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Flipping the Switch

Modernizing Canada's Electrical Grid for a Climate-Resilient Future

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LAND ACKNOWLEDGEMENT

Action Canada acknowledges that its work takes place on the traditional lands and territories of First Nations, Inuit, and Métis peoples across what is now called Canada. We recognize the enduring connection between Indigenous peoples and these lands, and we are committed to contributing to reconciliation through our learning, partnerships, and leadership development work.

DISCLAIMER

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Executive Summary

2050

Electricity demand is projected to more than double by 2050.

CANADA'S ELECTRICITY SYSTEM IS entering a decade of accelerating pressure. Extreme heat, cold, storms, drought and wildfires are straining electrical grids, creating reliability risks that will only intensify as the climate continues to warm. At the same time, electricity demand is projected to more than double by 2050 as transportation, buildings and industry electrify. Large, centralized generation projects will remain essential to meeting this demand, but they require long development timelines. The resilience Canada needs in the near term cannot wait for new energy-generation infrastructure that may not come online for many years. Strengthening resilience in this decade will depend on how quickly Canada can make existing electrical grid infrastructure more responsive and adaptive.

Making this a reality calls for a wide range of changes, broadly understood as grid modernization. This is the transition from a one-way electricity system where power flows from large, centralized plants to passive consumers, toward a more flexible and resilient grid capable of managing two-way power flows. This has advantages for making our electricity systems more reliable, but also more affordable and more responsive to economic development needs.

Two case studies of smaller utilities strongly engaged in modernization efforts are featured in this report. The first, on Summerside, P.E.I., shows how a small municipally owned utility transformed its electricity system through local generation, demand management, and battery storage to deliver greater resilience and lower costs to local residents. The second case study, examining the Essex Powerlines Corporation in southern

Ontario, shows how a small regional utility used a large blackout in 2003 as a turning point to build real-time visibility, enabling more reliable service and rapid integration of new loads and distributed energy assets.

Although some utilities are proactively adapting to climate pressures and increasing demand, many remain constrained by regulatory, financial and technical barriers originally designed for centralized systems. These barriers cause regulatory lag, where the rapidity at which technology is developing outpaces the years- long cycles that dominate utility planning, approval and rate-setting. However, there is now significant potential momentum to support grid modernization, with electrification being a major focus of the federal government's desire to secure Canada's role as an energy superpower.

Building an energy-resilient future will require a holistic approach, taking into account People, Communities, and Systems. Here are our recommendations:

Recommendation 1 (People):
Empower households to become active partners in grid resilience.

- Set a national 2035 target for residential demand flexibility.
- Scale automated, opt-in demand flexibility programs, overseen by provincial governments and energy regulators.
- Make residential renewables easy to adopt.
- Expand participation for renters and low-income households.
- Require clear standards from energy regulators .

Recommendation 2 (Communities):
Enable community-scale energy redundancy for critical services.

- Modernize net metering and community participation rules.
- Sustain and strengthen community-focused grid modernization funding.
- Enable multiple municipal grid participation models.
- Require distribution-level resilience planning.

Recommendation 3 (Systems):
Align grid modernization incentives, regulation, and data tools with resilience outcomes.

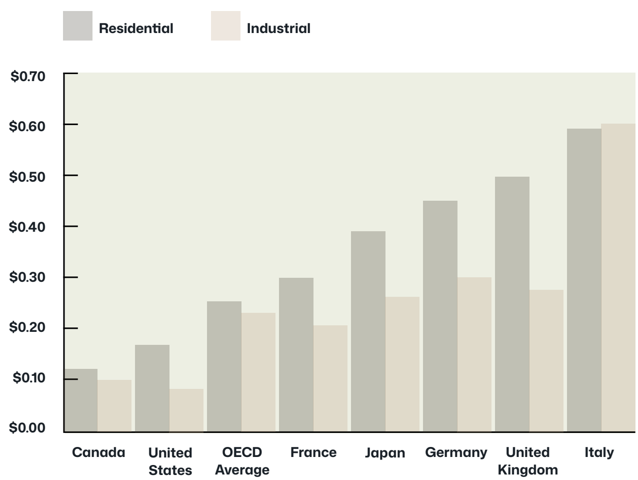
- Make DER integration an explicit regulatory objective
- Clarify utility roles for shared infrastructure that reduces peak stress.
- Launch a National Distribution Grid Digitalization Initiative (Federal government co-funds; utilities deliver; provinces align).
- Shift utility regulation toward resilience outcomes.
- Create regulatory sandboxes for grid innovation.

Canada is at a critical nexus for change, and grid resilience needs to be built now, not decades from today.

Introduction

CANADA HAS SOME OF the most affordable and clean sources of electricity in the world.[1] The electricity advantage has supercharged economic growth over the twentieth century and delivers the energy Canadians rely on for their basic needs. A secure and resilient electricity system provides safety and connection to communities and underpins Canada's economic well-being as well as its net-zero ambitions. Now extreme weather caused by climate change is feeding skyrocketing electricity demand and placing new pressures on the reliability of Canada's electrical grid, threatening the cornerstone of our social and economic well-being.[2]

FIGURE 1: Average electrical rates for various countries



Source: Powering Canada's Future: A Clean Electricity Strategy

Canada's electricity system is increasingly vulnerable to physical damage from extreme weather. These impacts are magnified by the reality that much of the country's grid infrastructure is aging.[3] Meanwhile, hydroelectricity, which makes up approximately 60 percent of national generation,[4] is increasingly strained by drought.[5] As extreme weather events intensify year over year, few areas in Canada are left untouched by this impact. The most damaging storms in B.C.'s history have occurred since 2018, according to BC Hydro,[6] with 2024 smashing all previous records.[7] In Central Canada, the 2022 derecho, a deadly windstorm that swept through the Quebec City–Windsor Corridor, caused a power outage lasting weeks[8] and affecting more than 1.1 million customers.[9] Across the country, ice storms, hurricanes and wildfires are increasingly causing devastation to the electrical grid, leading to extended power outages and high costs to repair the infrastructure.

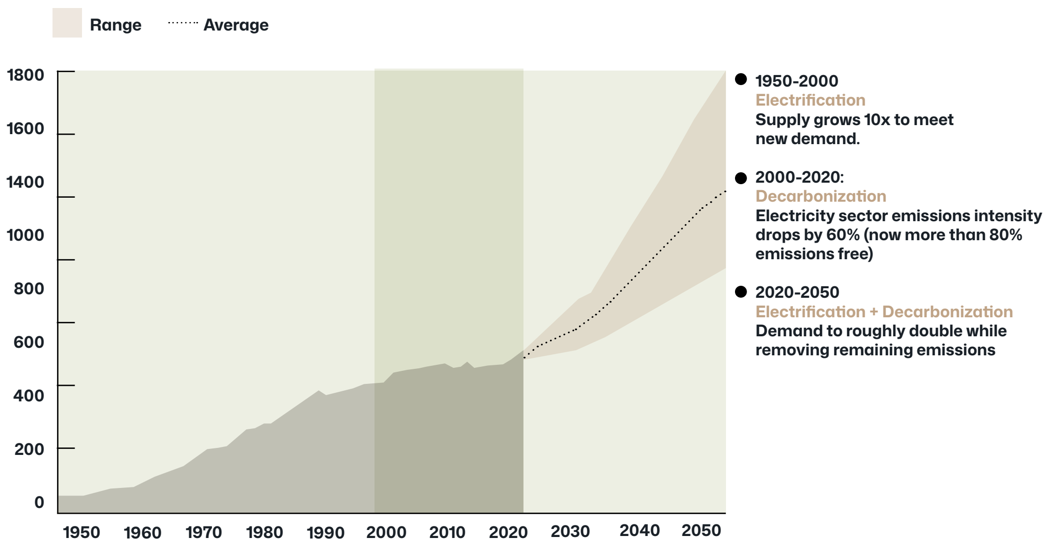
Extreme weather is also pushing electricity demand to unprecedented peaks. As Canada warms at roughly twice the global average,[10] communities will experience more frequent and prolonged extremes of both heat and cold, driven by heat domes and polar vortexes intensified by climate change.[11] The North American Electric Reliability Corporation (NERC) has found that most areas in Canada, and more broadly North America, are at risk of power shortfalls due to extreme weather.[12] These already have an outsized impact on our electrical systems. For example, the 2021 heat dome in British Columbia[13] and the 2023 polar vortex in P.E.I. led to peak electricity demand of around 30 percent above normal.[14] Fortunately, the electrical system did not fail.

However, in 2024, Alberta experienced a winter of power restrictions and localized blackouts due to extreme cold and infrastructure failures, which highlighted how fragile our systems can be.[15] In December 2025, Yukon warned residents to prepare for holiday power outages as a prolonged polar vortex drove temperatures below −50 °C, pushing electricity demand to the limits of generation capacity.[16]

In parallel, there are growing power requirements across the country as we decarbonize, and demand for electricity is projected to double or even triple by 2050.[17] Buildings, vehicles, and industries are electrifying. According to a report from Canada's Energy Regulator on Canada's Energy Future, electricity is projected to become the dominant end-use energy source under every net-zero pathway.[18] This challenge will require substantial investment in grid modernization and the unprecedented construction of new generating assets.[19] Otherwise, the evidence suggests that more expensive and less reliable electricity may be the reality for Canadians in the future. Power outages have a high cost to households and communities,[20] with immediate costs associated with spoiled foods, emergency supplies, repairs and even temporary accommodations, as well as opportunity costs from factors such as lost employment productivity.

The problem is clear and intensifying: electricity demand is projected to grow faster than new capacity can be built, while extreme weather events are becoming more frequent and disruptive. These pressures are placing unsustainable strain on Canada's electrical grid. As the urgency to upgrade Canada's aging grid infrastructure grows, so does the opportunity to invest in a more climate-ready electricity future.

FIGURE 2: Historical and future electrical demand in Canada



Source: Powering Canada's Future: A Clean Electricity Strategy

Building a Competitive Advantage through Reliable Electrical Grids

Canada's Clean Electricity Strategy[21] spells out the opportunity: Climate change is an existential threat, and an incredible opportunity to build a better future.

URGENT ACTION IS NEEDED now to avoid devastating financial losses. Modernizing the electrical grid is a key step to improve the future, and a net-zero modern grid may collectively lower energy costs for Canadians by up to $15B, a study for the Canada Electric Advisory Council cited in this strategy found.

WHAT IS GRID MODERNIZATION?

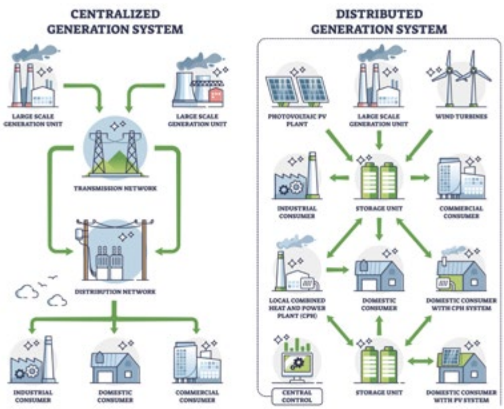
Grid modernization describes the transition from a one-way electricity system, where power flows from large, centralized plants to consumers, toward a more flexible and resilient grid capable of managing two-way power flows, integrating centralized generation with distributed energy resources (DERs).

There are three core pillars[22] of grid modernization. **Decentralization** redistributes some generation and storage from centralized plants to local systems, turning consumers into active participants in the grid and improving resilience by reducing reliance on long transmission lines.[23] **Decarbonization** accelerates the transition away from fossil fuels by enabling rapid deployment of renewable energy at multiple scales, expanding market participation while supporting Canada's net-zero commitments.[24] **Digitalization** binds the system together, using real-time data, automated controls and digital grid simulations to coordinate centralized and distributed assets, anticipate disruptions, and manage variability in demand and supply.[25]

DERs introduce a complementary model, in which smaller, local assets generate, store, and manage electricity closer to where it is consumed. These include, but are not limited to, rooftop, community, or balcony solar installations; battery storage; district energy systems; and microgrids that can operate independently during outages. The decentralized approach builds energy redundancy into the grid. This means having local backup options for generation, storage, and microgrids that can keep critical services powered when the wider grid is disrupted.

While distributed systems introduce new operational and regulatory challenges, advances in digital control and data-driven grid management are making these hybrid systems increasingly viable. As electricity demand rises and climate risks intensify, the question is no longer whether Canada's grid must modernize, but how quickly successful models — such as those implemented in Summerside, P.E.I. and in Essex County, Ont. — can be replicated elsewhere.

FIGURE 3: Centralized vs. distributed electricity generation



Source: iStock Illustration ID: 2076928828, 2024

Case Study: Summerside, P.E.I

Situated on the western side of Prince Edward Island, the City of Summerside sat at the far end of an electricity system it did not fully control. Power reached the city through undersea cables and flowed across infrastructure managed by Maritime Electric, based in Charlottetown. For years, this arrangement left Summerside exposed to outages, price volatility and decisions made far from the community itself.

Today, that same city of roughly 18,000 people generates more than 60 percent of the electricity it uses and is one of Canada's leading examples of municipally led grid modernization. That transformation was neither linear nor inevitable. It was shaped by experimentation, regulatory friction, and a near-crisis that clarified both the promise and limits of local energy control.

Summerside's grid modernization journey began in 2007, when the city's municipally owned utility, Summerside Electric, built a 12-megawatt wind farm. The project was a straightforward attempt to reduce reliance on imported power while keeping economic benefits local. However, it also delivered a clearer understanding of how local energy-generation systems behaved. Wind generation sometimes aligned well with local electricity use, but at other times it arrived when demand was low or fell short during peak periods.

The city treated this as evidence that building a resilient local grid would require new ways of operating the system and looking beyond generation capacity. This insight became the foundation for Summerside's emergence as a local energy powerhouse.

MORE THAN A CLIMATE INITIATIVE

As an island community that was supplied energy through a limited number of transmission assets, the city had little redundancy. Electricity interruptions had direct consequences for water systems, healthcare, communications and economic activity.

City leadership began to treat grid modernization as an operational necessity rather than a climate initiative. Decisions focused on keeping the system stable during winter peaks, avoiding high import costs, and maintaining enough local flexibility to respond

FIGURE 4: Overview of Summerside, P.E.I.'s electrical innovation

Source: With permission from City of Summerside

when upstream infrastructure failed. Over time, these choices also produced visible fiscal benefits. By reducing exposure to volatile import costs and keeping more energy dollars circulating locally, Summerside has avoided any municipal property tax increases for decades, helping to build long-term public support for the city's energy strategy.

POWER TO THE PEOPLE

One of Summerside's most distinctive innovations emerged from engaging the community directly in the electricity system. Their Heat For Less program was designed to reduce peak demand, which are the brief periods each year when electricity systems are most strained. Instead of building infrastructure sized to meet those peaks, Summerside offered residents electric thermal storage units or controllable hot water systems to store energy and heat their homes. These devices allow the utility to manage when electricity is consumed, while residents retain control over when heat is released. In return, participants receive electricity at half price for five years.

By 2025, approximately 450 households were participating, representing 15 to 20 percent of system load, with nearly 600 controllable devices connected. A pilot program offering smart heat pumps is now expanding this approach.

SCALING UP — AND A TEST

The city's most significant recent investment came in early 2024 with the completion of the Sunbank Solar and Battery Project. Developed in partnership with Samsung Renewable Energy, the $68-million project includes a 21-megawatt solar facility paired with a 10-megawatt, 20-megawatt-hour battery — a facility capable of powering thousands of homes.

For Summerside Electric, this local generation paired with battery storage was transformative. Excess wind or solar energy could now be stored and dispatched during peak periods or low-generation hours, reducing reliance on imports, stabilizing costs, and improving resilience to extreme weather and market volatility.

FIGURE 5: Action Canada Fellows visiting Summerside Sunbank Project, June 2025

Source: Jeffrey Mackay, June 2025

That resilience was tested in February 2024, when a transformer failure at a nearby Maritime Electric substation sharply restricted power flowing into the city. This revealed a risk that Summerside faces as a smaller, independent utility. As a relatively small customer within a larger system, Summerside was not the top priority for having limited electricity supply restored. In this case, however, the community's own wind, solar, battery, and demand management technologies allowed it to avoid blackouts and turn a potential structural disadvantage into a moment that demonstrated the value of local assets.

LOOKING AHEAD

Summerside has shown what a small city can do when it treats electricity as an operational responsibility rather than a distant service. What has not been given is the freedom to act on everything it has learned. Despite building local generation, storage, and demand control, the city remains bound by regulatory rules written for a centralized system that limit how Summerside can configure its own grid. One clear example is the city's decade-long, unsuccessful effort to secure a direct connection to the undersea transmission cable linking Prince Edward Island to New Brunswick, a change it has argued would improve reliability and reduce costs.

The city is still moving ahead. Its next phase focuses on practical investments: adding wind capacity, expanding battery storage and replacing aging diesel generators with cleaner backup resources. Summerside is also looking further ahead at more speculative technologies such as the potential of green hydrogen for longer-term storage of surplus generation capacity.

Summerside has treated each new investment as an opportunity to test, adjust, and build operational knowledge over time. As electricity systems across Canada become more complex and less predictable, the ability to adapt operations may matter as much as generation capacity itself. Summerside's experience suggests that institutional flexibility, not just technical sophistication, will be a defining feature of resilient grids.

Case Study:
Essex Powerlines Corporation, Ontario

In August 2003, much of eastern North America went dark. The Northeast Blackout shut down subways in Toronto and New York, knocked out traffic lights and forced hospitals onto emergency power. When the grid failed, the systems people relied on most were only as resilient as the local infrastructure supporting them. In Essex County, in Southwestern Ontario, the outage exposed a stark reality and an unexpected new path.

In Leamington, the regional hospital's backup generator ran out of fuel. Authorities had to think fast and did. Essex County has the world's second-highest concentration of greenhouses,[27] and Leamington is the tomato capital of the country. What kept the hospital's lights on was not the centralized grid, but nearby greenhouses growing those tomatoes and more, all of which were equipped with on-site generators. The regional authority, Essex Powerlines Corporation, worked with local operators to route electricity from those facilities to the hospital, effectively creating a temporary, improvised microgrid. This pointed to a different way of thinking about resilience, where generation is located close to where power is needed, combined with the ability to see and manage the system in real-time.

CLIMATE, GROWTH, AND RISING SYSTEM PRESSURE

Essex Powerlines has grown since that incident to now serve approximately 33,000 customers in the Windsor–Essex region. With one of the warmest climates in Canada, this region has experienced a growing number of extreme weather events that have contributed to increasing energy demands. At the same time, electricity demand in the region has risen sharply due to an energy-intensive niche industry.

Greenhouse development has transformed local load profiles, having expanded from roughly 200 acres two decades ago to more than 5,000 acres today. Each acre of greenhouse can require up to half a megawatt of power with large industrial connections; these require a 30–50 megawatt range, and are becoming more common. This is in addition to the general growth in demand from electric vehicles, manufacturing, and housing. These trends mean that peak demand is rising during peak hours and outages carry higher economic and human consequences.

Essex Powerlines recognized early that traditional approaches alone would not be sufficient to meet these pressures.

THE DATA ADVANTAGE

Rather than starting with large, centralized upgrades, Essex Powerlines focused on the lowest levels of the distribution system: meters, switches, transformers and feeder lines. The goal was not automation for its own sake, but to support visibility. The utility wanted to know, in near real-time, what was happening across its network.

Early adoption of advanced metering infrastructure in 2006 dramatically expanded data collection. Instead of roughly 100 digital readings per day, there were now more than 30,000. Over time, this data was integrated into a detailed digital model of the distribution system, often referred to as a "digital twin." This model reflects real-time conditions across the grid, allowing operators to see how electricity is flowing, where constraints are emerging, and how different parts of the system respond to stress.

Unlike many utilities that rely primarily on top-down supervisory control and data acquisition (SCADA) systems, Essex Powerlines built its situational awareness from the ground up. SCADA was added later, once the underlying data was in place. This sequencing gave operators a level of granularity and flexibility that is uncommon for a utility of this size.

With real-time visibility, Essex Powerlines can model and simulate grid behaviour during peak demand periods. Operators can reconfigure parts of the network remotely, isolate faults more precisely, and restore service faster when outages occur. The same visibility also changes how the utility works with customers. Essex Powerlines can assess new loads, such as greenhouse expansions or clusters of electric vehicle chargers, and review applications for DERs, including on-site generation, far more quickly and with greater confidence. By knowing exactly where capacity exists in the system, the utility can approve new connections without unnecessary delays, reducing uncertainty for customers while protecting system reliability.

FIGURE 6: NASA image showing the explosive growth of greenhouses in the Leamington area from 2015 to 2025

Source: NASA, North America's Greenhouse Hub, 2026

Essex Powerlines is now taking the next step by testing the role of automation alongside human judgment. In an ongoing multi-year experiment, system operators continue to make manual switching decisions while an automated control system runs in parallel, generating its own recommendations. By comparing outcomes, Essex Powerlines is learning where automation adds value, where human oversight remains essential, and how the two can work together.

WHY IT WORKS

Essex Powerlines' experience does not eliminate the need for physical infrastructure, nor does it make the system immune to extreme weather. What it does provide is a more practical form of preparedness: the ability to identify system constraints as they emerge, respond precisely when failures occur, recover more quickly, and work with customers in real-time to connect new loads and DERs without undermining reliability. Together, this operational awareness and responsiveness allow the utility to manage growth and climate risk together.

Policy and regulatory constraints remain. Five-year planning cycles can lag behind rapidly changing technology, and current rules limit how utilities coordinate electric vehicle charging or integrate DERs. These constraints are not unique to Essex, but they shape how far and how fast utilities can apply the capabilities they have built.

Essex Powerlines' story showcases how early planning can enable the foundations of grid modernization. By treating data as core infrastructure, the utility has positioned itself to manage a system that is becoming more complex. As climate impacts continue to intensify and electricity demand continues to grow, the experience of Essex Powerlines suggests that resilience begins long before an outage occurs. It starts with knowing, in real-time, how the system is behaving and building the institutional capacity to act on that knowledge when it matters most.

The Moment is Now

The federal government's *Climate Competitiveness Strategy*[28] makes it clear that reliable, clean electricity is now a cornerstone of Canada's economic future.

BUSINESSES ARE SEEKING ACCESS to dependable, low-carbon power, and Canada's competitiveness depends on a grid capable of supporting both rapid electrification and extreme climate conditions. The imperative to modernize Canada's electrical grid is practical and moral too, rooted in the need to protect communities from escalating climate-driven risks, ensuring household and economic resilience. Across Canada, modernization efforts are emerging, but progress remains uneven and fragmented.[29] Grid failures will undermine both economic stability and public trust.

Luckily, legislative momentum is growing. Canada's 2025 budget outlines the need to modernize our electrical grids in light of growing energy demands.[30] Grid modernization will also play an important role in our 2030 *Emissions Reduction Plan*,[31] which aims to cut emissions by 40 percent below 2005 levels by 2030, and the Canadian Net-Zero *Emissions Accountability Act*'s[32] goal for the Canadian economy to cut or offset greenhouse gas emissions to zero by 2050.

Regulatory Barriers

Across Canada, regulatory frameworks have not evolved at the same pace as grid innovation.

MOST PROVINCIAL ELECTRICITY REGULATIONS were designed for centralized systems characterized by predictable demand, long asset lifetimes, and limited participation beyond utilities themselves.[33] As grids become more digital, distributed, and interactive, these legacy frameworks are increasingly acting as a binding constraint on modernization and decentralization.

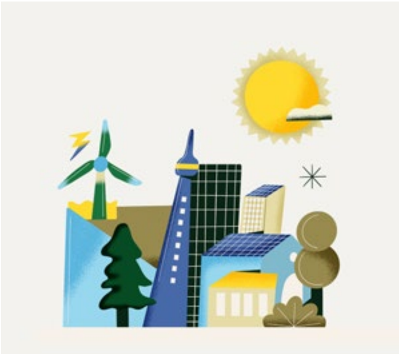
THE REGULATORY LAG

Technologies are evolving at an exceptional pace, on timelines measured in months, while utility planning, approval, and rate-setting processes typically operate on five-year cycles.[34] While these processes are important to protect the system and consumers, this mismatch can delay deployment, discourage experimentation, and lock in infrastructure investments that are poorly suited to managing rapidly changing patterns. Several experts interviewed for case studies in this report noted that investments in automation, DER orchestration, or localized resilience can be difficult to justify within existing frameworks, even when they may reduce long-term system costs and improve performance during outages. Furthermore, the process for changing standards or making amendments to codes for new technologies is convoluted and excessively long. Regulatory barriers also shape who is permitted to participate in the electricity system. Smaller actors often face complex interconnection requirements with the grid.

Individual Canadians are among those currently constrained. Within this context, the ability for a household to generate renewable energy for its own use, known as "net metering,"[35] provides a useful example. All provinces and territories allow some form of customer self-generation, with credits awarded to participating households, and options to share energy produced. Yet program design varies widely in system size limits, credit valuation, rollover periods, and whether surplus generation has any cash value. In many jurisdictions, credits expire annually, cannot offset fixed charges, or are explicitly structured to discourage electricity sales. While net metering enables household participation, these limitations reduce the ability of distributed generation to contribute meaningfully to grid resilience or system-wide optimization.

Additional barriers emerge in multi-unit residential and urban settings, where opportunities such as balcony solar or shared rooftop systems are constrained by building codes, electrical codes, and metering rules and regulations.[36] These challenges are particularly salient as electrification increases demand in precisely the communities with the least access to individual generation.

Taken together, these barriers point to a structural issue: regulation has not yet fully adapted to an electricity system where value is increasingly created through coordination and localized resilience rather than generation alone. Meaningful grid modernization will require regulatory frameworks that enable experimentation and balance accountability to ratepayers with the need for adaptive, decentralized, and climate-resilient electricity systems.



Recommendations

The case studies demonstrate that grid resilience strengthens when a broader set of actors can participate meaningfully in the electricity system. When households have accessible ways to contribute, when communities can pursue local solutions, and when utilities have modern tools that support flexibility and innovation, the grid becomes more capable of withstanding climate-driven stress.

Canada must use the next decade to strengthen the enabling conditions that make distributed action possible. The recommendations below outline pathways to a more flexible, adaptive, and climate-ready electricity system.

01: People

Recommendation 1: Empower households to become active partners in grid resilience.

Households represent one of Canada's largest untapped resilience assets. Summerside's Heat For Less program shows that simple automated demand flexibility can reduce peak stress, lower costs and help maintain service during extreme events. Yet participation remains limited across the country. Expanding household pathways, including options suitable for renters and those without upfront capital, can deliver fast, equitable resilience benefits.

Key Actions

1. Set a national 2035 target for residential demand flexibility

- Federal and provincial governments set a target that requires utilities to offer automated, opt-in load-shifting programs.

2. Scale automated, opt-in demand flexibility programs, overseen by provincial governments and energy regulators

- Require utilities to offer simple, automated programs with clear customer value and clear participation terms.

3. Make residential renewables easy to adopt

- Standardize interconnection rules (including net metering and compensation frameworks) and codes and technical standards so homeowners know exactly what is required, what they will be paid for exported power and how long approval will take.

4. Expand participation for renters and low-income households

- Use approaches that reduce or remove upfront costs, ensuring that resilience benefits can be built into affordability measures. Special consideration should be taken to enable certified plug-in options (e.g., balcony solar), where safe and appropriate, to ensure renters can participate in electricity generation with low upfront costs.

5. Require clear standards from energy regulators

- Energy regulators, supported by public education from the provincial government, should build trust and transparency on privacy, data use, and energy management systems.

02: Communities

Recommendation 2: Enable community-scale energy redundancy for critical services

Key Actions

1. Modernize net metering and community participation rules

- Encourage self-generation by harmonizing best practices for net metering across the country, including plain-language communications about fair compensation (what households are credited for electricity exports) and how long credits last.

- Enable shared/community-owned solar and energy storage projects so residents without suitable properties can subscribe to a local project and receive bill credits or electricity when the power goes down.

2. Sustain and strengthen community-focused grid modernization funding

- Build on existing federal and provincial infrastructure programs that already support community energy systems (e.g., the Investing in Canada Infrastructure Program and the Build Communities Strong Fund) by establishing a clearly defined and durable funding stream for community-scale solar and wind generation, storage, and microgrids.

3. Enable multiple municipal grid participation models

- Work with municipalities to enable a full spectrum of roles in community energy, allowing them to implement (own or manage), invest (through equity or partnerships), regulate (via zoning and bylaws), and encourage (through capacity building and community engagement) local projects.

4. Require distribution-level resilience planning

- Mandate practical resilience plans that identify critical loads, priority grid upgrades, and where community-scale assets would reduce outage risk. Link such planning to eligibility for public funding so investments are strategic.

03: Systems

Recommendation 3: Align grid modernization incentives, regulation, and data tools with resilience outcomes

Essex Powerlines illustrates what becomes possible when utilities invest in high-resolution visibility (advanced metering), digital system models (digital twins), and automation to reconfigure the grid during extreme conditions. However, many utilities face structural barriers: under conventional models, they may not capture the full societal value of resilience investments, creating a "split incentive" that slows hardening and modernization unless regulation and public funding bridge the gap.

Key Actions

1. Make DER integration an explicit regulatory objective

- Create a separate, clear requirement and incentive for utilities to increase their capacity to connect and manage distributed resources so DER hosting is not buried inside general reliability targets

2. Clarify utility roles for shared infrastructure that reduces peak stress

- Enable utilities to own or coordinate shared assets – such as community batteries and managed Electric Vehicle (EV) charging – where it demonstrably lowers system costs and improves resilience, while ensuring ratepayers share in the benefits.

3. Launch a National Distribution Grid Digitalization Initiative (Federal government co-funds; utilities deliver; provinces align).

- Co-fund advanced metering, grid "visibility" upgrades, energy management systems, digital twins, and automation – prioritizing small and mid-sized utilities and regions where back-up capability and faster restoration would be especially valuable during extreme heat, cold, storms, or wildfire events.

4. Shift utility regulation toward resilience outcomes

- Regulators should adopt performance-based incentives for utility companies tied to outage duration, restoration speed, ability to integrate distributed energy, and peak demand reduction. Keep the metrics simple and public.

5. Create regulatory sandboxes for grid innovation

- Energy regulators and standards bodies should enable the rapid deployment of time-bound pilots for innovations such as AI-based automation, pricing models, and innovative ownership models, with clear evaluation criteria. Ensure that these are paired with explicit pathways to scale what works into permanent regulation.

Conclusions

TAKEN TOGETHER, the evidence and case studies show that Canada's electricity resilience in the decade ahead will be determined by how quickly the country can modernize its grids and broaden who can participate in them. When households, communities, and utilities are equipped to act, resilience is achievable. In addition to the economic and environmental rewards, there are social benefits too.

A resilient grid is the foundation of community well-being. Extreme weather events disproportionately affect vulnerable, rural, and remote communities, where outages can quickly escalate into health, safety, and economic emergencies. Enabling local participation in generation, enhancing demand management, and supporting community-scale resilience projects ensures that Canadians are not just passive recipients of power but active partners in safeguarding their own futures.

This is a decisive decade. Large, centralized generation will remain essential, but it cannot deliver alone and in a timely way the resilience Canada needs. By empowering households, equipping communities, and modernizing the systems that connect them, Canada can "flip the switch" on a new era of electricity. One that keeps people safe, economies competitive, and communities resilient in the face of a changing climate. The models already exist; what is now required is the courage and imagination to scale them.

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