couple of our interviewees, and increases in intertie capacity will make these improvements possible.

Several Canadian interviewees, in stressing the need for greater transfer capacity between the countries, also pointed out that there are "artificial" barriers to electricity trading, including exit fees on power exports from New England to Nova Scotia that distort the value of electricity trade. According to those interviewees, these will need to be addressed in some manner.

NEDA's Substantive Focus

Unsurprisingly, most interviewees felt that a NEDA process should focus on the area that they felt offered the greatest promise for widespread benefit — that is, on resource planning and investment, and new transmission resources in particular. Market design, including the means by which inter-balancing area trading can be optimized, was second and operations, which many felt are already largely "seamless" and on which progress is already being made, a distant third. Several interviewees

felt that getting an idea now of what the NEDA subject-matter focus will be is less important than getting the collaborative started and allowing the foci to crystalize through the process.

Those advocating some kind of carbon pricing or carbon-intensity metric as a critical market reform and who see a regional collaborative like NEDA as a potential venue for developing broader support for it nevertheless acknowledged its controversy. Some of those advocating that NEDA include an examination of regional carbon pricing nonetheless acknowledged that it would require tremendous political will to create a sufficiently liquid and adequately priced regional carbon market. Instead, these interviewees suggested it might be better for NEDA to work on something else initially, such as transmission planning and investment, that has the greatest buy-in and potential to achieve early "wins."

Lastly, a number of interviewees recommended that the collaborative take advantage of opportunities to make early progress on straightforward, uncontroversial matters. Several people identified better information sharing among the balancing areas, including the states and provinces within each area. Specifically, gaining a better understanding of, among other things, neighboring systems' operations, plans and planning methods, and their respective policy environments will inform and alter behavior in simple, practical ways. It will also create a foundation of trust upon which longer-term cooperation can be built.

3. Question 3: Potential Barriers to Integration and Coordination

Question 3: What do you foresee as the most likely barriers to greater system integration and coordination? Are they technical, political, or other? How do we overcome them?

There was broad agreement among the interviewees that the biggest barriers to greater system integration and coordination are **political**. Greater electric system integration and coordination will not happen without firm commitment at the highest levels of state and provincial leadership. And this in turn will depend on governmental and public confidence that there are real net benefits from greater coordination and integration and that all jurisdictions can share in them fairly. The costs of integration, seen by the interviewees largely in terms of transmission investment (including the time and expense of siting it), are a huge political challenge.

Many interviewees pointed out that the states and provinces are naturally parochial in their outlooks. They — the jurisdictions — often see their low-carbon aspirations not merely as environmental objectives but also as economic growth and job creation programs. Consequently, they typically prefer in-jurisdiction solutions, even when those solutions might not be most economically efficient or yield the greatest regional net greenhouse gas emissions reductions. They also resist anything that reduces their control over resource decisions — anything they perceive as a diminution of sovereignty. This explains in part, said one person, the tensions between the northern New England ("corridor") states and the southern ("load") states. Another interviewee stated that Ontario and Quebec will not cede planning and investment authority to a greater regional entity and that we must assume that the current political and jurisdictional structures remain in place. This parochialism, observed one interviewee, has contributed to the absence of any regional processes that take a long-term view: "Even when the economic benefits are significant, if they are not perceived as registering a local win, the regional efficiency argument tends to fail." Two interviewees, however, presented a

contrasting view. They felt that some degree of regionalization is possible: for instance, an Atlantic Canada system operator, which they are confident will produce net benefits for its members.

National-level political challenges were also identified. One interviewee said that greater reliance on zero-carbon energy from Canada (presumably hydro) would raise national security questions that would need to be addressed. Several others talked about uneconomic trade barriers.

Social justice and environmental concerns will be raised by the prospect of greater grid integration, according to numerous interviewees. Transmission siting will be one aspect of this. Another will be new impoundment behind dams in Canada, as several interviewees, in both Canada and the U.S., said that the environmental and social impacts of expanded hydropower, on Indigenous peoples especially, must be taken into account when considering the costs and benefits of increased regional integration. In several instances, Canadian interviewees stressed how the development of new or expanded major infrastructure projects — particularly large-scale hydro — is characterized by a fundamental political dynamic that can only be adequately counterbalanced by governments working in concert with First Nations.

Another challenge, both political and economic in nature, surrounds any benefit-cost analyses that might be conducted to justify greater grid integration and coordination. Several interviewees warned of the inevitable contention that will surround the determination of what costs and benefits to include and how to assess them correctly. Who pays should be determined by who benefits, said one interviewee, but reaching agreement on those matters will be difficult. In the end, it will be as much a political question as an economic one. Another said that, unless environmental externalities are priced in the analysis, there will remain "a challenging economic tension" between continued reliance on natural gas and increased integration of renewable (or out-of-balancing area) resources. Most interviewees agreed that coming to some kind of consensus on these questions will be an early task of the stakeholders in the collaborative (see Section II.B.4, Modeling and Analytical Needs).

Several interviewees pointed out that, even with broad political support for greater integration and the investments it will require, there will still be significant legal and regulatory hurdles to get over. In some cases, legislation may be required. Siting, cost, and cost allocation will be debated first at negotiating tables and then in hearing rooms. Harmonizing complementary provincial and state emissions and renewables programs — ensuring the integrity of the systems and preventing the double-counting of attributes — will be critical. One interviewee commented that the calculation of baselines (against which compliance is measured) will be necessary to address this issue. Another explained that, in Canada, there is a problem with the pricing of interprovincial transmission services. Separate charges are incurred in each jurisdiction through which power is routed (i.e., wheeling fees are "pancaked"), which can inefficiently inflate the costs of bulk power transfers and render otherwise cost-effective transactions uneconomic. Solving this problem will require regulatory and political action.

Several interviewees spoke of the **institutional** imperatives that drive the behavior of the various stakeholders and how they can constitute barriers to greater coordination and integration. Mentioned a number of times were the system operators, whose first obligation is to ensure reliability, in terms both of *system security* (operational timeframes) and *resource adequacy* (investment timeframes). Several interviewees noted that system operators are naturally risk averse and resistant to change (although they do not necessarily see themselves in this light) and that this has created biases in favor of dispatchable resources and against variable, low-carbon ones. And this is

accompanied, one interviewee pointed out, by a financial bias in the system: The costs of some investments (e.g., transmission) can be socialized across a system, while those of others (e.g., distributed energy resources, including end-use energy efficiency) cannot. Another interviewee said that stakeholders that benefit currently — local generators, for example, that are not necessarily subject to out-of-area competition — will resist wider system integration.

Interviewees also identified a number of **economic and market barriers** to greater grid integration. Insofar as it will require significant investment in new transmission, financing and risk management become hurdles. Several interviewees, both Canadian and U.S., raised the challenges of integrating market-based systems with vertically integrated ones. The differences between them (operationally and in price formation) create obstacles to least-cost, low-carbon operations and investment. And, as mentioned earlier, there needs to be a strong demonstration that the benefits far exceed costs of increased coordination and integration. The citizens "who foot the bill," said one interviewee, must be convinced of the benefits and convinced as well that they are not sacrificing their autonomy to reap them.

The absence of a regional carbon price or market was cited by several interviewees as a significant barrier to integration that will most efficiently facilitate achievement of state and provincial climate goals. But the view that regional carbon pricing would help drive market reforms was not shared by all. One interviewee said, "I worry that, by broadening the electrical system scope, we will in some ways amplify and magnify the systemic issues that are already plaguing the New England and New York markets today."

Another important finding is that, by and large, the interviewees did not perceive **technical matters** to be significant barriers to coordination and integration. This is because, as several people noted, we understand the engineering and know how to build physical systems. Another explained that all the systems that might participate in a NEDA process (except the province of Newfoundland and Labrador) abide by Northeast Power Coordinating Council guidelines; within that framework, there will be some work to harmonize transmission practices and rules, but that shouldn't be too difficult.

Finally, the interviewees offered few concrete suggestions for how to overcome the barriers they'd identified. They all agreed that action needs to be taken and that determining that action must be a collective and transparent endeavor. Many interviewees said that active support from governors and premiers for greater coordination and integration would remove most of the political barriers and push stakeholders to focus on the technical ones. Several interviewees pointed to the need for a "robust stakeholder process" with the "right folks at the table" as an important ingredient to effectively begin tackling these barriers.

4. Question 4: Time Horizon on Which to Focus

Question 4: Should the NEDA process's analytical work and the blueprint it produces be focused on the next decade (through 2030) or through 2050 or both, and why?

2030-40
Most of the interviewees, in both Canada and the U.S., recommended that a NEDA collaborative

process,[5] if undertaken, should direct its attention to critical reforms and actions that need to happen between now and the 2030-40 timeframe. However, almost all qualified their counsel by saying that the nearer-term actions that emerge from the process should be designed with an eye to 2050 — which is to say that they should put the region on a trajectory that will make achievement of the constituent jurisdictions' climate objectives not only possible, but lowest in cost.

Both 2030 and 2050
Some interviewees argued for focusing more intentionally on both 2030 and 2050 so that the group develops a fuller and stark appreciation for the kinds of investments and policy choices needed to achieve the 2050 goals — and for what has to happen in the next 10 years to make that possible. One interviewee said the focus should be on the 2030 to 2050 timeframe, because the interim 2030 goals set by most states can be met without additional transmission. Another said that both 2030 and 2050 deserved equal consideration, because the magnitude of the shifts in energy production and use needed to decarbonize by 2050 must be recognized and planned for now. This calls for, that interviewee said, a "portfolio of objectives" between now and 2050.

Another interviewee said that there's already a good deal of work going on that is looking at 2030 and, therefore, a NEDA process should consider the longer term. It was not clear, however, that the current work alluded to focuses on, or even assumes, greater integration and coordination among the regional balancing areas.

2050
A couple of interviewees argued for focusing on 2050 because an endeavor this ambitious should take the long view. 2050 is the deadline for decarbonization and much of what's going to happen in the next decade has already been determined. For instance, one person said that 2050 should be the target, because "the momentum toward 2030" was already strong. A few others echoed this. Another interviewee sliced it slightly differently, suggesting that we should start by looking at 2040 and 2050 and "back-cast to what we need to do today." 2030 is "essentially today," when it comes to transmission investments, the interviewee explained.

Interviewees expressed a palpable desire for practical steps to be taken in the next 10 to 15 years or so that will make achievement of the 2050 goals more likely. One interviewee summed it up neatly: Create an aspirational vision for 2050, but develop specific near-term and midterm milestone objectives along the way.

B. Stakeholder Process Design

1. Question 5: The Nature of NEDA Success

Question 5:

- *What would you define as a successful outcome(s) if the NEDA stakeholder process on greater electricity system integration/coordination were undertaken?*

[5] Throughout this document, we use the expression "NEDA," by itself or as a descriptor, merely as shorthand for the collaborative that the assessment contemplates. We are presupposing nothing about the sponsorship or convening of the collaborative. Indeed, those are important questions yet to be answered. See Section III.E.

- *And what do you see as the most important factors or key ingredients to increase the likelihood of success for such a process?*
- *What do you foresee as the most likely barriers to a successful collaborative? How do we overcome these?*

Question 5 required the interviewees to give thought to what successful outcomes of a NEDA process might look like. The responses to each component of the question are summarized below. Note that not all the interviewees responded to each part.

A) *What would you define as a successful outcome(s) if the NEDA stakeholder process on greater electricity system integration/coordination topic were undertaken?*

There was a spectrum of responses to this question, ranging from the modest to the complex. For some interviewees, NEDA would be successful just to have policymakers and stakeholders formally recognize the importance of the potential for greater coordination and system integration and agree to come together to discuss a discrete list of subtopics, come what may from the undertaking. For other interviewees, educating stakeholders as to how decarbonization is accelerated and made more cost-effective through greater coordination and system integration would be successful enough, even if NEDA didn't culminate in a concrete set of recommendations or blueprints. As one interviewee explained, what's important is a deeper understanding of the "opportunity space" for greater regional coordination and system integration. The most common examples these interviewees gave included understanding the value of regional planning and greater interties/transmission, but some interviewees also mentioned the value of regional carbon pricing.

For others, a successful NEDA process would need to go further than education and understanding and conclude with a set of recommendations that prioritized the most important set of regional and local actions. Ideally, as several interviewees pointed out, these actions would balance affordability, reliability, and environmental objectives. According to these interviewees, the actionable recommendations could take the form of a prioritized and stepwise regional action plan or blueprint for meeting its collective carbon reduction goals in a least-cost manner.

B) *What do you see as the most important factors or key ingredients to increase the likelihood of success for such a process?*

The most frequent response to this question focused on getting buy-in to the objectives and design of the NEDA process and willingness to participate from **key stakeholders** up front. The key stakeholders most often mentioned in this regard were provincial and state governmental leaders, with transmission and system operators second most often mentioned. In both cases those supporting each option felt a memorandum of understanding or joint statement of support would go a long way in ensuring NEDA was successful. Several interviewees simply said that it was critical to get stakeholder buy-in from the outset but didn't specify any particular stakeholder group or groups being more important than others.

The second most frequent response to this question focused on tying the success of the NEDA process ultimately to **demonstrating significant net benefits** (both regionally and to individual jurisdictions) of greater system coordination and integration. The demonstration, according to these

interviewees, should come from reliable cost information and benefit-cost analysis that is well vetted through the NEDA process.

The third most commonly cited key ingredients for a successful NEDA process were **issue selection and sequencing strategy**. For some, this boiled down to structuring NEDA in a stepwise fashion — beginning with agreeing on goals and objectives; demonstrating through modeling and analysis that there are potential significant net benefits and where they may be found; developing an action plan for the most important regional actions to capture those benefits; and finally the key next steps. For others, the recommended strategy is to pick a single issue with broad common interest and relatively high probability of success, and work on that first (e.g., a regional transmission plan). And a third approach is to identify key barriers in the region to greater coordination and system integration and then develop a separate NEDA work plan to address each one.

Interviewees identified some specific outcomes that would constitute success, among them the following:

- Aligning goals and strategies between regions;
- Establishing greater consistency and harmonization among regulations, policies, and methods, such as generation information systems and carbon pricing;
- Developing a super-regional organization spanning both countries that would be influential in these areas (but not necessarily making binding decisions);
- Developing an approach and plan for regional cost allocation of key investments; and
- Issuing a joint white paper by the regional system operators.

C) *What do you foresee as the most likely barriers to a successful [NEDA] collaborative? How do we overcome these?*

There was a wide range of responses to the first part of this question, but most interviewees didn't offer recommendations on how to overcome the barriers they identified. Interviewees named the following barriers:

- **Key stakeholder participation** — getting key stakeholders on board and committed across the region and within each jurisdiction and getting the right high-level people in the main stakeholder group and topic-specific working groups;
- **Aligning policy goals and objectives** — syncing clean energy and climate goals and objectives across multiple states and provinces;
- **COVID-19** — running a stakeholder group if it can't meet in person, and if governors and premiers and their key staff don't have sufficient "bandwidth" to fully engage in it;
- **Group size** — having too many stakeholders involved will make the process cumbersome and will make it more difficult to make decisions;
- **Mission creep** — focusing on a few key issues but then adding on more issues than NEDA can or should reasonably tackle;
- **Absence of transparency** — a failure to engage with and create opportunities for other stakeholders to understand, follow, and contribute to the process will make it more difficult to gain public acceptance of its findings and recommendations;

- **Comprehensibility** — treating the issues as technical and engineering problems will deny many stakeholders access to the conversation;
- **Data availability** — access to necessary data required to run the range of scenario analysis could be tricky;
- **Different market structures** — having to find solutions that work within differing market structures/designs within the region (e.g., competitive markets and vertically integrated utilities);
- **Reaching agreement** — getting agreement and finding common ground among such a large and diverse group of stakeholders, and avoiding recommendations that reduce to the lowest common denominator; and
- **Distribution of benefits and costs** — getting agreement on recommendations that will impact how the potential net benefits are distributed across the region.

2. Question 6: Structure and Timeframe

Question 6:

- *Possible structures for this process, modeled on other successful regional stakeholder processes, could include the following:*
  - *Include 25-30 key stakeholder organizations/agencies/companies covering New England, New York, Quebec, Atlantic Canada, and Ontario.*
  - *NEDA stakeholder group with substantive working groups on key areas.*
  - *Over two years with roughly quarterly meetings of stakeholder group, and working groups meeting in between as needed.*
  - *Professionally facilitated, and with appropriate technical consulting and modeling support.*
- *Does this structure and approach make sense? Any suggested improvements?*

Everyone we interviewed generally thought this overall structure and approach made sense. They used language such as "it is fine," "makes sense," "seems reasonable," and "appears workable."

We then pressed the interviewees on whether they had any suggested improvements and received constructive feedback in several areas, including 1) scope and goals; 2) timing; 3) roles and responsibilities; 4) stakeholders; 5) technical support; and 6) other design principles. Each is covered briefly below, and then for stakeholders and technical support in greater detail under questions 7 and 8, where we specifically addressed those topics.

1) Scope and Goals
Some of the interviewees stressed that it was very important to have a very well defined and clearly articulated scope and goals for NEDA and that they should be established and described in ways that would be compelling to all stakeholders. Relatedly, interviewees recommended that there be a clearly articulated path on how things that emerge from NEDA would be ultimately acted on. A couple of interviewees cautioned that NEDA not tackle too much, but limit its scope to a few key and compelling topics.

2) Timing
Nearly all the interviewees thought that a two-year process sounded realistic, starting sometime in 2021. However, a couple said it should be shorter than two years either because they felt that it was

all the time they could dedicate to NEDA or because they felt the region needed to move more quickly on these issues. Another interviewee said that although two years sounded about right, there would likely be contingencies that could lengthen the timeframe. A couple of interviewees who advocated for piggybacking any NEDA modeling on top of current modeling efforts implied that starting later in 2021 might be preferable (e.g., following ISO-NE/NEPOOL's "Future Grid" study — see Section II.B.4).

3) Roles and Responsibilities

Several interviewees advocated for having a steering committee/management group that is "highly regarded" and would work with the technical/facilitation team to help guide the effort throughout. One interviewee suggested that it might be useful to have co-chairs to work with the technical/facilitation team (e.g., the Eastern Interconnection Planning Collaborative and the Transportation and Climate Initiative). Another interviewee saw a need to have a "strong facilitator" to keep things focused and on track. Finally, one interviewee posited that the NEDA structure is perhaps less important than securing the commitment required from the desired participants.

4) Stakeholders

A few interviewees commented that not including PJM or Midcontinent Independent System Operator but including New York and Ontario made sense (although one interviewee wondered whether there would be enough perceived potential benefits for Ontario to want to participate). Several interviewees also advocated for inclusivity by including both potential "rivals" or "those who could sabotage the process later" as well as broader representation from "civil society" rather than only the "traditional electricity sphere." A couple of interviewees stressed the importance of engaging policymakers with "sufficient clout" both in the main stakeholder group and any working groups. Finally, some were concerned that the main NEDA stakeholder group not get too large so that it remain "manageable," can be more "collaborative" and not overly "positional," and allow for greater opportunity for "relationship building" which will be key to NEDA's ultimate success.

5) Technical Support and Modeling for NEDA

Numerous interviewees commented here on the importance of technical support and modeling to the NEDA effort. Several stressed the importance of both "independence" and "competence" of any technical/modeling team. Two also stressed the need for the stakeholders to be "comfortable" with the technical/modeling team, and one suggested that the stakeholders themselves should select the technical/modeling team. Finally, one interviewee stressed the need for making any modeling process "open and transparent" and including stakeholder input into the modeling itself; another interviewee warned that a big challenge will be getting all the necessary data (as utilities often consider this proprietary); and a third stressed the need for making any modeling grounded in the "real world" and not academic.

6) Design Principles

- **Engage states/provinces** — Several interviewees stressed the need to engage in dialogue with states and provinces before initiating NEDA to gain their support and discuss their role during NEDA and afterward since their support is critical. "If the governors and the premiers agree to do this and be clear about what they want the foci to be and by when, then it would happen." One interviewee said that without strong state/province support, NEDA would need another backstop to compel stakeholders to participate — either FERC and

Canadian government request or a collective stakeholder decision that this is needed to "avoid a bad outcome." One interviewee, however, posited that NEDA should be "insulated from politics" to reduce the risk that any recommendations would be disavowed by subsequent governments.

- **Make transparent** — Several interviewees stressed the need for the NEDA process to err on the side of transparency. Specifically, some recommended that the public and media should be permitted in the meetings and there shouldn't be "any secret working groups."
- **Establish decision-making rules** — A couple of interviewees posited that to the extent that the NEDA process will be making recommendations to policymakers and others, the decision-making ground rules need to be clear, established upfront, and agreed to by NEDA stakeholders.

3. Question 7: Stakeholders and Roles

Question 7:

- *What are the most important entities, agencies, and organizations on both sides of the border to include in a collaborative process?*
    - *Specifically:*
        - *Who are the handful of critically important entities on both sides of the border without whose interest in participating in NEDA we should probably not proceed, and why?*
        - *Are we leaving out any key stakeholder groups or organizations on either side of the border for inclusion in NEDA (i.e., not included in the list of interviewees), and if so who and why?*

Prior to each interview we provided the interviewee with the list of all the individuals (including their organizational affiliations) that we planned to interview for the assessment (see Appendix IV.B). During the interview, we asked the interviewee to reflect on that list as potential NEDA process stakeholders, when answering this question.

Most interviewees commented that our list of interviewees was an impressive group who, if they are willing to participate, will comprise the core of an appropriate NEDA stakeholder process (with some caveats and augmentation, discussed below). Broadly speaking, interviewees supported the notion of a NEDA stakeholder process that includes representatives from government, market operators, transmission owners/operators, generation owners (both conventional and renewable), consumer advocates, and NGOs. No one pointed to any of the organizations we planned to interview as inappropriate to include in a NEDA stakeholder process.

When asked, "*Who are the most critical entities on both sides of the border without whose interest in participating we should probably not proceed?"* by far the most common answer was high-level representatives from state and provincial government. This was mentioned by well over half the interviewees. Virtually all of these interviewees explicitly stated that if the U.S. states and Canadian provinces were not interested in the NEDA process and its potential results, given that they would likely need to eventually authorize and implement many if not most of any NEDA recommendations, it would not make sense to proceed. Some went further to say that the NEDA process should be formally "blessed," if not in fact convened by the governors and premiers, possibly under the aegis of the

New England Governors and Eastern Canadian Premiers (NEG/ECP) and the Coalition of Northeastern Governors (CONEG).[6]

That said, there were two different concepts regarding the actual role(s) of the states and provinces in the NEDA stakeholder process. The first and more often heard opinion was that it would be essential for high-level provincial and state representatives to be actively and fully involved in the NEDA stakeholder process (i.e., having a seat at the table). Such representatives, these interviewees opined, should be high-level enough to establish that there is political support for this process and should come directly from the governors'/premiers' offices or from the lead energy agencies such as the energy offices or the public utility commissions. These interviewees felt that the states and provinces are such important and pivotal actors in the region that they should help steer and have direct input into any analyses conducted on behalf of NEDA, as well as into any recommendations at the conclusion of the process. They also argued that states and provinces will bring substantial and essential expertise (both technical and political) to the NEDA process.

Others posited that it wasn't absolutely necessary that the states and provinces, after blessing the process, participate as full stakeholders in it. These interviewees maintained that, to the extent that the NEDA process is making policy recommendations, it might be awkward to have states and provinces weighing in on matters that would ultimately come before them to decide. An alternative proposed by a couple of interviewees was to have the states and provinces participate in an *ex officio* role, in which they provide general guidance and advice on what the jurisdictions are likely to accept but refrain from signing on to NEDA outputs and recommendations.

The ISOs in the U.S. and system operators in eastern Canada were also labeled as "critically important entities" by numerous interviewees. As the operators of the electricity grid and, in the U.S. and Ontario, of the competitive wholesale markets, these entities are the gatekeepers of information and data that will be essential to the NEDA process. They will also need to be directly involved in the implementation of many if not most of any recommendations that emerge from the process. That said, those who commented on the importance of the ISOs and system operators' support of the NEDA process were split on whether these entities should have a seat at the table or be there as resources to assist in an *ex officio* capacity (i.e., as with the state and provincial governments, they wouldn't participate in the finalization of any recommendations that would ultimately come to them to implement).

While numerous other types of stakeholders were identified as important by one or more interviewees, many commented that if the NEDA process had the interest and blessing of the states and provinces and the active support of the ISOs and system operators, then all the other important and desired stakeholder groups would likely participate in the NEDA process.

When we asked interviewees whether, if we invited only the other interviewees into a process, we would be leaving out any key stakeholder groups or organizations, the answer was by and large "yes." Below is an annotated list of other potential stakeholders recommended by the interviewees more than once and their rationale. It is followed by a list of those mentioned just once.

[6] Note that NEG/ECP does not include New York or Ontario. CONEG includes all the New England states and New York, but not Canada. CONEG and NEG/ECP are separate entities, but their activities are closely coordinated and jointly administered.

Other Potential Key Stakeholder Groups and Organizations (mentioned at least twice):

- **Federal agencies** — These include FERC, the U.S. Department of Energy, and CER. Since NEDA will focus on issues largely related to wholesale markets and infrastructure that crosses state, provincial, and even international borders, federal support and involvement could be essential.
- **Organizations with technical expertise:**
    - The North American Electric Reliability Corporation (NERC) — Since NEDA will touch on reliability and potentially cybersecurity, having NERC involvement at least as a resource would be beneficial.
    - The Electric Power Research Institute — It does detailed research and analysis on behalf of the electric utilities.
    - U.S. national labs — They have a lot of expertise on these issues and often support stakeholder processes (e.g., Lawrence Berkeley National Laboratory, National Renewable Energy Laboratory) as a resource.
    - Consulting firms and academics — A number of firms and university-based entities have been doing a lot of the decarbonization pathways analyses in the Northeast as well as other relevant work (e.g., The Brattle Group, Analysis Group, Evolved Energy, Power Advisory, Massachusetts Institute of Technology [MIT]).
- **Environmental NGOs** — They are important stakeholders and "you only interviewed one." NEDA should include more regional stakeholders (e.g., Conservation Law Foundation, National Resources Defense Council, Sierra Club of Canada), plus some more local provincial- and state-focused environmental NGOs.
- **Environmental and social justice/vulnerable groups** — Such groups are often marginalized and are increasingly being integrated into the development of new energy and environmental policies (e.g., the Transportation and Climate Initiative in the U.S.). This could include those that could be directly impacted and others advocating more broadly for environmental and social justice.
- **First Nations** — The development and expansion of electricity infrastructure in Canada, as a general matter, has material implications for the First Nations communities whose traditional territories are the loci of these projects and whose treaty and indigenous rights may be threatened by such developments. Depending on the scope of the process, due consideration of the views of those communities is likely to prove essential to the collaborative's success.

Other Potential Key Stakeholder Groups and Organizations (mentioned once):

- PJM, or at least one or more progressive **PJM states** developing offshore wind (New Jersey, Maryland)
- **Renewables/distributed energy resources organizations** (offshore wind, solar, storage)
- **Organized Labor**
- In Québec:
    - **Bureau d'audiences publiques sur l'environnement (BAPE)**
    - **Régie de l'énergie**
    - **Regroupement national des conseils régionaux de l'environnement du Québec (RNCREQ)**
    - **Regroupement des organismes environnementaux en énergie (ROEÉ)**

Finally, numerous interviewees made the point that the NEDA process should be transparent and that interested stakeholders should all have visibility into the process either through representation at the table or by periodically opening up the core process to let others weigh in. Two observations/recommendations were made by multiple interviewees related to these points:

- **Umbrella organizations vs. individual companies/agencies** — Several interviewees mentioned that where possible it's better to have individual entities directly participating in stakeholder processes than their membership organizations, which often have to take positions that feel like "the lowest common denominator" (e.g., having all the New England states directly represented rather than relying solely on the New England States Committee on Electricity). Others argued that it's not going to be practical to have all or even most of the entities represented by a membership organization directly participate (e.g., the generators in New England vs. the New England Power Generators Association). Another option mentioned is to have a mix of membership organizations and key individual entities.
- **Engaging the public** — Local interest groups and citizens are becoming increasingly vocal/influential in energy and environmental matters germane to NEDA's likely areas of focus (e.g., transmission lines). A couple of interviewees recommended that, in addition to forming a key organization-based stakeholder process, NEDA consider including public listening/comment sessions at key junctures to share NEDA developments, present options, and receive feedback. Many interviewees recommended that the entire NEDA process be made entirely transparent and that the regular NEDA meetings be open for public viewing and periodic input.

4. Question 8: Modeling and Analytical Needs: Who, What, How?

Question 8: What types of information and/or modeling would be most useful in supporting this process — and what if any have been done (and by whom/when)?

There was almost universal agreement that development of quantitative information, mainly through analysis and modeling, in support of a NEDA collaborative will be essential. As one interviewee described it: "It's essential to support this process [with analysis and modeling], otherwise we're stumbling around in the dark." But, although there were more similarities than differences across the interviewees' responses, particularly with respect to *why* analysis and modeling would be important, there were some significant differences regarding what should be analyzed and modeled, how such work should be conducted, and who should lead the effort.

Many interviewees pointed out that analysis and modeling will be needed to demonstrate that there are potentially significant net benefits from increased coordination and integration between the northeastern U.S. and eastern Canada (as well as between new England and New York, and between the Canadian provinces). Included in the likely catalog of benefits are increased economic efficiency in system operations and investment, reductions in emissions of greenhouse gases and other pollutants, and improved public health. A couple of interviewees recommended that the types of benefits NEDA examines should be established by the stakeholders early in the process.

When it came to the types of analysis and modeling that NEDA might engage in, the interviewees divided into two somewhat different, but not necessarily incompatible, camps:

- The first calls primarily for "**regional economywide decarbonization pathways analyses.**" This pathways approach would look at what it would take to fully (or nearly so) decarbonize the economies of all the jurisdictions in the NEDA region. It would include all the sectors of the economies and account for the expected substantial electrification of the transportation and building sectors and the continued greening of the electricity sectors in the region. The modeling could look at building a regional resource mix composed of the most cost-effective resources (plus transmission) regardless of where they are or will be sited. It could explore various scenarios and, by comparing them, estimate the value of increased coordination and integration, most directly from increased interties and transmission capabilities.

- The second camp advises a narrower approach, that of "**targeted coordination and integration of electricity systems analyses.**" Here, scenario-based analysis could be used to look at a range of coordination and integration options across the region, such as additional interties and more coordinated power flows and dispatch. The scenarios could range from relatively modest investment and operations to much more aggressive.

A number of interviewees identified a third area that could potentially benefit from regional analyses and modeling. It centers on the potential benefits of more common wholesale market designs among the balancing areas and a regional approach to carbon pricing (and at a level significantly higher than that currently seen in RGGI). While many interviewees support these ideas conceptually, most were skeptical that a shared market design or uniform carbon pricing could be implemented successfully across the entire region (see also the discussions in Sections II.A.1 and II.A.2, above).

Interviewees were clear that, whatever NEDA decides to do, the collaborative should take advantage of a host of relevant studies either recently completed or now (or soon to be) underway that touch on aspects of greater integration between the northeastern U.S. and eastern Canada. These studies, which all rely on detailed modeling, have been conducted for states, provinces, trade organizations, or individual utilities or other companies by numerous consulting firms, NGOs, and academic entities. The four most frequently mentioned during the interviews were the *Canadian Energy Outlook 2018 — Horizon 2050*, published by the Institut de l'énergie Trottier (IET), MIT's recent study, *Two-Way Trade in Green Electrons*, the Atlantic Roadmap study led by Natural Resources Canada (NRCan), and the "future of the electric grid" study that ISO-NE/NEPOOL is soon to begin. The IET study evaluated Canada's energy production and consumption over the coming decades, comparing multiple greenhouse gas emissions scenarios to a base case and evaluating them in light of the established reduction targets. The MIT study looked at enhancing two-way power flows between New England and Quebec to use Canadian hydro as storage, to deal with the temporal mismatch between demand and renewables (primarily offshore wind) production in the northeastern U.S. The ISO-NE/NEPOOL study will also include a focus on the role of greater interties between New England and Canada.

Another important set of issues that surfaced during the interviews surrounded the role of the NEDA stakeholders in any analyses and modeling efforts. Most often mentioned was the need to have stakeholders directly involved in specifying the scenarios to be modeled and the major

assumptions underpinning them. Several interviewees emphasized that the modeling must honor the values and concerns of the stakeholders and, therefore, that they, the NEDA stakeholders, should be directly involved in the selection of the model or models as well as the modelers themselves. The endeavor, said one interviewee, needs to be structured as a joint fact-finding effort if it is to produce results they can trust.

Many interviewees identified models and modelers that they thought would (or, in some cases, would not) be appropriate for the NEDA process. Determining what model or models to use and who the modelers will be is an important and early-on task for NEDA. Interviewees stressed repeatedly that the modelers be perceived as "independent," "knowledgeable" (about electricity/energy systems and the NEDA region), and "realistic."

Finally, a number of interviewees brought up the importance of having access to good data in order for any NEDA analyses and modeling to be successful. Several pointed out that the ISOs and provincial operating companies should provide access to both their data and their institutional capacities to help with the work. A couple of our Canadian interviewees, having faced challenges having to do with the confidentiality of shared data for an eastern Canadian study, warned us not to underestimate the time and effort it takes to get permissions and then assemble the necessary data.

5. Question 9: Conveners

Question 9: What entity or entities can and should convene (i.e., host, sponsor) the stakeholder process — e.g., foundations, governments and their membership organizations, regional transmission organizations (RTOs), others?

"Convener" is generally used to describe an individual or group responsible for bringing people together to address an issue, problem, or opportunity. In the context of collaborative leadership, it usually involves convening representatives from multiple sectors for a multimeeting process, typically on complex issues.

Answers to Question 9 were colored by how respondents understood the role of the convener: whether it is "sponsoring" or "blessing the process" but not necessarily running the process; "orchestrating/running" the process; or both. This is something that we didn't tease out carefully in the interviews. Nor did we attempt to differentiate between the "conveners" and potential "funders" for the process and whether they needed to be one and the same or could be different entities.

The things we heard most often had to do with identifying and selecting conveners who were "**credible, independent, and trustworthy**," had the "**gravitas**" to persuade stakeholders to actively participate in the process, and had the "**capacity**" to run a successful process.

Table 1 shows at a glance the frequency with which interviewees mentioned various convener options. Some interviewees described more than one option (which is why the total is greater than the number of interviewees). Each option is discussed briefly below.

Table 1. Potential Conveners

Potential Convenors		***Times Mentioned***
States and Provinces		11
Foundations		5
Independent Entity		5
Multistakeholder Group		6
Other Convenor Options:		
	Federal Agencies (U.S./Canada)	2
	System Operators	1
	NEPOOL	1
None Identified		4

States/provinces: This was by far the most common convener option, mentioned by nearly half of our interviewees. It's worth noting that this option was recommended by approximately three-quarters of the U.S. interviewees but only a few of the Canadian interviewees (most of whom favored foundations over government). All those who mentioned the states and provinces as their preferred convener felt that, without their interest in the NEDA process and its results, as discussed in more detail under the stakeholder question above, NEDA probably shouldn't proceed. This led many interviewees to conclude that the states and provinces would therefore be the natural convener. But those subscribing to this option offered two different views on the nature of the "convention." The first and more common is that the states and provinces need to formally "authorize" or "bless" the process and call on stakeholders to participate, but then hand over the running of the process itself to other entities. Numerous interviewees suggested that a logical candidate to convene in this sense would be NEG/ECP. A second option was a variation on the first, but it went further in having the states and provinces run the process through organizations such as CONEG, Northeast States for Coordinated Air Use Management (NESCAUM), or the RGGI Board of Managers.[7]

Foundations: This was the second-most-mentioned option, though with less than one-quarter of interviewees recommending it. Almost all of those recommending this option were Canadian interviewees. What they stressed was that a foundation could be seen as "credible," "independent," and having the "capacity" (financial and otherwise) to bring stakeholders together and to run a successful process.

Independent entity: Those who recommended this option were also emphasizing the need for "independence" and "capacity" to run a successful process, and so in this way their responses were aligned with those recommending foundations. Two of the four recommending this option mentioned RAP as an example of this type of independent entity (and one highlighted the New England Demand Response Initiative run by RAP and Raab Associates together); the other two didn't name any organizations that might fit the bill.

[7] Note that New York is not a member of NEG/ECP and Ontario is not a member of either NEG/ECP or CONEG. If these entities sponsor NEDA, some kind of accommodation for Ontario and possibly New York will need to be made. The RGGI Board of Managers and NESCAUM include all the U.S. states but not the Canadian provinces.

Multistakeholder group: Another approach is to create a convening group of a limited number of key stakeholders that are directly engaged in the formation, launching, and ongoing support of the effort. One interviewee felt that this group should include the premiers and governors, the market operators, and the respective federal governments. Another thought that the stakeholders themselves should be the conveners; they would come together and draft their own charter. A third mentioned "a blend of industry and government."

Other convener options: One interviewee suggested two alternatives. One was for federal agencies in both countries to jointly convene the process; the other for NEPOOL to do so. The logic behind the first option was that the federal agencies have jurisdiction over transboundary issues and, given the binational nature of this effort, they might be natural and compelling joint conveners. The argument in favor of NEPOOL is that it is (for New England at least) an ongoing stakeholder group already dealing with many of the issues and analyses germane to NEDA.

None identified: Several interviewees did not name potential conveners of a NEDA process. They simply recognized the importance of finding the right convener or acknowledged that there was no obvious or easy choice of one.

Five interviewees made clear who should not convene the NEDA process. Four of them said it should not be one or more of the RTOs, and the fifth said that it shouldn't be any single entity that might directly benefit from the results.

C. Conclusion, Question 10: Should a NEDA Process Go Forward?

Question 10: On balance do you think that the NEDA collaborative process to develop a blueprint for better grid integration and coordination between the northeastern U.S. and Canada is worth undertaking (likely beginning in 2021)? Why or why not? And would your organization be interested in participating?

This final question gave interviewees an opportunity to size up the idea and offer a frank opinion on its possibilities.

1) *Is the NEDA collaborative process worth undertaking*?

Virtually all of our interviewees said that a NEDA collaborative process to develop a blueprint for better grid integration and coordination between the northeastern U.S. and Canada is worth undertaking. Most stated simply that yes, this was worth undertaking because of the potential benefits to the region, while many went further to say they were very enthusiastic about NEDA's potential. One interviewee predicted that this would be "one of the most important efforts on energy in the region." Even so, some interviewees' endorsements of the NEDA process came with some important caveats or elaborations, having to do with the following:

- Scope, structure, and roles need to be clearly defined.
- The scope should focus on (according to different interviewees):
    - Transmission planning and investment, and potentially carbon pricing.

    - Tapping more Canadian hydro resources and improving scheduling among system operators.
    - Building a regional decarbonization pathway study.
- The process "needs to be more realistic than bold."
- The collaborative's substantive work should complement that (or address altogether different topics than those of) the current Clean Power Roadmap for Atlantic Canada process.
- The effort will entail a large and complicated study to calculate the potential benefits that greater grid integration and coordination promise and how, through the allocation of the costs of greater integration and coordination, those benefits can be fairly shared through the region.
- Even a modest output, something less than a "blueprint," will make the effort worthwhile.

The very few interviewees who didn't express immediate and unqualified enthusiasm for the idea of a regional collaborative also didn't say no to it, but rather they identified some preconditions for their potential endorsement. These were 1) the need for high-level provincial and state support; 2) a well-defined and achievable scope; 3) a clear indication prior to commencing of potential significant net benefits; and 4) well-thought-out timing (i.e., should NEDA begin in 2021 or later to allow for completion of current and planned state and ISO studies?).

2) ***If the NEDA collaborative process went forward, would your organization, company, or agency be interested in participating***?

The vast majority of the interviewees said that their organizations, companies, and agencies would participate in the NEDA collaborative process if it were to go forward. Most of these interviewees expressed enthusiasm about it. Some conditioned their organization's willingness to participate on having state and provincial support for the process from the outset.

The few interviewees who didn't say yes didn't say no, but rather said that their participation depends on one or more factors. Several interviewees who are running membership organizations pointed out that they would need their members' support and direction before they could commit. A couple of them felt that, to get that support, they and their members would need to be persuaded that the likelihood of potential net benefits flowing from a collaborative effort is sufficiently high to justify participation, given the myriad other priorities and resource commitments their organizations face. Another interviewee felt that their organization needed to better understand the objectives and design of the process, and to review them with their management, before being more definitive about participating. Finally, two interviewees, who expressed a general desire to participate, said it would depend on whether any significant travel-related expenses would be covered.

We conclude this assessment with two different quotes from interviewees in response to these concluding questions, which seem to capture the spirit of the vast majority of our interviewees regarding NEDA:

- "NEDA would provide a good opportunity to fully understand the interactions between our regions, and to better understand the bigger picture and potential benefits from more holistically addressing our collective goals and requirements."
- "Bring us together to have the conversation. Then we can see where it goes."

III. Recommendations

Our recommendations are based mainly on the feedback we received from our NEDA assessment interviews with key stakeholders in the United States and Canada. They are also informed by the half-dozen detailed case studies of other regional stakeholder processes that we conducted for the NEDA advisory committee and by our own extensive experience and expertise as policy advisors, consultants, and facilitators/mediators.

A. Should a NEDA Collaborative Go Forward?

1) **NEDA should proceed.** We recommend that NEDA should proceed, given that 1) virtually all of our interviewees said that a collaborative process to develop a blueprint for better grid integration and coordination between the northeastern U.S. and Canada is worth undertaking (no one said it wasn't); and 2) the vast majority of the interviewees said that their organizations, companies, and agencies would participate in the collaborative process (and no one said outright that they wouldn't participate).
2) **However, there are prerequisites to be met before NEDA can proceed.** Although there is stakeholder interest in NEDA and willingness to participate, at least three preconditions surfaced through the interviews and the case studies we conducted that would need to be satisfied before NEDA can proceed:
    a. **Provincial and state support** — Climate policy action in the region occurs almost entirely at the provincial and state level. The implementation of any recommendations that come out of a NEDA process will depend on these subnational governments. In light of this, the interest in, and support of, a NEDA process by the states and provinces is a threshold issue. That support is essential, but its nature is variable: It can range from an informal endorsement of the process, to participation as full members or as active observers, to a more formal convening and guidance role. See Sections III.E and III.F, below, for discussions of the options for state and provincial involvement in a NEDA stakeholder process.
    b. **Access to data** — Since analysis and modeling will be central to a NEDA stakeholder process, access to the necessary data to support such activities will be essential. Those data reside mainly with the electricity system operators and utilities in the U.S. and Canada. Data for economywide analysis and modeling (if the process decides to go this route) should be publicly available from governmental and other sources. Willingness by all these entities to make needed data available or to perform supporting and coordinated analyses, or both, is therefore a necessary precondition, if the process is to have any hope of success.
    c. **Sufficient resources** — Successful stakeholder processes, like the one envisioned for NEDA, need substantial resources to adequately staff and support the endeavor. They include labor for project management, analysis and modeling, and facilitation and mediation. They will also include travel reimbursement for essential stakeholders with limited resources (e.g., for provincial and state government officials) and the full range of meeting-related costs. See Recommendations F.2 and 4, below, for more detail on these resource needs. Here we simply conclude that, without adequate funding, a NEDA process will not be able to proceed.

B. What Should NEDA Focus On?

1) **NEDA should likely focus first and foremost on regional resource planning and investment opportunities.** The vast majority of the interviewees felt that regional resource planning and investment offer the greatest opportunity for regional benefit from greater integration and coordination. Transmission and related intertie investments, in particular, are likely critical lynchpins to the least-cost achievement of regional decarbonization goals — by providing access to lower-cost renewables, better enabling two-way power flows, and potentially using Canadian hydro as regional clean energy storage. Therefore, this is likely to be the first major focus of the NEDA stakeholder process.
2) **Market design and operations harmonization should likely be a secondary focus and taken up, perhaps, in a later phase.** Harmonizing wholesale markets where they exist or introducing a uniform and effective carbon pricing mechanism across the region were also of interest to many of our interviewees. However, many felt these may not be practical near-term steps for the region. With respect to operations in particular, most interviewees felt that coordination was already happening reasonably well and, because the technical challenges facing greater integration were not particularly daunting, shouldn't be a primary focus of a NEDA process. Although we don't recommend that market design and carbon pricing be taken off the NEDA plate because they are too difficult, or operations because it is relatively more straightforward, we do find compelling the arguments made by several interviewees that these issues might more logically follow a deeper dive into regional decarbonization pathways and the roles of greater interties and transmission investment. That said, certain aspects of these matters can be folded into the analyses and modeling early on (e.g., looking at scenarios with and without carbon pricing).
3) **NEDA should include New England, New York, and eastern Canada.** The NEDA region should be carefully selected. It should be large enough to realize significant net benefits from greater coordination and system integration, but not so large as to be incapable of analysis or too diverse (by which we mean too divergent in stakeholder views and aspirations) to get widespread agreement on policy recommendations. We recommend therefore that, to start, the NEDA core be composed of stakeholders from New England, New York (but not PJM or Midcontinent Independent System Operator), Quebec, Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador), and, possibly, Ontario. There is no question that Ontario is a critical player in the longer-term ambition at which this effort is aimed, but its participation, at least at the beginning, adds complexity with respect to geographic scope and the number of stakeholders. Still, Ontario's interest in participation should be ascertained and considered. Lastly, regardless of the geographic boundaries of NEDA, it will be important to look at both north-south and east-west current and potential power flows to NEDA states/provinces and their neighbors.
4) **NEDA areas of focus and geographic boundaries should be finalized through further stakeholder engagement.** The main topics that NEDA should work on, including the geographic boundaries and any sequencing of topics, should be finalized through consultation with state and provincial leaders, a NEDA advisory group or steering committee (see Sections III.E and F, below), potential funders (see Section III.F, Recommendation 2, below), and, of course, a cross-section of the affected actors and interest groups.

C. What Should NEDA Do?

1) **The collaborative should begin by establishing its objectives and a scope of work.** This will entail determining a structure most conducive to achieving its objectives (see the following recommendation and Section III.D, below), what kinds of information it will need, and what kinds of analytical work, if any, it will want to support its findings and recommendations.
2) **NEDA should be structured initially as a joint "fact-finding" process.**[8] The NEDA process and its analytical efforts should be structured as a joint fact-finding endeavor, wherein the stakeholders agree upon methodological approaches and inputs with which they will explore the potential net benefits from different coordination and integration options. The types of benefits and costs used to determine net benefits, which should be identified by the stakeholders themselves (and evaluated with the aid of modeling and analysis), will likely include not merely the cost savings that arise from the increased efficiencies in system operations and investment but also an accounting of the potential impacts on the region's economy more broadly, on equity and environmental justice, and on the environment. Furthermore, the NEDA stakeholders should be directly involved in specifying any modeling scenarios and major assumptions and, probably, weighing in on the selection of the models and modelers. The NEDA stakeholders should also be involved in the detailed planning for each topic and subtopic that NEDA looks into.
3) **NEDA stakeholders should make recommendations.** The stakeholder members of NEDA should make recommendations, on the basis of the joint fact-finding results, to identify important next steps for the region and key policy or procedural recommendations. These recommendations could be bundled in a final NEDA report or issued in interim reports if the NEDA process occurs in discrete phases. NEDA should seek consensus among its stakeholders and, if consensus is not reached on a particular issue or recommendation, should report out on the competing options and on who supports each and why. If states, provinces, and system operators are full NEDA stakeholder members, as opposed to *ex officio* members (discussed in greater detail below in Recommendation III.E.2), then they may choose to abstain from recommendations that will come before them. However, if the states and provinces and other stakeholders prefer not to engage in a recommendations-seeking process, then a process that is centered on regional, broad-based, joint fact-finding will still have high value.
4) **Substantial analysis and modeling are likely to be needed.** Interviewees agreed that empirical analysis will be useful to the collaborative. Two approaches to modeling emerged from the discussions. They are not mutually exclusive. Indeed, there's good argument for taking them on sequentially, starting with regional decarbonization pathways modeling, then turning to more targeted options analysis as needed:
    a. **Regional economywide decarbonization pathways analyses** — This approach will look at what it will take to fully (or nearly so) decarbonize the economies of all the jurisdictions in the NEDA region. It will focus primarily on those sectors of the economy that will need to be electrified, particularly the transportation and building sectors and the continued greening of the electricity sectors in the region. The modeling will look at building a regional resource mix composed of the most

[8] There are, of course, no facts about the future. "Joint fact-finding" is a term of art in dispute resolution/stakeholder design that denotes a process of developing methodologically agreed-upon analytical approaches and inputs, so as to generate a shared understanding of potential outcomes and their effects.

cost-effective resources (including transmission) regardless of where they are, or will be, sited. It will explore a number of scenarios and, by comparing them, estimate the value of increased coordination and integration, most directly from increased interties and transmission capabilities.

b. **Targeted coordination and integration of electricity systems analyses** — NEDA can also use scenario-based analysis to look at a range of specific coordination and integration options for the region, such as additional interties and transmission and more coordinated power flows and dispatch. These can be tested against a range of grid demand trends and profiles that result from the pathways analyses or from other sources. Also to be considered are more common wholesale market designs among the balancing areas and a regional approach to carbon pricing.

5) **NEDA analysis and modeling should piggyback on other subregional efforts.** There are a number of other analyses — recently completed, in process, or about to be undertaken — on decarbonization pathways or grid integration more generally that are germane to this effort. Most are more narrowly focused — geographically or with respect to subject matter — than a NEDA collaborative will likely aim to be. Still, any NEDA analysis should be cognizant of those studies and, where possible, piggyback on those efforts.
6) **NEDA analysis and recommendations should focus primarily on the near and medium term.** Any analysis and modeling that NEDA undertakes should be conducted with an eye on the region's collective carbon reduction goals, to make sure that any recommended actions facilitate the region's achievement of those goals (that is, both the 2050 economywide decarbonization objectives and any interim sectoral requirements). That said, NEDA analysis and recommendations should focus on critical reforms and actions that need to happen now and in the next decade or so (i.e., 2023 to 2035 or 2040), to put the region on a trajectory to achieving those long-term goals/requirements.

D. How Should NEDA Be Structured?

1) **NEDA should consist of a main stakeholder body, substantive working groups, and possibly a resource panel of experts.** The main stakeholder body should include representation from the major interest groups in the region (see the discussion of stakeholders below). It should be reasonably sized to include direct or indirect representation of important stakeholder interests, yet be manageable in size (e.g., in the 25-35 person range). The representatives from each member organization should be of sufficiently high rank in their respective organizations or agencies to be able to speak authoritatively for the organization and, as appropriate, to make commitments on behalf of the organization. In addition to the main stakeholder body, there should be substantive working groups focused on discrete tasks that develop materials for and advise the main stakeholder body. The working groups can be composed of staff from the NEDA member organizations, staff from other stakeholder groups, and outside experts. It may also make sense to create a "resource panel" to advise the main stakeholder group and the working groups throughout the NEDA process. Such a resource panel could include, for example, academics, national labs or think tanks, key federal agencies (CER and NRCan in Canada and FERC and the Department of Energy in the U.S.), NERC, consultants, and even the system operators if they prefer to act in this capacity rather than as full stakeholder members.
2) **NEDA needs a strong project management, facilitation/mediation, and technical team.** To be successful, NEDA will need competent project managers, a skilled

facilitation/mediation team,[9] and substantial technical expertise to conduct analyses and modeling; together they will comprise the NEDA team. It is very important at the outset to bring on the project managers and facilitation/mediation team to assist in finalizing the NEDA design. The project manager and facilitation/mediation team should not only have significant experience and expertise in project management and facilitation/mediation but should also have substantial expertise in the subject matters on which NEDA will be focusing. The technical and modeling team can be brought on later, possibly through an RFP process that has significant input and review from the NEDA stakeholders.

3) **NEDA should also consider having co-chairs, an advisory committee, or both.** NEDA should also consider naming a pair of co-chairs to work with the NEDA team. To the extent that the states and provinces are directly involved in the collaborative (see Section III.E, below), co-chairs who are high-level representatives of a U.S. state and Canadian province would be a logical and potentially highly effective approach. Another option instead of, or in addition to, co-chairs would be maintaining an advisory committee to act as a sounding board on the final design of the process and thereafter to be available to advise and work with the NEDA team. It can be made up of stakeholders, outside experts, and possibly funders. The advisory committee, depending on when it is established, can assist with the selection of the NEDA project management and facilitation team and, later, the technical and modeling team. However, it would also be feasible to run a successful NEDA process without an advisory committee or co-chairs once a strong NEDA project management and facilitation team is in place.
4) **NEDA should take place over 18 to 24 months beginning in 2021 or 2022, and the main NEDA body should meet approximately quarterly.** NEDA should take place over one and a half to two years — enough time to delve deeply into the issues, but not so long as to risk losing focus or not producing timely outputs. NEDA can start as soon as all of the prerequisites are met but may choose to start later in 2021 or early 2022, following the completion of any studies of which it wants to make use (e.g., NRCan's Atlantic Roadmap study and NEPOOL/ISO-NE's "Future Grid" study). Substantive working groups should meet as often as needed, on a schedule set by the main body of participants in consultation with the NEDA team. It's possible, depending on how NEDA is structured and the topics it chooses to tackle during this first phase, that a follow-on phase may be warranted.
5) **There should be meaningful public engagement opportunities throughout the NEDA process and the NEDA region.** Meetings of the main body and any working groups should be open to the public, so that the process is transparent, and time should be allotted within meetings for public comments. In addition, there should be periodic, dedicated, and well-structured opportunities to share with the public what's unfolding in the process and garner input from across the NEDA region.

E. Who Should Be Invited to Participate In NEDA and Who Should Convene It?

1) **NEDA should include representation from the main stakeholder groups in the region.** This includes transmission and traditional generation owners, clean energy developers, customers, and environmental and other NGOs. Provincial and state

[9] To the extent that NEDA will be making recommendations and seeking consensus where possible, NEDA should seek experienced and skilled mediators rather than just meeting facilitators.

governments and system operators should also be part of the main stakeholder body, if they so choose.

2) **State and provincial support of NEDA is essential, but their specific role(s) within NEDA should be explored directly with them.** While it's essential that the states and provinces be supportive of the process, there are at least three different options for their involvement in NEDA that should be fully explored with them, to ascertain their preferences:
    a. **Full NEDA membership** — High-level provincial and state representatives[10] would be actively and fully involved in the NEDA stakeholder process (i.e., having a seat at the table). As such, they would have direct input into any analyses and modeling conducted on behalf of NEDA, and they would participate fully in the development of any NEDA recommendations. A variation on this approach is to allow the states and provinces to abstain from any recommendations that target them as decision-makers, but to allow them to fully participate in other recommendations.
    b. ***Ex Officio* NEDA membership** — An alternative is for the states and provinces to participate in an *ex officio* role, in which they provide general guidance and advice on what the jurisdictions are interested in (i.e., with respect to modeling scenarios) and on the kinds of recommendations that they are likely to accept. They would, however, refrain from formally signing on to final NEDA modeling assumptions, outputs, and recommendations.
    c. **States and provinces use regional stakeholders as a sounding board** — Another option is for the states and provinces to enter into a collaborative process with each other (supported by the NEDA team). Under this approach, the states and provinces would negotiate agreements among themselves on such matters as modeling scenarios and final recommendations, after seeking advice and feedback from stakeholders and the public. Thus they would use the regional NEDA stakeholder body as a well-structured sounding board. This is, essentially, the approach taken in the U.S. for the initial formulation of RGGI.
3) **RTOs and system operators should be either NEDA members or part of the resource panel.** RTOs and system operators are key stakeholders and are the gatekeepers of essential data that NEDA will need. However, given that a subset of recommendations will likely be targeted at them, NEDA will need to explore with them whether the right role for them is as members (full or *ex officio*) or as participants on the resource panel, if there is one.
4) **First Nations are essential stakeholders in a NEDA process.** It is important that representatives of First Nations participate in the collaborative — in its design, in the determination of its objectives, and in the identification of the social, economic, and environmental challenges it should address — from the start. Providing adequate resources for their participation should be considered when developing a budget for the collaborative.
5) **Social and environmental justice interests should be incorporated in the NEDA stakeholder process design.** In addition to the more traditional regional electricity stakeholder groups, political actors, and First Nations, NEDA needs to explicitly incorporate social and environmental justice interests and concerns in its design. This can be achieved in a couple of (not mutually exclusive) ways. There should be representation in the main stakeholder body of groups that might be directly affected by NEDA's recommendations and other organizations advocating more broadly for social and environmental justice. And

[10] By "high-level representatives," we mean senior officials from the offices of the premiers and governors and, as appropriate, from the relevant provincial ministries and state agencies.

there should be a meaningful public engagement process that gives other affected interests an opportunity to review and comment on NEDA's objectives and work.

6) **States and provinces would be powerful conveners for NEDA if they were willing and able, but there are other options.** Given that we (and most of our interviewees) perceive the need for support by states and provinces as a precondition for proceeding with NEDA, it makes sense to explore first whether they would be interested in being the formal conveners of NEDA. As conveners they will be putting their "stamp of approval" on it and encouraging stakeholders to participate. They will not need to be the funders and can hand over the running of the process to the NEDA team (but can still consider how they want to participate in NEDA, as discussed above in Recommendation III.E.2). If the states and provinces are interested in convening NEDA, the New England Governors and Eastern Canadian Premiers/CONEG is probably the most logical vehicle for orchestrating this.[11] A few other convener options that should be considered if states and provinces are not interested or able include:
    a. **Foundations** — A partnership of two or more foundations, ideally from both sides of the border, might be seen as sufficiently credible, independent, and possessed of the capacity (financial and otherwise) to bring stakeholders together and to run a successful process.
    b. **Independent entities** — Some other entities perceived as sufficiently independent, well-regarded, and knowledgeable might also be able to convene a process. For instance, the New England Demand Response Initiative stakeholder process was convened by independent experts (and, importantly, had upfront support from the states, ISO-NE, NYISO, FERC, and the Department of Energy).
    c. **Multistakeholder group** — Another option, given the broad interest expressed for NEDA in the interview process, would be for the stakeholders themselves to convene the process.

F. What Are the Critical Next Steps for NEDA to Proceed?

1) **Finalize and publish this assessment** (including the recommendations). Once the current NEDA advisory committee's feedback is received, this assessment should be finalized, provided to all the interviewees as promised, and made public.
2) **Develop a NEDA budget range and begin to identify potential long-term NEDA funders on both sides of the border.** A range of budgets for a NEDA process (which will reflect different approaches to, among other things, modeling, technical support, travel, project management, and facilitation/mediation) need to be developed. Based on the budgets for the other regional stakeholder processes we examined in the case studies, total costs of over $4 million (CAD)/$3 million (USD) would not be unrealistic. While developing these budgets, NEDA should begin to explore funding options with foundations, government entities, and others. NEDA might also approach national laboratories and other research organizations for in-kind support. We note that some of these options, at least on the U.S. side, might be difficult to nail down ahead of the upcoming elections.
3) **Conduct detailed discussions with states and provinces regarding their interest in and preferred role(s) within a NEDA collaborative.** Among the matters to be explored

[11] As noted earlier, NEG/ECP together with CONEG includes all of the states and provinces being considered for NEDA, except for Ontario.

are their interest in and support for NEDA generally; the subject matter that NEDA should address and its geographic boundaries; the three different options for their participation in NEDA as outlined above; and their willingness to act as conveners. This will require a detailed strategic plan for approaching, briefing, and recruiting the desired states and provinces; such a plan will, among other things, describe the sequencing of outreach and identify the stakeholders and NEDA team members who will make these efforts.

4) **Map out and then recruit stakeholder organizations to become members of a NEDA collaborative.** This will include detailed mapping and consultation with key stakeholder interest groups to determine the most effective membership (in terms of expertise, representation, and commitment) for the process. This will also entail the sorting of organizations and agencies into the main NEDA stakeholder body, working groups, and, possibly, a resource panel.
5) **Delineate in detail the collaborative's structure and workplan.** This will cover the organizational structure, including any initial working groups, and the NEDA schedule, including the start date, the frequency and locations of meetings, a draft agenda for the first meeting, etc.
6) **Transform the assessment advisory committee and revisit the role of the NEDA assessment team for this phase and beyond.** The advisory committee should be reconstituted to include other key stakeholder groups. The committee and other members of NEDA should also consider whether the NEDA assessment team members should continue (and are interested in doing so) assisting with the development of a stakeholder process and, if so, whether additional human resources and skill sets are needed**.**
7) **Seek funding to move a NEDA process forward.** There are two approaches to funding to be considered:
    a. **Bridge funding** — This would cover primarily labor expenses incurred to finalize the design of a collaborative process (described in Critical Next Steps 2-5 above) and to ensure that all three of the prerequisites are met: state and provincial support, access to data, and the commitment of adequate resources. Ideally this bridge funding should come from both sides of the border. This work would be completed with the submission to potential funders of a fully fleshed-out scope of work and a budget for, and expressions of key stakeholder commitment to, the NEDA collaborative.
    b. **Comprehensive funding** — Under this approach, funding for the entire NEDA collaborative would be sought as soon as possible, without a separate design phase supported by bridge funding. Under this approach, only portions of the Critical Next Steps 2-5 (above) that are necessary to develop proposals to funders would be completed, with the rest taking place as a first step when that funding is secure. Wrapping much of the design, budgeting, and recruitment activities into the overall framework of the collaborative could make some parties more willing to commit to the process.

[End of report]

IV. Appendices

A. Advisory Committee Members

Philip Dugay, Vice President (Canada), Anbaric

Paul L. Joskow, Elizabeth and James Killian Professor of Economics, Emeritus, Massachusetts Institute of Technology

Bruce Lourie, President, Ivey Foundation

James Meadowcraft, Professor, School of Public Policy, Carleton University

Normand Mousseau, Professor, Department of Physics, University of Montreal

Mark O'Malley, Senior Research Fellow, National Renewable Energy Laboratory

Pierre-Olivier Pineau, Professor, Department of Decision Sciences, HEC Montreal

Marco Presutti, Director General, Natural Resources Canada

Susan F. Tierney, Senior Advisor, Analysis Group

Henry Yoshimura, Director, Demand Resource Strategy, Independent System Operator-New England

B. Interviewees

Canadian Interviewees:

Utilities, Transmission System Operator, Regional Transmission Operators

Hydro-Québec
Sophie Brochu, Chief Executive Officer
Martin Imbleau, Vice President, Stratégie d'entreprise et développement des affaires
Gary Sutherland, Director, External Relations — Exports and Acquisition

Ontario Independent Electricity System Operator
Chuck Farmer, Senior Director, Power System Planning

Ontario Power Generation
Nick Pender, Director of Trading and Origination

Nalcor Energy
Greg Jones, General Manager

Nova Scotia Power Inc.
Mark Sidebottom, Chief Operating Officer

Independent Power Producers

Evolugen (Brookfield Renewables)
Nicolas Bossé, Senior Vice President, Strategy & Growth Initiatives

Emera
Dan Muldoon, Executive Vice President, Project Development

Provincial Government Authorities

Government of Ontario, Ministry of Energy, Northern Development and Mines
Tim Christie, Director, Electricity Policy, Economics and System Planning

Government of Québec, Ministère de l'Énergie et des Ressources naturelles
Luce Asselin, Sous-ministre associée

Consultants, Nongovernmental Organizations

Helios Centre
Philip Raphals, Executive Director

Federal Government

Natural Resources Canada
André Bernier, Senior Director, Renewable and Electrical Energy Division
Bradley Little, Policy Advisor, Renewable and Electrical Energy Division

United States Interviewees:

Balancing Authorities, Transmission Operators in Affected Jurisdictions

Independent System Operator-New England
Gordon Van Welie, Chief Executive Officer

New York Independent System Operator
Rich Dewey, Chief Executive Officer

Avangrid
Sebastian Libonatti, Vice President, Business Development

Transmission Owners/Load-Serving Entities
National Grid
Mike Calviou, Senior Vice President, Strategy and Regulation
Rudolph Wynter, President and Chief Operating Officer, Wholesale Networks and US Capital Delivery

State Energy and Environmental Agencies and Governors' Offices
New England States Committee on Electricity
Heather Hunt, Executive Director
Coalition of Northeastern Governors (CONEG, which houses the Conference of Northeastern Governors and Eastern Canadian Premiers)
Jay Lucey, Executive Director
New York State Energy Research and Development Authority
John Williams, Vice President, Policy and Regulatory Affairs
Connecticut Department of Energy and Environmental Protection
Katie Dykes, Commissioner
Massachusetts Executive Office of Energy and Environmental Affairs
Patrick Woodcock, Commissioner

Customers/State Consumer Advocates, Consumer Groups, Load-Serving Entities
Eversource
James Daly, Vice President of Supply
Consolidated Edison
Matt Ketschke, Senior Vice President of Customer Energy Solutions
Massachusetts Attorney General
Rebecca Tepper, Chief of the Energy and Telecommunications Division
New Hampshire Office of the Consumer Advocate
D. Maurice Kries, Consumer Advocate

Energy Trade Organizations
New England Power Generators Association
Dan Dolan, President
Northeast Clean Energy Council
Peter Rothstein, President

Nongovernmental Organizations
Acadia Center
Dan Sosland, President

C. Description of the Assessment Purpose and Process

The following is the text of the document that the assessment team sent to the interviewees prior to their interviews.

The Northeast Electrification and Decarbonization Alliance (NEDA): A Multistakeholder Collaborative to Consider Expanded Electric System Coordination in Eastern Canada and the Northeastern United States

The Assessment

Eight separately operated balancing areas make up the eastern Canadian and northeastern U.S. electric grid.[12] System operators, regulators, and policymakers recognize that greater coordination of grids — however defined across a broad continuum of operations, investment, market, and planning activities — can yield significant economic, reliability, and environmental benefits to the region.[13] While progress in this region has been made over the past 50 years, primarily in the form of increased interties and bulk power trading, deep and strategic coordination that broadens the geography of day-ahead and real-time operations, takes advantage of greater regional load diversity, encourages more integrated planning, and facilitates deeper penetration of non-emitting, variable resources has so far been elusive.

In recent years, most of the Eastern provinces and Northeastern states have set themselves ambitious greenhouse gas emissions reduction targets. Numerous analyses have shown that the goals are achievable, but that they will depend in large measure on the decarbonization of electricity and the electrification of most fossil fuel combustion in the building and transportation sectors. Since the costs of decarbonization can vary widely between power systems with differing generation and transmission resources, it follows that increased operational and planning integration and deep investment in end-use energy efficiency will be central elements in lower cost scenarios. And with such coordination should come increased system reliability, resilience, cost savings, and opportunities for grid modernization.

These conditions suggest that there may be renewed interest in greater regional electric system coordination. Under the aegis of the Northeast Electrification and Decarbonization Alliance (NEDA), The Transition Accelerator, in collaboration with the Regulatory Assistance Project (RAP) and Raab Associates, is evaluating the extent and nature of interest in pursuing deeper coordination of the regional electrical systems. That is, to investigate where joint action may offer the most promise and best return for the broad set of affected institutions and stakeholders on both sides of the border.

[12] They are the system operators and vertically integrated utilities that operate the systems in New Brunswick, Newfoundland and Labrador, Nova Scotia, Prince Edward Island, Ontario, Quebec, New England, and New York.
[13] See, for example, Williams, Dr. James H., et al., *Deep Decarbonization in the Northeastern United States and Expanded Coordination with Hydro-Québec*, Sustainable Development Solutions Network in collaboration with Evolved Energy Research and Hydro-Québec, April 2018; and Dimanchev, Emil, et al., *Two-Way Trade in Green Electrons: Deep Decarbonization of the Northeastern U.S. and the Role of Canadian Hydropower*, Massachusetts Institute of Technology, CEEPR WP 2020-003, February 2020.

The assessment will not analyze the value or means for greater coordination of the eight balancing areas. Rather, it will evaluate whether there is sufficient institutional support in key jurisdictions for an extended multistakeholder, multijurisdictional collaborative process dedicated to developing a comprehensive blueprint for such coordination. The assessment will also identify any barriers and opportunities of common interest between certain essential stakeholders.

The assessment will be conducted primarily through a series of in-depth interviews of policymakers, system operators, utilities, market participants, advocacy groups, and other stakeholders. It will also develop some short case studies on other similarly complex stakeholder engagement processes. On the basis of these discussions and case studies, the assessment will produce a set of findings and, if warranted, recommendations for further action including the scope, structure, and analytic support for a collaborative process seeking enhanced grid integration throughout the region.

The assessment is expected to be completed by September 2020.

NEDA: About the Initiator

The Transition Accelerator is a not-for-profit organization that collaborates with targeted groups to solve major business or social challenges and where significant greenhouse gas reductions can be built into the solutions. The Accelerator receives no funding from for-profit entities and is entirely financed by independent, like-minded, philanthropic organizations. The Accelerator creates Transition Pathways, which are the stepwise sequence of actions needed to advance positive change. Its purpose is to nurture new ideas, build coalitions of innovators, enhance promising alternatives, and establish consortia interested in generating change. Learn more at www.transitionaccelerator.ca.

Assessment Organizations

The Regulatory Assistance Project (RAP) is an independent, nonpartisan, nongovernmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future. RAP is made up of former utility and environmental regulators, industry executives, system operators, and other policymakers and officials who have extensive experience in the power sector. RAP helps energy and air quality decision-makers and stakeholders navigate the complexities of power sector policy, regulation, and markets. RAP focuses on the world's four largest power markets responsible for half of all power generation: China, Europe, India, and the United States. For more information, go to www.raponline.org.

Raab Associates, Ltd. has been providing expert dispute resolution and consulting services since 1990 — including mediation, facilitation, training, and consulting. Raab Associates specializes in the design and facilitation/mediation of multistakeholder processes on complex issues. Its clients include local, state, and federal agencies; utilities and other businesses; and nonprofits throughout the United States, Canada, Europe, and Japan. Raab Associates has substantial expertise in energy, climate, environmental, and regulatory issues. More information about Raab Associates can be found at www.raabassociates.org.

D. June 2019 NEDA Report

[Report begins on the next page.]

Northeast Decarbonization:
The opportunities and challenges of regional electricity sector integration for high renewable penetration

Northeast Decarbonization Alliance (NEDA)

Report prepared by:
Pierre-Olivier Pineau, HEC Montréal
Simon Langlois-Bertrand, Concordia University

June 21, 2019

The Northeast Decarbonization Alliance (NEDA) promotes collaboration among jurisdictions in the North American Northeast to achieve deep reductions in greenhouse gas (GHG) emissions through almost 100% renewable energy systems.

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- Christopher Greig, Princeton University
- Eric D. Larson, Princeton University
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Executive Summary

Deeper regional integration in the electricity sector across the North American Northeast can bring substantial benefits in reducing greenhouse gas (GHG) emissions through the deployment of renewable energy. In this region, as elsewhere in the world, GHG emission reduction targets imply the dual challenge of electrifying many energy needs (e.g., heating, transportation, industry) and decarbonizing electricity production. The electricity sector will play a central role in decarbonization.

This report argues that better coordination in planning and operating the Northeast electricity sector could greatly facilitate decarbonization. Disparities in production and consumption levels – particularly the availability of existing inexpensive low-carbon resources – already lead to fruitful electricity trade. Much more is however achievable. After providing some general background information on the Northeast region electricity profile, this report provides information on three key aspects of the issue:

1. What are the subnational jurisdictions' (i.e., states and provinces) goals and current tools with respect to reducing GHG emissions?
2. What does the current scientific literature say about the need for collaboration in the electricity sector – both in generic terms and more specifically in the context of deep penetration of renewables?
3. What barriers must be overcome to foster such collaboration?

Despite putting forward several ambitious GHG reduction and renewable deployment targets, policy efforts by subnational jurisdictions across the Northeast are falling short, and prospects for meeting renewable penetration levels required by long-term targets appear dim. Even the more promising policy initiatives' chances of success may be undermined by various barriers unless they are accompanied by measures to overcome them. Upscaling GHG reduction efforts through measures targeting the electricity sector and more aggressively fostering the use of renewables requires giving significantly more attention to integration strategies across the region.

Regional integration in the electricity sector can help these efforts in various ways. Electricity sector integration can be defined as increased coordination and collaboration among adjacent jurisdictions. Integration involves different aspects such as physical infrastructure (e.g., interties), institutional and regulatory cooperation and harmonization (e.g., shared regulation, market design, and systems operation rules), and commercial integration (e.g., level of trade). There is an important academic consensus on the benefits of electricity market integration. Academic and engineering studies have demonstrated how aggressive decarbonization goals can be achieved while maintaining current levels of reliable electricity service. Indeed, to meet the challenges of progressively increasing the penetration of renewables in the electricity mix across the region, increased integration is essential. Recent political initiatives in the Northeast seem to recognize these benefits, and early efforts could lead to calls for an even greater coordination.

To achieve such coordination and collaboration, significant institutional, political and social barriers must be overcome.

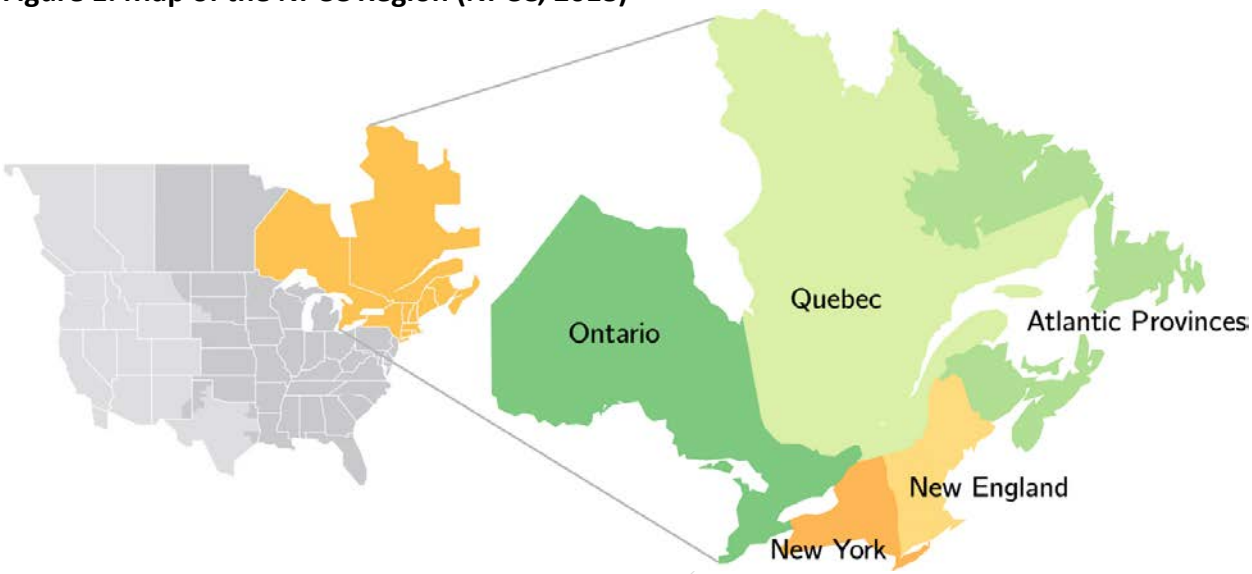
- Institutional barriers imply a need for subnational jurisdictions to give special attention to regulatory discrepancies across jurisdictions – such as price levels or market access, for instance. This is necessary to ensure that regional collaboration leads to a streamlining of efforts to harmonize and facilitate integration of grids across subnational jurisdiction borders.
- Political barriers often take the form of combining renewable deployment efforts with local industrial policy and job creation objectives. By adding unrelated constraints, they prevent more rapid and extensive penetration of renewables in the electricity mix. Although this type of policy rationale can foster public support for such renewable policy, this strategy seems to have reached its limits, and often works against achieving higher penetration levels for renewables across the region.
- Finally, social barriers materialize through opposition to projects (e.g. wind farms, dams, transmission lines). The failure to address such concerns results in lower renewable penetration and sub-optimal investments, either from the perspective of a single jurisdiction or for the region as a whole. A viable path to regional integration must consider both the legitimate concerns in local areas and the regional goals to accelerate renewable energy deployment.

Reaching medium- and long-term targets for GHG emission reduction and renewables deployment necessitates an urgent intensification of policy efforts. In the electricity sector, regional integration presents opportunities in this regard. If both technical and non-technical difficulties can be managed, this integration will provide significant benefits in terms of sharing renewable resources across the region and meeting the challenges associated with attaining higher shares of renewables in the electricity mix.

Introduction

The North American Northeast includes six Canadian provinces and seven American states (collectively referred to as the "Northeast" in this report).[1] Their electricity systems are interconnected, and their reliability standards are overseen by the Northeast Power Coordinating Council (NPCC).[2] Figure 1 displays the region.

Figure 1. Map of the NPCC Region (NPCC, 2018)



As for all countries in the world, meeting ambitious greenhouse gas (GHG) emission reduction targets probably implies the dual challenge of electrifying many energy needs (e.g., heating, transportation, industry) and decarbonizing electricity production. Despite variation among plans laid out so far on how to reach aggressive GHG reduction targets, the electricity sector will play a central role in all cases.

Better coordinating the planning and operation of the Northeast electricity sectors could facilitate decarbonization. This document provides information on three key aspects of the issue:

1. What are the subnational jurisdictions' goals and current tools with respect to reducing GHG emissions?
2. What does the current scientific literature say about the need for collaboration in the electricity sector – both in generic terms and more specifically in the context of deep penetration of renewables?
3. What barriers must be overcome to foster such collaboration?

[1] Throughout this report, the term "state" is used predominantly to refer to U.S. subnational jurisdictions and "province" for Canadian ones. To avoid confusion, the term "jurisdiction", unless otherwise specified, refers to subnational jurisdictions across North America (i.e., states and/or provinces).

[2] Only New Brunswick and Nova Scotia (the two largest provinces) are part of the NPCC, out of the four Canadian Atlantic provinces (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador, referred to here as "AT").

Before getting into the specifics of these questions, we provide some general background information on the Northeast region and its electricity consumption and generation. Table 1 shows that New York is by far the most populous jurisdiction, with close to 20 million people. Ontario comes second (14 million), followed by Quebec (8 million) and Massachusetts (almost 7 million). However, electricity generation and consumption are dominated by Quebec, with 212 TWh of generation in this province, almost entirely from hydroelectric production. Given the availability of low-cost hydroelectric power in Quebec, consumption per capita is close to 21,000 kWh per year, while it is below 8,000 kWh in New York and New England.

Table 1. NPCC population in 2018 and total electricity consumption and production in 2017 (U.S. Census Bureau, 2018; Statistics Canada, 2019a and b; EIA, 2019a)

		Population	Generation	Consumption	*Surplus (Deficit)*	Per capita (kWh/2017)	
		(2018)	(2017) in TWh		*(TWh)*	Gen.	Cons
New England	**NE**	**14,853,290**	**105.23**	**115.46**	***-10.22***	**7,085**	**7,773**
Connecticut	CT	3,572,665	34.56	28.14	*6.43*	9,674	7,875
Maine	ME	1,338,404	11.26	11.21	*0.05*	8,416	8,378
Massachusetts	MA	6,902,149	32.20	52.51	*-20.31*	4,666	7,608
New Hampshire	NH	1,356,458	17.45	10.79	*6.66*	12,862	7,953
Rhode Island	RI	1,057,315	7.61	7.38	*0.23*	7,202	6,984
Vermont	VT	626,299	2.14	5.42	*-3.28*	3,419	8,660
New York	**NY**	**19,542,209**	**128.07**	**144.99**	***-16.93***	**6,553**	**7,419**
Quebec	**QC**	**8,356,699**	**212.09**	**173.72**	***38.37***	**25,380**	**20,788**
Ontario	**ON**	**14,246,035**	**150.96**	**133.72**	***17.24***	**10,597**	**9,386**
Atlantic	**AT**	**2,403,044**	**63.08**	**35.91**	***27.16***	**26,249**	**14,945**
Nova Scotia	NS	955,708	10.07	10.29	*-0.22*	10,540	10,766
New Brun.	NB	768,865	13.23	13.03	*0.20*	17,202	16,945
Prince Ed. Isl.	PE	152,009	0.61	2.13	*-1.52*	4,008	14,017
NF. & Lab.	NL	526,462	39.17	10.47	*28.70*	74,399	19,878

Table 2 shows installed generation capacity by fuel type and location. Notably, more than 45,000 MW of installed capacity is in Quebec, which accounts for 25% of the Northeast installed capacity, but only 14% of the region's population.

Table 2. Installed Capacity by Fuel in 2017, in Megawatt (EIA, 2019a; Statistics Canada, 2019c)

	NE	NY	QC	ON	AT	Total
Coal/Petroleum/Biomass	9,132	6,239	675	5,512	3,893	25,452
Hydroelectric	1,951	4,684	40,438	9,122	8,099	64,294
Natural Gas	16,592	23,169	824	5,153	1,069	46,807
Nuclear	4,075	5,709		13,328	705	23,817
Other	377	265			20	662
Pumped Storage	1,571	1,240				2,811
Solar	785	161		2,296	0	3,242
Wind	1,408	1,830	3,432	5,077	1,166	12,914
	35,891	43,298	45,369	40,489	14,953	179,999

Note: Fuel categories have been modified from the sources to allow for a uniform presentation of U.S. and Canadian data.

Electricity trade is already very important in the Northeast, allowing Massachusetts, for instance, to obtain about 20 TWh of electricity from its neighbors (40% of its consumption), while New York is a net importer of close to 17 TWh (12% of its consumption). Canadian provinces, through their excess generation, are important sources of power for New York and importing New England states (MA and VT).

The diversity among jurisdictions, further detailed in section 1, is a source of potential complementarity gains (as detailed in section 2), but is also a difficulty in and of itself, as each jurisdiction is different and operates independently on its own terms (section 3 further discusses these issues, which impose barriers to further coordination). To answer the three questions above, we begin in the next section with a careful look at how jurisdictions across the Northeast have approached efforts to meet GHG emission reduction targets and accelerate the deployment of renewables in the electricity sector.

Section 1 – Overview of climate targets and electricity policies

Section highlights

- *GHG emissions from the electricity sector in the Northeast have declined over the past decade, following the replacement of coal by natural gas and renewables.*
- *All Northeast jurisdictions have set forth ambitious targets to further reduce their emissions, and many have aggressive targets to increase the share of renewables in the electricity mix.*
- *Current policies to help reach medium- and long-term GHG targets are unlikely to be sufficient.*
- *Coordinated regional strategies in the electricity sector have been very limited, jeopardizing higher penetration for renewables and compromising the realization of GHG reduction targets.*

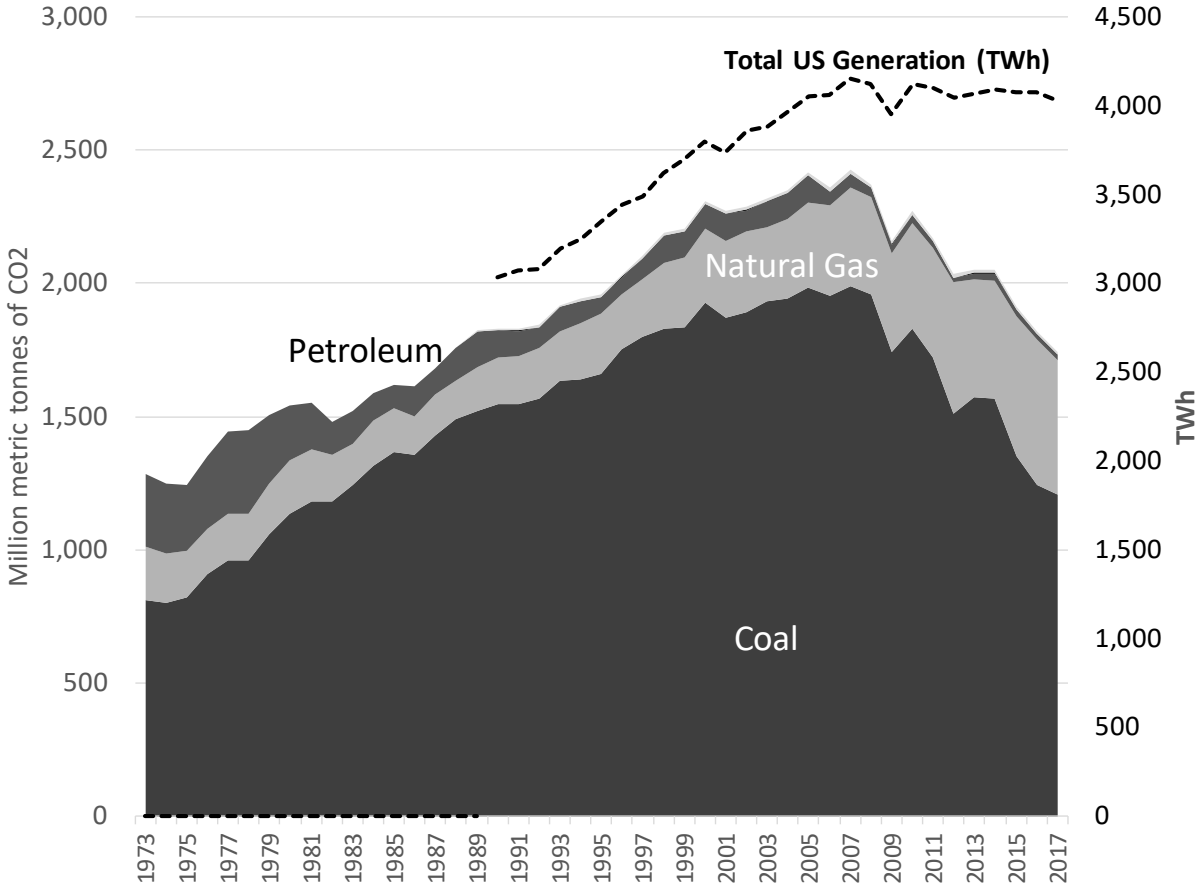
This section presents GHG emissions trends in the electricity sector and compares GHG emission reduction targets and related goals and initiatives put forward by various jurisdictions in the Northeast.

GHG Trends in the Electricity Sector

While total U.S. power generation has been stable since 2005 (around 4,000 TWh of generation per year, Figure 2), direct electricity sector emissions of CO_2 have been declining at the same time – from a 2007 peak of 2,400 million tonnes to about 1,700 in 2017 (28% decrease).[3] This is because coal is in effect being displaced by natural gas and renewable energy sources (not shown in Figure 2 because they do not emit GHGs).

[3] Most GHG emissions from the combustion of energy are CO_2 emissions, and these are the emissions most commonly reported by the U.S. EIA and the International Energy Agency for the energy sector. However, small amounts of CH_4 and N_2O, which are also GHGs, are also emitted in the energy sector, but are less reported.

Figure 2. U.S. Electricity Sector CO2 emissions, 1973-2017 and U.S. total Generation, 1990-2017 (EIA, 2019a and b)



Northeast jurisdictions have been on the same trend: declining electricity sector emissions in New York, New England and Ontario, in particular. Figure 3 shows the drastic decline in electricity sector CO_2 emissions from 1990 to 2016 in New York (-57%), New England (-46%) and Ontario (-79%), achieved by virtually eliminating coal and petroleum generation from their electricity mix (Figure 3). In the case of Ontario, this was achieved through an official coal phase-out policy (Ontario, 2019).

Figure 3. New York, New England, Ontario, Quebec and Atlantic Canada Electricity Sector CO2 emissions, 1990-2016 (EIA, 2019b; ECCC, 2018)

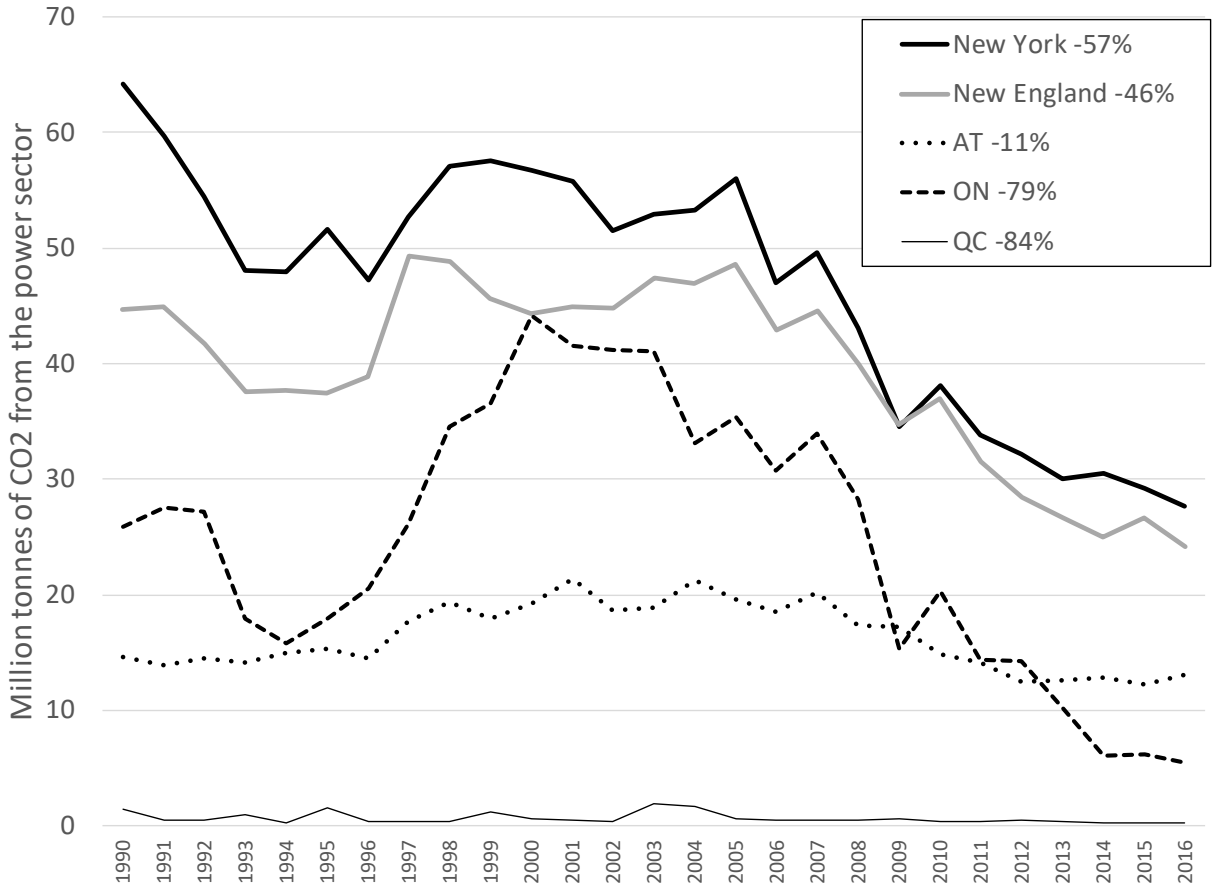


Figure 3 shows how CO_2 reductions have resulted from coal and petroleum being practically eliminated between 1990 and 2017, with natural gas, nuclear and, more modestly, renewable sources being used instead. While generation went down in New York and New England over the 1990-2017 period (Figure 4), it grew in the Canadian provinces, especially in Quebec, with important additions in hydroelectric and wind generation (Figure 5).

Figure 4. New York and New England Power Generation by source in 1990 and 2017 (EIA, 2019a)

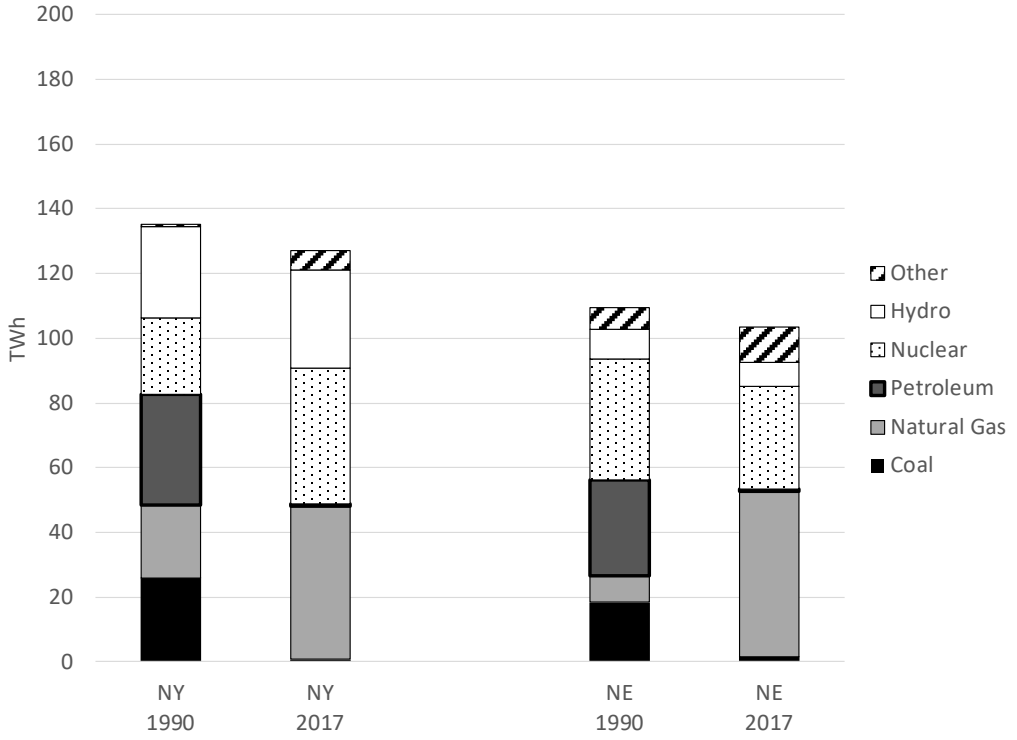
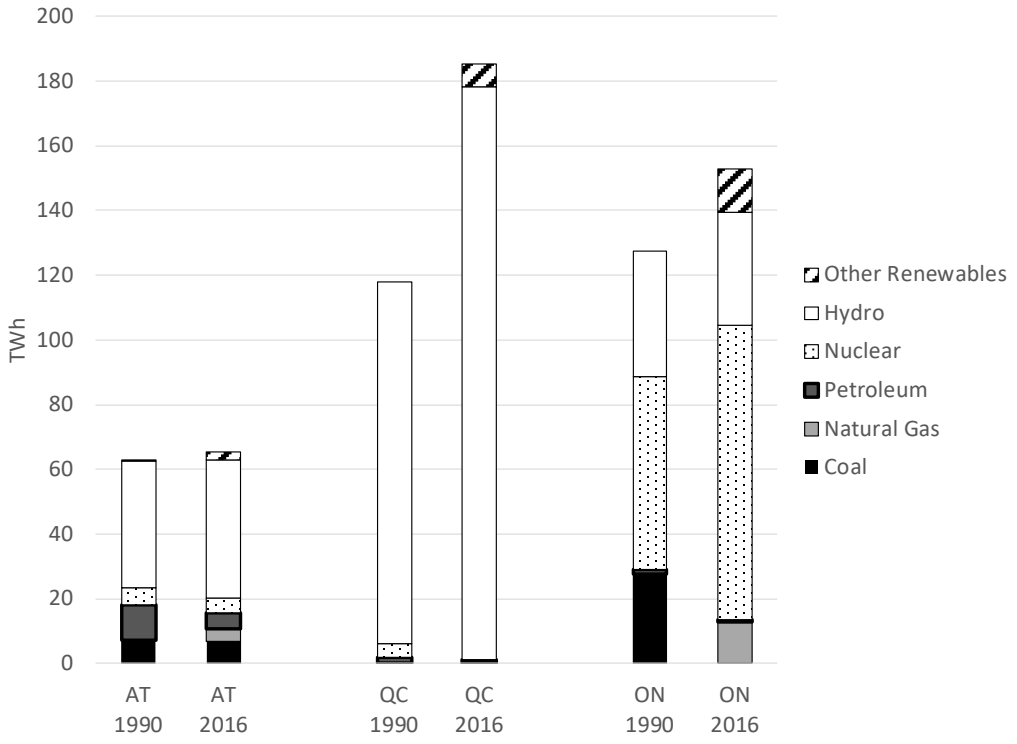


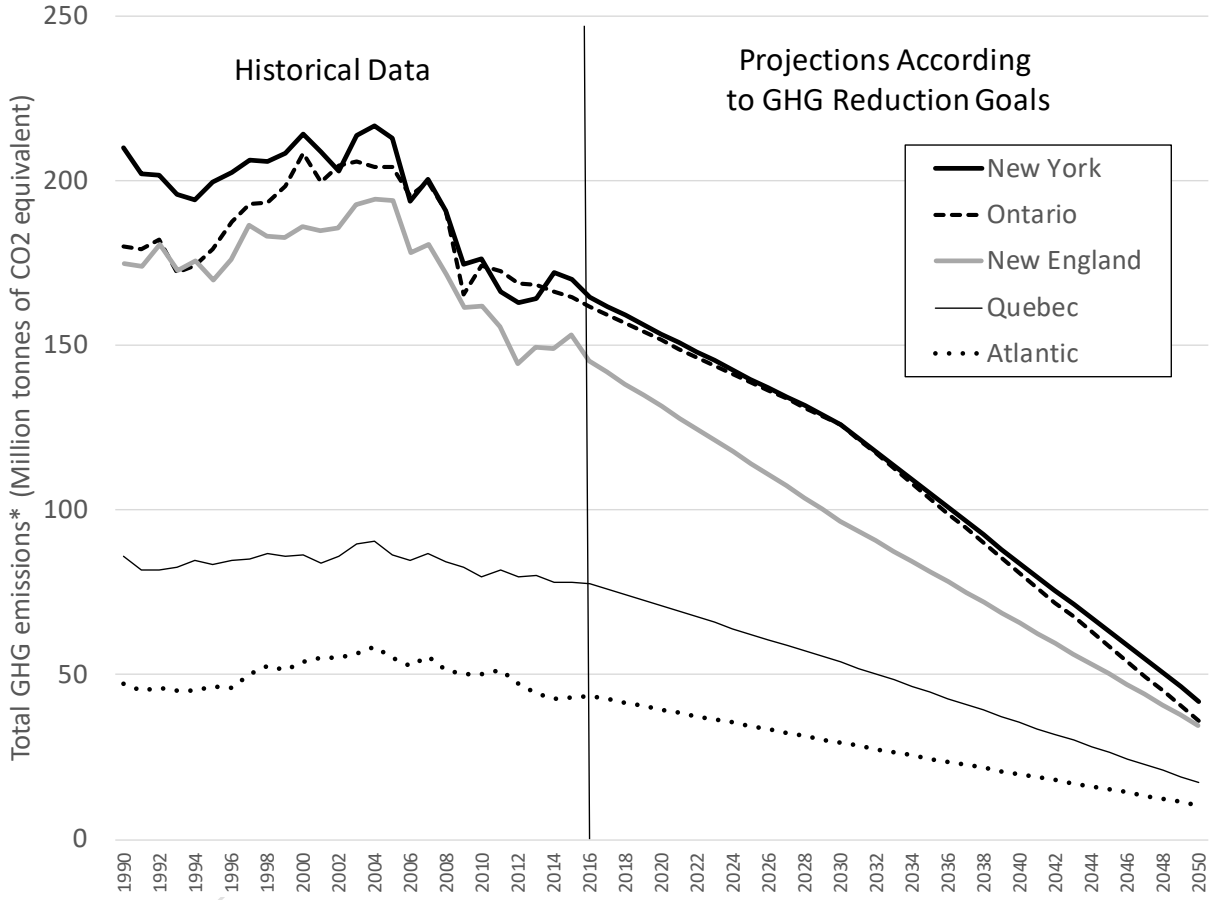
Figure 5. Ontario, Quebec and Atlantic Canada Power Generation by source in 1990 and 2016 (Canada) (ECCC, 2018)



GHG Targets and Policies

Most jurisdictions in Northeast have three timeframes for GHG emission reduction targets: 2020, 2030 and 2050, each with increasingly stringent objectives. For most of these, the most rapid increases are between the 2030 and 2050 targets, which require an intensification of efforts compared to earlier objectives: targets for 2030 correspond more or less to reductions in the order of 30-40%, whereas those for 2050 require an 80% reduction in emissions.[4]

Figure 6. Historical Total GHG Emissions* from 1990 to 2016 (EIA, 2019b and ECCC, 2018) with Projections to 2050 According to GHG Reduction Goals (Table 3)



* For US states, only CO_2 emissions are available at the state level, not all GHG emissions (including CH_4, N_2O and other GHG). CO_2 represent about 80% of total GHG emissions. Real total emissions for New York and New England are therefore higher than what appears on the Figure.

In order to achieve these targets, jurisdictions across the Northeast have put forward a varying set of initial measures and initiatives, summarized in the last column of Table 3. Some of these are more typical across subnational jurisdictions: for instance, several governments set targets for the decarbonization of certain sectors of the economy, often the electricity sector.

[4] The reference year from which emission reductions are measured varies among different jurisdictions. Typical reference years include 1990, 2001, or 2005 (see Table 3). Judging from Figures 2 and 6, the reference year used could make achieving a reduction target more or less challenging.

The main initiatives are the following ones, even if they vary substantially across jurisdictions:

- **Renewable Portfolio Standards (RPS)**, which require utilities to have a progressively larger share of the electricity they sell to end-use customers come from renewable sources;
- **Cap-and-trade systems** such as the Regional Greenhouse Gas Initiative (RGGI) and the Quebec Western Climate Initiative (WCI, a joint cap-and-trade system with California), which requires large CO_2 emitters to acquire allowances from the government or from other allowance owners in an amount equal to their emissions, with a progressively decreasing cap on the total number of allowances available in the region covered;
- **Clean energy funds** of various forms, through which jurisdictions support efforts to decrease emissions toward the stated targets by financing eligible projects that are expected to lower GHG emissions.

In addition, a few less common policy initiatives exist, such as specific objectives for increasing the market share of electric vehicles (New Brunswick, Quebec), attempts to decarbonize more rapidly through securing large hydroelectricity purchases from Canadian provinces, notably Hydro-Quebec (for instance, through Massachusetts' 83D Clean Energy request for proposals)[5], or the grouping of various objectives in more comprehensive energy strategies. In this latter category, New York is putting together a comprehensive regulatory and policy reform of the electricity sector through its Reforming the Energy Vision (REV) initiatives. REV, however, is primarily oriented towards an internal (or "New York only") approach to decarbonization, never explicitly mentioning the current and possible future gains from regional collaboration.

Some of the common measures nevertheless illustrate a significant degree of collaboration across the region. The RGGI, for instance, includes not only all New England states and New York, but also a few other neighboring states (Maryland and Delaware). New Jersey, which participated in the program in its early years before leaving in 2012, is also set to re-enter in 2020. Through the RGGI, participating jurisdictions commit to reducing GHG emissions from large emitters in the electricity sector, by setting a regional cap for emissions, which declines over time (currently at a rate of 2.5% per year). Each participant then allocates allowances for their share of this cap, the vast majority of which are distributed through auctions. Between 2020 and 2030, electricity sector emissions in RGGI participating jurisdictions should decrease by 30%.

The RGGI represents a credible measure to curb emissions. The constraints it imposes on members are stable over time, and the reduction in emissions is controlled by the declining cap on emission allowances across the entire region subject to the program, which ensures that the targets are reached. Moreover, the rules for compliance and allocation of allowances are clear and transparent, and revenues from the auctions are overwhelmingly assigned to other

[5] See the Massachusetts Clean Energy website (https://macleanenergy.com), dedicated to the "collaborative efforts of the Massachusetts Department of Energy Resources, Eversource Energy, National Grid and Unitil to procure Clean Energy for the Commonwealth of Massachusetts."

measures dedicated to reducing emissions, for instance energy efficiency, community-based renewable energy projects, or other greenhouse gas reduction measures.

Nevertheless, as a closer look at the overview presented in Table 3 makes clear, the RGGI remains an exception in the set of measures adopted across the Northeast in recent years. Clean energy funds, for instance, rarely have specific GHG reduction targets attached to their performance requirements and funding, and a result it is often difficult to assess whether they constitute a satisfactory contribution to GHG mitigation for a given level of funding.

Most importantly, despite the urgency associated with addressing these shortcomings if short- and medium-term targets are to be reached, the failure of matching the intensity of efforts with the requirements of these targets becomes even more difficult for achieving the longer term and more aggressive 2050 GHG reduction objectives. As Figure 6 shows, the required decline in GHG emissions between 2030 and 2050 is steeper in the largest Northeast jurisdictions. As a result, it is important to remember that meeting the 2050 targets will be more challenging, because earlier and less costly reductions in GHG emissions will have already been made.

The bottom line is that upscaling GHG reduction efforts through measures targeting the electricity sector and more aggressively fostering the use of renewables requires giving significantly more attention to the credibility and effectiveness of associated programs and initiatives. As we turn to in the next section, the integration of such efforts across the region is a strategy presenting significant benefits in this regard.

Table 3. Overview of Targets and Initiatives for Reducing GHG Emissions and Increasing the Deployment of Renewables in Northeast Subnational Jurisdictions

Jurisdiction	GHG targets	Other targets and initiatives
New Brunswick	→ -10% by 2020, from 1990 → -35% by 2030, from 1990 → -80% by 2050, from 2001	→ 2,500 electric vehicles on the road in New Brunswick by 2020 and 20,000 by 2030
Newfoundland and Labrador	→ -10% by 2020, from 1990 → -75–85% by 2050, from 2001	
Nova Scotia	→ -10% by 2020, from 1990 → -45–50% by 2030 from 2005 → -80% by 2050, from 2009 → 25% cap-induced reductions in emissions from electricity sector by 2020, 55% by 2030	→ 40% renewables in the electricity mix by 2020 → Cap-and-trade program (emitters above 50,000 tonnes, petroleum product suppliers, natural gas distributors, and electricity importers)
Ontario	→ -30% by 2030, from 2005 → -80% by 2050, from 1990	→ Increase ethanol content to 15% by 2025
Prince Edward Island	→ -30% by 2030, from 2005	
Quebec	→ -20% by 2020, from 1990 → -37.5% by 2030, from 1990 → Between -80% and -95% by 2050, from 1990	→ -40% oil products consumption by 2030, from 2013 → +25% renewable energy production by 2030, from 2013 → +50% 2013 bioenergy production by 2030 → Elimination of thermal coal → Cap-and-trade program (Western Climate Initiative, WCI) covering all sectors except waste and agriculture. → Revenues of auctions from the cap-and-trade program go into the "Fonds vert", a green funds for projects linked to GHG reduction efforts → 3.5% of EV (or PH or hydrogen) for new vehicles sales for 2018, increasing progressively to 22% in 2025 → 100 000 EVs by 2020, 1 000 000 by 2030

Connecticut	→ -10% by 2020, from 1990 → -45% by 2030, from (legislated) → -80% by 2050, from 2001 (legislated)	→ RPS 40% renewables by electricity providers by 2030 (of which hydro includes only run-of-the-river) → Comprehensive Energy Strategy 2018 → Participation in RGGI → Participation in Transportation emission cap regional initiative
Maine	→ -10% by 2020, from 1990 → -75–80% from 2003 ("sufficient to eliminate any dangerous threat to the climate")	→ Participation in RGGI → Participation in Transportation emission cap regional initiative → Biennial report to legislature on progress toward reduction targets
Massachusetts	→ -25% by 2020, from 1990 → -80% by 2050, from 1990	→ Clean Energy Standard 16% for 2018 and 2% yearly increase until 80% in 2050 (minimum percentage of electricity sales that utilities and competitive retail suppliers must procure from clean energy sources) → RPS: Class I requirement increases by one percent annually with no established end date → RPS: Class II (for older facilities) + Waste energy → Alternative Energy Portfolio Standard (similar to the RPS: requires a certain percentage of the state's electric load to be met by CHP, flywheel storage, and efficient steam tech): increase by -0.25% per year indefinitely → Clean Energy and Climate Plan 2020 (updated in 2015) → Clean Energy solicitations: 83D (state purchase Canadian hydropower through a 20-year contract) and 83C (offshore wind) → Participation in RGGI → Participation in Transportation emission cap regional initiative
New Hampshire	→ -20% by 2025, from 1990 → -80% by 2050, from 1990	→ RPS: 25.2% by 2025 (large hydro ineligible) → Renewable Energy Fund (finances renewable energy projects) → Renewable Energy Rebates (several incentive programs for PV, wind, solar water heating, as well as other types of installations) → Participation in RGGI → Participation in Transportation emission cap regional initiative

New York	→ -40% by 2030, from 1990 in the energy sector (including power generation, industry, buildings and transportation) → -80% by 2050 for total carbon emissions (1990 implied as reference year) → -80% by 2050, from 1990 in New York City	→ 100% clean electricity by 2040 → Clean Energy Standard: 50% renewable sources in electricity by 2030, announced 70% in Cuomo's new plan → 600 trillion Btu increase in statewide energy efficiency → 1.5 GW of energy storage by 2025 → Green New Deal proposed in 2019 budget (not passed yet): o Offshore wind target raised to 9,000 megawatts by 2035, up from 2,400 megawatts by 2030 o Distributed solar deployment increased to 6,000 megawatts by 2025, up from 3,000 megawatts by 2023 o New large-scale, land-based wind and solar resources through the Clean Energy Standard (solar 3GW by 2023) o Deploying 3,000 megawatts of energy storage by 2030 → Reforming the Energy Vision (REV) initiative: uses a two-track process to reorient the electricity industry: (1) focus on (1) markets and on (2) ratemaking reform → Participation in RGGI → Participation in Transportation emission cap regional initiative
Rhode Island	→ -45% by 2035, from 1990 → -80% by 2050, from 1990	→ Energy 2035: Rhode Island State Energy Plan → Renewable Energy Standard: 38.5% by 2035 → Participation in RGGI → Participation in Transportation emission cap regional initiative
Vermont	→ -40% by 2030, from 1990 → -80-90% by 2050, from 1990	→ Comprehensive Energy Plan 2016 → RES (reaching 75% by 2032 from 55% in 2017; also by 2032 10% of each utility's electricity must come from in-state renewable generators under 5MW → Reduce total energy consumption per capita by 15% by 2025, and by more than one third by 2050. → 25% of the remaining energy need from renewable sources by 2025, 40% by 2035, and 90% by 2050. → Three end-use sector goals for 2025: 10% renewable transportation, 30% renewable buildings, and 67% renewable electric power → Clean Energy Development Fund → Participation in RGGI → Participation in Transportation emission cap regional initiative

Section 2 – Benefits from greater coordination and collaboration in renewable energy deployment

Section highlights

- *There is a consensus on the benefits of **electricity market integration** and of regional collaboration for **deep renewable integration in electricity systems**.*
- *Regulatory policy changes, market design innovation, and flexible operating procedures are critical to achieving technical potential.*
- *Current policies do not seriously consider regional collaboration.*
- *The scope of the GHG challenge and the electricity system context of the Northeast calls for a greater coordination between New England, New York and Canadian provinces.*

Electricity Sector and Renewable Integration: Two Related Challenges

Electricity sector integration can be defined as increased coordination and collaboration among adjacent jurisdictions. Integration involves different aspects such as physical infrastructure (e.g., interconnections), institutional and regulatory cooperation and harmonization (e.g., shared regulation, market design, and systems operation rules), and commercial integration (e.g., level of trade). In the following, "integration" has no specific implication on the extent to which additional coordination and collaboration is involved on each of these dimensions – but to meet the challenges of progressively increasing the penetration of renewables in the electricity mix across the region, increased integration is essential.

Renewable integration in the electricity sector is a different, but related concept. It covers the challenges of adding large amounts of renewable electricity production sources in a power system. It has been studied in many context – see for instance Holttinen et al. (2019) for the final summary report of the IEA Wind Task 25, providing many insights on the design and operation of power systems with large amounts of wind power.

In a nutshell, integrating different electricity systems can bring some benefits, even if no renewable capacity is added. If significant increases of renewable capacity are considered, regional integration of electricity system is even more beneficial.

Generic Benefits of Electricity Sector Integration[6]

Even without considering the addition of renewable capacity, there is an important consensus on the benefits of electricity market integration. The UN has published many reports on the subject (see in particular UNECA, 2004; and UN, 2006), and so have the World Bank (ESMAP, 2010), the World Energy Council (WEC, 2010), the Organization of American States (OAS, 2007) and even the Commission for Environmental Cooperation (CEC, 2002). This latter organization is a North American organization established in 1994 along with the North American Free Trade Agreement (NAFTA). This literature identifies a series of potential technical benefits that can be achieved through increased integration. Basically, benefits derive from efficiency gains obtained through trade and increased productive efficiency. These benefits, in the context of electricity markets, are summarized in Table 4.

Table 4. Potential Technical Benefits From Electricity Sector Integration (CEC, 2002; UN, 2006; ESMAP, 2010; see also Pineau, 2012)

Improving reliability and pooling reserves	With access to the production facilities of its neighbours, each region gains access to much greater resources to meet the demand in the case of an incident. This increases reliability and reduces the need for local reserves of production capacity.
Reduced investment in generating capacity	Thanks to pooling, each region can avoid costs of adding further capacity on its own.
Improving load factors and increasing demand diversity	Greater geographic reach often provides a more diverse demand, where peak periods do not coincide. This helps to avoid operating generating plants only for peak periods, and it uses the generator fleet in a more constant and efficient manner.
Economies of scale in new construction	With guaranteed access to a much larger market, larger generating stations can be installed, making some economies of scale accessible.
Diversity of generation mix and supply security	With more types of generation producing electricity, over a larger territory, the system is less exposed to events that affect a particular source of energy (low rainfall, lack of fuel, etc.). This increases the overall security of the integrated system.
Economic exchange	With a more diversified generating fleet and production costs, it is possible to use less costly technologies, situated in other regions, to meet various energy needs. It becomes possible to use lower cost, but distant, energy resources if equivalent local resources are not available. This reduces the overall operating costs of the system.
Environmental dispatch and new plant siting	With a larger territory in which to choose the location of generation facilities, the best sites can be chosen (for example, areas with less fragile ecosystems or zones with the most favourable winds for wind power).
Better coordination of maintenance schedules	Greater flexibility and reduced impact can be obtained with a more extensive production fleet.

[6] This section draws partly from Pineau (2013).

Assessing Integration Benefits in a context of Increased Renewable Penetration

In the North American context, different studies have looked at how more electricity sector integration could help achieve different goals, notably increasing the penetration of renewable energy sources or reducing cost.

The benefits and needs for increased transmission capacities, in particular high-voltage direct current (HVDC) lines, have been recently studied by the EIA (2018) and Weiss et al. (2019), and in a Canadian context, the Standing Committee on Natural Resources (2017). Transmission lines are needed to help transmit electricity generated from remote intermittent power sources to load centers. More detailed studies of the challenges related to additional renewable capacity in the generation portfolio are also conducted by NREL – see for instance the NREL (2016a) and the forthcoming *North American Renewable Integration Study*.[7] See also GE (2016) for a Canadian study on wind integration. In the context of the Eastern North American grid, NREL (2016a) identifies how old and new generation capacity can be used when renewable penetration is on the rise. It points, however, that "regulatory policy changes, market design innovation, and flexible operating procedures are critical to achieving technical potential" (NREL, 2016b). These issues have more institutional components than technical ones, stressing the importance of increased discussions and coordination among jurisdictions.

Beyond transmission and technical aspects, different studies have tried to assess some of the economic gains that could be achieved through increased integration, in the Northeast region:

- Hatch (2018) modeled the Atlantic region of Canada and assessed the various generation and transmission options to minimize the procurement cost of lower carbon-intensive electricity. Quebec and United States interconnections and projects were, however, excluded from the scope of this study, which was financed by Natural Resources Canada through its Regional Electricity Cooperation and Strategic Infrastructure Initiative (NRCan, 2019).
- Dolter and Rivers (2018) modeled the entire Canadian electricity system to assess the cost of decarbonization – but without including the United States.
- Williams et al. (2018), in a study commissioned by Hydro-Québec, explored different electricity sector coordination scenarios between Quebec and New England and New York. These scenarios illustrate various gains from coordination in a deep decarbonization context, where loads would significantly be higher than current ones. However, they excluded other Canadian provinces and the scenario approach adopted did not optimize investment across various possible technologies and transmission line configurations.
- Bouffard et al. (2018) presented gains from greater integration in the Northeast region, derived from a capacity expansion model similar to the one of Dolter and Rivers (2018). It is the only regional study that models large hydropower reservoirs available in the Northeast to examine how they could help reduce the cost of decarbonization in the region.

[7] See https://www.nrel.gov/analysis/naris.html.

While these studies all point towards the significant benefits of increased integration, especially when renewables penetration is pursed for deep decarbonization goals, they have not yet fully made their way to energy policy makers and electricity system planners. There are promising signs, however, as detailed in the next subsection.

Political Recognition of Electricity System Integration Benefits

Some initial steps have been taken by New England Governors and Eastern Canadian Premiers (Quebec and Atlantic provinces), through their annual discussions in the context of the *Conference of New England Governors and Eastern Canadian Premiers*. In August 2018, they have taken the following resolutions (CAP, 2018):

> "system planners and operators should strengthen and diversify the generation resource mix and storage capabilities to reduce energy cost pressures and for greater system resilience during periods of extended temperature extremes" (Resolution 42-2, Resolution Concerning Energy Security and Affordability)
>
> "governors and premiers encourage ongoing dialogue among elected officials, businesses and stakeholder groups in Canada and the United States to further promote cross-border trade, trade liberalization and North American cooperation" (Resolution 42-4, Resolution Concerning the NAFTA and the Benefits of Cross-Border Trade)

Following the resolution 42-2 from the 2018 conference, the Northeast International Committee on Energy (NICE) has been created (Coneg, 2019a). Clearly, goals pursued in these resolutions are related to the potential benefits brought by electricity market integration. When GHG targets are considered, higher renewable penetration becomes required and the electricity system integration and renewable energy integration become joint challenges.

In March 2019, the New England Governors have taken a further step in their commitment towards energy collaboration through the release of the statement "New England Governors' Commitment to Regional Cooperation on Energy Issues" (Coneg, 2019b), which declares that:

> "the New England Governors commit to work together, in coordination with ISO New England and through the New England States Committee on Electricity (NESCOE), to evaluate market - based mechanisms that value the contribution that existing nuclear generation resources make to regional energy security and winter reliability. In addition, to the extent a state's policies prioritize clean energy resources, those states commit to work together on a mechanism or mechanisms to value the important attributes of those resources, while ensuring consumers in any one state do not fund the public policy requirements mandated by another state's laws."

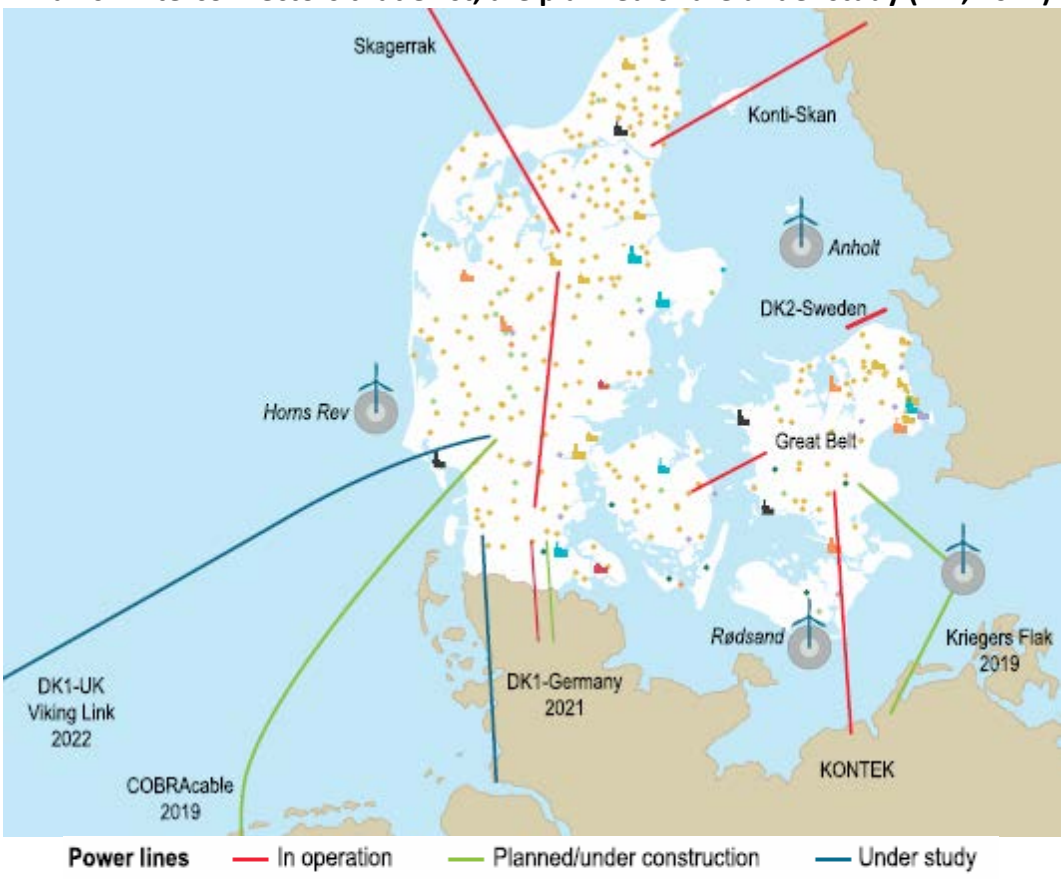
If increased coordination in the New England power system goes in the direction of greater electricity system integration, the scope of the challenge (detailed in section 1) and the

electricity system context of the Northeast[8] calls for an even greater coordination, beyond New England, including Eastern Canadian provinces, as well as Ontario and New York.

International Examples

The case of Denmark is also particularly telling. As Figure 7 illustrates, that country is highly interconnected with its neighbors: it has 4,500 MW of such interconnectors with a peak load of 5,600 MW in 2017. This makes possible almost 100% imports, in the worst local supply situations (IEA, 2017). This capacity to trade allowed that country to go from a 100% coal and oil electricity production system in 1990 to a 66% renewable system in 2016 – with wind and biomass accounting for the renewable energy production. Wind intermittency is managed through the ability to export and import electricity with a wide variety of neighbors.

Figure 7. Danish Interconnectors that exist, are planned or are under study (IEA, 2017)

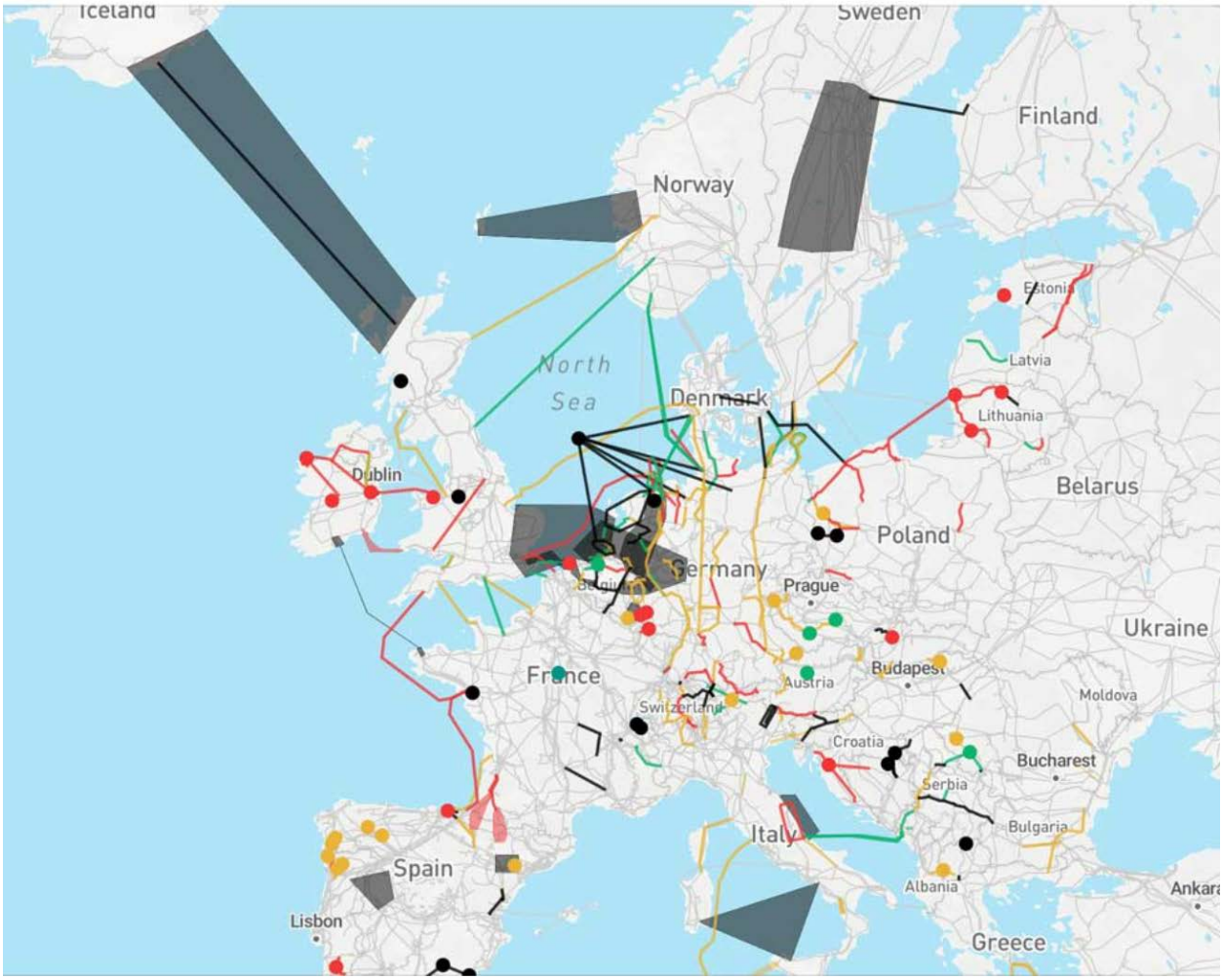


Part of the coordination in planning is done through the Nordic Energy Regulators forum, the Nord Pool (wholesale market owned by Nordic transmission system operators), the Nordic Regional Security Coordinator and of course through European Union organizations such as the European Network of Transmission System Operators for Electricity (ENTSO-E).

[8] With the already existing power trade and agreements and shared reliability institution, the Northeast Power Coordinating Council, NPCC (https://www.npcc.org/).

In the Europe, this ENTSO-E was formed in 2009 to support the “setting up the internal energy market and ensuring its optimal functioning, and of supporting the ambitious European energy and climate agenda” (ENTSO-E, 2019a). It is in charge of Europe's Network Development Plan to 2025, 2030 and 2040, which studies and tests various transmission and storage projects, as illustrated in Figure 8. Such coordinated approach in planning allows, for instance, to better establish the importance of some particular transmission projects.

Figure 8. European Transmission projects from the ten-year network development plan 2018 (ENTSO-E, 2019b)



Section 3 – Identification of barriers to greater regional cooperation and coordination in the electricity sector

Section highlights

- *While some technical challenges remain to be solved, non-technical barriers complicate regional integration.*
- *These barriers prevent or hinder both regional integration and the most effective deployment of renewable sources in the electricity mix, required to reach GHG reduction targets.*
- *Political barriers dim the prospects for integration across the Northeast electricity sector, through the conflation of industrial policy objectives and climate-related ones.*
- *Decision-makers should give special attention to these barriers, notably by addressing social acceptance issues and by harmonizing electricity regulation and policies across jurisdictions.*

Increased integration requires meeting some technical challenges, such as the need for transmission infrastructure or managing dispatch and reliability over greater areas. Although these obstacles may be important, this section highlights additional and often overlooked non-technical challenges. Combined with technical challenges, they prevent or complicate efforts to coordinate the electricity sector across the Northeast. More specifically, institutional, political and social barriers prevent, slow down, or increase the cost of, regional cooperation and coordination to achieve GHG reduction and greater renewable energy take-up.

Institutional and organizational barriers

A first type of non-technical barrier to regional integration comes from the organization of regulatory and other overseeing governmental institutions. Both in the U.S. and in Canadian provinces, primary regulatory authority is in the hands of state- or province-based utility commissions, which have a mandate that requires they look over the costs and benefits for customers in their home jurisdiction. As a result, there is, by design, little incentive for these institutions to consider integration from a regional perspective. The U.S. Federal Energy Regulatory Commission (FERC) has however authority over interstate trade and favors the creation of Regional Transmission Organizations (RTOs), which compels greater electricity-sector integration among RTO-member states. Between 2001 and 2005, the FERC even pushed for the mandatory creation of RTOs across the U.S., all organized under a Standard Market Design – but this initiative was received with a lot of resistance and eventually failed.[9]

[9] States with lower regulated prices (resulting from favorable access to hydropower or coal) indeed resisted the concept of exporting more electricity to higher cost markets, with the consequence of experiencing higher local prices. Such change was unpopular among consumers groups and led to the rejection of RTO, mostly to protect local lower cost electricity. See Sullivan et al. (2003) for a detailed account.

Subnational authority over electricity markets, as opposed to a more central or federal control, can create a barrier to integration for a variety of reasons. Regulatory clustering across states or provinces, notably, makes integration difficult as it adds administrative and operational costs to collaborative arrangements between firms or governments from different jurisdictions. This is because this clustering often results in substantially different regulations and standards: as a result, regional collaboration requires their harmonization, which in turns involves political and regulatory actors from all jurisdictions involved.

This is further complicated by constitutional issues: for instance, Canadian provinces may be reluctant to pursue interprovincial transmission projects in order to avoid involving the federal government's participation through the National Energy Board approval process, which applies to designated interprovincial power lines. Favorable low-price regulation in some provinces, such as Quebec (made possible by the abundance of low-cost hydropower) can also complicate regional integration given the diverging pricing approaches.

In the U.S., the prospect of federal pre-emption may make Northeastern states and their regulatory agencies hesitant to pursue collaborative arrangements on a regional basis (Craig 2010). Moreover, regulatory preferences on tariff practices make it more difficult for large utilities to benefit from economies of scale following the integration of their operations across jurisdictions, as the definition of public interest applied by regulatory agencies in evaluating rate proposals varies across jurisdictions (Brown and Rossi 2010).

These difficulties come in addition to variation in the importance and role of electric utility companies, which have a government-sanctioned monopoly over certain aspects of the services they provide. This variation reflects distinctions in regulatory and political approaches that may be difficult to reconcile in regional collaboration efforts. For instance, some jurisdictions across the Northeast have fully deregulated wholesale markets, whereas others see a single state-owned enterprise dominate. Therefore, the prospects for integrating these markets raises questions about how to treat and resolve concerns over competitivity among public monopolies and private actors of various sizes.

For such reasons, these barriers prevent or hinder the regional integration of efforts related to achieving GHG reduction targets and increasing the share of renewables in the electricity mix, even when this integration would be more effective at achieving these objectives.

Political Barriers: Regional cooperation conflicting with industrial policy

In subnational jurisdictions, industrial policy is designed to achieve objectives such as job creation, expansion of certain sectors of economic activity, or technological innovation and leadership. With regard to fostering the deployment of renewable energy technologies, the political rationale has long been to couple the climate-related benefits with such industrial policy concerns. The electricity sector is often impacted by such policies, for instance when subnational governments encourage the development of wind and solar energy as a way to increase employment and innovation within its own jurisdiction – such as how New York's REV

is largely designed. Ontario and Quebec, in Canada, also largely justified their wind and, to a lower extent, solar investments in the name of local economic development.

In some instances, these objectives shape policy design, which may act as a barrier to a more effective expansion of renewables installed capacity, as it can raise the cost of achieving the targets by incorporating local industrial development or job creation concerns. In this situation, the objectives of GHG policy and industrial policy are conflicting, leading to suboptimal policies to achieve the former (Langlois-Bertrand et al. 2015). One example is Ontario's Green Energy and Green Economy Act of 2009, which contained feed-in tariff support for renewable energy technologies like wind and solar, but which required developers to respect minimum domestic content requirements. The stated objective was to use the legislation not only to increase the share of renewables in the electricity mix, but also to develop a manufacturing sector within the province and create "green" jobs. This had the effect of raising the price of renewables, thereby diminishing the rate of installations.[10] A similar wind investment program took place in Quebec, requiring some "local" content for contracted wind farms, that had to be of course located in the province.

Another example is the RPS program in New Hampshire, which was designed to be a key tool in reducing the state's emissions, by requiring utilities in the state to procure a steadily increasing share of their electricity from renewable sources. Under the program's rules, meeting RPS goals can be achieved in a variety of ways, and the general approach was to rely on the market to determine the most cost-effective options to meet the requirements. However, in the RPS legislation, the definition used by New Hampshire for eligible renewable sources specifically excluded large-scale hydropower. In practice, this results in making imports of low-emission electricity from neighboring Canadian provinces ineligible to meet RPS requirements, even when cost would be lower than other options. By design, New Hampshire-based producers are preferred over clean energy imports, at a higher cost linked to a significant expansion of local production from sources like wind, solar and local hydropower. Concerns related to job creation and promoting local industry, in particular, made the New Hampshire authorities – like several other jurisdictions in the region – very hesitant to procure large amounts of electricity from North of the border.

A third example is New York using its hydropower to foster development in some regions of the state. The New York Power Authority's ReCharge NY program, for instance, provides qualifying businesses with arrangements to get guaranteed access to specifically allocated hydropower at below-market prices. In return, the businesses must make commitments to expand their operations and/or to create jobs. Here as well, the result in terms of pushing for cost-effective GHG reduction strategies may be less than optimal, given that this low-carbon electricity is sold at a cheaper rate than the state could otherwise get. This results in a disincentive to increase efficiency in its use, or to develop the fleet of low-carbon resources, since below-market prices

[10] The domestic content requirement was eventually removed after being successfully challenged at the World Trade Organization by Japan and the European Union.

make it less attractive for utilities and renewable energy developers to install additional renewable resource capacity.

Therefore, political barriers also dim the prospects for integration across the Northeast electricity sector, through the conflation of industrial policy objectives and climate-related ones.

Social Acceptance Barriers

Given that regional integration often requires the building of new transmission lines, social acceptance barriers add to the difficulties of fostering collaborative efforts to achieve GHG reduction targets. Local opposition to infrastructure projects often comes from local populations concerned by the project's economic, environmental, social or sometimes simply visual impacts. In the energy sector, if opposition is strong enough, it can derail valuable regional integration projects. This opposition is often simplified in terms of Not-in-my-Backyard (NIMBY) arguments, although the rationales are often more varied (Komendantova and Battaglini 2016; Nelson et al. 2018)

In the specific case of transmission lines, opposition coalitions often consist of actors with very different interests and perspectives. In Maine, for instance, recent opposition to Central Maine Power's construction of a transmission line as part of the New England Clean Energy Connect to import hydropower from Quebec to Massachusetts (Clean Energy 83D solicitation) is composed of environmental groups (the Natural Resources Council of Maine (NRCM), the Sierra Club), local renewable energy producer associations (Maine Renewable Energy Association, ReEnergy Biomass Operation) and notably the New England Power Generators Association (NEPGA), a Boston-based trade group that represents mostly natural gas generators in the region. This coalition is made possible by the multiple concerns regarding the project, including environmental and tourism impacts (e.g., destruction of habitats, impact on landscape, uncertain impact on GHG emissions), local business concerns (e.g., crowding out of small local renewable producers, unfair advantage given to one large utility over other players), and, finally, local opposition from towns closest to the planned path with specific siting concerns (e.g., land property value, health risks).

Given the frequent presence of organized social opposition to transmission line projects, the failure to address such concerns results in a lesser take-up of renewables from a regional perspective, as it prevents the sharing of renewable resources across jurisdictions.

Overcoming barriers and the way forward

Realizing deeper integration across the Northeast electricity sector can result in higher penetration of renewables and increase effectiveness in efforts to reach GHG reduction targets. However, achieving this integration requires overcoming or eliminating institutional, political, and social acceptance barriers that add to technical challenges.

The examples above suggest a few points in moving forward. One is that institutional barriers imply a need for subnational jurisdictions to give special attention to regulatory discrepancies across jurisdictions. This is necessary to ensure that regional collaboration leads to a streamlining of efforts to harmonize and facilitate integration of grids across subnational jurisdiction borders. A second point is that combining renewable deployment efforts with industrial policy and job creation objectives appears to prevent more rapid and extensive penetration by renewables in the electricity mix. Although this type of policy rationale can help in selling government support for renewables to the public, this strategy seems to have reached its limits, and often works against achieving higher penetration levels for renewables across the region. This, in addition to providing a legitimate process for addressing citizens concerns over transmission line projects, must be a key concern for governments so that they manage to convince their constituents of the merits of regional integration and more aggressive renewable energy deployment.

Conclusion

The Northeast has ambitious economy-wide GHG reduction targets for 2030 and 2050. It already enjoys a low-carbon electricity sector, with declining emissions. However, given the decarbonization aspirations and likely increase of electricity demand, related to the decarbonization of transportation, heating and industrial processes, important changes will have to take place in the electricity sector to achieve GHG reduction targets.

The literature and the current disparities in the supply and demand clearly show that there would be significant benefits in integrating electricity sectors across the Northeast, especially if increased renewable penetration is required. These benefits derive from the increased efficiency at which the sector can operate if optimal collaboration and cooperation can be achieved and sustained. These efficiency gains would come from trade, pooling capacity, economies of scale, demand diversity, among others.

However, there are significant technical, institutional, political and social barriers that must be overcome to achieve the level of integration needed to efficiently and effectively achieve GHG reduction targets.

A first step toward addressing these barriers, which has already been largely recognized, is to strengthen regional collaboration through additional dialogue, sharing of information and data, and further technical and economic studies on the gains of and approaches to greater integration.

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RGGI
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