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Rethinking Regulation to Decarbonize Canada

Directing Decarbonization

Examining regulatory barriers to a cleaner electricity grid

Lia Codrington and Grace Brown

March 2024

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Recommended citation: Codrington, Lia and Grace Brown. *Directing Decarbonization: Examining regulatory barriers to a cleaner electricity grid*. The Pembina Institute, 2024.

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Acknowledgements

The Pembina Institute wishes to thank Environment and Climate Change Canada for their generous support of this work.

We thank the project Advisory Committee members – Chris Chapelsky, Ben Derochie, Rachele Levin, Mima Micic, Matthew Roorda, and Jay Wilson – for their valuable contributions and insights throughout the course of this research. While these contributors represent a diversity of professional backgrounds and perspectives, their contributions to the Advisory Committee are made as individuals. The content presented in this report is the sole responsibility of the Pembina Institute and may not necessarily reflect the views or opinions of the respective organizations of Advisory Committee members.

The Pembina Institute acknowledges that the work we steward and those we serve span across many Nations. We respectfully acknowledge the space our organization is headquartered in as the traditional and ancestral territories of the Blackfoot Confederacy, comprised of the bands Siksika, Piikani, and Kainai, the Îyârhe Nakoda Nations, including the bands of Goodstoney, Chiniki, and Bearspaw, and the Tsuut'ina Dené. These Lands are also home to the Métis Nation of Alberta — Region 3 whose Peoples have deep relationships with the Land.

These acknowledgements are some of the beginning steps on a journey of several generations. We share them in the spirit of truth, justice, reconciliation, and to contribute to a more equitable and inclusive future for all of society.

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Executive summary

Canadian electricity systems must implement wide-ranging changes to meet decarbonization targets, and regulatory authorities can play a central role in facilitating this transition. However, regulatory structures as they currently stand are not well-suited to facilitate the scale of investments that are necessary to meet the nation's climate goals. Mobilizing cohesive regulator action towards the energy transition is especially challenging in Canada, where provinces and territories are responsible for managing the regulation and operation of their own electricity systems, resulting in 13 different approaches to regulation across the country.

Understanding opportunities for change begins with an understanding of the current systems of electricity regulation in Canada. Nationally, Canada does not have an overarching federal body that oversees utility regulation. Although every province and territory has constructed a different regulatory environment to govern their electricity system, each regulatory structure was shaped by the same guiding principles: the regulatory compact, an agreement that grants a company a protected monopoly in exchange for supplying reliable electricity to all at a reasonable price; the Bonbright Principles, a framework for reasonable rate design and assessment; and regulatory constructs, a toolbox of best practices.

Regulators can also enact change through the design of approval processes and exemptions, utility remuneration schemes, and benefit-cost analyses. Additionally, each province and territory, as well as the federal government in a more limited capacity, has intervention points they can use to change how electricity is regulated in their jurisdiction.

Governments and electricity regulators have begun using these intervention points, as well as other creative solutions, to address barriers in their regulatory systems. A literature review and interviews with electricity system stakeholders identified some of these key regulatory barriers to accelerated electricity system decarbonization, as well as examples of how they have been addressed in jurisdictions outside of Canada. These barriers can be organized into six categories:

1. Limited inter-jurisdictional coordination towards electricity system innovation
2. Lack of strategic direction and governance on the path to net-zero
3. Slow and burdensome regulatory processes
4. Complexities associated with adding new technologies to the grid

5. Information asymmetry between electricity system stakeholders
6. Concerns surrounding the affordability of a decarbonized electricity system.

The regulatory intervention points and case studies described in this report provide a suite of options from which governments and regulators can draw inspiration as they adapt their regulatory structures to enable decarbonization in today's changing grid. Given the differences between electricity systems across the country, each provincial and territorial government and regulator will need to combine these strategies in a way that best supports innovation and utility viability in their jurisdiction.

This introductory report is the first in a series that aims to uncover the regulatory bottlenecks that inhibit grid modernization and decarbonization in Canada and to recommend potential solutions to address these barriers. Subsequent reports will focus on challenges and solutions specific to the electricity systems in Ontario, Alberta, and remote and Indigenous communities in British Columbia and the territories. Understanding the unique circumstances in each of these focus areas will reveal insights and opportunities for regulatory reform that can be applied across the country.

1. Introduction

In 2021, the Government of Canada committed to achieving a net-zero electricity grid by 2035 and net-zero emissions by 2050.[1] A clean electricity grid with increased capacity is essential for achieving emissions reductions in Canada's highest-emitting sectors — oil and gas, transportation, and buildings — as these sectors electrify. Canada's electricity grid is already nearly 84% non-emitting, and momentum is building to decarbonize the rest while adding increased clean capacity to meet growing demand.[2] In 2023, the federal government proposed the Clean Electricity Regulations, a set of performance standards beginning in 2035 that are meant to reduce greenhouse gas (GHG) emissions from fossil-fuel-based electricity generators. The federal government also announced a series of investment tax credits that encourage growth in the country's clean technology manufacturing and clean electricity generation industries as part of Budget 2023.

While these federal-level announcements signal that the Canadian government is committed to the clean energy transition, decarbonizing electricity systems across the country requires action at the provincial and territorial level as well. Section 92A of the Constitution Act holds provincial and territorial governments responsible for the electricity grid within their borders.[3] As a result, Canada hosts 13 electricity systems, all with different generation mixes, regulatory bodies, and market structures. While some provinces and territories have taken steps towards decarbonizing their grids, the fragmented and individualist nature of the Canadian electricity sector makes interregional coordination and collaboration challenging.

Across all of Canada's electricity systems, outdated approaches to regulation remain a barrier to achieving a net-zero electricity grid. Some of these regulatory challenges differ between provinces and territories because of their unique electricity market and regulatory structures, while others persist across the country. To accelerate national achievement of net-zero electricity, each province and territory will need to pursue the

[1] Government of Canada, *Canadian Net-Zero Emissions Accountability Act,* S.C. 2021, c. 22. https://laws-lois.justice.gc.ca/eng/acts/c-19.3/fulltext.html

[2] Environment and Climate Change Canada, "Table A13-1: Electricity Generation and GHG Emission Details for Canada," November 10, 2023. https://data-donnees.az.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/C-Tables-Electricity-Canada-Provinces-Territories/?lang=en

[3] Government of Canada, *Constitution Act* (1867), VI. Distribution of Legislative Powers, Section 92, 23. https://laws-lois.justice.gc.ca/PDF/CONST_TRD.pdf

regulatory reform opportunities that are most effective for their own system. That said, adopting common approaches can help support collaboration on inter-provincial transmission and other matters, which can make the electricity system cleaner, more reliable, and more affordable. Other jurisdictions such as Australia and the United States have increased generation efficiency, reduced greenhouse gas emissions, and saved ratepayer dollars by developing regional and national electricity governance structures that enhance coordination.[4,5] This report is the first in a series that aims to provide a roadmap of available regulatory reform opportunities and potential solutions, including case studies from other jurisdictions, for the provinces and territories within the project's scope.

1.1 About this report

This introductory report provides an overview of current electricity regulations in Canada. It examines common motivations behind electricity regulation, existing regulatory structures in the country, and the mechanisms employed to provide direction to these provincial and territorial regulatory structures. This report also highlights common regulatory barriers that inhibit grid modernization, as determined from existing work and interviews with electricity system actors. Finally, it presents case studies from jurisdictions around the world that have already begun to address regulatory barriers.

The regulatory barriers in this report have been organized into six categories:

1. Limited inter-jurisdictional coordination towards electricity system innovation
2. Lack of strategic direction and governance on the path to net-zero
3. Slow and burdensome regulatory processes
4. Complexities associated with adding new technologies to the grid
5. Information asymmetry between electricity system players
6. Concerns surrounding the affordability of a decarbonized electricity system

[4] Alan Rai and Tim Nelson, *Australia's National Electricity Market after twenty years* (Centre for Applied Energy Economics & Policy Research, 2019), 6. https://www.griffith.edu.au/__data/assets/pdf_file/0030/1800687/No.2019-05-NEM-after-twenty-years-TN41.pdf

[5] William Massey, "Organized regional power markets: A rich source of benefits", *Utility Dive,* January 28, 2021. https://www.utilitydive.com/news/organized-regional-power-markets-a-rich-source-of-benefits/594080/

The information contained in this report will serve as a base and reference from which future reports will draw.

1.2 About future reports in this series

To facilitate a deeper dive into regulatory barriers and solutions, three focus areas have been selected for more detailed analysis: Ontario, Alberta, and remote and Indigenous communities in British Columbia and the territories. These focus areas were selected due to their high decarbonization potential and unique circumstances that make them important case studies for understanding pathways to electricity system decarbonization across the country.

1.2.1 Ontario

Ontario, Canada's most populous province, is the country's second-highest generator and consumer of electricity.[6,7] Its partially deregulated electricity market is unique and complex. The province's electricity demand is expected to double to about 300 TWh by 2050, driven by electrification, population growth, and an expanding industry sector bolstered by the availability of affordable, clean energy.[8,9] Meeting these unprecedented demand forecasts in a way that maintains and improves upon the province's existing low-emissions grid will require thoughtful capacity expansion as well as other, more creative solutions.

Ontario's electricity regulator, the Ontario Energy Board, and system operator, the Independent Electricity System Operator, have already begun exploring how distributed energy resources can be integrated into the grid to help address rising demand. Lessons learned from Ontario's complex electricity market and existing innovations can show how regulatory reform in other provinces can support the implementation of new technologies. This report will analyze potential regulatory opportunities to accelerate

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[6] Canada Energy Regulator, "Provincial and Territorial Energy Profiles – Canada," August 23, 2023. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html

[7] Natural Resources Canada, *Energy Fact Book 2022-2023*, 60-61. https://natural-resources.canada.ca/sites/nrcan/files/energy/energy_fact/2022-2023/PDF/Energy-factbook-2022-2023_EN.pdf

[8] IESO, *Pathways to Decarbonization* (2022), 26. https://www.ieso.ca/en/Learn/The-Evolving-Grid/Pathways-to-Decarbonization

[9] Ontario Ministry of Energy, *Powering Ontario's Growth* (2023), 34. https://www.ontario.ca/files/2023-07/energy-powering-ontarios-growth-report-en-2023-07-07.pdf

the adoption of new technologies and new approaches to meet Ontario's growing demand.

1.2.2 Alberta

There is ample opportunity for grid modernization and decarbonization in Alberta. While Alberta provided less than 10% of Canada's electricity generation in 2021, it accounted for nearly half of the country's total electricity emissions.[10] However, Alberta's grid has decarbonized much more quickly than any projections suggested, due to an accelerated phase-out of coal-fired power and the explosive growth of renewable energy. Alberta's deregulated, energy-only market presents unique opportunities for clean, reliable power sources to enter a competitive marketplace.

Momentum towards much-needed decarbonization in the province, as well as its competitive electricity market, will provide an interesting case study on how regulatory reform can be beneficial in a deregulated system. This report will examine regulatory pathways Alberta can deploy to achieve a clean, affordable, and reliable electricity grid under the province's unique market construct.

1.2.3 Remote and Indigenous communities

Current regulatory and legislative structures are not conducive to supporting Indigenous ownership and the application of Indigenous rights and energy sovereignty in the clean energy transition. British Columbia has legislated the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), meaning the province has a legislated responsibility to integrate Indigenous rights into energy planning. In the territories, Indigenous communities make up a significant portion of the population and the remote nature of their electricity grids presents a unique challenge for decarbonization.

Evaluating regulatory reform in these jurisdictions provides a unique lens through which to support Indigenous-owned renewable energy projects. This report will describe the status quo and evaluate paths forward to enable Indigenous-owned renewable energy projects in remote communities in British Columbia and the Territories.

[10] Will Noel and Binnu Jeyakumar, Z*eroing In: Pathways to an affordable net-zero grid in Alberta*. (Pembina Institute, 2023), 12-13. https://www.pembina.org/pub/zeroing-in

2. Current regulatory practices

The electricity industry is a classic example of a natural monopoly. High barriers to entry, including formidable start-up costs and the challenges of building economies of scale, make it easier for one organization to construct and operate the generation, transmission, and distribution infrastructure in a region. This structure exists in most Canadian provinces and territories, giving these early actors the potential opportunity to operate their electricity systems as they see fit. The role of electricity regulators is crucial for protecting consumers in situations with weak market forces by ensuring that utilities cannot abuse their monopoly status.[11] There are several guiding principles that regulators follow to keep electricity ratepayers' best interests at the forefront. Some of these principles are almost as old as the electricity system itself and as progress towards the clean energy transition drives significant changes in the industry, they are also evolving and being applied in new ways.

2.1 Regulatory compact

The regulatory compact is a general term describing agreements between regulators and companies where, in exchange for supplying reliable electricity to all at a reasonable price, the regulator grants the company a protected monopoly.[12] The purpose of the agreement is to reach a compromise between the economic interests of the electricity companies, who want to maximize their revenue, and their ratepayers, who want their electricity bills to be as low as possible.

Although this kind of agreement between regulator and service provider has created a stable foundation for the electricity system over the years, new business models and technologies have created a shifting landscape. Alberta transitioned to a fully deregulated market in 2001,[13] and Ontario adopted a partially deregulated electricity

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[11] Karl Rábago and Radina Valova, "Revisiting Bonbright's principles of public utility rates in a DER world," *The Electricity Journal* 31 (2018), 10.

[12] Marla Orenstein, *Changes & Challenges to the Regulatory Compact* (Canada West Foundation, 2019), 2. https://cwf.ca/research/publications/backgrounder-changes-challenges-to-the-regulatory-compact/

[13] AESO, "Guide to understanding Alberta's electricity market." https://www.aeso.ca/aeso/understanding-electricity-in-alberta/continuing-education/guide-to-understanding-albertas-electricity-market/

market in 2004 following a two-year experiment with full market deregulation.[14] Today, new business models, new players, and new technologies create opportunities to reshape the grid and change how customers pay for electricity. The regulatory compact may need to be updated to reflect this shifting landscape and enable utilities to innovate and remain viable.[15] Broadening the scope of the regulatory compact would make it applicable in jurisdictions like Alberta and Ontario, where utilities are not the only actors that the regulator must oversee.[16]

Like the structure of the electricity system, societal values have also evolved since the creation of the regulatory compact with its emphasis on reliability and price. Environmental impacts, Indigenous rights, equity, and decarbonization have become important components of the public interest. There are opportunities to adapt the regulatory compact such that regulators can optimize for multiple shared desired outcomes, rather than balancing electricity providers' and consumers' competing economic interests.[17]

2.2 Bonbright Principles

Ratemaking proceedings are an important way that regulators uphold the regulatory compact and ensure the financial needs of both electricity providers and consumers are met. Published in 1961, economist James Bonbright's *Principles of Public Utility Rates*[18] laid out a framework for designing and assessing reasonable rates that protect the public interest. The Bonbright Principles, which are still in use today, can be summarized as:

1. A utility revenue requirement must be established to ensure utilities can cover their costs.
2. These costs should be stable and fairly apportioned among customers.

[14] Government of Ontario, *Electricity Restructuring Act*, S.O. 2004, c. 23 - Bill 100. https://www.ontario.ca/laws/statute/s04023

[15] Robert Mechler, "The Changing Face of Power – The New Power Grid: Obligations in the Era of Change," in *Strategic Directions: Electric Report* (Black and Veatch, 2018), 43. https://webassets.bv.com/2019-11/SDR_Electric_2018.pdf

[16] *Changes & Challenges to the Regulatory Compact*, 2.

[17] *Changes & Challenges to the Regulatory Compact*, 2.

[18] James Bonbright, *Principles of Public Utility Rates* (New York: Columbia University Press, 1961).

3. Rate design should incentivize optimized energy use for maximum efficiency.[19,20]

These principles were established in a time where the electricity system was centralized, and large power plants were the only source of electricity.[21] With the emergence of distributed energy resources, increased competition in the electricity industry, changes to the definition of the public interest, an evolving climate and energy policy landscape, and an imperative for utilities to expand their capacity to meet growing population and clean energy needs, the environment these principles were originally designed for and applied in has changed significantly.

Despite this changing landscape, the Bonbright Principles are still applicable to ratemaking decisions today because of their universal nature and ability to capture the core priorities of utility ratemaking and the public interest.[22] The Bonbright Principles are not immutable rules, but rather a list of considerations that help regulators weigh all competing needs when evaluating a rate application.

2.3 Regulatory constructs

A number of regulatory constructs, or guidelines commonly accepted by regulators, have developed from the Bonbright Principles. These constructs are more specific and prescriptive than the principles upon which they were based, creating a toolbox of practices used by energy regulators around the world.[23] These constructs are generally followed, except in some jurisdictions under certain circumstances. Table 1 summarizes regulatory constructs and the rationale behind them.

[19] "Revisiting Bonbright's principles of public utility rates in a DER world," 10.

[20] Utilis Consulting, *Back to Bonbright: Economic regulation fundamentals can enable net zero* (Electricity Canada, 2023), 2. https://issuu.com/canadianelectricityassociation/docs/ec_sel_frame_-_2023_21_

[21] "Revisiting Bonbright's principles of public utility rates in a DER world," 9.

[22] *Back to Bonbright*, 41.

[23] *Back to Bonbright*, 41.

Table 1. Regulatory constructs and their rationale

Regulatory construct	Rationale
Just and reasonable rates	Approved rates should cover a utility's cost to provide electricity services.
Used and useful	Utilities only earn a return on their rate base, which is a collection of infrastructure assets they have constructed to provide electricity services. To be considered part of the rate base, an asset must be actively used and provide a useful service.
Fair return standard	Utility shareholders are entitled to a return on their investments. This return should be comparable to the return they would receive if they invested the capital in another enterprise with similar risk, and it must permit the attraction of incremental capital to the enterprise.
Cost-based pricing	Rates are set based on a utility's cost of service.
No retroactive ratemaking	Future rates should not be set to recoup a utility's past losses or refund extra earnings back to ratepayers.
Multi-year ratesetting	Cost-of-Service reviews are separated by several years, with rate indexation in intermediate years, to create rate stability for both utilities and customers.
Performance-based regulation	Utilities should be financially incentivized to align their priorities with public policy and customer needs. Utility achievement of outcomes in these priority areas can be measured with metrics such as PIMs.
Rate design	Consumers' bills should have an appropriate balance between fixed charges, demand charges, and consumption charges.
Postage stamp rates	Regardless of a customer's location and the actual costs a utility incurs to serve them, all like customers should pay like rates.
Benefit-cost assessments	When modifying the system, the utility undertakes an analysis of the viability of the proposed investments.
Capital contributions	Customers with identifiable needs that trigger system investment should contribute towards those added costs.
Cost causation	Costs should be allocated proportionately to the customer or rate class that caused those costs to be incurred.
Functionalization, classification and allocation	A utility's assets are routinely assessed and categorized so their costs can be appropriately assigned to customers.

Intergenerational equality	In a given period, ratepayers should only be responsible for the costs incurred to serve them during that period, not for past or future costs.

Adapted from: Utilis Consulting[24]

Because these regulatory constructs are more specific than the Bonbright Principles, some of them are losing their applicability in today's changing electricity landscape. This report will explore examples from a selection of jurisdictions, including the United States, the United Kingdom, and Australia, where updated applications of the regulatory constructs have been implemented to better reflect the needs of modern electricity systems. Specific updates to these constructs relevant to the provinces and territories within the project scope will be discussed in future reports in this series.

[24] *Back to Bonbright*, 43.

3. Electricity regulations in Canada

In Canada, provinces and territories are responsible for managing the regulation and operation of their own electricity systems, resulting in 13 different but interconnected grids and regulation structures across the country.

3.1 Electricity governance

Provincial and territorial governments have jurisdiction over the generation, transmission, and distribution of electricity that occurs within their borders.[25] Under this responsibility, provinces and territories are also required to oversee the planning and reliability of their respective electricity systems. All jurisdictions have recognized the reliability standard-setting expertise of the North American Electric Reliability Corporation (NERC). In British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia, NERC reliability standards or a slightly modified version thereof are mandatory and enforceable.[26]

While provincial and territorial governments manage their own electricity systems, the federal government provides support and oversight for matters that cross provincial, territorial, or international borders. Organizations under the federal government's umbrella address nationwide energy concerns. These include Natural Resources Canada (NRCan), which monitors and responds to potential energy emergencies across the country;[27] the Canadian Nuclear Safety Commission, which regulates all matters relating to nuclear energy; and the Canada Energy Regulator, which is responsible for electricity exports as well as international and interprovincial power lines.[28] Numerous

[25] Natural Resources Canada, "About Electricity," June 15, 2020. https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/electricity-infrastructure/about-electricity/7359

[26] North American Electric Reliability Corporation, "North America." https://www.nerc.com/AboutNERC/keyplayers/Pages/Canada.aspx

[27] Natural Resources Canada, "Canada's Electric Reliability Framework." https://natural-resources.canada.ca/energy/electricity-infrastructure/electricity-canada/canada-electric-reliability-framework/18792

[28] "About Electricity."

environmental regulations include provisions that pertain to electricity; however, this report focuses only on regulations that directly apply to electricity system governance.

3.2 Regulatory bodies

Utility regulators' permissions and abilities vary widely across the country. Most provincial and territorial governments have granted overarching regulatory authority to an independent board or commission, which uses its authority to oversee the operation of utilities. These kinds of regulators exercise their authority by setting the electricity rates that utilities are allowed to charge, approving the construction of new generation or transmission assets, and monitoring the wholesale electricity market, among other responsibilities.[29] In contrast, utility regulator roles in Saskatchewan and Nunavut are limited, with regulatory decision-making ultimately undertaken by the government itself.[30] The Canada Energy Regulator does not have jurisdiction over electricity systems within each province and territory; however, in the electricity sector, international and some interprovincial power lines as well as offshore renewable energy projects are the Canada Energy Regulator's responsibility.[31]

Where regulation is executed by an independent body, the provincial or territorial government provides that body with a mandate to guide their decision-making. This mandate is outlined in the legislation that grants the body regulatory authority over the electricity system. Most commonly, these mandates require the regulatory body to ensure that electricity in their jurisdiction is safe, reliable, and affordable for consumers.[32]

[29] Most regulator websites describe their legislated mandates and responsibilities; for example: Ontario Energy Board, "What we do." https://www.oeb.ca/about-oeb/what-we-do

[30] Navigant, *Starting a conversation: Is there flexibility to adapt Canada's current utility regulation landscape?*, prepared for Electricity Canada (2018), 2. https://www.electricity.ca/wp-content/uploads/2018/10/Navigant-Flexibility-to-Adapt-Regulation.pdf

[31] Government of Canada, *Canadian Energy Regulator Act*, S.C. 2019, c. 28, s. 10. https://laws-lois.justice.gc.ca/eng/acts/C-15.1/index.html

[32] Emily He, Grace Brown and Dave Lovekin, *Transforming the Utility Business Model: Options to improve services and opportunities for clean energy in remote communities* (Pembina Institute, 2022), 100-104. https://www.pembina.org/reports/transforming-the-utility-business-model.pdf

3.3 Market structures

Similar to electricity system regulation, electricity market structures vary across the country. The range of different markets can be described using three dimensions: vertical integration, ownership, and level of competition.[33]

Vertical integration refers to the level of control the same organization has over generation, transmission, and distribution. Ownership refers to whether generation, transmission, and distribution organizations are private or public. Finally, level of competition describes the openness of generation and retail markets. In some systems, only certain companies are permitted to provide these services, while in others any company can participate.[34] Systems with low levels of competition require strong regulation to compensate for the lack of market forces.

Each provincial and territorial electricity system in Canada falls somewhere in the space defined by these three axes. For example, the most common structure is a vertically integrated, publicly owned system with low competition, like those in B.C., Saskatchewan, Manitoba, Quebec, New Brunswick, Newfoundland and Labrador, and Nunavut.[35,36] A single company called a Crown corporation, owned by the provincial government, handles all aspects of the electricity system from generation to retail.[37]

Alberta's unbundled electricity system, which utilizes a competitive wholesale market, is on the opposite end of all three axes. Investor- and municipally-owned generation facilities respond to hourly price signals; the electricity is transported through investor-owned transmission lines and distributed by municipal companies and competitive retailers. Ontario reformed their electricity system with a similar approach in the early 2000s, but ultimately reverted to a partially regulated market that includes both real-

[33] Pierre Olivier Pineau, *Improving integration and coordination of provincially-managed electricity systems in Canada* (CICC, 2021), 5. https://climatechoices.ca/wp-content/uploads/2021/09/CICC-Improving-integration-and-coordination-of-provincially-managed-electricity-systems-in-Canada-by-Pierre-Olivier-Pineau-FINAL.pdf

[34] *Improving integration and coordination of provincially-managed electricity systems in Canada*, 5.

[35] *Improving integration and coordination of provincially-managed electricity systems in Canada*, 7.

[36] Elizabeth Dowdell and Sonak Patel, Nunavut Energy Market Profile (University of Alberta, 2018), 2. https://www.futureenergysystems.ca/public/download/documents/70235

[37] *Improving integration and coordination of provincially-managed electricity systems in Canada*, 6.

time, market-based electricity prices and long-term, contract-based procurements with regulated rates.[38,39]

Nova Scotia's electricity systems are vertically integrated but are operated by a privately owned company with limited competition. Independent Power Producers (IPPs) and generators outside the province can be contracted to supply electricity.[40] Newfoundland and Labrador, Prince Edward Island, Northwest Territories, and the Yukon fall in the middle ground, using unbundled systems with both investor-owned and Crown corporations.[41]

This diversity of electricity system markets and structures, as well as the provincially and territorially fragmented authority that created it, makes implementing nationwide solutions for accelerated decarbonization and electrification challenging. However, provincial and federal governments each have a toolbox of regulatory levers that they can apply to direct future development of Canada's electricity systems.

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[38] *Improving integration and coordination of provincially-managed electricity systems in Canada*, 6.

[39] Richard J. King, "Canada," in *Electricity Regulation*, ed. Kirsti Massie (London: Law Business Research, 2018), 49. https://www.osler.com/osler/media/Osler/reports/energy/Ontario-Electricity-Regulation-2018.pdf

[40] *Improving integration and coordination of provincially-managed electricity systems in Canada*, 6.

[41] *Starting a conversation*, 11.

4. Regulatory levers

Electricity systems are complex structures shaped by several different actors, but in general their rules are hierarchical. Acts sit at the top of the pyramid, followed by regulations, directive letters, and quasi-judicial rules, with standards and guidelines at the base. Acts are put in place by parliaments and legislatures to establish the highest-level rules. Regulations, orders, and directives are enacted by ministers or cabinets to create the next layer of rules to accomplish the act's intended outcomes. Acts often establish other bodies, such as utility commissions, and give them authority to make quasi-judicial rules that work like regulation. At the base of the pyramid, rules can take many forms, such as guidelines, methodologies, forms, and standards, and they are generally made by regulators to set detailed requirements, provide clarity, and improve efficiency. All of these are required to keep utilities aligned and working toward agreed-upon goals. Changes in these governing rules can direct actors to reshape the system and accomplish new goals.

Because electricity system governance in Canada primarily falls under provincial and territorial jurisdictions, the specific tools available in each province or territory differ depending on government legislation and what it enables regulators to do. Province- and territory-specific opportunities will be discussed in future reports; the regulatory levers presented here are a general overview of options that governments or other regulatory bodies could choose to apply.

4.1 Acts

Every province and territory in Canada has a legislative act, created by the provincial or territorial government, which governs and sets the mandate of the jurisdiction's utility regulatory body.[42] These mandates define the responsibilities of regulatory bodies and identify the priorities that will guide their decision-making. Most commonly, mandates require that electricity rates are just and reasonable, and that electricity services are reliable and safe.

[42] *Starting a conversation*, 3.

Regulators often view these mandates as a directive to make decisions based on their understanding of the public interest,[43] which some institutions narrowly interpret to consider only the ratepayers' financial concerns. In the United States, most public utility commissions consider their role to be exclusively economic.[44]

Updates to the legislative acts that outline regulator mandates provide provincial and territorial governments the opportunity to identify additional priorities beyond economics for their electricity regulators to consider during regulatory proceedings. The outcomes of regulatory proceedings influence utilities and other electricity system players to adopt any new priorities as well, ideally shifting the whole sector to align with provincial or territorial goals. However, in practice, economic considerations often outweigh other policy priorities, such as climate and energy targets, in regulator decision-making.

4.2 Letters of direction

Also known as mandate letters, letters of direction are directives from provincial and territorial governments to their electricity regulator that help maintain system alignment with state goals. These letters provide an opportunity for energy ministries to flag priority actions for their electricity regulator to advance over the coming year without the delay or administrative burden of a legislation update. The Ontario Ministry of Energy is already employing annual letters of direction to provide guidance to the provincial electricity regulator, the Ontario Energy Board (OEB).[45] However, these letters are not standard across all provinces and territories; they are not used in some jurisdictions, and in others, their prescriptiveness depends on the provincial or territorial ministry's priorities. Some jurisdictions use Memorandums of Understanding (MOUs) to communicate partnership expectations between regulators and other entities.[46]

[43] Tina Northrup, *A Comparative Analysis of the Legislated Electricity Regimes in New Brunswick and Nova Scotia* (East Coast Environmental Law, 2020), 4. https://www.conservationcouncil.ca/wp-content/uploads/2020/11/ECELNS_NBComparisonsSept2020.pdf

[44] Jessie Ciulla, Dan Cross-Call, Cory Felder and Aaron Schwartz, *Purpose: Aligning PUC Mandates with a Clean Energy Future* (RMI, 2021), 8. https://rmi.org/insight/puc-modernization-issue-briefs/

[45] Ontario Energy Board, "Letters of Direction (formerly Mandate Letters)," November 29, 2023. https://www.oeb.ca/about-oeb/corporate-governance-and-reports/letters-direction-formerly-mandate-letters

[46] The British Columbia Utilities Commission is an example of a regulator that uses MOUs. British Columbia Utilities Commission, "Partnerships & MOUs." https://www.bcuc.com/AboutUs/Partnerships

Orders in council provide similar opportunities for federal and provincial or territorial governments to provide direction to regulators. At the federal level, orders in council are legislative instruments containing formal Cabinet recommendations that have been approved and signed by the governor general. These recommendations are made under existing legislative authorities and can span a range of administrative and legislative matters.[47] Similarly, at the provincial and territorial levels, orders in council are raised by a provincial or territorial minister or premier, approved by the provincial or territorial cabinet, and signed by the lieutenant governor or commissioner.[48]

4.3 Approval processes and exemptions

The Government of Canada has identified slow-moving regulatory processes as a significant challenge to modernizing electricity grids across the country. Streamlining review and permitting processes, particularly for interprovincial projects that must be approved in multiple jurisdictions, will help accelerate the development of necessary infrastructure.[49] The Government of Canada's 2023 Budget announced future work to improve impact assessment and permitting process efficiency under the Impact Assessment Act,[50] but how these plans will be affected by the recent Supreme Court decision declaring the act unconstitutional is yet to be seen.[51]

In the short term, granting exemptions for specific activity types gives regulators the opportunity to identify and enable the ideas that best align with their jurisdiction's energy vision. For example, the OEB noted that broadening their authority to grant generic time-limited exemptions for specific activities, thereby reducing the number of case-by-case assessments they must perform, could facilitate the implementation of

[47] Queen's University Library, "Orders in Council - An Overview," July 24, 2023. https://guides.library.queensu.ca/gov/canada/federal/orders-in-council

[48] Government of Ontario, "Orders in Council," May 15, 2023. https://www.ontario.ca/page/orders-council

[49] Natural Resources Canada, *Powering Canada Forward: Building a clean, affordable and reliable electricity system for every region in Canada* (2023), 12. https://natural-resources.canada.ca/sites/nrcan/files/electricityVisionPaper/Electricity%20Paper_ENGLISH.pdf

[50] Government of Canada, *Budget 2023: A Made-in-Canada Plan* (2023), 92. https://www.budget.canada.ca/2023/pdf/budget-2023-en.pdf

[51] Joel Dryden, "Supreme Court rules environmental impact legislation largely unconstitutional," *CBC News*, October 13, 2023. https://www.cbc.ca/news/canada/calgary/supreme-court-richard-wagner-impact-assessment-act-1.6993720

innovative projects and create a more predictable permitting environment.[52] Giving regulators the authority to grant blanket exemptions to thoughtfully selected project types accelerates electricity sector growth in a direction that aligns with government energy goals.

4.4 Utility business models

Choosing how utilities are remunerated presents another opportunity for regulators to direct electricity system development. A utility's approach to creating value for themselves and for their customers depends on their ownership structure, the level of competition they face, and the level of integration in their electricity market. Other factors like the mandates and regulatory processes discussed previously also play a role in shaping a utility's business model. While these factors differ from utility to utility, the most common business model across North America is the cost-of-service model.[53]

4.5 Cost-of-service model

Under the traditional cost-of-service (CoS) model, utilities are reimbursed for the expenses they incur to provide electricity to their customers through the rates they charge. Capital investments in new infrastructure to meet forecasted grid and customer needs are utilities' most important expenses as they are permitted to earn a return on these investments. If approved by the regulator, capital investments are added to the utility's rate base, which is the value of all the utility's useful capital assets.

The utility is permitted to recover the capital costs of their rate base by including the annual depreciation amount of each rate-based asset in their expected service costs. These depreciation costs, along with the utility's predicted operating costs, are important components used to determine the utility's revenue requirement. In the case of for-profit utilities, the revenue requirement also includes a regulator-approved profit margin.[54]

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[52] Ontario Energy Board, *Report of the OEB to Ontario's Electrification and Energy Transition Panel* (2023), 22. https://www.oeb.ca/sites/default/files/uploads/documents/reports/2023-07/oeb-report-EETP-20230630-en.pdf

[53] *Transforming the Utility Business Model*, 36.

[54] *Transforming the Utility Business Model*, 37.

Once a utility's proposed revenue requirement is reviewed and approved by the regulator, electricity rates are set such that each customer group pays a fair portion. Under the selected customer group-specific rates, the utility will recover their full revenue requirement so long as each customer group consumes as much electricity as predicted during the rate-setting process.[55] Utilities are therefore incentivized to encourage increased demand above the forecasted amount so they can bring in additional revenue.[56]

Under the CoS model, utilities are also incentivized to develop infrastructure and grow their rate base so they can increase their revenue through capital cost recovery. As a result, utilities have a reduced financial incentive to enable demand management solutions or outsource electricity production to renewable energy IPPs.[57]

4.5.1 Alternatives to cost-of-service

To address the shortcomings of the traditional CoS model, a suite of alternatives have been applied in jurisdictions to adapt to the changing needs of the modern electricity grid. Performance-based regulation (PBR) is arguably the most widely applied, as well as the most varied of these. PBR describes several alternative models which include an additional component in the utility revenue requirement equation that assigns a value to the utility's performance, often towards environmental, social, or reliability goals.[58] Each PBR model uses a different method to define and measure this performance component. These different methodologies can be applied on their own or in combination with each other to create the right incentives.

Alternative utility business models vary widely by jurisdiction and options for implementation are highly dependent on the existing regulatory framework. Collaboration between regulators, utilities, and other stakeholders is essential for transitioning away from the CoS model. Future reports in this series will examine potential approaches that can be applied in specific jurisdictions.

[55] *Transforming the Utility Business Model*, 37.

[56] Dan Cross-Call, Rachel Gold, Cara Goldenburg, Leia Guccione and Michael O'Boyle, *Navigating Utility Business Model Reform: A practical guide to regulatory design* (Rocky Mountain Institute, 2018), 15. https://rmi.org/wp-content/uploads/2018/10/RMI_Navigating_Utility_Business_Model_Reform_2018-1.pdf

[57] *Transforming the Utility Business Model* 39.

[58] Daniel Shea, "Performance-Based Regulation: Harmonizing Electric Utility Priorities and State Policy," *National Conference of State Legislatures*, April 7, 2023. https://www.ncsl.org/energy/performance-based-regulation-harmonizing-electric-utility-priorities-and-state-policy

4.6 Benefit-cost analysis

All the utility business models discussed here, along with other options not mentioned in this summary, can be designed to incentivize utilities to pursue alternative grid solutions that align with provincial or territorial energy goals. Benefit-cost analysis methodologies, which are essentially the same as cost-benefit analyses, can help regulators evaluate those alternative solutions fairly.[59] New technologies are enabling creative electricity solutions to system and customer needs that are vastly different from one another and from the solutions utilities have used in the past. Policy-driven, non-economic objectives are also beginning to influence decision-making in the rate-setting process. A common language is needed to consistently evaluate disparate solutions and quantify their achievement of these hard-to-quantify goals.[60]

Benefit-cost analysis (BCA) frameworks can make these comparisons possible by using consistent testing methodologies to measure how potential solutions achieve non-economic goals. By considering objectives that extend beyond typical least-cost analysis, BCA can better align utilities' investment decisions with the public interest.[61] However, consensus on the best tests to apply has not been reached.[62] Each jurisdiction has the flexibility to design a BCA framework that best reflects their policy goals through government assessments and regulator consultations on available options, or case-by-case analysis of utility framework proposals. For example, the National Energy Screening Project has a manual that provides a structured framework and guidance from which jurisdictions can develop their own testing protocols.[63] Regulators will also need to be given the authority to use the results of their selected framework in their decision-making processes.[64]

[59] Richard O. Zerbe and Tyler Scott, *A Primer for Understanding Benefit-Cost Analysis* (2015), 3. https://aisp.upenn.edu/wp-content/uploads/2015/09/0033_12_SP2_Benefit_Cost_000.pdf

[60] *Back to Bonbright*, 23.

[61] John Shenot, *Using Benefit-Cost Analysis to Improve Distribution System Investment Decisions* (Regulatory Assistance Project, 2022), 1. https://www.raponline.org/wp-content/uploads/2023/09/rap-shenot-prause-shipley-using-benefit-cost-analysis-issue-brief-2022-november.pdf

[62] *Back to Bonbright*, 23.

[63] Tim Woolf et al., *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources* (National Energy Screening Project, 2020). https://www.nationalenergyscreeningproject.org/national-standard-practice-manual/

[64] *Back to Bonbright*, 26.

5. Challenges and case studies

Government energy ministries and regulators have several levers to reshape the electricity system, but careful thought is required to ensure changes are positive. Transitioning to a net-zero grid is a massive, intersectional undertaking made more complex by institutional inertia, path dependency, and the isolated provincial/territorial approach to governing electricity systems in Canada. Deliberate regulatory action is needed to overcome these deep-seated barriers and accelerate decarbonization. Potential solutions to these challenge areas, as well as examples from Canadian provinces and territories, will be discussed in future reports in this series.

Through a thorough review of existing literature and a series of expert interviews, we have identified six primary regulatory challenges that currently hinder electricity sector innovation in Canada:

1. Inter-jurisdictional coordination towards electricity system innovation is limited.
2. Strategic direction for what a net-zero future should look like is lacking, along with the governance structures to achieve it.
3. Regulatory processes that were designed for a slower-moving, centralized energy system are struggling to adapt to changing systems and increasing demand.
4. New technologies are challenging the electricity market and the physical system itself, requiring framework and infrastructure updates before their benefits can be utilized.
5. Information asymmetry between actors in the electricity system creates power imbalances and a lack of transparency.
6. The expense of the clean energy transition must be managed to ensure affordability for all, particularly for ratepayers who are already burdened by the existing system.

These challenges are expanded upon in this section.

5.1 Coordinated action

The challenges outlined above are complicated by a lack of provincial and territorial coordination towards electricity system innovation. A federal regulatory body similar to the Federal Energy Regulatory Commission in the U.S. could help (see case study below), but adding such a body could risk infringing on provincial and territorial constitutional jurisdiction over electricity systems.

A collaborative entity led by the provinces and territories themselves, but funded and perhaps convened by the federal government, could benefit Canada's electricity system through establishing consistent standards and better facilitating coordination across provinces. However, if provinces do not lead this initiative, increased federal guidance could reduce the ability of provinces and territories to tailor their grids to their regional strengths and needs.

Case Study: The U.S. Federal Energy Regulatory Commission

The United States Federal Energy Regulatory Commission (FERC) has the authority to make nation-wide orders that support the decarbonization of electricity systems across the country. This authority is made possible by strong federal policy. Originally called the Federal Power Commission, this body was created under the Federal Water Power Act in 1920 to regulate hydropower projects.[65] It was later granted the authority to regulate electricity and natural gas industries. In 1977, the commission was abolished and its responsibilities were divided between the newly created Department of Energy and a new independent regulator, the FERC.[66]

In the U.S., there is more federal authority over electricity than in Canada. The FERC has many responsibilities in the electric power sector including regulating interstate electricity transmission, creating and enforcing interstate transmission reliability standards, providing electricity market oversight, permitting and licensing new hydropower projects, and reviewing transmission siting applications in some limited circumstances.[67] However, states also have substantial responsibility for their electricity systems. While the FERC has the authority to issue nationwide orders, each state has the flexibility to meet those orders in a way that works for their own electricity structure.

The FERC has introduced several regulations that advance grid decarbonization including Order 90, which directs the North American Electric Reliability Corporation (NERC) to update their reliability standards to accommodate the needs of inverter-based resources

[65] Federal Energy Regulatory Commission, "Hydropower - Commission's Responsibilities," January 25, 2023. https://www.ferc.gov/industries-data/hydropower

[66] U.S. Energy Information Administration, "Glossary." https://www.eia.gov/tools/glossary/index.php?id=F

[67] Federal Energy Regulatory Commission, "What FERC Does," August 16, 2022. www.ferc.gov/what-ferc-does

like solar photovoltaics, wind turbines, and battery storage;[68] and Order 2023, which ensures that new technologies are treated fairly in interconnection procedures.[69]

Case Study: Australia's National Electricity Market

Australia's electricity system is structured similarly to Canada's, with the provision of electricity being a subnational responsibility. In 1998, the country adopted a National Electricity Market (NEM) in response to a Commonwealth Government inquiry into improving the productivity and efficiency of the electricity industry. The NEM, which is both a wholesale electricity market and a physical power system, began as a four-state interconnected grid. [70] Today, five regional market jurisdictions have opted into the NEM.[71] Interconnections from the NEM to Queensland and Tasmania were required to facilitate this expansion.[72,73] Western Australia and the Northern Territory could not be connected because of their distance from the rest of the grid.[74]

Creating and operating the NEM requires state coordination and continued leadership. The NEM is overseen by the Council of Australian Governments' Energy Council, which is comprised of energy ministers from participating jurisdictions as well as the Commonwealth minister. Since its inception, the NEM has lowered unit costs, brought in investment, shifted investment risk to capital markets, and maintained reliability of supply with few exceptions.[75]

[68] Federal Energy Regulatory Commission, *Reliability Standards to Address Inverter-Based Resources* (2023), Order No. 901, i. https://www.ferc.gov/media/e-1-rm22-12-000

[69] Federal Energy Regulatory Commission, *Improvements to Generator Interconnection Procedures and Agreements* (2023), Order No. 2023, 1. https://www.ferc.gov/media/e-1-order-2023-rm22-14-000

[70] Paul Simshauser, *Lessons from Australia's National Electricity Market 1998-2018: the strengths and weaknesses of the reform experience* (2019), 3. https://www.eprg.group.cam.ac.uk/wp-content/uploads/2019/08/1927-Text.pdf

[71] Australian Energy Market Operator, "National Electricity Market (NEM)." https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem

[72] *Australia's National Electricity Market after twenty years*, 6.

[73] *Lessons from Australia's National Electricity Market 1998-2018,* 3.

[74] *Lessons from Australia's National Electricity Market 1998-2018,* 3.

[75] *Lessons from Australia's National Electricity Market 1998-2018,* 1, 2.

5.2 Strategic direction and governance

Beyond the technical uncertainties that come along with technological advances, there is also a lack of clarity on how these goals will be achieved, who has the authority to pursue them, how alternative options will be evaluated, and what the ideal electricity system would look like.

5.2.1 Electricity planning

Most jurisdictions lack an integrated, net-zero aligned electricity plan.[76] In Canada, energy systems are a provincial and territorial responsibility, and the lack of federal authority results in highly compartmentalized planning that discourages collaboration.[77] As a result, inter-provincial and inter-jurisdictional projects can be difficult to coordinate.[78] Respondents to a recent federal request for information on Canadian electricity regulation and grid modernization stressed the need for federal leadership to promote inter-jurisdictional policy alignment and create certainty on the country's trajectory in order to enable long-term electricity system planning.[79]

Some progress has been made to solidify the national plan for decarbonization through the federal government's draft Clean Electricity Regulations, which propose greenhouse gas emission standards for electricity generators beginning in 2035.[80] However, the objective of the draft regulations is not to achieve Canada's commitment to a net-zero grid by 2035, as outlined in the national electricity strategy.[81] These draft regulations would need to work with other policies, such as carbon pricing and investment tax credits, to reach this goal.

[76] Dunsky Energy and Climate Advisors and Electricity Canada, *Build Things Faster*, 2023, 2. Available at https://issuu.com/canadianelectricityassociation/docs/ec_sel_frame_-_2023_21_b1a2024679b3b0

[77] Sara Hastings-Simon, *Barriers to innovation in the Canadian electricity sector and available policy responses*, (CICC, 2021), 4. https://climateinstitute.ca/wp-content/uploads/2021/09/CICC-Barriers-to-innovation-in-the-Canadian-electricity-sector-and-available-policy-responses-by-Sara-Hastings-Simon-FINAL-1.pdf

[78] *Build Things Faster*, 2.

[79] Natural Resources Canada, "What we heard: Request for information on Canadian electricity regulation and grid modernization," October 18, 2023. https://natural-resources.canada.ca/science-and-data/funding-partnerships/requests-for-information/what-we-heard-request-for-information-on-canadian-electricity-regulation-and-grid-mod/24891

[80] Government of Canada, "Canada Gazette, Part I, Volume 157, Number 33: Clean Electricity Regulations," August 19, 2023. https://www.gazette.gc.ca/rp-pr/p1/2023/2023-08-19/html/reg1-eng.html

[81] *Powering Canada Forward*, 2.

Within provincial and territorial jurisdictions, planning is further divided between ministries and energy types, such as between electricity and natural gas. In the past, these divisions did not cause problems as each system could be operated and optimized independently. Recent grid innovations have linked supply and demand, energy resources, and regions in way that requires coordinated planning.[82] Unfortunately, a lack of continuity in provincial and territorial government policies has been a challenge to coordinated, long-term planning, making efficient system design difficult.[83]

Case Study: Texas' Competitive Renewable Energy Zones (CREZ)

Texas is a good example of how a clear plan for renewable energy growth can accelerate development and reduce costs.

Texas hosts a unique electricity grid. The grid that services 75% of the state is not connected to the Western or Eastern Interconnection systems that cover the rest of the United States and some of Canada.[84] As a result of their grid's relative isolation, electricity planning is crucial. Texas must be prepared to handle all demand scenarios without support from other regions.

Between 2006 and 2009, Texas added more than 7,000 MW of wind capacity to their grid. Most of this new capacity was sited in rural areas in the northwest of the state, while most demand occurs in the densely populated eastern half. This geographical polarization of supply and demand led to congestion on the grid and, ultimately, curtailment of wind-generated electricity.[85]

Fortunately, Texas had anticipated this issue. As early as 2005, Texas began planning to construct transmission corridors between demand centres and these areas of intense wind development. In 2007, the Public Utilities Commission of Texas designated five areas as Competitive Renewable Energy Zones (CREZ) and requested the Electric Reliability Council of Texas, the state's grid operator, to develop transmission plans to connect these areas.[86] Legislation was passed to approve the initiative in 2008,[87] and the

[82] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 4.

[83] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 4.

[84] Warren Lasher, *The Competitive Renewable Energy Zones Process*, ERCOT, webinar, August 11, 2014, 2. https://www.energy.gov/sites/prod/files/2014/08/f18/c_lasher_qer_santafe_presentation.pdf

[85] U.S. Energy Information Administration, "Fewer wind curtailments and negative power prices seen in Texas after major grid expansion,", June 24, 2014. https://www.eia.gov/todayinenergy/detail.php?id=16831

[86] *The Competitive Renewable Energy Zones Process*, 4.

[87] *Build Things Faster*, 5.

lines were completed by the end of 2013. As each of the new lines was energized, wind curtailment dropped.[88]

Beyond the immediate reduction in curtailment, the CREZ approach also encouraged further wind development by creating more connection capacity and certainty for developers.[89] Without transmission access, wind and solar developers typically struggle to secure funding because new high-voltage transmission lines can take more than ten years to plan and construct.[90] The creation of dedicated zones directed development of wind capacity to the areas with the most potential, ensured those developments would be able to supply electricity to demand centres, and increased economies of scale by minimizing the need to build many, smaller transmission lines to dispersed generation resources.

5.2.2 Statutory authority

The narrow and prescriptive scope of regulator's statutory authority leads to hesitation in the electricity sector. Utility commissions, utilities, and system operators are required to follow explicit mandates, and given the conservative nature of the sector, they tend to narrowly interpret their authority unless they are given explicit direction.[91,92] Under their current mandates, many utility regulators feel their role is to make decisions based purely on economics.[93] This narrow view limits the priorities they can consider during regulatory proceedings.[94]

As a result of the energy transition, regulators are being asked to rule on complex issues that extend beyond their traditional mandates.[95] However, they often lack the authority to include other considerations, such as environmental or social mandates, alongside cost prudence and reliability in their decisions. Without a clear mandate to do so, regulators hesitate to consider additional benefits of innovative solutions, disincentivizing utilities from deploying novel approaches. That said, some regulators have chosen to reference government policy objectives and strategies in their decision-

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[88] "Fewer wind curtailments and negative power prices seen in Texas after major grid expansion."

[89] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 14.

[90] NREL, *Renewable Energy Zones: Delivering Clean Power to Meet Demand* (2016), 1. https://www.nrel.gov/docs/fy16osti/65988.pdf

[91] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 3.

[92] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 8.

[93] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 8.

[94] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 3.

[95] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 8.

making, but they are not required to do so. Some governments are also moving to explicitly include climate policy objectives in their electricity regulator's mandate. For example, Nova Scotia recently tabled legislation that would create a new regulatory body called the Nova Scotia Energy Board and require them to consider the province's Environmental Goals and Climate Change Reduction Act in decision-making.[96] Enhanced regulatory mandates and clear policy objectives are necessary to enable regulators to better evaluate new ideas and adapt to rapidly evolving system changes.[97]

Case Study: Massachusetts aligns regulator priorities with climate goals

Several U.S. states have legislated broader mandates for their electricity regulators. For example, the Massachusetts legislature's 2021 Act for Creating a Next-Generation Roadmap for Massachusetts Climate Policy adds equity and GHG emissions to the list of priorities the Department of Public Utilities (DPU) must consider and co-optimize when making decisions.[98] The legislation also commits the state to net-zero emissions by 2050, sets out interim sector-specific emissions limits every five years, and mandates the DPU to prioritize the achievement of these targets. The Act also directs the DPU to consider the social value of GHG emissions reductions when evaluating the cost-effectiveness of utility proposals.[99]

Case Study: Connecticut sends new directive with existing tools

Connecticut created a similar directive for their Public Utilities Regulatory Agency (PURA) with a different approach. While Massachusetts used legislation to codify a new mandate for the DPU, Connecticut integrated state GHG emissions targets, as set out in the Global Warming Solutions Act,[100] into existing energy planning documents. The Climate Change

[96] Government of Nova Scotia, "Legislation to Modernize Electricity System, Improve Regulation," media release, February 27, 2024. https://news.novascotia.ca/en/2024/02/27/legislation-modernize-electricity-system-improve-regulation

[97] "What we heard: Request for information on Canadian electricity regulation and grid modernization."

[98] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 9.

[99] Government of Massachusetts, *An Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy*, 2021 Chapter 8. https://malegislature.gov/Laws/SessionLaws/Acts/2021/Chapter8.

[100] State of Connecticut, *An Act Concerning Connecticut Global Warming Solutions* 2008, Public Act No. 08-98. https://www.cga.ct.gov/2008/ACT/PA/2008PA-00098-R00HB-05600-PA.htm

Planning and Resiliency Act requires the state's Integrated Resource Plan (IRP) meet projected customer needs in a way that minimizes costs and maximizes consumer benefits in alignment with the state's emissions reductions targets. The Act also specifies that the Comprehensive Energy Strategy provide direction on the best policy pathways to achieve Connecticut's emissions reduction goals.[101] The IRP and the Comprehensive Energy Strategy are prepared every two or four years, respectively, by the state's Department of Energy & Environmental Protection, of which the PURA is a part.[102,103]

By linking the regulatory body's electricity planning requirements to state emissions reductions targets, Connecticut leveraged existing systems to align state energy policy and climate goals.[104] This approach, while less direct than Massachusetts' mandate update, may be a better option in jurisdictions where changing the electricity regulator's mandate is not politically feasible.[105]

5.2.3 Definition of public interest

While regulating in the public interest is specified explicitly in some regulator mandates, all regulators are indirectly guided to do so by the Bonbright Principles. However, the definition of "public interest" is intentionally ambiguous to allow interpretations to change along with the times.[106] Similar to the uncertainties surrounding regulator authority, the lack of a clear definition can cause regulators to hesitate when expanding traditional public interest considerations. Interpreting the term in a novel way opens the door for potential court challenges from stakeholders who are unsettled by the change in direction. These parties may also push for legislative reductions of the regulator's authority in response.[107]

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[101] State of Connecticut, *An Act Concerning Climate Change Planning and Resiliency* 2018, Public Act No. 18-82. https://www.cga.ct.gov/2018/ACT/pa/pdf/2018PA-00082-R00SB-00007-PA.pdf

[102] Connecticut Department of Energy & Environmental Protection, "Integrated Resource Planning," October 2021. https://portal.ct.gov/DEEP/Energy/Integrated-Resource-Planning/Integrated-Resource-Planning

[103] Connecticut, *An Act Concerning Climate Change Planning and Resiliency* 2018.

[104] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 9.

[105] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 9.

[106] Eric Filipink, *Serving the "Public Interest"—Traditional vs Expansive Utility Regulation*, prepared for the National Regulatory Research Institute (2009), 3. https://pubs.naruc.org/pub/FA864C03-DC7D-B239-9E29-4D68D1807BE4

[107] *Serving the "Public Interest"—Traditional vs Expansive Utility Regulation,* 3.

It is possible the threat of these retaliatory actions is only perceived.[108] Regardless, the lack of direction on which priorities are and are not in the public interest creates uncertainty and delay for regulators as they try to navigate the changing electricity landscape.

Case Study: Colorado defines the public interest

Colorado used legislative measures to reduce uncertainty about how to consider the public interest in regulatory proceedings. In 2019, the Colorado state legislature passed Senate Bill 19-236 and instructed the state's Public Utility Commission (PUC) to only approve a utility's Clean Energy Plan, which each utility files as part of their planning process, if the plan is in the public interest.

Senate Bill 19-236 provided the PUC with three questions to consider when evaluating whether a Clean Energy Plan was in the public interest: whether the plan would reduce GHG emissions, whether that reduction in emissions would create environmental and health benefits, and how the plan will affect electricity system reliability and resilience.[109] Through these questions, Senate Bill 19-236 sent a clear message to the regulator that emissions reductions are a key component of the public interest, allowing them to rule based on GHG concerns without fear of consequence.

Case Study: New Mexico equates energy and public goals

In New Mexico, the Public Regulation Commission (PRC) took matters into their own hands and sent a signal to the sector that climate goals are part of the public interest. In December 2020, the state's PRC denied a permit for a natural gas plant in El Paso, Texas, even though the Public Utility Commission of Texas had previously approved the proposal and El Paso Electric (EPE) had already begun construction. Because 80% of EPE's customers are in New Mexico, the utility must consider regulations in both states.[110]

[108] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 14.

[109] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 16.

[110] Kassia Micek, "NM regulators deny permit for El Paso gas plant already under construction," S&P Global Market Intelligence, December 17, 2020. https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/nm-regulators-deny-permit-for-el-paso-gas-plant-already-under-construction-61783407

The New Mexico PRC ruled that the new gas plant would not be in the public interest because it did not align with the goals of the New Mexico Energy Transition Act.[111] The PRC found that the EPE proposal divided costs over a 40-year lifespan, while the Energy Transition Act specifies that investor-owned utilities must supply 100% carbon-free electricity by 2045, so a much shorter lifespan is justified.[112] Ultimately, New Mexico PRC's permit denial did not achieve their goal of halting the project. Construction of the new gas plant, Newman 6, went ahead, but the PRC prohibited EPE from selling the electricity generated by the plant to New Mexico customers.[113] This ruling set a precedent that links state clean energy legislation with the public interest.

5.2.4 Regulatory vision

As a result of the lack of clarity from government, regulators themselves struggle to provide clarity on the path forward for the rest of the electricity system. Many jurisdictions do not have an explicit regulatory vision for their future electricity system. Utilities, therefore, lack guidance when making rate applications.

This absence of pre-emptive direction is especially challenging in Canada's quasi-judicial system, in which regulators respond reactively to utility proposals. The United States shares this issue, with many public utility commissions employing a reactive approach that does not specify their vision for the future or how utilities can meet expected performance goals.[114] Passive regulation styles like these leave utilities guessing at the targets their proposals will be evaluated against as electricity priorities change due to the clean energy transition. A clearly articulated vision for the electricity system, including the roles and activities of each of the agencies that act within it, would provide utilities with certainty on how their proposals will be evaluated.[115]

Case Study: New Mexico's vision prioritizes clean technologies

New Mexico's legislative updates set an example of how regulators can advocate for change and make a clear statement about their vision for tomorrow's electricity system.

[111] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 15.

[112] "NM regulators deny permit for El Paso gas plant already under construction."

[113] Hannah Grover, "El Paso Electric, community advocates reach agreement regarding Newman Unit 6," *NM Political Report*, August 18, 2021. https://nmpoliticalreport.com/2021/08/18/epe-community-advocates-reach-agreement-regarding-newman-unit-6/

[114] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 11.

[115] *Purpose: Aligning PUC Mandates with a Clean Energy Future*, 11.

Following the regulatory battle against El Paso Electric's new gas plant, the New Mexico PRC opened docket 21-00128-UT to debate an update to state law governing electric utility IRPs. The PRC wanted to rework Rule 17.7.3 of the New Mexico Administrative Code to ensure that utilities prioritize projects in alignment with the GHG emissions reduction targets set out in the state's Energy Transition Act. Other objectives of the rule update were to ensure that utilities prioritize new technologies like distributed energy resources, demand response, energy efficiency, and renewable energy in their proposals, and improve proposal transparency for regulators and intervenors charged with evaluating IRPs. These updates were made law in 2022.[116] Adding climate priorities to the IRP law provided utilities with insight into the regulator's vision for the electricity system, guiding their proposals to align with state energy goals and ideally avoiding future conflict.

Case Study: United Kingdom's future electricity system

While in New Mexico it was the regulator that took action, the United Kingdom's (U.K.) climate vision was established from the top down. On October 26, 2023, the U.K. government amended their Energy Bill to support investment in energy infrastructure, ensure long-term energy affordability and independence, and align regulator mandates with the country's net-zero targets. The amendment also called for the establishment of a new independent body called the Future System Operator that will be responsible for developing both gas and electricity systems efficiently and affordably.[117]

The Office of Gas and Electricity Markets (Ofgem), the U.K.'s energy regulator, welcomed the amendment and their specific mandate to achieve the net-zero by 2050 obligation established in the U.K.'s Climate Change Act 2008. According to the CEO of Ofgem, Jonathan Brearley, the legislative amendment creates clarity that "consumers are best protected by building a low-carbon, low-cost energy system," and "directly links consumers' interests to specific net zero targets."[118] At the time of writing, Ofgem is

[116] New Mexico Public Regulation Commission, *Integrated Resource Plans for Electric Utilities* (2022), 17.7.3. https://www.srca.nm.gov/parts/title17/17.007.0003.html

[117] U.K. Department for Energy Security and Net Zero, "New laws passed to bolster energy security and deliver net zero," media release, October 26, 2023. https://www.gov.uk/government/news/new-laws-passed-to-bolster-energy-security-and-deliver-net-zero

[118] Ofgem, "Ofgem welcomes proposed legal mandate to prioritize the UK's 2050 net zero target," media release, June 7, 2023. https://www.ofgem.gov.uk/publications/ofgem-welcomes-proposed-legal-mandate-prioritise-uks-2050-net-zero-target

further developing its vision for the future through a consultation on the Future System Operator's policy direction and regulatory framework.[119]

5.3 Processes

Because of the electricity system's natural monopolies, regulation is critical to ensure ratepayers' interests are protected. However, the deterministic nature of regulatory processes results in processes that are inadequately designed to manage uncertainty or keep pace with system changes and the urgency of the clean energy transition.[120] In addition to causing delays, current regulatory processes can be difficult to navigate for stakeholders operating under resource constraints.

5.3.1 Permitting uncertainty and delay

All of Canada's 13 unique electricity regulatory structures share a common quasi-judicial structure that inherently encourages caution at the expense of speed.[121] Similar delays occur in the United States; a survey of 650 U.S. energy industry stakeholders found that regulatory lag was their third biggest concern for grid development over the next three to five years.[122] If the regulatory cycle continues at its current pace, regulators will have limited opportunities to review and guide utilities' IRPs before reaching Canada's net-zero grid target in 2035.

These delays are due, in part, to the lack of coordination between provincial and federal departments, agencies, and ministries that are involved in approval processes, and the resulting duplication of work. A shortage of regulatory personnel further exacerbates this issue.[123] Increasingly burdensome and unpredictable regulatory requirements at the federal level are also causing delays. Budget 2023 has proposed steps to reduce these delays, primarily through a "one project, one assessment" framework, but these changes are yet to be implemented.[124]

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[119] Ofgem, "Consultation on the policy direction for the Future System Operator's regulatory framework." https://www.ofgem.gov.uk/publications/consultation-policy-direction-future-system-operators-regulatory-framework

[120] *Build Things Faster*, 2.

[121] *Build Things Faster*, 13.

[122] Laszlo von Lazar, *2023 Electric Report* (Black & Veatch, 2023), 7. https://view.ceros.com/black-and-veatch-corporation/2023-electric-report/

[123] *Build Things Faster*, 2, 3.

[124] *Budget 2023: A Made-in-Canada Plan*, 92.

Case Study: Australia's proposed-respond approach

Australia has taken two measures to streamline the regulatory process and reduce uncertainty for utilities. First, instead of using a quasi-judicial regulatory process like that of Canada and the U.S., Australia has employed a proposed-respond approach. Under this method, utilities are aware of the conditions against which their application will be evaluated before they prepare it, reducing uncertainty and delays.[125]

The second notable feature of Australia's regulatory system is how they stage applications. Utility projects progress through the regulatory process in stages, with each stage being submitted to the Australian Energy Regulator as a Contingent Project Application. This allows the utility to adapt each stage as necessary in case of changing market conditions.[126] Combined, these two regulatory features allow utilities and regulators to work more closely and quickly towards a common vision and reduce the risks of developing large projects in an uncertain system.

5.3.2 Barriers to stakeholder participation

Traditional regulatory processes are demanding and hard to navigate, creating barriers to entry for resource-constrained stakeholders.[127] For example, the siloed nature of energy conversations in Canada means that many entities are discussing the same topics without much coordination, and resource-constrained stakeholders cannot participate in every working group. In some jurisdictions, a lack of funding for intervenors also limits the extent to which these stakeholders can engage in regulatory proceedings. Many Indigenous communities face additional challenges as their engagement is restricted by capacity constraints and unrealistic timeframes for input.[128]

At the same time, input from historically marginalized and vulnerable populations is critical to the regulatory process to ensure the energy transition and energy action is

[125] *Build Things Faster*, 15.

[126] Australian Energy Regulator, *Guidance Note: Regulation of actionable ISP projects* (2021), 25. https://www.aer.gov.au/system/files/AER - Final Guidance note - Regulation of actionable ISP projects - March 2021 - FINAL FOR PUBLICATION(12129318.1).pdf

[127] Jacob Becker, Jessie Ciulla, Cory Felder and Rachel Gold, *Regulatory Process Design for Decarbonization, Equity, and Innovation* (RMI, 2022), 8. https://rmi.org/wp-content/uploads/dlm_uploads/2022/07/regulatory_process_design_for_decarbonization_equity_and_innovation.pdf

[128] *Build Things Faster*, 3.

equitable in both access and development.[129] Greater diversity of rightsholder and stakeholder participation provides regulators with a richer evidence base from which to draw when making decisions and increases the decision's legitimacy.[130] However, methods, timelines, and communications regarding Indigenous rightsholder and stakeholder participation currently limit the actual and full engagement of affected communities, individuals, and organizations in the regulatory process.

Case Study: British Columbia Utilities Commission launches the Indigenous Intervener Capacity Fund

The British Columbia Utilities Commission (BCUC) is working to build more inclusive regulatory proceedings, particularly for the many Indigenous communities and organizations in the province. In 2020, BCUC conducted a survey and collected feedback on how they could improve Indigenous engagement practices. Respondents recommended that: 1) Indigenous leaders and community members should be included in engagement design; 2) engagement processes should have extended timelines and more opportunities for discussion-based feedback and personal meetings; 3) qualified Indigenous individuals should be hired in BCUC staff and Commissioner roles; and 4) Indigenous representatives should receive capacity funding to support their participation.[131]

BCUC launched a pilot program in August of 2023 that provides capacity funding to Indigenous intervenors in BCUC proceedings. This program, called the Indigenous Intervener Capacity Fund, provides Indigenous governments and organizations with up to $5,000 to support their engagement. These funds can be used for related activities such as hosting community meetings, providing honoraria, conducting research work, and paying professional fees. The pilot program will run for one year or until the allocated funds are dispersed.[132] Because of the pilot's recent launch, the effectiveness of this program is yet to be evaluated.

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[129] *Regulatory Process Design for Decarbonization, Equity, and Innovation*, 8.

[130] Paula Antunes, Krystyna Stave, Nuno Videira and Rui Santos, "Using participatory system dynamics in environmental and sustainability dialogues," *Handbook of Research Methods and Applications in Environmental Studies* (2015), 346. DOI: 10.4337/9781783474646

[131] British Columbia Utilities Commission, *BCUC Indigenous Engagement Survey* (2020), 1. https://docs.bcuc.com/documents/Reports/2020-12-23-BCUC-Indigenous-Engagement-Survey-Summary.pdf

[132] British Columbia Utilities Commission, *Indigenous Intervener Capacity Funding* (2023), 1. https://docs.bcuc.com/documents/FactSheets/IICF-Fact-Sheet.pdf

Case Study: Oregon studies engagement opportunities

Oregon's investigations into improving engagement processes are a good example of how processes can be redesigned with stakeholder and rightsholder input in mind. In 2019, the Oregon Public Utility Commission (PUC) opened Docket No. UM 2005 to understand increasingly complex distribution system planning and identify opportunities to increase transparency and stakeholder engagement.[133] The PUC successfully applied several engagement strategies, such as creating a preliminary whitepaper and discussing it in a stakeholder workshop to identify areas of further research;[134] providing a timeline of the investigation with an explanation of the objectives of each component;[135] holding educational online, asynchronous workshops on planning topics to reduce stakeholder barriers to entry;[136] and creating a webinar archive of all presentations relating to the distribution system planning investigation to enhance accessibility.[137]

Upon completion of the investigation, the PUC proposed a requirement for utilities to hold at least two stakeholder workshops before filing each of the two parts of their plans. The submission date for these components were spaced ten months apart (Fall of 2021 and Summer of 2022) to give utilities the time to hold these workshops and incorporate stakeholder feedback.[138]

5.4 Integrating new technologies

Adding new technologies like distributed energy resources (DERs) to the grid is not as simple as just plugging them in. For example, to take full advantage of residential batteries and generation resources, the distribution system would need to be upgraded to allow bidirectional electricity flows, which raises questions about who is responsible

[133] State of Oregon, "Distribution System Planning," *Oregon Public Utility Commission*. https://www.oregon.gov/puc/utilities/pages/eo20-04-utilityservices-activities-dsp-interconnection.aspx

[134] Caroline Moore, *Public Utility Commission of Oregon Staff Report* (2019), 2. https://edocs.puc.state.or.us/efdocs/HAU/um2005hau15477.pdf

[135] *Public Utility Commission of Oregon Staff Report*, 4.

[136] *Regulatory Process Design for Decarbonization, Equity, and Innovation*, 18.

[137] Oregon Public Utility Commission, *UM 2005 Distribution System Planning New Opportunities Stage Webinar Series Archive* (2020). https://www.oregon.gov/puc/utilities/Documents/DSP-Archive.pdf

[138] Oregon Public Utility Commission, *Consideration for Adoption Staff Proposed Guidelines for Distribution System Planning* (2020), Order No. 20-485, 3. https://apps.puc.state.or.us/orders/2020ords/20-485.pdf

for making that investment. Integrating DERs could also cause stranded asset issues.[139] Owners of these assets can therefore feel threatened by DER integration.

Utilities have expressed concern about DER integration and how it could lead to what has been called the "utility death spiral". If more customers begin to generate their own power, electricity becomes more expensive for the customers that remain on the grid. As a result, these remaining customers are more strongly incentivized to also switch to self-generation, and the cycle continues until the utility is no longer financially viable. Utilities see the death spiral as a potential outcome if they do not implement their own alternative energy solutions or if regulatory structures prevent market flexibility.[140]

Under current market and regulatory structures, utilities may find integrating DERs and other non-wires alternatives (NWAs) less economically attractive than pursuing more conventional solutions for meeting grid needs.[141] Creating an environment with fair competition will require novel valuation methodologies, support for new technologies, and implementation strategies that balance the needs of all players in the system.

5.4.1 Valuing new technologies

DERs and NWAs provide important grid services that advance the clean energy transition, but integrating them into the grid is challenging due to the fundamental differences between services provided by traditional energy resources and these new technologies. New resources are often only rewarded for some of the value they provide to the grid, making it difficult to build a complete business case for their deployment.[142] For example, energy storage technologies can increase grid resilience and stability, allow for peak shaving and reduced grid congestion, and provide conventional and new ancillary services such as fast-ramping capabilities and fast frequency response that can help maintain the grid.[143,144] Conventional generators can also provide frequency stabilisation by increasing output, but battery storage resources can provide the same

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139 *Starting a conversation*, 2.

140 Jeremy Klingel, Jason Abiecunas and Lou Graving, "Renewables Drive Change: The Future of Energy," in *2018 Electric Report* (Black & Veatch, 2018), 7. https://webassets.bv.com/2019-11/SDR_Electric_2018.pdf

141 *Barriers to innovation in the Canadian electricity sector and available policy responses*, 5.

142 *Barriers to innovation in the Canadian electricity sector and available policy responses*, 6.

143 Garrett Fitzgerald, James Mandel, Jesse Morris and Hervé Touati, *The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid* (Rocky Mountain Institute, 2015), 15. https://rmi.org/wp-content/uploads/2017/03/RMI-TheEconomicsOfBatteryEnergyStorage-FullReport-FINAL.pdf

144 IRENA, *Innovative Ancillary Services: Innovation Landscape Brief* (2019), 9. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Feb/IRENA_Innovative_ancillary_services_2019.pdf

service much faster.[145] Without performance-based regulation, typical markets do not differentiate compensation based on response quality and therefore do not recognize the strengths of battery storage in this situation.[146]

New valuation methodologies are particularly important for the integration of storage. Currently, resources are classified as either load, generation, transmission, or distribution infrastructure; however, energy storage does not fall neatly into one of these categories. A single storage project can participate in the generation market while also providing transmission and distribution services by using stored power to meet local demand during periods of grid congestion. Since generation, transmission, and distribution are considered separate categories under current market rules, storage resources can only be compensated for a subset of the services they provide. As a result, storage resources may not be appropriately valued, and market rules may impede the full use of their functionality.[147]

Further complicating matters is the lack of certainty on the value of climate-resilient infrastructure, which has higher upfront costs but fewer expenses over the long term.[148] Updated valuation methodologies and market rules are necessary to capture the full benefit of new technologies.

Case Study: New York's Value Stack

In 2017, the New York State Public Service Commission (PSC) introduced a new approach to calculate the value of DERs and compensate them accordingly. The Value of Distributed Energy Resources (VDER) mechanism, also known as the Value Stack, analyzes when and where the DER provides grid services to determine its worth. The Value Stack evaluates DERs in five categories: energy value, capacity value, environmental value, demand reduction value, and locational system relief value. Some community distributed generation projects are also eligible for additional community credits. Through these categories, the Value Stack rewards GHG emission reduction, customer and utility cost savings, and avoidance of new capital investments. A DER's value under each of these

[145] *Innovative Ancillary Services: Innovation Landscape Brief*, 11, 14.

[146] IRENA, *Adapting Market Design to High Shares of Variable Renewable Energy* (2017), 72. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/May/IRENA_Adapting_Market_Design_VRE_2017.pdf

[147] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 6.

[148] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 7.

categories is calculated by the utility each month and is credited toward the electricity bill of the owner(s).[149]

The Value Stack initiative captures a range of different benefits in a single program, streamlining the compensation process for DER participants and valuing the technologies for the full suite of services they can provide. However, the Value Stack program is not currently compatible with dispatchable resources like batteries because it lacks an operational component. The program as it stands is best suited to DERs like solar.

5.4.2 Supporting innovative initiatives

In the electricity sector, new resources and innovative ideas face an uphill battle against the inertia of the status quo. Even if a new resource reduces overall electricity system costs, it may face resistance if implementing it may undermine the economics of previous investments. Owners of these threatened assets can use regulatory processes to discourage development of new resources, and in the case of Crown-controlled markets, Crown corporations have the power to simply veto anything that reduces their revenue. As a result, opportunities for IPPs have typically been small, short-term, and uncertain in vertically integrated markets, but rules and structures in deregulated markets like those in Ontario and Alberta have, in some cases, limited the participation of new technologies, as well.[150]

Innovative ideas and new resources need dedicated support to compete in the traditional energy system. The OEB has implemented an Innovation Sandbox to help new ideas get off the ground, but once these initiatives leave the sandbox environment, there is no further regulatory oversight to shepherd them from pilot to program stage. Some of the initiatives that showed promise are not implemented widely, perhaps due to regulatory barriers yet to be identified.

Case Study: Connecticut Innovative Energy Solutions program

In 2022, the Connecticut Public Utilities Regulatory Authority (PURA) approved the establishment of their own regulatory sandbox called the Innovative Energy Solutions (IES) program. The IES launched in January of 2023 with the aim to test and scale innovative solutions to meet grid needs, and in doing so, advance the state's

[149] New York State Energy Research and Development Authority, "The Value Stack." https://www.nyserda.ny.gov/All-Programs/NY-Sun/Contractors/Value-of-Distributed-Energy-Resources

[150] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 4, 5.

decarbonization goals.[151] The IES program consists of four phases that occur over two years: ideation and screening, prioritization and selection, project deployment, and assessment and scale. Throughout the process, the submitted projects are evaluated based on their economic benefit, cost-effectiveness, usefulness in addressing grid or market needs, and equity. GHG emissions reductions may be added as an evaluation metric in future program cycles.[152]

In the first phase, third-party developers, electric distribution companies (EDCs), or joint EDC/third-party partnerships can submit a simple concept proposal. Proposals selected move on to the second phase, where proponents develop and submit more thorough project proposals that show how the pilot will be implemented and analyze its potential benefits to society and the grid. The third stage provides selected innovators with 12-18 months to implement their projects and collect data. Finally, in the last stage, the innovators submit a final report that evaluates their project's performance and discusses any lessons learned. Successful projects will be asked to submit a full regulatory application so they can be deployed at scale. These projects can either be scaled independently through their own docket or incorporated in existing state programs.[153]

While the IES and the OEB Innovation Sandbox have similar goals, the Innovation Sandbox takes a less structured approach. After an initial meeting with OEB staff, applicants complete a Project Proposal Form. If the project is deemed eligible, OEB staff schedule additional meetings to discuss how to support the project and address regulatory barriers to its implementation. Innovators who wish to proceed with their projects submit a final proposal that will be reviewed by Sandbox staff within 185 days. Innovators can begin the Sandbox's four-step process at any time.[154]

As the IES has not yet completed its first iteration, it is too early to determine which approach will be more successful at bringing projects from proposal to deployment at scale.

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[151] Connecticut Public Utilities Regulatory Authority, "PURA Establishes the Innovative Energy Solutions Program," media release, March 3, 2022. https://portal.ct.gov/pura/press-releases/2022/pura-establishes-the-innovative-energy-solutions-program

[152] Connecticut Public Utilities Regulatory Authority, *Innovative Energy Solutions Program Design Document* (2022), 10, 29, 30. https://www.dpuc.state.ct.us/2nddockcurr.nsf/8e6fc37a54110e3e852576190052b64d/da52e606ad2c1efe85258815005aa04f/$FILE/171203RE05-Attachment%20B-033022.pdf

[153] *Innovative Energy Solutions Program Design Document*, 7.

[154] Ontario Energy Board, "How the Innovation Sandbox Works." https://www.oeb.ca/_html/sandbox/process.php

5.4.3 DER integration

Once new DER initiatives are ready for deployment at scale, there are still hurdles to overcome to integrate them into the electricity system. These hurdles stem from incompatibilities with current market structures and technical systems. One of the biggest challenges is the institutional inertia for the status quo. Integrating DERs onto the grid will require a change in grid management practices, but precisely what those changes will look like is still unclear. Utilities are typically conservative and risk-averse, so they may hesitate to make proactive changes under these uncertain conditions.[155]

On the technical side, DER integration raises reliability and privacy concerns. Utilities will need high-resolution, feeder-level grid visibility to know where congestion will occur so they can plan their assets accordingly. Extensive and expensive system upgrades would be needed to provide this visibility, and not all utilities have the resources to do so. Further, the system operator will require this data to ensure reliability, but the current environment does not promote data sharing between actors in the system. Data sharing, as well as the security measures needed to protect it, will become increasingly important as more third parties bring DERs onto the grid.

Case Study: U.S. Public Utility Regulatory Policies Act

Enacted in 1978 to reduce dependence on foreign oil, the Public Utility Regulatory Policies Act (PURPA) helped drive the growth of alternative energy technologies in the United States.[156] PURPA states that utilities must purchase electricity from IPPs if doing so would be less expensive than deploying a utility-owned asset.[157] This act created certainty for IPPs that, if they could produce cheap electricity, it would be purchased. This certainty enabled them to develop and deploy innovative technologies that made economic sense.[158]

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[155] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 3.

[156] Union of Concerned Scientists, "Public Utility Regulatory Policy Act (PURPA)," media release, July 15, 2002. https://www.ucsusa.org/resources/public-utility-regulatory-policy-act

[157] Federal Energy Regulatory Commission, *Public Utility Regulatory Policies Act of 1978*, Public Law 95-617. https://www.ferc.gov/media/public-utility-regulatory-policies-act-1978

[158] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 10.

Case Study: FERC Order 841 supports storage implementation

In 2018, the United States Federal Energy Regulatory Commission (FERC) issued Order 841 to enable the participation of storage assets in the electricity market.[159] As mentioned previously, the market has specific rules for different categories of generation assets. Order 841 mandated that system operators establish a new set of rules such that storage assets can participate in the wholesale market and receive compensation for each of the system services they can provide. The order also set the minimum size requirement of participating assets to 100 kW, which increased the number of DERs that were eligible to participate. Companion order 841-A, released in tandem, requires the new market rules to increase investor confidence, enable investment, and accelerate the development and integration of new storage assets.[160] While Order 841 removed some market obstacles to storage participation, other barriers have risen in their place, and additional work is needed to clear the path for increased storage deployment.[161]

5.5 Information asymmetry

Governments and regulators often do not have the time and resources to stay informed on emerging technologies, evaluate their value, and adapt electricity system planning as necessary. Siloed information gathering by each jurisdictional government and regulator exacerbates this issue; the data available to each body is often limited, and the decisions they make about new technologies therefore have higher risk and uncertainty.

Challenges with information asymmetry also impact rate applications due to the opacity of utility proposal costs and the lack of stakeholder access to modelling tools and information. Stakeholders with more data and analysis capabilities have more influence on regulator decisions because regulators are required to rule based on the evidence with which they are presented.[162] There is a need for enhanced collaboration and information sharing between jurisdictions, especially in the Canadian context where

[159] Federal Energy Regulatory Commission, *Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators* (2018), Order No. 841, 162 FERC 61,127. https://ferc.gov/sites/default/files/2020-06/Order-841.pdf

[160] *Barriers to innovation in the Canadian electricity sector and available policy responses*, 13.

[161] Sean Baur, "Going beyond Order 841 to more meaningful FERC storage policy," *Utility Dive*, September 1, 2020. https://www.utilitydive.com/news/going-beyond-order-841-to-more-meaningful-ferc-storage-policy/584129/

[162] *Regulatory Process Design for Decarbonization, Equity, and Innovation*, 22.

isolated electricity governance is the norm.[163] Public data sharing frameworks would also provide opportunities for inter-jurisdictional learning, facilitating efficient deployment of new technologies and approaches nation-wide based on the lessons learned from previous projects.

5.5.1 Cost transparency

In rate application proceedings, utilities propose solutions to meet forecasted system needs and customer demand, then lay out how the associated costs will affect ratepayers. Under the CoS model, which remunerates utilities based on the value of their infrastructure assets, utilities are incentivized to propose solutions that require capital expenditures and earn them a specified rate of return. In Ontario, utilities are strongly encouraged, but not required, to show alternative solutions that would meet forecasted needs.[164] If utilities do choose to show alternative options, the lack of data transparency in the regulatory process creates opportunities for misrepresentation of ratepayer benefits such that the rate-of-return solution appears most favourable.

Case Study: Arizona and the Four Corners Power Plant

Regulatory proceedings in Arizona over a coal-fired power plant provide an example of how information asymmetry can complicate the assessment of grid solutions. In November 2021, the Arizona Corporation Commission (ACC) denied Arizona Public Service's (APS) request for full cost recovery on their investments in selective catalytic reduction (SCR) systems for Units 4 and 5 of the coal-fired Four Corners Power Plant. The ACC found that the APS knew, or should have known, that investing in SCRs for the two units was not the most cost-effective option.[165] The economic assumptions the APS had made in their initial decision to pursue the SCR solution changed rapidly as the cost of other resources decreased.[166] The ACC stated that the APS had either withheld information or purposefully conducted their analyses such that the economic superiority of other resource options was never brought to light. The APS's actions were only

[163] "What we heard: Request for information on Canadian electricity regulation and grid modernization."

[164] Ontario Energy Board, "Chapter 5: Distribution System Plan," in *Filling Requirements for Transmission and Distribution Applications* (2023), 15. https://www.oeb.ca/sites/default/files/OEB-Filing-Reqs-Chapter-5-2023-Clean-20221215.pdf

[165]Arizona Corporation Commission, *In the Matter of the Application of Arizona Public Service Company for a Hearing to Determine the Fair Value of the Utility Property of the Company for Ratemaking Purposes, to Fix a Just and Reasonable Rate of Return Thereon, to Approve Rate Schedules Designed to Develop Such Return* (2021), Decision No. 78317, 113. https://docket.images.azcc.gov/0000205236.pdf?i=1648058793065

[166] Arizona, Decision No. 78317, 114.

possible because the APS possessed "an overwhelming asymmetry of information."[167] The ACC ruled that $215.5 million of the APS's investment into SCR for Four Corners could not be recovered from rates due to the utility's planning imprudence.[168]

This case study shows the difficulties regulators face when assessing utility proposals. To come to this conclusion, the ACC had to examine historic APS IRPs, the SCR planning and construction timeline, economic trends on other electricity resources, market regulations enabling these other resources, and the performance of the power plant itself. Third-party intervenors such as Sierra Club and the Citizens' Group supported the effort, providing the ACC with additional evidence on the economics of both Four Corners and renewable energy alternatives.[169]

5.5.2 Modelling transparency

One way that data opacity is introduced into the ratemaking process is through modelling. Electricity system modelling is a critical component of ratemaking evidence because the results show how potential solutions address forecasted system needs. In most jurisdictions, there is no standard or publicly available modelling tool or data set that all utilities are required to use.

This lack of standards and limited access makes it difficult for other stakeholders to review a utility's findings. The expense of electricity system modelling tool licenses is one barrier, and the opacity of the utility's modelling methodologies, assumptions, and inputs is another.[170] Even if a stakeholder could access the modelling tool used by a utility, it would be immensely challenging to recreate their process and verify their results without the information used to create the modelling scenario. New Mexico is attempting to address the information asymmetry between utility and nonutility stakeholders by requiring the utility to share all modelling information, as well as allowing stakeholders reasonable access to the utility's modelling software.[171]

[167] Arizona, Decision No. 78317, 113.

[168] Arizona, Decision No. 78317, 116.

[169] Arizona, Decision No. 78317, 114-115.

[170] *Regulatory Process Design for Decarbonization, Equity, and Innovation*, 22.

[171] *Integrated Resource Plans for Electric Utilities.*

Case Study: California PUC RESOLVE Model

California takes additional measures to promote transparency in IRP modelling processes. The California Public Utilities Commission (CPUC) uses Energy + Environmental Economics' RESOLVE model to evaluate utility IRPs. RESOLVE, a capacity expansion model, generates the optimal electricity asset portfolio to meet the state's emission reduction targets and reliability requirements for the least cost while also respecting policy constraints.[172] This optimal portfolio, called the Preferred System Portfolio, is used as a guide when assessing utility IRPs. The CPUC consolidates all the new assets proposed by utilities in the IRP cycle into an aggregated portfolio and compares it to the Preferred System Portfolio to ensure that each resource type is not being developed beyond the optimal solution.[173]

To improve transparency, the RESOLVE model is publicly available on the CPUC website, and they publish update notices, model inputs, and user guides to facilitate modelling by other stakeholders.[174] To complete the loop, utilities must share their spreadsheets and modelling assumptions as attachments to their IRP filings.

5.6 Affordability

While the exact cost of modernizing and decarbonizing Canada's electricity grid is uncertain, all parties can agree that it will require large capital investments. Most also agree that electrifying heating and transportation with clean electricity is an efficient and affordable way to decarbonize the Canadian economy overall.[175] Deciding who will ultimately pay for grid decarbonization is an ongoing source of debate. Utilities are

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[172] Zach Ming et al., *Long-Run Resource Adequacy under Deep Decarbonization Pathways for California* (Energy + Environmental Economics, 2019), 12. https://www.ethree.com/wp-content/uploads/2019/06/E3_Long_Run_Resource_Adequacy_CA_Deep-Decarbonization_Final.pdf

[173] Public Utilities Commission of the State of California, *Order Instituting Rulemaking to Continue Electric Integrated Resource Planning and Related Procurement Processes* (2022), Decision 22-02-004, 13. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M451/K412/451412947.PDF

[174] California Public Utilities Commission, "Portfolios and Modeling Assumptions for the 2023-2024 Transmission Planning Process." https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2022-irp-cycle-events-and-materials/portfolios-and-modeling-assumptions-for-the-2023-2024-transmission-planning-process

[175] Electrifying Canada, *Canada's electrification advantage in the race to net-zero: Five catalysts to accelerate business electrification* (International Institute for Sustainable Development, 2022), 1. https://www.iisd.org/system/files/2022-05/canada-electrification-advantage-net-zero-en.pdf

unwilling to take on the financial risks of innovation without incentives, and ratepayers should not have to carry the full burden of the transition on their own.

5.6.1 Paying for innovation and energy efficiency

As discussed previously, the traditional CoS model for utility remuneration links costs to infrastructure and undervalues new technologies.[176] The CoS model is designed to reward large capital expenses and increased electricity consumption, and provides little incentive for utilities to pursue innovation. New frameworks are needed to ensure that utilities can be compensated for deploying innovative technologies and approaches to meet grid needs. Some jurisdictions have already begun experimenting with different remuneration methods to meet this need, the most popular being performance-based regulations (PBR). As of 2022, 17 states in the U.S. had implemented or were working to implement some form of a PBR mechanism.[177] Alberta, Ontario, and British Columbia have implemented or will implement some aspects of PBR in their ratemaking procedures.[178, 179, 180]

Case Study: New York's performance-based regulations

New York was one of the first states to implement PBR and create financial incentives for innovation. In 2014, the New York PSC announced its Reforming the Energy Vision (REV) initiative. The PSC launched REV to explore how utilities could enable energy efficiency initiatives, load management, and deployment of DERs, and to investigate how current market, rate, incentive, and regulatory designs could be updated to align utility interests

[176] Canadian Electricity Association, *Developments, experience, and best practice from Performance-Based Regulation*, webinar, October 27, 2020. https://www.electricity.ca/membership/conversation-series/developments-experience-and-best-practice-from-performance-based-regulation/

[177] Gennelle Wilson, Cory Felder and Rachel Gold, "States Move Swiftly on Performance-Based Regulation to Achieve Policy Priorities," RMI, March 31, 2022. https://rmi.org/states-move-swiftly-on-performance-based-regulation-to-achieve-policy-priorities/

[178] Alberta Utilities Commission, *2024-2028 Performance-Based Regulation Plan for Alberta Electric and Gas Distribution Utilities*, 27388-D01-2023.

[179] Ontario Energy Board, *Report of the Board on 3rd Generation Incentive Regulation for Ontario's Electricity Distributors* (2008), 1. https://www.oeb.ca/oeb/_Documents/EB-2007-0673/Report_of_the_Board_3rd_Generation_20080715.pdf

[180] British Columbia Utilities Commission, *Review of British Columbia Hydro and Power Authority's Performance Based Regulation Report*, G-388-21. https://www.ordersdecisions.bcuc.com/bcuc/decisions/en/item/518304/index.do

with state energy policy.[181] As part of the program, the PSC applied a utility compensation framework that consists of both earnings adjustment mechanisms (EAMs), a type of performance incentive mechanism (PIM), and platform service revenues (PSRs). [182] The EAMs are designed to reward energy efficiency, affordability, interconnection, customer engagement, and reductions to peak load.[183] For example, the proposed customer engagement EAM measures utilities' success connecting customers with DER providers by tracking the implementation of an online tool, the percentage of customers using it, and how well the tool influences uptake of demand response and time-variable rate programs.[184]

The dual-incentive framework is meant to smooth the transition from cost-based earnings to market-based earnings; the end goal is for utilities to earn their revenue from platform service revenues as market activity increases. With platform service revenues becoming a main source of income, utilities are incentivized to expand DER participation in the market to increase the number of potential customers.[185] This approach is made possible by utilities taking on a new role as Distributed System Platforms, which enable market-friendly connections between DERs, power generators, and customers.

The framework also uses multi-year ratemaking with a maximum cycle time of five years.[186] Traditionally, multi-year rate plans include a clawback mechanism that requires utilities to refund ratepayers any planned capital spending that is not incurred at the end of the rate cycle. Under the REV program, utilities are incentivized to pursue alternative options like DER or energy efficiency, which are primarily operational expenses. Choosing these options over planned capital expenses would result in utilities losing out on their capital earnings with no replacement compensation. To resolve this issue, the New York PSC adapted the clawback mechanism so utilities could retain the earnings on capital that was already considered in the rate base until the end of the rate cycle. During the next

[181] State of New York Public Service Commission, *Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision* (2014), Case 14-M-0101, 2. https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={9CF883CB-E8F1-4887-B218-99DC329DB311}

[182] State of New York Public Service Commission, *Order Adopting a Ratemaking and Utility Revenue Model Policy Framework* (2016), Case 14-M-0101, 12. https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={D6EC8F0B-6141-4A82-A857-B79CF0A71BF0}

[183] New York Public Service Commission, Case 14-M-0101, 13.

[184] New York Public Service Commission, Case 14-M-0101, 87.

[185] New York Public Service Commission, Case 14-M-0101, 12.

[186] New York Public Service Commission, Case 14-M-0101, 13.

rate case, DER expenses would be added to the rate base and earnings associated with a capital project that was not pursued would be removed.[187]

The New York REV initiative has been in place for over nine years. While there have been several success stories, such as the state's Value Stack program, some core aspects of REV have not yet matured. For example, the distributed system platform is still a work in progress; the vision was much more advanced than system capabilities, but ongoing efforts to develop compensation strategies for storage assets and to facilitate information sharing are beginning to close the gap. The EAM framework has also not been refined to align the metrics with state energy policies, partly because of delays caused by the rollout of the Value Stack program, and partly because of a lack of smart meters in the state.[188]

5.6.2 Rate increase concerns

It is likely that ratepayers will take on significant financial risk over the course of the energy transition, particularly in the early and middle phases,[189] but some of those ratepayers will receive more benefits in exchange.

Under the Bonbright Principles, regulators must avoid "undue discrimination," including from one generation to the next and between rate classes. This regulatory construct of intergenerational equality specifies that ratepayers should pay only for the services they are receiving; they should not have to subsidize electricity costs for past or future ratepayers.[190] Given the urgency of achieving a net-zero grid, the costs of decarbonization will occur in a relatively short period of time. The benefits, financial and otherwise, will persist for years to come. The difference in time scale between costs and benefits make it challenging to determine how ratepayers now and into the future should pay for the transition to respect intergenerational equality. The European Union is currently exploring the role of anticipatory investment in grid development as part of the European Grid Action Plan; guidance on when such investments are appropriate is expected in early 2025.[191]

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[187] New York Public Service Commission, Case 14-M-0101, 99.

[188] Herman K. Trabish, "New York's landmark Reforming the Energy Vision framework remains both vital and unfinished, analysts say," *Utility Dive*, December 9, 2021. https://www.utilitydive.com/news/new-yorks-landmark-reforming-the-energy-vision-framework-remains-both-vita/610015/

[189] "What we heard: Request for information on Canadian electricity regulation and grid modernization."

[190] *Back to Bonbright*, 55.

[191] European Commission, *Grids, the missing link - An EU Action Plan for Grids*, COM(2023) 757. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52023DC0757

The question of who pays and who benefits exists in the present, as well. As electricity customers with disposable income begin to take an active role in the grid through residential battery storage or self-generation, the distribution system will need to be upgraded both physically and operationally. The expense of these upgrades will be passed on from utilities to all customers through increased rates. However, customers who are not in a financial position to install DERs or drive an electric vehicle are not able to take advantage of the new capacity for which they are paying.[192] That said, the environmental benefits of a cleaner grid are shared among all customers. Quantifying the shared benefits of decarbonization and distributing costs to ratepayers in a way that reflects the value they receive in return will be a challenging but important task to ensure an equitable transition.

These concerns exist not only at the intergenerational and inter-income level but are also prevalent across Canada's diverse geographies; these inequities in the electricity system must be addressed to ensure an equitable transition. In particular, isolated remote communities operating independent, often diesel-reliant, electricity systems without interconnection to Canada's primary electricity grid experience higher electricity costs that complicate the apportionment of the capital investment required for the energy transition. Even with subsidies, residents of remote communities regularly pay four times as much as urban ratepayers for electricity and heating needs.[193] For example, households in Nunavut and the Northwest Territories pay over $0.30/kWh for electricity, while the average Canadian pays only $0.129/kWh.[194] Individuals in these remote grid regions and those facing energy poverty across the country must not be further burdened with the costs of the transition. These individuals and communities must also not be left behind in Canada's transition to clean energy; funding, programming, and policies must be appropriately designed and available for marginalized populations.

Reducing the energy burden on low-income households can be approached in two ways: lowering electricity bills for these households or increasing the efficiency of these households' electricity use. Several provinces and territories have already implemented means-tested electricity bill support programs for low-income households, such as the

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[192] "What we heard: Request for information on Canadian electricity regulation and grid modernization."

[193] Pembina Institute, *Diesel Subsidies – Simplified* (2021), 3. https://www.pembina.org/reports/diesel-subsidies-simplified-2021-06.pdf

[194] Canada Energy Regulator, "Market Snapshot: Explaining the high cost of power in Northern Canada," May 23, 2023. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2017/market-snapshot-explaining-high-cost-power-in-northern-canada.html

Ontario Electricity Support Program[195] and Alberta's Emergency Needs Allowance.[196] Provincial, territorial, and/or federal governments may play an increasing role in assuming some or all system upgrade costs accrued because of the energy transition.

Many provinces have also initiated programs to support energy efficiency upgrades in low-income households.[197] The federal government provides additional support for energy efficiency upgrades through the Affordable Housing Fund[198] and the Greener Homes program.[199] However, the Greener Homes program is rebate-based, making it inaccessible for low-income households that cannot take on the upfront costs of renovation,[200] and the entire program faces an uncertain future.[201]

Case Study: Michigan's Healthy Climate Plan

As part of their Healthy Climate Plan, Michigan is applying three approaches to ensure that changes to their energy system do not burden or exclude low-income ratepayers. First, they are expanding pilot programs that limit the energy burden of low-income households to less than 6% of their annual income. This percentage includes both electricity and home heating. Second, the Michigan Public Service Commission (MPSC) plans to set a minimum amount that utilities must invest in low-income energy efficiency programs.[202] This increase in targeted investment is much needed; a 2017 study found

[195] OEB, "Ontario Electricity Support Program." https://www.oeb.ca/consumer-information-and-protection/bill-assistance-programs/ontario-electricity-support-program

[196] Government of Alberta, "Income and Employment Supports Policy Manual: Emergency Allowance," January 1, 2024. http://www.humanservices.alberta.ca/AWOnline/IS/4868.html

[197] *Electricity affordability and equity in Canada's energy transition*, 5.

[198] Canadian Mortgage and Housing Corporation, "Affordable Housing Fund: Renovation," January 9, 2024. https://www.cmhc-schl.gc.ca/professionals/project-funding-and-mortgage-financing/funding-programs/all-funding-programs/affordable-housing-fund/affordable-housing-fund-renovation

[199] Natural Resources Canada, "Canada Greener Homes Grant," January 19, 2024. https://natural-resources.canada.ca/energy-efficiency/homes/canada-greener-homes-initiative/canada-greener-homes-grant/canada-greener-homes-grant/23441

[200] Abhilash Kantamneni and Brendan Haley, *Efficiency for All: A review of provincial/territorial low-income energy efficiency pograms with lessons for federal policy in Canada* (Efficiency Canada, 2022), 54. https://www.efficiencycanada.org/wp-content/uploads/2022/03/Low-Income-Energy-Efficiency-Programs-Final-Report-REVISED-with-COVER.pdf

[201] David Thurton, "Ottawa's green grants program for homeowners is running out of money faster than expected," *CBC*, November 17, 2023. https://www.cbc.ca/news/politics/greener-homes-grants-energy-efficiency-1.7029403

[202] Michigan Department of Environment, Great Lakes, and Energy, *MI Healthy Climate Plan* (2022), 33. https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Offices/OCE/MI-Healthy-Climate-Plan.pdf

that Michigan utilities' investment in residential energy efficiency programs saved high-income electricity consumers nearly ten times as much electricity as low-income consumers.[203] Finally, Michigan aims to increase funding to the Utility Consumer Representation Fund to support low-income community participation in MPSC proceedings, particularly as these new affordability and efficiency programs are developed.[204] This increase in funding is supported by the Low-Income Energy Policy (LIEP) Board, the MPSC's new advisory committee that aims to encourage participation of historically marginalized communities. The LIEP board also acts as coordinator between policy agencies working in the same space to ensure the state's approach to energy affordability and accessibility is cohesive, supporting the ultimate goal of reducing the number of households with high energy burdens.[205]

[203] Ben Stacey and Tony Reames, *Social Equity in State Energy Policy: Indicators for Michigan's Energy Efficiency Programs* (University of Michigan Urban Energy Justice Lab, 2017), 2. https://justurbanenergy.files.wordpress.com/2017/12/equity-in-energy-efficiency-investment-and-savings-report-2017.pdf

[204] *MI Healthy Climate Plan,* 33.

[205] Michigan Public Service Commission, "Low-Income Energy Policy Board." https://www.michigan.gov/mpsc/commission/workgroups/low-income-energy-policy-board

6. Conclusion

Transitioning to a net-zero grid will require significant changes to system infrastructure and operations. To enable these changes to occur, the regulatory structures that govern the electricity system must be updated. This report identified six key areas of need for regulatory change in the Canadian context: collaborative action, strategic direction and governance, faster and more inclusive processes, integration of new technologies, broader information sharing, and affordability.

This report and the following reports in this series aim to support provincial and territorial governments as they clarify their priorities and give direction to their respective jurisdiction's electricity sector. The reports also aim to empower regulators to enable change with the authority they are granted. The levers and case studies discussed here provide a suite of options that regulators could apply to create a regulatory environment that supports innovation and enables utilities to remain viable as the grid changes. This regulatory environment will look different for each province and territory; thus, regulators will have to combine these options in a way that best reflects the priorities in their jurisdiction.

Additional reports in this series will dive deeper into jurisdiction-specific opportunities for regulatory reform in Ontario, Alberta, and remote and Indigenous Communities in British Columbia and the territories, and provide recommendations for government and regulator action.

Appendix A. Definitions and acronyms

A.1 Definitions

The terms listed here are used throughout this report and future reports in this series.

Benefit-Cost Analysis (BCA)

A systematic approach used to evaluate the strengths and weaknesses of alternative solutions, including their social, environmental, and other impacts that can be difficult to quantify, to enable direct comparison between disparate options.

Cost-of-Service (CoS)

Traditional utility business model where regulators determine the total amount, called the revenue requirement, that utilities must collect to recover their costs and earn a return on their infrastructure investments. To determine appropriate rates, this total is apportioned among customer classes to reflect the services delivered and the costs incurred by the utility to provide those services. This incentivizes utilities to expand their capital investments to increase potential revenue.

Crown Corporation

A wholly government-owned organization that operates as a private enterprise. In Canada, the electricity sector contains many provincially or territorially owned Crown Corporations that handle generation, transmission, and/or distribution in their jurisdictions.

Deregulated Market

A market structure that allows entities other than a crown corporation or utility to own and operate electricity infrastructure. These entities compete with one another to sell electricity to consumers. Rates are set based on the wholesale market price rather than regulatory proceedings.

Distributed Energy Resources (DERs)

Small-scale decentralized energy technologies that generate, store, and/or manage energy close to where grid services are needed. Because of their proximity, DERs are less reliant on transmission and distribution networks, thereby reducing grid demands. DERs can include solar panels, small-scale wind, energy storage, and demand-side management of controllable loads.

Energy sovereignty

The inherent right of individuals, communities, and Indigenous peoples to make their own decisions regarding every aspect of the energy they use, from generation to distribution to consumption regarding sources, scales, ownership, and access structures.

Independent Power Producers (IPPs)

Renewable energy projects that are owned by renewable energy developers or companies other than the utility regulated to operate in the community. Electricity produced from these systems is sold directly to the utility. Electricity revenue is based on a formal contract between the provider and the utility.

Independent System Operator (ISO)

In a competitive wholesale electricity market, the independent system operator is responsible for grid operations and bulk system planning. They schedule the generation, transmission, and reserve activities of assets owned by other entities and manage the system in real time. In some jurisdictions, they are also responsible for market facilitation.

Natural monopoly

Natural monopolies occur when high barriers to entry make it more economically efficient for a single company, rather than multiple competitors, to supply a product or service. Natural monopolies must often be regulated for consumer protection and continued market efficiency.

North American Electric Reliability Corporation (NERC)

An international regulatory authority that develops and reinforces grid reliability standards in the United States and Canada.

Non-wires alternatives (NWAs)

Investments and utility programs that defer or reduce capital spending on electricity transmission and distribution upgrades (e.g., power lines or transformers) by the utility. NWAs can include deployment of DERs, energy efficiency measures, demand response programs, and other innovations that lead to cost-effective alternatives to expanding physical infrastructure.

Partially Regulated Market

A unique structure with components of both regulated and deregulated markets. For example, consumers in Ontario can choose to purchase electricity from competitive retailers or a regulated utility, while electricity transmission remains fully regulated.

Performance-Based Regulation (PBR)

An outcomes-based regulatory approach that seeks to improve utility performance by rewarding them for implementing creative solutions that achieve desired outcomes.

Performance Incentive Mechanism (PIM)

A type of PBR, PIMs are metrics used to measure and incentivize utility progress towards outcome-based objectives in priority areas.

Power Purchase Agreement

A contract between an energy producer and a buyer that specifies the purchase of an amount of energy, and may include its environmental attributes, at an agreed upon price.

Private utility

For-profit companies governed by private boards and owned by investors or shareholders, who are generally not customers of the utility or members of the community. Private utilities can be involved in the generation, transmission, distribution, and/or retail of electricity. Also known as investor-owned utilities.

Public utility

Utilities owned by the provincial or territorial government or a municipality that elects to provide its own electricity services for its residents. They can be involved in the generation, transmission, distribution, and/or retail of electricity. Crown corporations that are utilities are an example of public utilities.

Rate base

The value of property on which a utility is permitted to earn a specified rate of return, calculated as the total monetary value for all infrastructure assets a utility owns, minus depreciation of those assets.

Return on equity (ROE)

A utility's net income divided by its shareholder's equity. ROE is a metric to evaluate a corporation's profitability and efficiency in generating profits. Electricity regulators approve an allowable ROE for each utility that balances utility profitability and customer costs during rate case proceedings. Higher ROE means higher income or lower shareholder equity.

Revenue requirement

The amount of money the utility needs to collect to cover their costs and potentially earn a profit. Established through a general rate application.

Unbundled utility

In contrast to vertically integrated utilities, areas with unbundled electricity systems can be served by separate and/or multiple generation, transmission, and distribution utilities.

Utility regulator

Government body that regulates utility rates and operations to safeguard customer expenses while also allowing utilities to earn a reasonable profit. Also known as public utility boards or utility commissions.

Vertically integrated utility

A single company that owns and operates all electricity equipment, including the generating facility, transmission system (if in a non-remote context), and distribution and retail services. Utility may be publicly or privately owned.

A.2 Acronyms

BCA	Benefit-cost analysis
CoS	Cost-of-service
CREZ	Competitive renewable energy zone
DER	Distributed energy resources
DSP	Distribution system planning
EAM	Earnings adjustment mechanism
FERC	Federal Energy Regulatory Commission (U.S.)
GHG	Greenhouse gas emissions
ISO	Independent System Operator
IPP	Independent power producer
IRP	Integrated resource plan
NEM	National Electricity Market (Australia)
NERC	North American Electric Reliability Corporation
NRCan	Natural Resources Canada
NWA	Non-wires alternatives
PBR	Performance-based regulation
PIM	Performance incentive mechanism
PPA	Power purchase agreement
PUC	Public utility commission
ROE	Return on equity
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples