



# Power Shift:

How Ontario Can Cut Its \$450-Billion Electricity Bill



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Ontario faces a \$450-billion investment bill by 2050 to meet surging demand and emerge as a green-grid hub that's attractive to industries looking to cut or eliminate their emissions.



Rising electricity demand could strain the province's grid as early as 2026 and even trigger chronic shortages by 2030. To meet pressing short-term needs, Ontario is eyeing more gas-fired power generation, which, unabated, could clash with the federal government's forthcoming Clean Electricity Regulations.



The province can avoid making expensive decisions on its future energy mix by pursuing robust policy measures and incentives to save power.



Timely action to conserve energy could save enough electricity to power 3 million homes by early 2040s—a little more than half of the province's residential electricity demand.



Readily available technologies such as smart thermostats, electric panels and AI-enabled HVAC systems that can substantially improve grid efficiency and sustainability would give Ontario the room to manage demand peaks without building new gas plants.

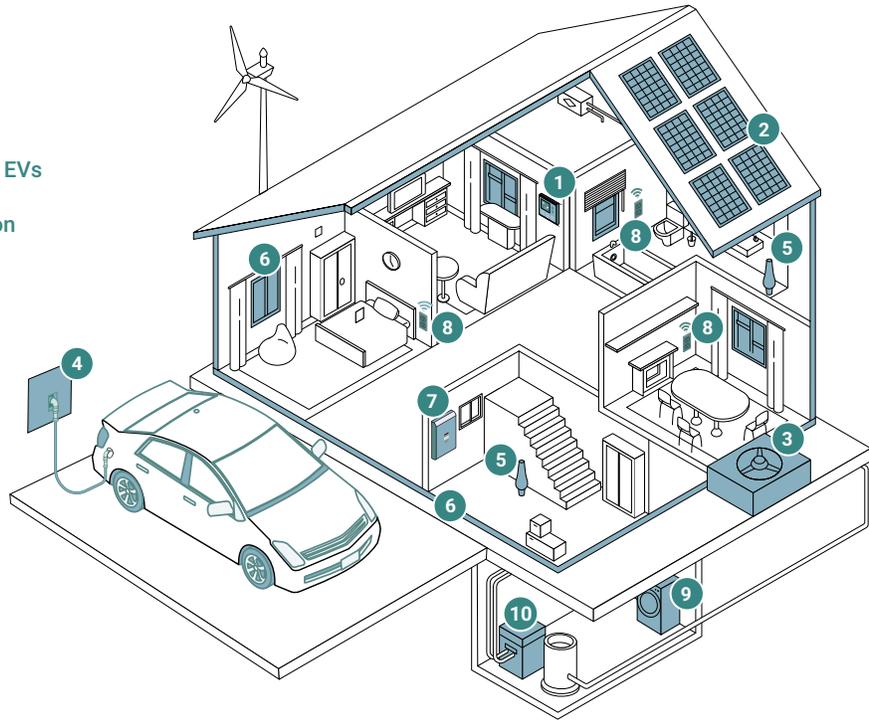


The measures could save Ontario ratepayers at least \$500 million in avoided generation costs annually over that time.

# Smart homes can unlock grid efficiencies

Tech-savvy homes could save Ontario ratepayers \$500 million annually

- 1 Smart thermostats
- 2 Solar panels
- 3 Heat Pump Heater
- 4 Distributed battery storage for EVs
- 5 LED light bulbs for conservation
- 6 Insulation and air sealing
- 7 Smart electrical panel
- 8 Wi-Fi enabled plugs
- 9 Energy-efficient appliances
- 10 Heat Pump Water Heater



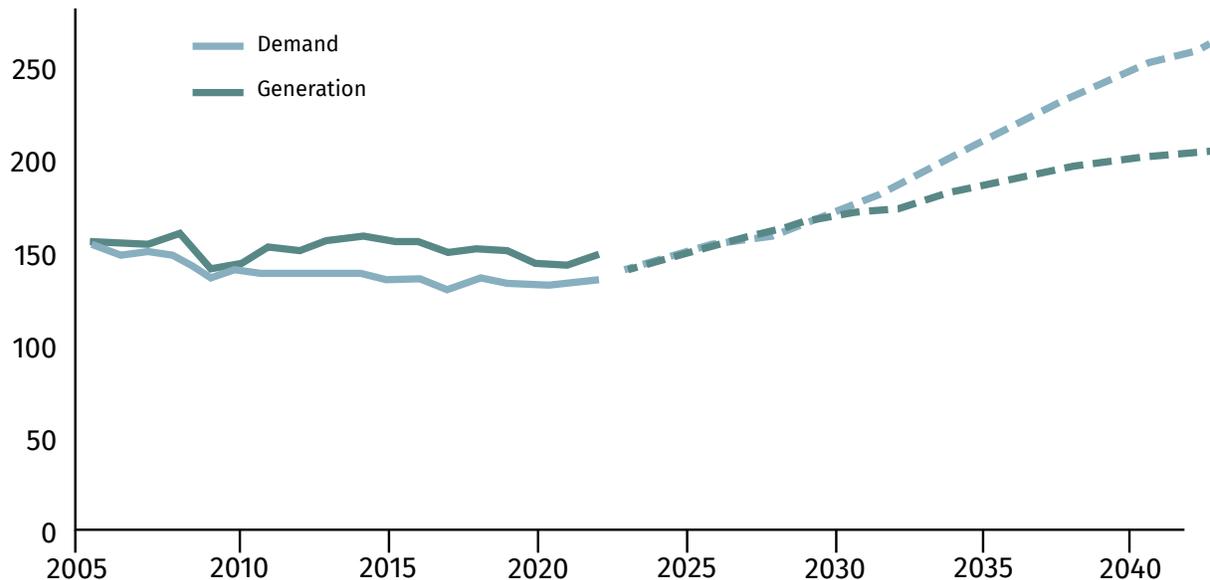
## Ontario is bracing for a wave of electricity demand

The province's rapidly growing population, electrifying industry, and aging nuclear reactors will shift the province's electricity grid from decades of comfortable surplus to critical shortages in just a few years. By 2026, the province's grid could strain to meet demand during peak hours; by 2030 soaring demand could outpace generation capacity.

Clearly, building more power generation is going to be unavoidable in the coming years. The Independent Electricity System Operator (IESO), which runs the province's power market, plans to import power (primarily from Quebec), expand renewables, store power in batteries, and dabble with new nuclear reactors to meet demand. But IESO is also seeking bids for new gas-fired power plants that are vital to manage near-term capacity pressures.

# Ontario will struggle to meet rapid electricity growth

Ontario grid demand, TWh per year



Source: IESO Pathways to Decarbonization, Annual Planning Outlook, RBC Climate Action Institute

The strategy could clash with Ottawa’s expected Clean Electricity Regulations (CER) that will prohibit unabated gas-fired power plants to ensure a Net Zero electricity grid by 2035.

Electricity generates 7.7% of Canada’s greenhouse gas emissions—the 6th largest source of emissions in the nation.

The country boasts one of the cleanest grids in the world, but that label is threatened as provinces such as Ontario, Alberta and Saskatchewan remain heavily dependent on natural gas and see it as a critical and reliable source to meet future demand.

The expected CER builds on federal coal regulations that stipulate phasing out unabated coal-fired electricity units by 2030, and aims to avoid grid emissions as other sectors electrify. Rising demand for electric vehicles and heat pumps, electrified steelmaking, and battery manufacturing, among other segments, will cause the grid to expand rapidly over the next few decades. Left to their own devices, some provinces have planned to add natural gas power, partially offsetting emissions cuts from these sectors.

The federal government believes recently announced electricity tax credits should offset the cost of taking gas out of the power mix or fitting it with carbon capture, but several provinces say building enough non-emitting power to meet Ottawa’s timeline is going to be difficult. Alberta and Saskatchewan who are rapidly phasing out

coal as a power source, are reluctant to shut the door on natural gas without ensuring the reliability of other sources.

The CER’s rollout in its current form and timeline could set up a federal-provincial fight.

Ontario, the country’s largest economic engine and most populous province, faces the most immediate challenge.

But investing \$450 billion in generation, transmission, and distribution by 2050 without knowing the scale of demand is risky.

To ensure an accelerated but orderly transition, Ontario will have to do both: boost supply, but also find other ways to manage demand in the interim.

RBC’s \$2-Trillion Transition report estimates annual investment of \$5.4 billion in renewable and batteries are needed to save around 11 million tonnes in electricity emissions, but natural gas will have to play a stabilizing role in ensuring an orderly energy transition.

As Ontario’s reliable generators such as nuclear plants get refurbished and coal power shuts down, more natural gas generation is the province’s preferred route. But that strategy is at odds with federal Net Zero targets: A recent IESO estimate foresees nearly tripling of emissions by the end of the decade, as gas plants meet increasing demand and declining nuclear production.

# Stepping off the gas

What can the province do to bide its time and avoid making an early call on costly natural gas generation?

One way is to use policy levers to delay demand. Energy conservation can buy the province time to build large-scale, cleaner power sources such as hydro and nuclear instead of gas, saving money long-term, as we wrote in *Price of Power* last year.

Deferring hefty financial commitments will keep electricity affordable and gives Ontario time to redefine itself as a low-carbon manufacturing hub that attracts companies involved in electric car supply chains, green metal production, and clean-tech.

The good news: technology exists that Ontario can use to navigate the looming demand rush and delay committing fully to natural gas-powered generation. Changing consumer attitudes and behaviours to promote flexible demand and energy efficiency will also be key to unlocking significant savings and alleviating grid pressures.

*By 2040, Ontario could meet nearly 20% of its electricity demand growth via economically viable conservation.*

Electricity conservation is often overlooked, since it has done little to cut emissions in Ontario's already-green grid, but it could emerge as a vital policy lever to avoid new gas plants. By 2040, Ontario could meet nearly 20% of its expected demand growth—or 28 terawatt-hour (TWh)—via economically viable conservation. Doing so could save Ontario ratepayers at least \$500 million annually by 2040.

It's worked before. Over the past two decades, albeit against slowing demand growth, IESO's conservation programs have outpaced demand. By funding retrofits and LED lighting, among other actions, electricity conservation doubled between 2014 and 2021, from 11 TWh to nearly 22 TWh. Demand grew just 7 TWh in comparison.

To maximize potential, Ontario will need to leverage technology to shift peaks to avoid building more capacity now.

# Smart tech to the grid's rescue

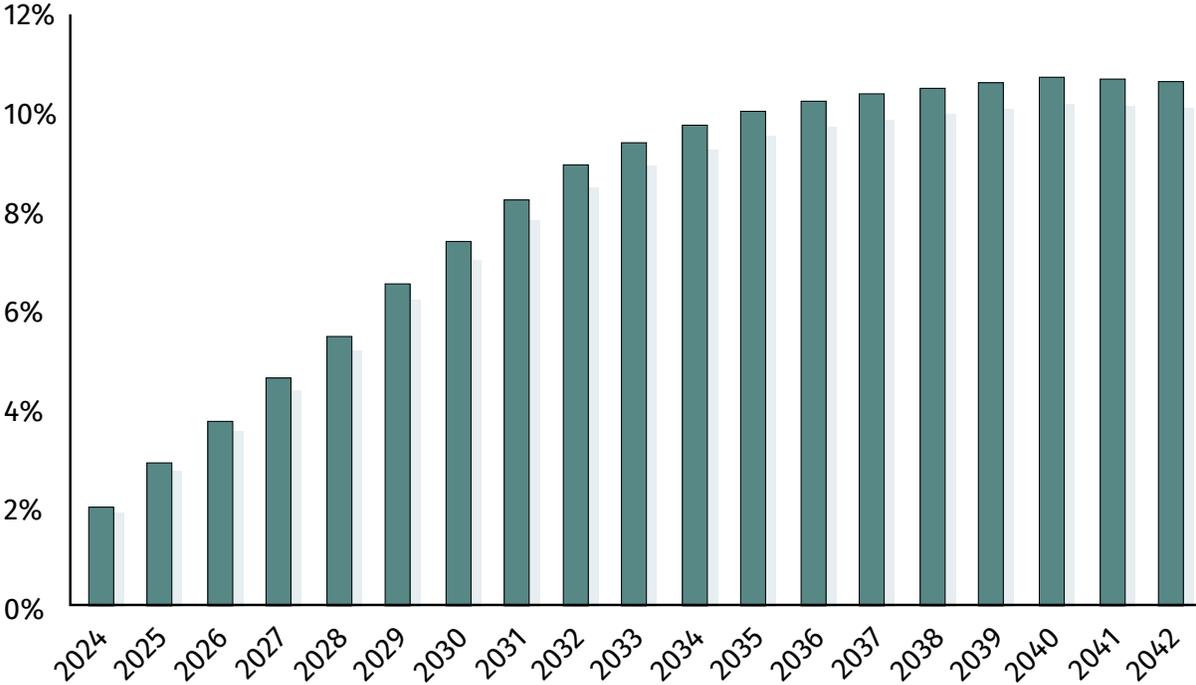
Ontario can build on its reputation as a leader in grid innovation to support smart energy use. It's one of the only jurisdictions globally that has a smart meter installed in nearly every home. That's allowed the province's widespread time-of-use pricing policy to manage peak demand.

Flexible demand can also respond better to variable zero-emitting sources, like wind and solar. Given the right financial incentives that inspire attitude change, consumers may be prompted to install home solar panels, smart thermostats and smart electrical panels that can improve grid efficiency.

Currently, Ontario's centralized grid system is underutilizing these technologies. Here are a few ways the province can leverage new technologies.

## Efficiency could meet 10% of demand by the 2040s

Share of demand that can economically and feasible be conserved, %



Source: Guidehouse, IESO, RBC Climate Action Institute



**Make it pay:** EV owners save money when they charge their cars overnight. But what if they could use it themselves when they turn on their induction stove or sell the leftover power in their car back to the grid? Our research suggests EV owners could earn as much as \$100 per month. Those payments could offset distribution upgrade costs for households, although infrastructure upgrades will be needed to facilitate the new vehicle-to-grid technology. Set right, they can save the province money, too, since storing power in EVs may be cheaper than single-use utility-scale batteries. Giving consumers the right price signals can facilitate more responsive demand. A study in California, where power prices are higher than Ontario, found consumers cut demand by 18% in response to notifications about system peaks when given payments for doing so.



**Make it smart:** Home monitoring systems attached to electrical or smart panels can combine with Wi-Fi-enabled plugs and smart thermostats to remotely control appliances, lights, heating and cooling to avoid electricity peaks. In Montreal, start-up Brainbox's artificial intelligence software cut electricity use 10% in a major office tower by weeding out inefficiencies in the system.



**Make it responsive:** With smarter systems in place, electrical panels can alert consumers that the dryer they just turned on is more economical to run in an hour. Or when the system predicts new peaks, smart water heaters could pre-heat and store hot water for later in the day. This could be key to managing a grid that's increasingly reliant on variable renewable power.



**Make it accessible:** Ontario's current demand response programs focus on paying industry and large buildings to cut demand during peaks. Finding ways to encourage widespread, distributed adoption of these technologies can help consumers benefit (and get paid) for the services they can provide to the grid, easing the cost of electrification.



**Make it cost-effective:** Traditional energy efficiency can also ease the strain on Ontario's grid. Think analog solutions like LED light bulbs, energy-efficient appliances, efficient pool pumps for homeowners. Retrofit programs will also need to be scaled up, with support from IESO.

# Actions to ensure a green & efficient grid

Ontario is in an enviable position to get electricity consumers to change behaviour. Adjustments to time-of-use pricing are already set to shift demand away from peaks. But with overnight set as the cheapest rate, consumers may not be willing to alter behaviour beyond EV charging.

A well-established track record of successful efficiency programs does not mean consumers will invest in retrofits without education or financial incentives. The key will be to help consumers understand the cost of their actions and price them sufficiently to change behaviour. We'll need to support household investments in technologies to get there faster and assist lower income households through transition.

The action points below should ideally be pursued together to maximize benefits for consumers, industry and the province.

## Ideas to move forward

- Ontario's Ministry of Energy should direct IESO to ramp up and expand cost-effective energy efficiency programming.
- Energy efficiency programs should finance low-income households' adoption of smart technologies such as panels, thermostats, and water heaters to ensure they can benefit from new rate structure.
- Economic incentives in existing time-of-use pricing structure are not large enough to nudge consumers to shift their energy consumption to off-peak and mid-peak hours. After supporting tech adoption and real-time pricing feedback, the Ontario Energy Board should introduce higher on-peak rates and set time-of-use pricing as a default, with financial support for low-income households.
- Utilities should take a more consumer-minded approach to pricing that clearly communicates to ratepayers the pricing consequences of their electricity use patterns.
- As a policy default, allow homeowners and building operators with onsite renewable power generation capacity to sell surplus power back to the electricity grid during peak demand.
- Future electricity subsidies from all levels of government should not be focused on subsidizing more generation, regardless of cleanliness. Rather they should support adoption of new technologies to make the grid smarter and accelerate behaviour changes.

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