

Scaling Up Clean Electricity



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About Electrifying Canada

Electrifying Canada is a business-led task force aiming to accelerate electrification across Canada to reach net-zero by 2050. As business leaders, we are eager to collaborate with government, Indigenous, and civil society leaders to translate electrification ambition into action. The Electrifying Canada task force is affiliated with the Energy Transitions Commission and funded by its founding members. Learn more at electrifyingcanada.ca.

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About the Research

Research for the Electrifying Canada task force is provided by Dunsky Energy + Climate Advisors. Dunsky's team of nearly 50 specialists across the buildings, transportation, industry, and energy supply sectors is proud to serve as the task force's research arm.

This report is a collective view of the Electrifying Canada task force and may not represent the individual viewpoints of members and/or their respective organizations.



Table of Contents

1. Turning Net-Zero Ambition Into Electrification Action.....	1
1.1 State of Play	1
1.2 Key Barriers to Scaling Up Clean Electricity	4
2. Seizing the Opportunity: Five catalysts to accelerate electrification	6
2.1 Empower Utility Climate Leadership Through Regulator and Utility Net-Zero Mandates	8
2.2 Align Utility Planning With Net-Zero Pathways to Proactively Ensure Ample Electricity Supply for Economy-Wide Electrification.....	10
2.3 Finance the Scaling Up of Clean Electricity by Crowding in Private Investment	12
References	14

List of Figures

Figure 1. Growth in clean electricity generation required to achieve net-zero	2
Figure 2. Five catalysts to accelerate electrification	7

List of Boxes

Three big wins across the electricity supply chain.....	3
Developing demand: The act and tilt catalysts.....	6
Spotlight: Massachusetts regulator required to prioritize emission reductions	9
Spotlight: Hydro-Québec's new 5-year strategic plan puts a strong focus on electrification	11
Spotlight: Exploring electricity system financial products	13



1. Turning Net-Zero Ambition Into Electrification Action

An expanded Canadian clean electricity system will be the backbone of efforts to reach net-zero by 2050. We will need to clean up the remaining sources of carbon-emitting electricity generation and, in parallel, at least double total clean generation.

Canada's electricity systems have become increasingly clean as coal-fired power generation is phased out, with emissions dropping more than 50% since 2005 to 62 million tonnes in 2020 (Environment and Climate Change Canada, 2022). Looking ahead, the federal government's recent Emissions Reduction Plan committed to implementing a Clean Electricity Standard requiring a net-zero electricity grid by 2035.

While the policies and technologies needed to achieve this grid decarbonization are relatively clear, there is much greater uncertainty regarding how to double the electricity supply by 2050. The scale of this build-out is unprecedented, yet to date it has not received the attention or action it requires. This is why our task force has identified it as a key area of focus. If Canada is not successful in scaling up clean electricity production, it will be challenging to electrify our business operations and achieve net-zero by 2050.

This build-out requires action from actors across the electricity supply chain. Utilities—whether they are Crown corporations, private, or Indigenous—need to take a leading role. This is true whether they are vertically integrated or focused on generation, transmission, or distribution. These efforts can be supported throughout the value chain, with roles to expand generation for independent power producers, alongside the expansion of transmission and distribution by public, private, and Indigenous utilities and electricity planning by system planners and system operators. In this brief, we refer to these actors collectively as electricity system actors.

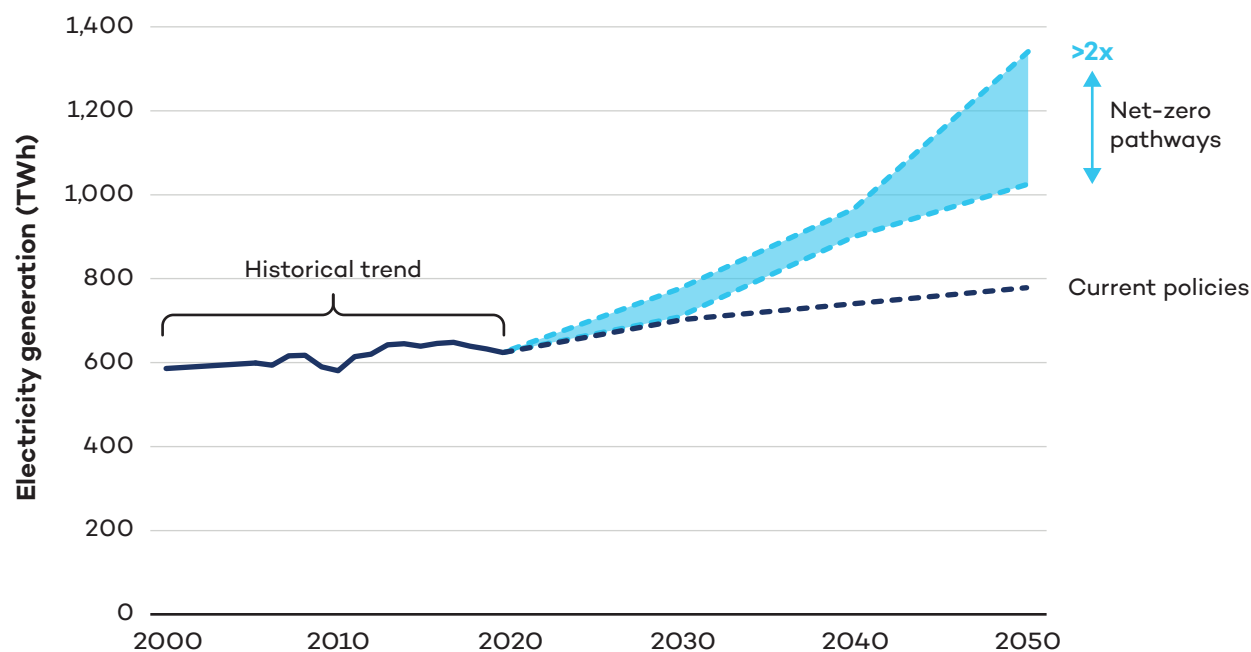
1.1 State of Play

We need to leverage Canada's clean and renewable resources and expertise to deploy significant power generation capacity over the coming decades. After decades of little to no growth in demand, the electricity sector now needs to accommodate *at least*¹ a doubling of current electricity consumption by 2050 to support the scale of electrification needed to achieve net-zero (Figure 1). About half of that increase will be driven by additional demand from buildings, a third from transport, and 10–15% from the industrial sector (assuming energy productivity gains in buildings and industry are realized) (Langlois-Bertrand et al., 2021).

¹ Some economic optimization studies assume that all cost-effective energy efficiency gains will be realized, which therefore frees TWh that do not have to be generated. However, as only a portion of the efficiency potential is likely to be realized, much more generation will be required than is shown in these economic optimization pathways.



Figure 1. Growth in clean electricity generation required to achieve net-zero



Source: Produced by Dunskey Energy + Climate Advisors for Electrifying Canada, 2022.

Data source for historical and current policies: Canada Energy Regulator, 2022.

Data sources for net-zero pathways: Electric Power Research Institute, 2021; Langlois-Bertrand et al., 2021.

While we have an abundance of clean and renewable energy resources, technologies, and companies that we can tap to deliver this supply, the current reality is that almost all **electric utility system planners and operators are not currently moving quickly enough to secure the clean power we will need to electrify substantial portions of our economy.** For example, while decarbonization pathways suggest we will need at least 12%–25% more power by 2030 (Figure 1), most utility plans currently fall far short, with many not entering this range until a full decade later.²

This growth presents a major opportunity for Canadian electricity system actors. Decarbonization requires major growth in electricity's market share, and this translates to long-term growth, increased revenue, an expanded customer base, and a burgeoning clean electricity workforce.

² Utility plans vary across the country. By 2030, Hydro-Québec projects that 12% in additional power generation will be needed (Hydro-Québec Distribution, 2021). By 2040, New Brunswick Power forecasts an additional 6% generation capacity, BC Hydro forecasts 13%, and Ontario's IESO projects 18% (BC Hydro, 2021; Independent Electricity System Operator, 2021; New Brunswick Power, 2020).



Three big wins across the electricity supply chain

We see three big wins for the key actors across the electricity system:

1. Indigenous energy sovereignty and economic reconciliation

Indigenous utilities, power generators, and communities have been leaders in clean electricity production and use. As highlighted in Indigenous Clean Energy's Waves of Change report (2022), First Nations, Métis, and Inuit entities are partners or beneficiaries of almost 20% of Canada's electricity-generating infrastructure, the majority of which is renewable. Indigenous communities are harnessing renewable electricity to control their energy sources and supply. This effort has generated major economic opportunities, with Indigenous communities becoming major or sole equity partners in projects, developing local skills, and reinvesting in communities. The race to net-zero will accelerate and expand this opportunity.

2. Counteracting the impacts of a “utility death spiral”

Electric utilities have a critical role to play in the energy transition. While concerns about the utility death spiral—where reduced electricity sales associated with the high penetration of rooftop solar and other distributed generation could impact utilities' abilities to recover costs and sustain their business model—are real, electrification will counteract some of them. Specifically, the magnitude of load growth from electrification will increase throughput from existing assets and require additional investments in transmission and distribution grids, thus ensuring a sustainable future for utilities and the ratepayers they serve. While the role of utilities will evolve during the transition, they will remain central to maintaining the affordability, reliability, and safety of our electricity systems.

3. A growing role for the private sector

Unlocking the grid build-out at this scale requires significant support across the sector, including from private sector actors. Governments and utilities cannot and should not have to do this work alone. Independent power producers—those that generate electricity outside of the regulated utility system—have seen major growth in recent years, and this will only increase given growing demand for electricity under net-zero pathways. More utilities and corporations are exploring innovative partnership and off-take agreements to secure new clean electricity supply. This translates into opportunities for provinces and territories to attract major private investment to build out the clean electricity supply that will be needed.



1.2 Key Barriers to Scaling Up Clean Electricity

Our research and interviews with Canadian and Indigenous corporate leaders identified three main barriers to scaling up clean electricity production and reaching net-zero:

- 1. Demand forecasting and system planning do not incorporate net-zero:** Demand forecasts that utilities, system planners, and system operators are using to plan, build, and maintain their electricity systems are not aligned with the electrification levels required to achieve net-zero. To reach this scale of climate action, we need to make an unprecedented shift from fossil fuels to clean electricity, and these shifts are not considered by traditionally conservative approaches to demand planning.

Moreover, the traditional planning processes are not aligned with the need for new partnerships and engagement, especially with Indigenous communities, required for net-zero. New generation and transmission projects are complex and have long lead times, so unless they are planned and executed proactively, they can arrive too late to enable electrification. The build-out needed will require access to large swaths of land, which will require free, prior, and informed Indigenous engagement and consent.

While some utilities are starting to recognize their potential role in achieving net-zero, even forecasts for “high-growth” or “electrification” scenarios remain modest relative to the build-out that will be needed. The reasons for this are complex and vary by jurisdiction. Vertically integrated utilities’ reluctance to plan for and invest in this scale of growth may arise from concern that the demand may not arrive, thereby putting upward pressure on rates to cover costs. In competitive markets, generators bear the financial risk if capacity is overbuilt and results in downward pressure on energy prices.

- 2. Regulatory context does not require net-zero:** Electricity is typically a regulated market, which is critical to ensuring fair and reasonable access to electricity to Canadians where there are monopolies. Regulators, and therefore utilities under their jurisdiction, have been required to focus exclusively on providing safe and reliable power at the lowest possible cost to ratepayers. There is limited/no allowance for climate considerations, let alone requirements that utilities meet and contribute to net-zero targets. As a result, utilities focus on their own operations and growth projections under a “business-as-usual” scenario. The massive scale up of electricity to enable economy-wide decarbonization by electrification is not (yet) a valid regulatory consideration.
- 3. The price tag of net-zero by 2050:** The rapid build-out of the electricity system to meet net-zero will require significant capital investments in the coming years. Utilities pay for system expansion through electricity rates, which would need to increase, potentially significantly even with infrastructure costs capitalized over their lifetimes. Although this would in part be mitigated by the expanded electricity customer base—spreading costs among a larger number of users and thereby reducing costs for all—it is important to recognize that rising electricity prices can have negative impacts on affordability (particularly on those most vulnerable) and on the business case for electrification (which



could slow the growth in demand needed to offset utility costs). Even in the lowest-cost electricity provinces, there have been concerns about rising power prices. These concerns can lead to political interference and restrictions on rate increases, which further limit the amount of capital available to build out the grid.

Despite these barriers, innovative solutions are being tested and implemented across the country to scale up clean electricity.



2. Seizing the Opportunity: Five catalysts to accelerate electrification

Canada has a transformational opportunity to meet our net-zero target by leveraging the competitive advantage offered by our clean electricity. However, our research finds that while Canada has huge opportunities and significant advantages, we also face a significant risk: complacency. **Without clear direction, proactive planning, and bold decisions, we will not be successful in overcoming the barriers to electrification identified above.** Failure to do so means wasting our competitive advantage, vastly increasing transition costs and risks, and foregoing significant opportunities.

But it is clear that whether we succeed or fail is up to us. **Achieving electrification at the pace and scale needed requires the proactive and collaborative efforts of all stakeholders**—electricity producers, end users, regulators, and policy-makers—across the electricity value chain. Meeting Canada’s net-zero target is a significant challenge, and clean electrification is the single most valuable tool to reduce emissions. That is why we, as leaders from the nation’s private sector, have identified five evidence-based catalysts to initiate and enable electrification (Figure 2). This brief analyzes the catalysts and their implications for the electricity sector.

Developing demand: The act and tilt catalysts

Electrifying to reach net-zero requires major shifts for both electricity supply and demand. Today, there is a major chicken-or-egg dilemma, or in electricity terms, a “plug-or-socket” dilemma: what comes first, new electricity demand or new electricity supply?

The practical reality is that both need to move forward in parallel. This brief covers the catalysts linked to clean electricity supply and its proactive scale-up. The **act** and **tilt** catalysts are the critical other half of the equation, driving electrification and associated electricity demand. To learn more, please review the companion briefs on electrifying commercial and institutional buildings, medium- and heavy-duty vehicles, and industry.

Figure 2. Five catalysts to accelerate electrification



2.1 Empower Utility Climate Leadership Through Regulator and Utility Net-Zero Mandates



Fully embracing electrification's potential and enabling its role in cutting pollution requires modernizing the mandates of regulators and utilities to reflect the key role they will play in achieving net-zero. A clear net-zero mandate is necessary to ensure utility plans and regulatory decisions are consistent with net-zero, as well as providing the financial means to enable the necessary action.

Why?

Electricity is a tightly regulated market in Canada, ensuring protection and access to all citizens. With a mandated focus on safety, affordability, and reliability, traditional utility regulation may consider but is not bound by climate targets in the decision-making process. The constraints of a relatively conservative, risk-averse regulated system limit the authority of utilities, system planners, and system operators to proactively meet the needs of a rapidly decarbonizing economy, while simultaneously prohibiting other electricity system actors from providing solutions where the utility may not be able to meet low-carbon energy demand. Further, electricity and natural gas are commonly siloed in regulations, which limits the potential to optimize economy-wide decarbonization across both the electricity and gas systems.

Call to Action: Provincial governments must embed net-zero objectives into regulator and utilities mandates.

Provincial governments must modernize regulator mandates, which would impact the mandate of those under their regulation: the governing bodies of utilities and then the utilities. These changes are necessary to ultimately empower utilities to integrate electricity and natural gas systems with economy-wide net-zero targets.

The utility mandates and regulatory oversight should be modified to require electricity supply planning to align with net-zero targets by using load forecast scenarios that are consistent with net-zero modelling (see Figure 1) and by meeting this demand with non-emitting sources of new supply, efficiency, and other demand-side measures. This mandate will require utilities to optimize supply mix to meet net-zero demand with non-emitting resources at lowest cost while still meeting the requirements of safety, affordability, and reliability.

Empowering utilities for net-zero will also require review and revision of existing regulatory policies that may include conflicting requirements. This process should consider what changes to utility spending, utility remuneration, partnership and off-take agreements, and monopoly rules are needed to allow end users to access sufficient emission-free electricity to meet their climate goals. Meeting a mandate of this scale cannot be done without also providing the means to achieve it.

**Goal:**

This catalyst aims to:

- Ensure regulators and utilities realize the decarbonization potential of electrification.
- Provide licence for electric system growth, including utilities and private electricity developers.
- Enable optimization across the electricity and gas systems, as well as ties between provinces, to reduce pressure on energy rates and bills.

Spotlight: Massachusetts regulator required to prioritize emission reductions

In 2021, Massachusetts enacted a new climate law focused on achieving net-zero by 2050. Under the law, the Department of Public Utilities (DPU, the regulator for investor-owned utilities) and utilities are required to prioritize emissions reductions (Massachusetts General Laws ch. 8., 2021). The regulator is now legally required to consider how a utility project or decision will reduce emissions. Previously, the DPU was only required to consider safety, energy reliability, and affordability for consumers in its decisions (Cronin, 2021). Similar mandates were given to utility regulators in Maine, Maryland, and Oregon, though regulators must only consider (not require) how utilities will help achieve state greenhouse gas (GHG) reduction targets (Executive Order No. 20-04, 2021; Maine Stat., No. 1682, 2021; Maryland Code, Com. Law. Ch. 615, 2021).

In Canada, regulators largely remain guided by non-climate priorities. However, in British Columbia, the GHG Reduction Regulation has empowered utilities to spend ratepayer funds on emission-reduction activities. As of 2020, public utilities can invest in public electric vehicle fast-charging stations to enable transportation electrification. They can also invest in electrification programs that provide financial and other supports to switch customers from higher-GHG energy sources to electricity. This regulation does not align with net-zero but highlights a recent effort to broaden utility mandates toward economy-wide decarbonization (Government of British Columbia, 2022).



2.2 Align Utility Planning With Net-Zero Pathways to Proactively Ensure Ample Electricity Supply for Economy-Wide Electrification



Align and optimize utility planning with net-zero to ensure Canada can reap the benefits from and mitigate the growing pains of scaling up clean electricity supply. Planning for the economy-wide electrification required to achieve net-zero will ensure we can deliver clean power where and when customers need it and at the scale and pace required.

Why?

On the supply side, the governing bodies of utilities and planning authorities (which can include local, provincial, and Indigenous utilities, system planners, and system operators, depending on the jurisdiction) are increasingly aware of the need for vastly more power to achieve net-zero, but actual electricity resource plans have not caught up. For example, while decarbonization pathways suggest we will need at least 12%–25% more power by 2030 (see Figure 1), most utility plans currently fall far short, with many not achieving this scale of growth until a full decade later.³ According to the Canadian Energy Regulator (2022), utilities across Canada are collectively planning to grow electricity output by only 40% by 2050, whereas net-zero pathways require growth of between 65%–115% in absolute terms (see Figure 1). The gap could not be any clearer.

Call to Action: Governing bodies of utilities and planning authorities must proactively align plans and investments with economy-wide net-zero targets.

The governing bodies of utilities and planning authorities must focus planning and investments to align with net-zero.

Electricity forecasting needs to incorporate the expected load growth from electrification under economy-wide decarbonization. This additional growth must be met using new, zero-carbon generation that is developed with Indigenous consent or through cost-effective demand-reduction and efficiency efforts. This shift allows utilities to expand their focus to growing in support of decarbonizing economy-wide energy use by increasing electrification, not solely maintaining the existing electricity grid.

By proactively planning for growth, utilities can explore opportunities to unlock smart electrification. Utilities can consider opportunities to efficiently integrate new loads to mitigate negative impacts. For example, while the additional load from certain sectors, such as heating or transportation electrification, could create peak demand challenges, these can be addressed by integrating demand management, innovative rate structures, and other solutions.

³ Utility plans vary across the country. By 2030, Hydro-Québec projects 12% additional power generation will be needed (Hydro-Québec Distribution, 2021). By 2040, New Brunswick Power forecasts an additional 6% generation capacity, BC Hydro forecasts 13%, and Ontario's IESO projects 18% (BC Hydro, 2021; Independent Electricity System Operator, 2021; New Brunswick Power, 2020).

**Goal:**

This catalyst aims to:

- Encourage utilities to become proactive champions of electrification and to bridge the gap between electrification needs and utility planning.
- Improve awareness of utilities regarding their central role in, and benefits of, accelerating electrification to reach economy-wide net-zero targets.
- Assess and mitigate electricity supply build-out risks through planning and outreach.
- Ensure Canadian businesses have enough clean power in the near and long terms to electrify their buildings, fleets, and industries.

Spotlight: Hydro-Québec's new 5-year strategic plan puts a strong focus on electrification

Hydro-Québec recently published its 2022–2026 strategic plan, which emphasizes its role as a catalyst for economy-wide decarbonization and aligns new electricity supply and demand-side management with this goal (Hydro-Québec, 2022). This is a significant change from Hydro-Québec's previous strategic plan.

The plan puts a priority on efficiency and peak demand management, plans near-term increases of generating capacity of 5,000 MW, includes large increases to infrastructure investments, and adds a clear long-term direction to increase generation by more than 50% by 2050. With this new commitment to boost supply, Hydro-Québec has aligned itself with economy-wide net-zero modelling and the net-zero future (Dunsky Energy + Climate Advisors, 2021).

To meet this decarbonization objective, Hydro-Québec outlined two key strategies focused on fuel-switching to electricity: electrifying transportation and fossil fuel replacement. To encourage electric transportation, the utility will build on its public charging network, expanding it to commercial vehicles, while also supporting smart charging to mitigate peak demand and encourage adoption. To replace fossil fuels with electricity, Hydro-Québec will support pilots of novel, efficient electrification technologies and accelerate deployment of commercially available technologies.

These electrification efforts are supported by efficiency and peak demand management efforts, which can reduce the scale of additional generation and capacity needed, thereby reducing system costs and helping customers manage bill impacts.



2.3 Finance the Scaling Up of Clean Electricity by Crowding in Private Investment



Channel interest by convening private investment actors and exploring innovative public–private–Indigenous approaches to finance the doubling of electricity supply in Canada. These efforts should also recognize and replicate the current examples of private–Indigenous approaches that do not require public funding.

Why?

Electrification projects at the scale and pace needed to meet net-zero targets will require significant capital investment in electricity generation, transmission, and distribution. These projects have different returns on investment, risks, and opportunities than traditional infrastructure projects. In addition, some utilities are currently over-leveraged and therefore are constrained in their ability to borrow capital to invest at the scale needed to meet net-zero goals, even though this electrification process can grow the customer base and increase energy sales and revenues.

Public funds can be leveraged to mitigate some risk, but there are limits to the scale of government investment available, and current approaches to public–private finance are not designed to easily attract private capital. Therefore, new approaches to financial sector deal preparation, analysis, and design are needed.

Call to Action: Develop and deploy public–private–Indigenous financing initiatives at scale.

Public and private financial institutions must develop innovative financing initiatives and scale up proven initiatives to fund the grid build-out. Convening public, private, and Indigenous partners can support knowledge sharing on how to evaluate and finance new types of deals. This process can also support the co-development of new financial products that improve risk sharing between actors (e.g., using public funds to mitigate some, but not all, project risk). This public investment can leverage broader, long-term private investment. Financial institutions should evaluate the cost and risk profile of capital for climate solutions and assess their own appetite for risk in electricity system investments.

Private investment models could include utility project financing, utility project equity partnerships with Indigenous or private actors, or private power purchase agreements that leverage private sector efficiencies, among other solutions. The exploration of these new financing models should investigate how to mitigate the ratepayer risk associated with the cost of reaching net-zero.

Additionally, the federal government should consider channelling funding directly to provinces and territories, given that their own direct jurisdiction over electricity markets is limited.

**Goal:**

This catalyst aims to:

- Address upfront capital needs and improve access to available private capital.
- Mitigate risk to ratepayers for the cost of electricity system build-out.
- Increase the competitiveness of projects with meaningful Indigenous participation.

Spotlight: Exploring electricity system financial products

In Northern Quebec, Innergex and Pituvik Landholding Corporation have a 50–50 equity partnership to develop a hydroelectric project, the first of its kind between an Inuit corporation and an independent power producer in Canada (Innergex, 2020). The partnership is constructing a 7.5 MW run-of-river facility near Inukjuak, Nunavik, replacing off-grid diesel generation and channelling revenue into the local Inuit community. The clean generation project has a 40-year power purchase agreement with Hydro-Québec (Innergex, 2021) and is primarily financed through a private sector construction loan, with additional financing provided by the equity partners (Innergex, 2020).

In Southern Ontario, public, private, and Indigenous partners are investing in a major energy storage project. The Oneida Project plans to bring 250 MW/1,000 MWh of battery energy storage to the grid to reduce the use of gas-fired power plants for peak demand, mitigating emissions and ratepayer costs. This ~CAD 500 million project is equally owned by Six Nations of the Grand River Development Corporation (SNGRDC) and NRStor Inc., with investments from the two project partners and the Canada Infrastructure Bank and the balance of financing from private sector lenders (Canada Infrastructure Bank, 2021). Notably, this project is an addition to SNGRDC's 1,000 MW clean energy portfolio, where they have equity interest (10% to 90%) in many of their portfolio projects (Six Nations of the Grand River Development Corporation, 2022).

These projects highlight examples of new financing models for challenging or novel grid expansion, but other approaches are also needed. Canada Grid and the Institute for Sustainable Finance are convening actors across the electricity and financing sectors to develop innovative solutions in the Macro-Grid Financing Roundtable, which will be held in 2022.



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Annex 1. Electrifying Canada

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