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Harmonizing the Electricity Sectors across North America

*Recommendations and Action Items
from Two RFF/US Department of
Energy Workshops*

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Abstract

To address a number of the recommendations included in the US Department of Energy's (DOE's) *Quadrennial Energy Review* (QER), Resources for the Future—in concert with DOE, two partners (the International Institute for Sustainable Development and Instituto Tecnológico Autónomo de México) and two host institutions (Boise State University and the University of New Mexico)—held two workshops in October 2015, looking at the electricity sectors in the United States, Canada, and Mexico. The workshops had several purposes: first, to identify gaps, best practices, and inconsistencies with regulations and electricity system planning across the three large North American countries; second, to inform the creation of legal, regulatory, and policy roadmaps for harmonizing regulations and planning; and third, to bring together individuals who can help implement greater harmonization, and also others who can offer helpful input. The two workshops examined policies, regulations, and planning associated with the electricity sector, and within this sector, environmental regulations (for air pollution, greenhouse gases, and renewables), and regulations and processes associated with the operation and planning of the electricity system, including generation and transmission. This paper summarizes recommendations and observations of workshop participants. The recommendations include action items for DOE, other government agencies in all three countries, research groups, academics, stakeholders, and others, to move toward greater harmonization of policy and planning affecting the electricity system.

Key Words: North America, electricity, electricity markets, policy design, policy harmonization

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Alan Krupnick, Daniel Shawhan, and Kristin Hayes*

This paper contains information, recommendations, and action items related to two workshops held in October 2015 entitled “Electric Power in the United States, Canada, and Mexico: Opportunities for Transboundary Regulatory and Planning Harmonization.” These workshops were put together by Resources for the Future and its partners and host institutions with funding from the US Department of Energy (DOE), in support of DOE’s mandate to investigate opportunities for stronger data, policy, operations/planning, and economic ties across energy sectors in the United States, Canada, and Mexico. The end goal is a roadmap for facilitating greater energy harmonization in North America.

Introduction

The past decade has seen significant, even historic, change to all facets of the energy sector in North America. Canadian oil sands development operates at scale even as provinces expand their climate policies, the shale gas and tight oil revolutions have transformed the US energy picture, and major institutional energy reforms in Mexico will enable substantial new investment in the Mexican oil, gas and electricity sectors.

The three countries have much to gain individually—and together—from these developments. It is easy to imagine scenarios in which enhanced cross-border energy trade could make energy-intensive economic sectors more competitive, improve North American energy security, dampen short-term energy price volatility, and, ultimately, stimulate continent-wide

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economic growth. In the electricity sector in particular, use of Canadian hydropower to help meet US renewable energy goals and construction of increased transmission capacity could enable expanded US imports of power from Canada. Similarly, low-cost power from Texas could flow across the border to Mexico, and renewable resources in northern Mexico could find a market in the US Southwest. Additionally, increased transmission capacity between the United States and Mexico could provide reliability benefits to grids on both sides of the border.

While private energy and capital markets throughout North America will drive the development of expanded continental energy and trade, there is a substantive role to be played by governments. Coordinated policies can effectively foster economic growth and technological development, and have the potential to improve some aspects of environmental protection. A more purposeful and coordinated North American energy strategy could serve to shape a shared vision of the areas where government policy can effectively be deployed to coordinate infrastructure development and project financing; reduce barriers to trade, investment, and technology; and develop harmonized approaches to reducing continent-wide carbon dioxide (CO₂) emissions.

The idea of integrating North American energy is not new. Following on the heels of the North American Free Trade Agreement (NAFTA) entering into force in 1994, a large two-year study led by the Energy Institute at the University of Texas in 1996 examined the goal of facilitating the free flow of cross-border trade in natural gas and electricity (Foss et al. 1998).¹ NAFTA has only created a few openings for cross-border energy trade, however, and there remains much opportunity for progress toward true energy market integration.

The US Department of Energy (DOE) acknowledged this opportunity in its recent *Quadrennial Energy Review* (QER), dedicating a full chapter to issues and questions concerning North American energy integration. The report highlights the benefits of integration, noting it “expands the size of energy markets, creates economies of scale, lowers capital costs, and reduces energy costs to consumers” (DOE 2015) as well as increases electricity reliability.

A number of recommendations are included in that chapter, including one calling for the establishment of “collaborative programs in each country for academic institutions and not-for-profits to develop legal, regulatory, and policy roadmaps for harmonizing regulations across borders” and to “identify gaps, best practices, and inconsistencies with regulations in Canada

¹ There are many publications since then on this topic, such as Klein, Tobin and Angevine (2008).

and/or Mexico with the goal of harmonization” (DOE 2015). The QER also highlights the importance of increased coordination of planning, data-sharing, modeling, and forecasting.

Defining Harmonization

What does harmonization mean in the context of North American energy? We use the word harmonization to cover a broad spectrum of activities ranging from basic information sharing to considering impacts on neighboring countries in policymaking and planning, to broadly coordinating policies and decisionmaking, to actually making policy changes that align policies—and all the way to fully integrating energy policies, as one would in a customs union or common market.

There are already many examples of harmonization within this range in North America:

- As an example of information sharing, in 2014 the three countries signed a Memorandum of Understanding on the sharing of energy-related data and definition of terms (led by the US Energy Information Administration).
- An example of considering impacts on the other nations (in this case, all other nations) is the use in some US federal government regulatory decisionmaking of a global damage estimate for greenhouse gas emissions.
- The North American Electric Reliability Corporation, which involves Canada, the United States, and northern Baja California, provides examples of broadly coordinating some policies, planning processes, and decisionmaking, and of integrating others. The linked greenhouse gas emission cap-and-trade programs of California and Quebec provide another example.
- An example of policy coordination between the United States and Canada is the tightening of standards for railcars, tracks and the like after the major spill of Bakken oil in Lac-Mégantic in 2013. In this case, no attempt was made to make these policies the same, but there was recognition that the countries should communicate about the changes being contemplated.
- Finally, an example of more complete policy harmonization is in Canadian automobile emissions and fuel economy policies; these mirror those of the United States in stringency over time, primarily because the US and Canadian vehicle markets are fully integrated.

Benefits of Harmonization

It is important to consider why countries might choose to invest the time and energy required to share information, coordinate policymaking, or even fully harmonize policies.² Harmonization is not automatically beneficial, but it can lead to beneficial outcomes under certain conditions. First, it is beneficial if it allows a worthwhile activity such as power generation or emission reductions to occur where that activity can be accomplished at the lowest cost. Linking emission cap-and-trade programs is an example of a harmonization action that can have this benefit. Enabling the free flow of power, and equalizing the marginal tax rate on generation, are additional examples.

Second, harmonization is beneficial if it reduces transaction costs. For example, if regulatory requirements are sufficiently similar on both sides of a border, then companies can use just one set of procedures for complying with them, saving the expense of having to follow two different sets of procedures.

Third, harmonization can be beneficial if it takes the form of coordinated decisionmaking that makes possible additional options. Considering the integration of assets and markets on both sides of the border through coordinated decisionmaking enables market access and system efficiency gains. For example, deciding to meet a system's needs with a new transmission line instead of a new power plant is possible only with coordination.

Fourth, where cross-border externalities exist, such as pollution from Country A flowing across the border into Country B, charging the sources of those cross-border externalities can be beneficial from a central planner's perspective. From the perspective of Country A, an easier case for such harmonization can be made if cross-border externalities flow both ways.

Finally, harmonization can be beneficial if it takes the form of Government A adopting a policy like that of Government B that ends up serving A better than its alternative. For example, a country, state, or province with a command-and-control scheme for regulating emissions might be able to reduce the cost of its intended emission reductions by following the example of those governments that have adopted an emission pricing policy.

² The benefits of harmonization described here primarily reflect the authors' vision, but were also introduced at the North American Electricity Harmonization Workshops to provide a common premise for the workshop discussions.

Workshop Takeaways and Action Items

The two workshops yielded a large number of ideas that DOE, other government agencies in all three countries, research groups, academics, stakeholders, and others could consider to move toward harmonization of energy policy and planning affecting the electricity system. The workshops were not designed to drive to consensus in any way, and the lists below therefore reflect a set of ideas embraced by various participants to various degrees. It is also important to note that participants also highlighted several areas where cross-border energy cooperation is already quite effective, including the role played by the North American Electric Reliability Corporation (NERC) in coordinating reliability across international borders.

Goals and Principles for North American Energy Harmonization

- Be clear on the goals of harmonization, and decide on the ends that are to guide harmonization and planning decisions. Possibilities include reductions in direct costs, reduced outages, reductions in CO₂ and other types of emissions and concentrations, and increased rates of economic development. Maintaining energy reliability and security was felt by some participants to be the first priority when considering a new cross-border project.
- Move deliberately but quickly, as time is of the essence. Mexico's new energy reforms are being developed and implemented now.
- Utilize the "do no harm" principle with respect to the shared reliability standards and institutions in the US/Canada/northern Baja California electricity relationship. In that area, there is much that works well and that should be preserved.
- Consider the challenges and opportunities presented by subnational regulation by states/provinces, cities, etc. and their cross-border counterparts. Problems can develop when sub-national entities have their own ways of regulating that differ markedly from their neighbors—and yet, in some cases, subnational regulation may be more politically feasible than national regulation. A good example of a subnational policy opportunity is California and Quebec's effort to develop a shared trading system for greenhouse gas emissions allowances, which may soon expand to include Ontario, Manitoba, and Mexico as well
- Be open to using a portfolio approach: establish deals over multiple projects where any single project might not be mutually beneficial.
- Include communications activities to bring stakeholders, the press and the general public on board.

- Continue and expand spending on research and technology innovation in all three countries, and consider creating common pools of research funding and collaborative projects in this area. Technology sharing may be a low controversy area for harmonization, so long as patents and related issues are addressed.
- Think about harmonization issues in the context of the future electricity system, rather than the current one. The electricity system will be more distributed in the future and more dependent on renewables. Being able to import power when it is needed and export it when it is abundantly available will help balance supplies and ease energy transitions.
- Consider the natural gas market in the electric harmonization analysis.

Action Items for Systems Operation, Reliability, and Transmission Pricing

- Coordinate operation between neighboring systems more closely, including those on opposite sides of an international border, to increase reliability and reduce the total cost of the electricity supply. Examples of close coordination include Manitoba with the rest of the Midcontinent Independent System Operator, northern Baja California with the US state of California, and New York with the neighboring provinces and states. In each case, it is largely the control area operators and/or regional transmission organizations that are coordinating their operation. Variable generation sources such as wind and solar add to the sophistication required to achieve efficient trade of energy and ancillary services.
- Where transmission prices include extra charges in addition to the difference in marginal cost of supply, explore whether those extra charges are more distortionary than the alternative means of collecting the necessary revenues, such as higher income taxes or sales taxes. Similarly, where power crossing the border earns a lower price if it comes from a more distant generator (a phenomenon reported to occur in MISO), study whether such a pricing differential is justified.
- Examine the extent of taxes that apply specifically to imported or exported power, such as Ontario's electricity export tax, and whether they should be eliminated.
- Examine not only whether there are restrictions on selling energy across the border that could and should be reduced, but also whether there are restrictions on selling ancillary services across the border that could and should be reduced.
- Modify rules and incentives that prevent electric distribution utilities from taking advantage of opportunities to reduce costs (taking into account any costs of maintaining reliability) or improve reliability by trading more with domestic or international neighbors (on existing ties or by building additional ones). For example, a utility is likely to have its costs covered, and may raise its profits, if it favors the generation capacity it

owns, builds its own additional generation capacity, or favors local generators, even when lower-cost supply is available from across the border.

- Consider reducing the restrictions on participation by US federal entities, such as the Bonneville Power Administration, in open, competitive markets. Reducing those restrictions could reduce total system-wide costs and, for entities near an international border, make cross-border flows more economically efficient. An impediment is that such participation could subject these entities to US Federal Energy Regulatory Commission (FERC) regulation that they may wish to avoid.

Action Items for Planning, Siting, and Approval Processes

- Compare siting regulations and practices across the three countries.
- Assess whether US permitting of proposed cross-border transmission infrastructure investments can be streamlined. Related to this, assess whether the border crossing point can be agreed upon in an international review process.
- Improve and apply benefit-cost analysis methods and standards for potential new transmission lines and other investments that increase cross-border transmission capacity.
- Examine whether disagreements over cost allocation may prevent beneficial future cross-border infrastructure from being built. If so, attempt to establish a process for determining cost allocation that will prevent such disagreements. Calculating compensation for those who are likely to be hurt by such infrastructure could further improve the effectiveness of such a process.
- Modify the incentives or approval processes for entities that may incur stranded costs from a project with positive net benefits such that they are unable to prevent such a project from being built.
- Align (or eliminate) federal permitting requirements for electricity exports.

Action Items for Harmonizing Environmental Regulations on Air Pollution, Climate Change, and Renewables

- On cross-border policy for conventional air pollutants (SO₂, NO_x and ozone), evaluate whether cross-border pollution issues among the three countries warrant expanded policy harmonization beyond what is already covered in the US-Canada Air Quality Agreement—and also understand how any such pollution is distributed among the three countries.

- Analyze the possibilities of Clean Air Act section 115 language for incorporating another country's damages and costs into US benefit-cost calculus for rulemaking purposes. Look for similar provisions in Mexico's and Canada's statutes.
- Consider how previous links between cap-and-trade programs have been made (between states, and between states and provinces); look to Quebec and Ontario on linking with California. Study how to facilitate Mexico joining California and Quebec's trading program or another large emission trading program.
- Implement clear criteria to define renewables consistently in all three countries, including for purposes of facilitating trade in renewable energy credits and/or allowing imports of renewable energy to satisfy domestic GHG reduction requirements.
- Research competitive renewable energy zones in California and Texas for the applicability of the concept elsewhere in North America, both within and between countries.
- Learn from the mistakes and successes of the California Air Resources Board's experience in designing, evaluating, monitoring, and verifying emissions and in developing an emissions trading system. California's South Coast Air Quality Management District RECLAIM Program, a tradable permit program for a conventional air pollutant, could provide additional useful program features for other jurisdictions designing emission trading programs, such as Mexico.
- Conduct research on the subsidies, incentives, and taxes that exist for renewables in the three countries, as well as how electricity market competition compares across the three countries. Evaluate whether these differences create distortionary outcomes in terms of renewable energy siting.

Cross-Cutting Items

- Develop an inventory of recently completed and ongoing research on cross-border electricity policy and harmonization issues.
- Consider building a North American energy market and policy model that incorporates an electricity sector and a natural gas sector, at a minimum. Such a model would be useful for infrastructure planning, and to test the costs and benefits of various policy proposals. Data needs for such a model are high.
- The trilateral memorandum of understanding and related work on data sharing were strongly endorsed in both workshops. FERC is also currently sharing information on standards development and enforcement practices with its Mexican counterpart, the Comisión Reguladora de Energía. Beyond the terminology and data sharing efforts already underway, there is a need to stimulate data development, as sometimes key data

series are not collected. There would be benefits from sharing monitoring, verification, and enforcement practices.

- Examine the outcomes of past regulatory harmonization efforts (while being mindful that North America would have its own unique set of circumstances and challenges). For example, consider the case of Scandinavian power system integration, or the lessons learned about cross border cost allocation from regional filings between regional transmission organizations in the past 5 years.
- Identify how regulation differences across countries may cause distortions if national markets become more harmonized. Could differences in regulatory incentives potentially create unintended consequences if electricity markets were to become more integrated than they currently are?
- Consider developing a series of pilot projects (either bilateral or trilateral) that make sense to the countries involved irrespective of broader policy reforms. Projects that help both (all three) countries are the lowest hanging fruit. Alignment of policies would not need to be an end result of these projects; instead they can simply foster a safe place for conversations and build cross-border groups that take ownership.
- Consider developing a coordinated regulatory framework for cross-border energy projects. In addition, if we treat the border as a region on its own politically, we could have specific standards and processes for benefit-cost analysis, cost-sharing, permitting, environmental protection, reliability, etc., that could increase harmonization on matters for which the two countries as a whole are not sufficiently harmonized.
- Develop a continent-scale plan for facilitating renewables. To make renewables as efficient and desirable as possible, such a plan could examine the locational advantages of such systems on a North American scale, accounting for transmission and possibly habitat issues.
- To move ahead with climate change policy integration, consider beginning with the goal of developing a North American Intended Nationally Determined Contribution (INDC) for 2050 and working backwards to lay out the necessary steps to develop such a vision.
- Develop an initiative on expanding the workforce for the electricity sector, including addressing labor policy. One idea is to develop joint certification programs so a person getting certified in one country to work on power systems would be accepted to work on such systems in the other countries. A starting place would be to look at the workforce initiatives the US Department of Energy developed under the American Reinvestment and Recovery Act; these could be continued or expanded.
- Establish a North American initiative on cybersecurity of the electricity systems in anticipation of their greater integration and interdependence, and their vulnerability to the

weakest link being compromised. This could be a new initiative, a further development of the collaboration efforts to date, or both.

- Create a North American energy security blueprint. Such a blueprint could have an outside component (e.g., how a North American energy bloc would be advantageous from an energy security perspective). It should also have an internal component (e.g., examining the risks to Mexico from much greater reliance on US natural gas).
- Build an understanding of institutional counterparts across governments to facilitate effective cooperation. Assess how the three governments could develop mappings of sister agencies across the three countries to facilitate the development of effective working groups.
- Alternatively, expand already-existing working groups to include broader participation. For example, are there NERC working groups that don't currently have representatives of mainland Mexico? Participants noted that NERC's Electricity Information Sharing and Analysis Center covers sharing information on cybersecurity--and commented that Mexico should be integrated into this framework.
- Consolidate or closely coordinate planning over large areas of North America, areas that span the international borders (beyond the US-Canada interconnections already covered by NERC). Finding the best options can require consideration of impacts or transmission lines that span multiple control areas. A logical option would be to start the Mexico-US coordination at the interconnection level (i.e., mainland Mexico with the Western Electricity Coordinating Council (WECC) and Mexico with the Electric Reliability Council of Texas).
- Open up dialogue on an official "E-NAFTA" dealing with energy and with environmental policy.

Conclusion

Although there is no perfect framework for prioritizing the many action items listed above, there are a few next steps that stand out (to the authors of this report) and may be worthy of near-term attention. The appendix provides an explanation of possible criteria that could be used to evaluate the recommendations from these workshops. Some key priority recommendations include the following:

1. *Embark on foundational research efforts—develop an inventory of cross-border research; build a North American energy market and policy model; estimate the benefits of harmonization.*

As acknowledged in the QER and elsewhere, a need exists for additional tools to better estimate the benefits and costs of North American energy policy harmonization actions and of potential new transmission and pipeline links. Building an inventory of cross-border research to understand what analysis has already occurred and building tools for better and more extensive analysis are both essential.

2. Expand participation in already-existing organizations.

Considering the low cost of effort, looking for opportunities to expand tri-country participation in existing organizations seems to be a clear priority: no new institutions are needed for it, and the value of information imparted to new participants (particularly from Mexico) could be quite high. For example, Mexico's power grid entities and WECC could join or closely coordinate to enable mutual improvements in power system operation, planning, and acceptance of new transmission ties. Workshop participants also raised the example of NERC working groups that do not currently have representatives from mainland Mexico, including the Electricity Information Sharing and Analysis Center that covers cross-border exchanges on cybersecurity.

3. Work toward greater climate policy integration, potentially leading toward a North American INDC for 2050.

Underlying a number of workshop recommendations is the idea of closer, continent-wide collaboration on climate policy. As part of this, participants recommended setting a goal of developing a North American INDC for 2050 and working backwards from that goal to lay out the necessary steps to achieve it. These steps could range from development of government-to-government working groups, to information sharing and planning for a coordinated INDC, to real greenhouse gas policy integration. Taking any—let alone all—of these steps is certainly no small undertaking, but they have the potential to deliver large economic as well as environmental benefits to all three countries.

4. Implement closer coordination of electricity system operation and planning.

Closer cross-border coordination would provide cost reductions and reliability improvements. Some specific targets (taken from bullets above) include wide-area planning, improved benefit-cost analysis, streamlined project approvals, and an agreed-upon method of calculating cost allocations. In addition, regulators could enable greater coordination by modifying incentives for utilities.

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Appendix. Suggested Criteria for Evaluating Recommendations

1. Is this effort foundational?

Certain efforts—whether carrying out a study, building a model, or building a new institution—are important, even critical, building blocks for other, longer-term efforts. They may represent opportunities to fill knowledge gaps, or may be necessary precursors to completing other longer-term actions. In other words, which activities are foundational to advancing other harmonization efforts?

2. Does this effort have a high value of information?

Economists often consider the value of information as an important evaluation criterion. The value of information increases with the probability that that information will change decisions. If a particular research study simply adds to an existing literature without creating a new point of view, it has less value. Where information is lacking, a study can have high value if no decisions have been contemplated because of that lack.

3. To what degree does this effort immediately or ultimately address a market failure?

Economic principles suggest that government should focus on involvements that address or limit a market failure. By market failure, we mean that an unregulated market is unable to deliver quantities of goods and services that are socially optimal as a result of an inherent characteristic, such as environmental or network externalities, or conditions that prevent adequate competition. Bigger market failures and/or much movement toward ameliorating those failures would prioritize an action item over other action items. We decompose this criterion into two parts: the impact of the market failure, and the extent to which the effort in question could reduce that market failure.

4. What is the value of this effort?

Certain action items do not address market failures but call for the organization of institutions and so on. We use this criterion to rank them according to the value we believe they could provide as a forum or engine for change. Notice that if a ranking is in the market failures columns, it is not in the value column and vice versa.

5. What is the political feasibility of this effort? To what extent is there momentum behind this effort that should be capitalized on?

Although often thorny to gauge, this criterion is perhaps the most practical on our list. There is value in considering the related issues of political feasibility and momentum when

prioritizing next steps; for example, at the moment, a number of Canadian provinces have put forward new carbon pricing mechanisms, some of which may tie into existing US-Canada programs. Given the momentum behind these policy changes, doing research on linking options may receive higher priority than it would otherwise.

6. What is the cost of this effort?

The person-hours and other costs of the effort may help determine some “low hanging fruit” worthy of shorter-term action. For example, a relatively low-cost regulatory review that has a high value of information might be prioritized; at the same time, projects with higher costs of effort should not automatically be penalized. In these cases, the large scale of effort simply needs to be valued against the other criteria described here.