Unlocking DER potential in Canada

Join us at **11am PT/2pm ET on March 10**
as one of Canada's leading climate think tanks is joined by experts in the field to offer informed insights on how we can leverage DERs in our energy system.

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Centering DERs in energy planning

Key opportunities in the Canadian context

Evan Pivnick, Catherine Jeffery

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Clean Energy Canada's projects

Ontario Diverse market (~60 local distributors with range of sizes)	Illustrate how DERs could be deployed by LDCs to defer infrastructure upgrades and assess quantitative and qualitative benefits (The Brattle Group)
British Columbia Vertically integrated market (majority served by B.C. Hydro)	Identify cost-effective and technically feasible DERs, assess their potential to reduce peak demand in B.C. (Dunsky Energy + Climate Advisors)

Advocate for policy solutions to **unlock DER potential** and **maximize the role** that DERs can play in our grids

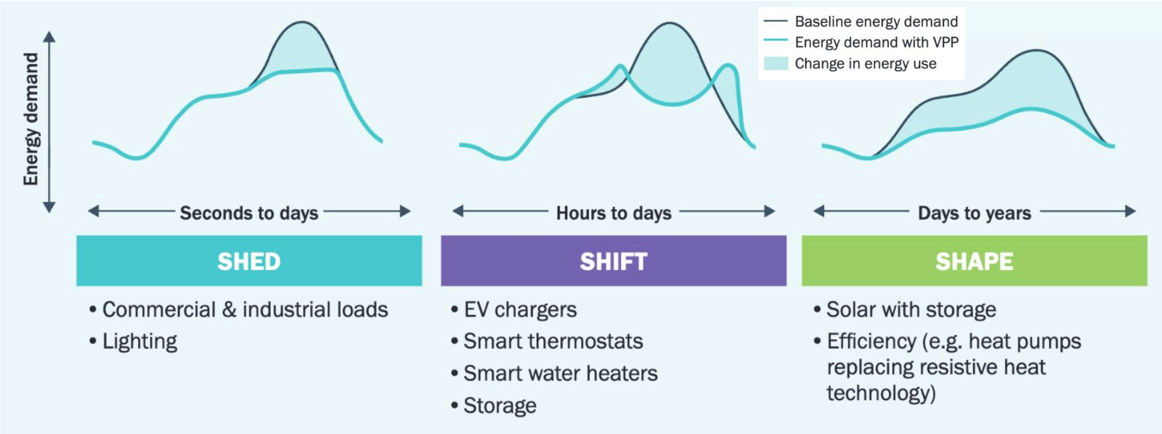
The grid of the future

Historic electricity planning

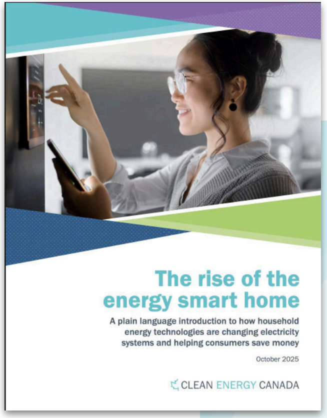
- System sized to meet peak demand
- Centralized generation
- Oversized and costly supply and backup to maintain reliability

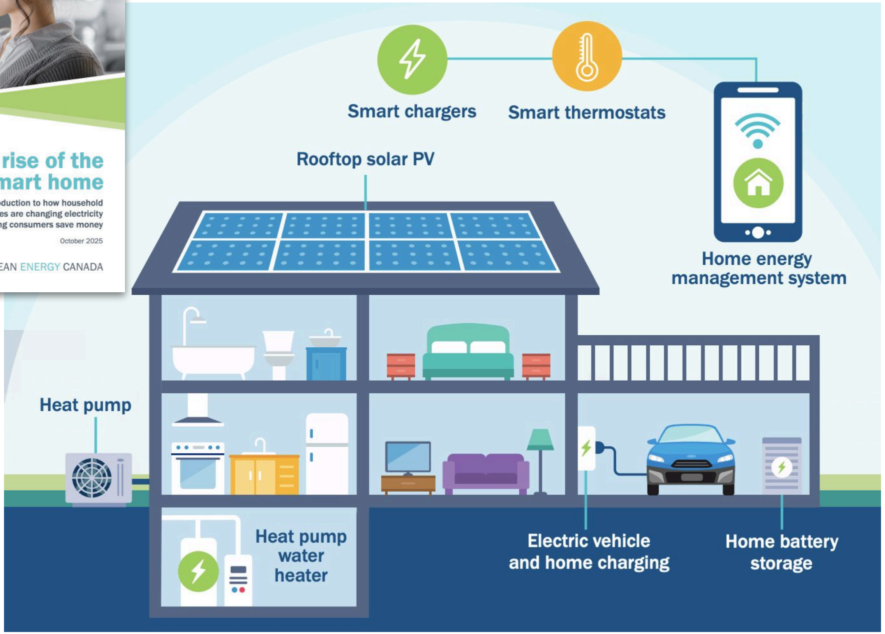
Modern electricity planning

- DERs can be used to shape peaks
- Utility-scale generation with distributed supply
- Reliability needs met with DERs



A critical role for smart homes





- Consumer-based energy technologies are growing in popularity in part to **keep bills in check**
- These DERs can be leveraged to **manage peaks**, **shift demand** to align with generation, and **lower system costs**
- **But mass adoption** is critical for scaling benefits–so getting technologies into homes is a key priority

Unlocking the DER value stack

System level	Value realized through	Key benefits
Generation and transmission	Demand response and shifting load to follow variable generation	• Infrastructure deferral • Reduced curtailment • System resilience
Local distribution	Aggregating consumer generation and demand response as VPPs	• Infrastructure deferral • Resilience • Revenue streams
Households	Consumer technologies such as heat pumps, EV charging	• Bill savings • Resilience • Comfort

A DER-centric future state

- Governments prioritize DERs as an energy solution before more costly options
- Utilities and system planners champion the role of households in driving DER potential
- Energy forecasts integrate VPPs as an essential–not peripheral–resource

Thank you

How VPP-ready is Canada?

VPP Readiness Index – Clean Energy Canada – 10th March 2026

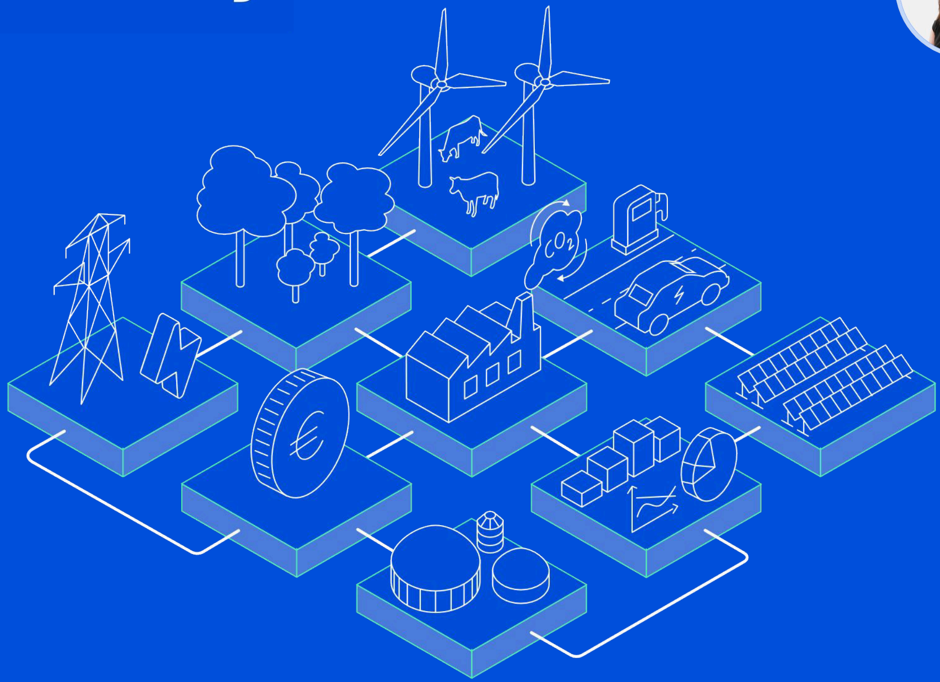
INTEGRATE TO ZERO

blunomy

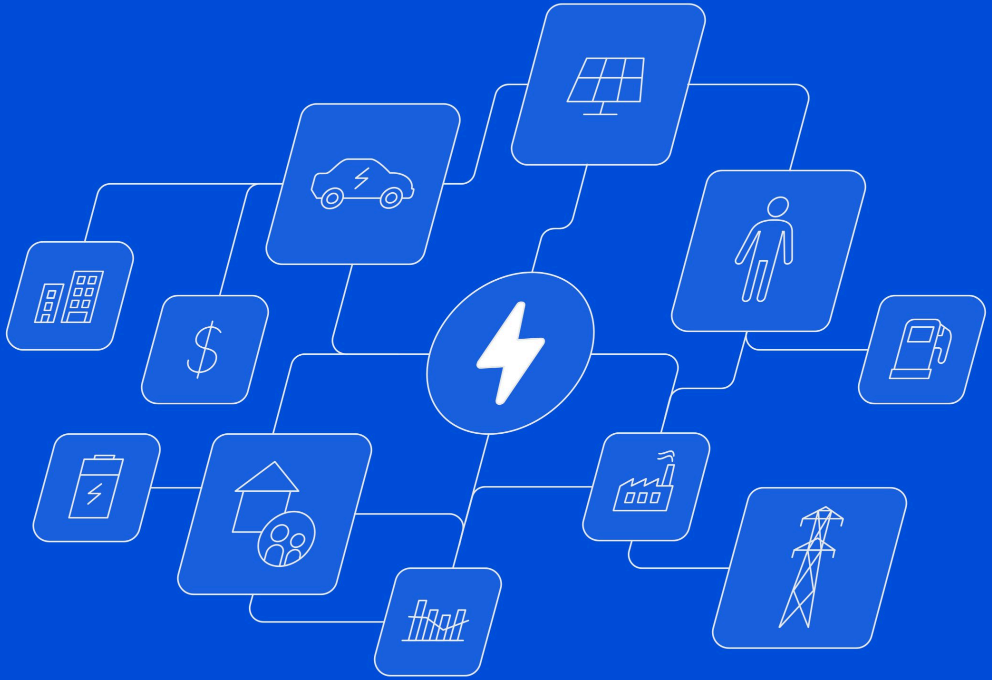
CLEAN ENERGY CANADA

Constanza IRIBARREN

Manager, Blunomy



1 – Why do we need a *VPP Readiness Index?*



A tool for cross-learning – to enable global VPP acceleration

Global VPP uptake requires:

- **Technology transfer**
- **Grid modernisation policies**
- **Awareness**
- **Targeted financing**

A VPP readiness index allows to:

- ***Identify the leaders***
- ***Facilitate policy cross-learning***
- ***Increase sectoral awareness***
- ***Highlight opportunities for investors***

The VPP Readiness Index:

Assessing a region's readiness for VPPs

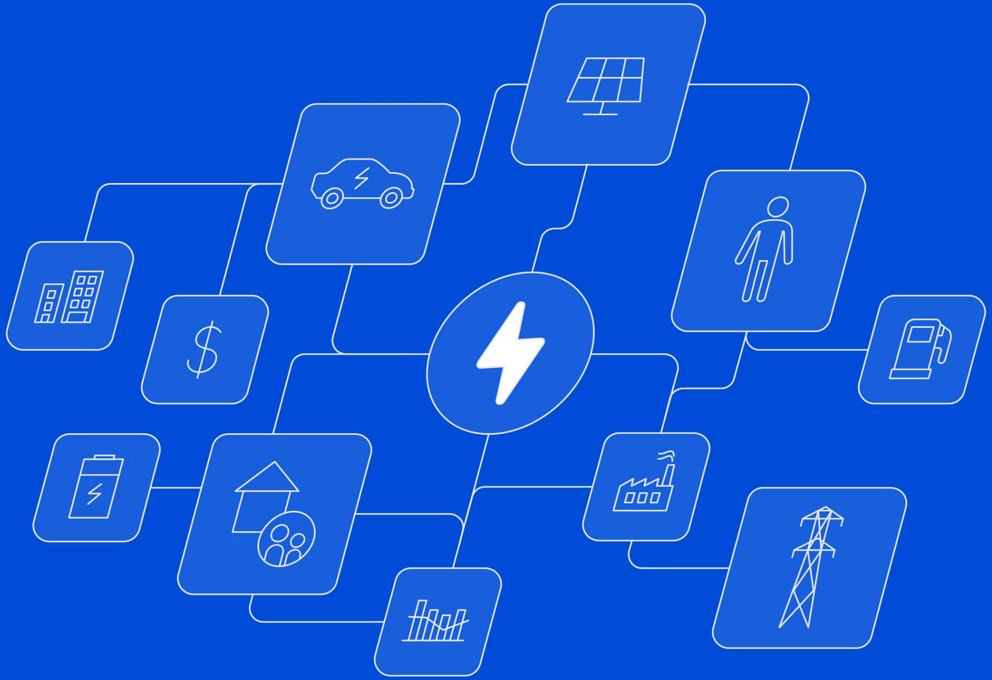
VPP Readiness Index

1. Resource availability
2. Flexibility needs
3. Market attractiveness
4. Regulatory environment
5. Grid operations

2025 edition - covering 10 provinces across Canada

- Ontario (ON)
- Alberta (AB)
- Nova Scotia (NS)
- British Colombia (BC)
- Quebec (QC)
- New Brunswick (NB)
- Prince Edward Island (PEI)
- Saskatchewan (SK)
- Newfoundland and Labrador (NL)
- Manitoba (MB)

2 – The VPP Readiness Index: Canada and international results



Canada VPP Readiness Index results

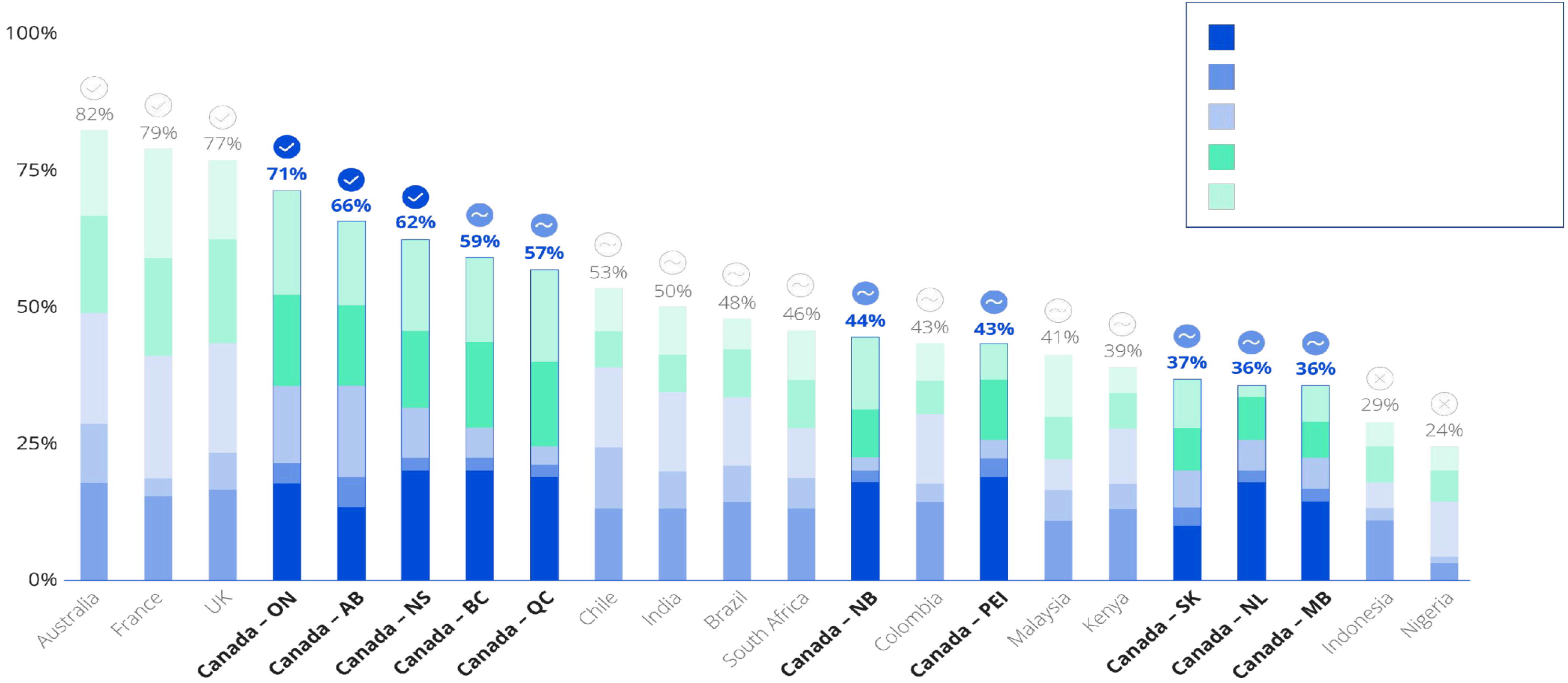
High readiness (61-100%)	Moderate readiness (31-60%)	Low readiness (0-30%)

Ontario and Alberta lead in VPP readiness

Leading province(s)

1	Resource availability	NS, BC
2	Flexibility needs	AB
3	Market attractiveness	AB
4	Regulatory environment	ON
5	Grid operations	ON

Several provinces match international peers



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International trends offer lessons and pitfalls to avoid

Countries are supporting CER adoption and integration

CER capacity in most countries suggests untapped potential for VPPs

Lack of adequate regulations and access to revenue streams hinders VPPs

Smart meter rollout remains insufficient

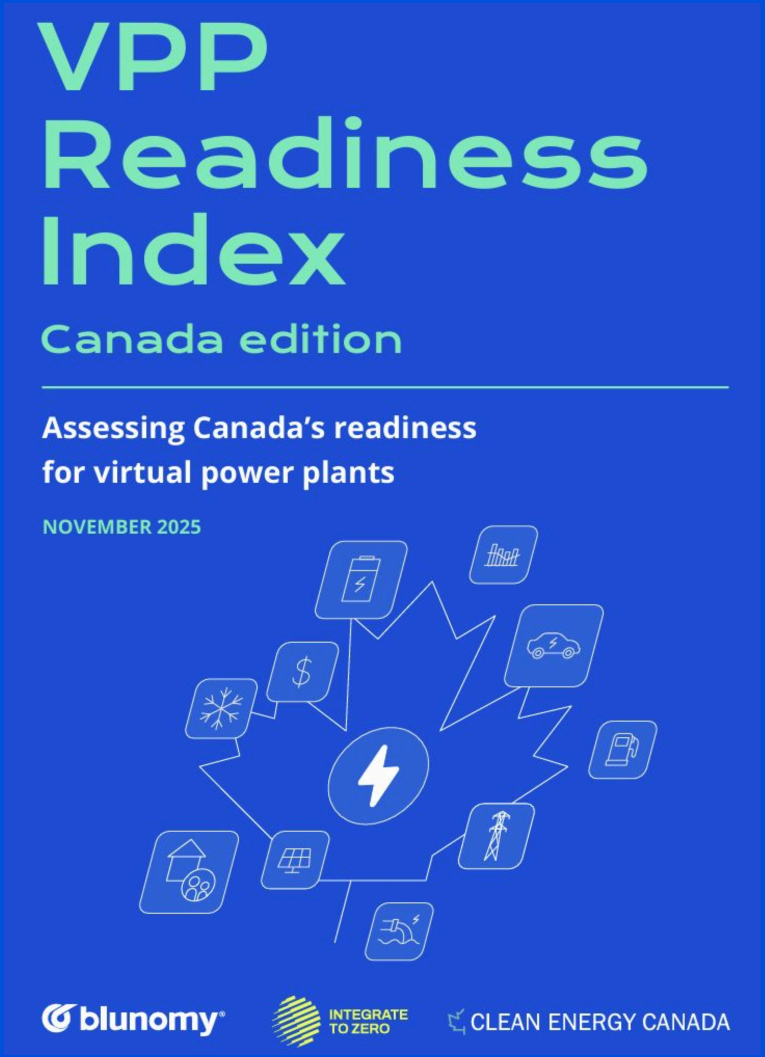
Getting Canada ready for VPPs

Leverage electric heating as a core VPP resource

Strengthen provincial policies and incentives for CER adoption

Build VPP capabilities to address rising flexibility needs

Create revenue streams for commercial VPPs participation



Download our report:
https://theblunomy.com/publications/new-report-vpp-readiness-index-canada-edition

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Unlocking DER Potential in Canada:
Ontario’s Progress and the Path Forward

PRESENTED BY

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PREPARED FOR

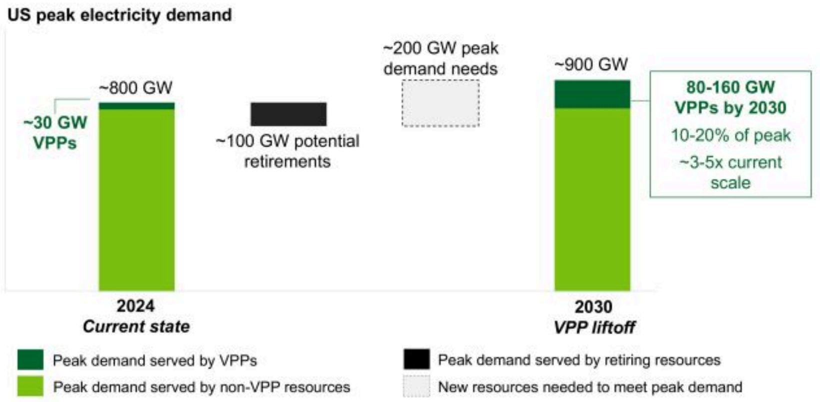
CLEAN ENERGY CANADA WEBINAR

03/10/2026

Brattle

Distributed generation resources (DERs) have been playing an increasingly important role in North America's energy transition

US VPP potential of ~80–160 GW by 2030 (DOE 2025)



- DR remains the backbone of flexible capacity today; at about 6.5% of U.S. peak demand in 2022 (FERC)
- Flexible electrification loads represent a major emerging source of dispatchable demand flexibility
- Distributed battery storage is scaling quickly, estimated at 12 GW through 2028

Common models to enable DER participation and achieve value

- **Retail rates and tariffs**: time-of-use (TOU), dynamic pricing, demand charges, export compensation designs, and special EV charging rates
- **Utility programs**: demand response, bring-your-own-device battery programs, managed EV charging programs, and targeted non-wires procurements
- **Aggregator-led VPPs**: third parties bundle many small DERs and dispatch them as a portfolio to provide capacity and other services
- **Wholesale market participation via ISO/RTO rules** (FERC Order 2222): enables DER aggregations to participate in wholesale markets with distribution coordination.

Ontario expects robust electricity growth into the next decade and beyond

Ontario's **electricity demand is expected to ramp up significantly** due to economic growth, electrification, and evolving technologies over the next 25 years

- System-level net annual energy demand is projected to rise from 157 TWh (2026) to 262 TWh (2050), implying a compound annual growth rate (CAGR) of ~2.2%
- Over the same time frame, summer peak is expected to grow at 1.7% CAGR, from 24 GW to 36 GW (2050) and the winter peak is expected to grow at 1.9% CAGR from 23 GW to 37 GW

The IESO is planning to build a significant amount of new generation and supply infrastructure to meet this demand and invest $10.9 billion into its **electricity demand side management programs (eDSM)** through 2037 to mitigate the pace of load growth

- These programs include energy efficiency, demand response, behind the meter solar and storage, and targeted beneficial electrification

*These **distributed energy resources (DERs)** help reduce the system peak, enable integration of renewable resources through flexibility, and when placed on locations with transmission or distribution constraints, help defer wires investments*

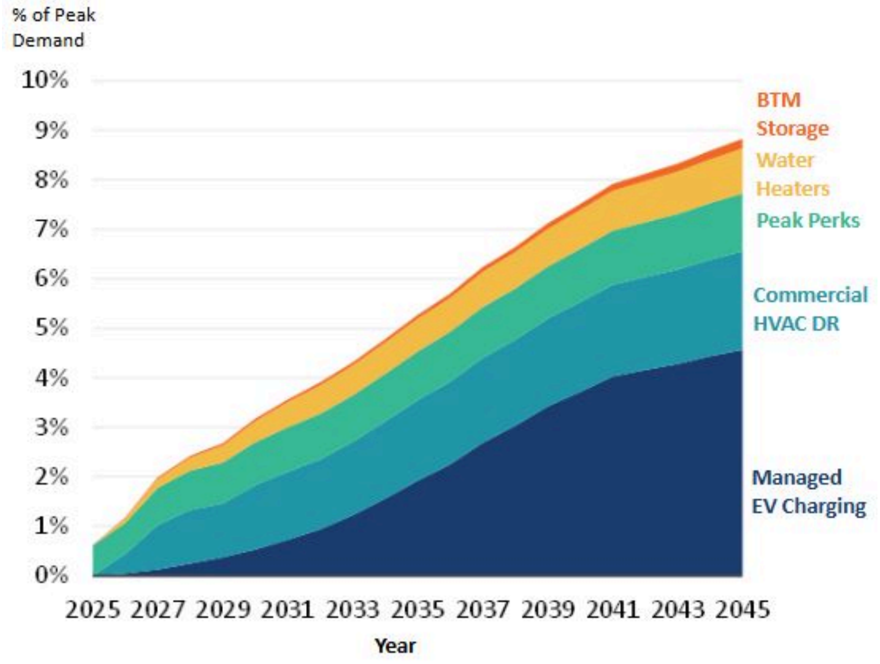
Source: IESO Annual Planning Outlook- Ontario's Electricity System Needs 2026-2050, April 2025.

Ontario has significant DER growth potential

- Based on Brattle projections, Ontario DERs could account for approximately 5 percent of peak demand (~1,500 MW) by 2035 and about 9 percent (~3,000 MW) by 2045 (*)
  - Near-term growth is expected to come primarily from Peak Perks (smart thermostat program) and commercial HVAC DR opportunities, while managed EV charging is projected to expand rapidly in the 2030s
  - Battery storage represents a relatively small share of DER potential, largely due to the limited customer base that forms the starting point of projections
- This outlook indicates that DERs can become a material and scalable resource in Ontario, especially when supported with compensation mechanisms that would allow them to stack value for different services they can provide

(*) These projections exclude the contribution of ICI resources as they are already deployed during system peak hours to reduce ICI participants' Global Adjustment charges

TOTAL ACHIEVABLE DER POTENTIAL PROJECTION (2025-2045)



Source: Brattle Projections (2026)

Ontario's DER Compensation Mechanisms

Ontario has an array of compensation mechanisms in place today that are available to different DERs and participant types

DER COMPENSATION MECHANISMS IN ONTARIO

Price-Based Mechanisms	Procurement and Wholesale Market Mechanisms	Programmatic Mechanisms
• Industrial Conservation Initiative (ICI) • Interruptible Rate Pilot (IRP) • HOEP Pricing • Regulated Price Plans (RPP) and Non-RPP for Class B Customers • Net metering • Distribution charges • Transmission charges • IESO uplifts (recovery of Capacity Auction and ancillary services)	• Energy market (bid/offer participants) • Expedited, medium, and long-term resource acquisitions and contracts (≥ 1 MW) • Capacity Auction • Ancillary services (e.g., operating reserves, frequency regulation) • Small Hydro Program	• Demand-Side Management (DSM) programs offer energy efficiency measures, residential demand response (DR), and targeted behind-the-meter (BTM) solar and storage incentives

Source: Assessment of Ontario's DER Compensation Mechanisms and Recommendations, Brattle (2025) prepared for the IESO and the OEB.

Availability of participation pathways, and value-aligned compensation are key to realize the potential

Brattle team developed a DER assessment framework and identified several opportunities to improve economic efficiency while managing trade-offs around comparable compensation, simplicity/accessibility, and predictable and acceptable payback

Price-Based Mechanisms	There are opportunities to allocate Global Adjustment (GA) costs to all customer types more efficiently, which will result in more appropriate price signals for DER adoption and dispatch
Procurement and Wholesale Market Mechanisms	Continued integration of DERs into existing wholesale/procurement mechanisms will improve economic efficiency by creating additional competition among energy service providers
Programmatic Mechanisms	When rates alone fall short of conveying all underlying costs—and/or where existing mechanisms have gaps due to unrecognized or underrecognized value streams or the complexity that DER participants experience—programmatic mechanisms can be used to bridge the gaps and incentivize DERs more efficiently

Efforts are already underway to implement many of these improvements, but opportunities remain

Recommendations for Price-Based Mechanisms

Introduce further rate improvements and rate options for RPP Class B customers

Retail rates send price signals that are not fully reflective of system costs. Ontario has taken steps to improve the cost-reflectiveness of retail rates by introducing a standard time-of-use rate and the opt-in Ultra-Low Overnight rate.

The OEB could continue to explore more dynamic opt-in rates and periodically review TOU periods to ensure that they accurately incentivize customers to respond to system conditions.

Introduce further rate improvements and rate options for Non-RPP Class B customers

Non-RPP Class B customers currently pay for GA through a flat volumetric charge that varies on a monthly basis, which is not cost-reflective.

The OEB is developing a report with recommendations to the Minister on dynamic pricing options for cost-reflective GA collection for this group of customers. The OEB should continue to explore options that send more efficient price signals to Non-RPP Class B customers.

Examine alternative transmission and distribution cost recovery methods that align with system needs

Transmission and distribution costs are largely fixed and/or driven by peak demand, but are sometimes recovered from customers volumetrically.

The OEB should continue to evaluate how more cost-reflective billing determinants for recovery of transmission and distribution costs could encourage participants to shape their loads in grid-beneficial ways.

Recommendations for Procurement and Wholesale Market Mechanisms

Provide opportunities for DERs to participate in procurement processes where they are capable of meeting service requirements

DERs that can provide the desired services should be able to compete with traditional resources on a level playing field, providing that DERs meet important and clearly defined participation and performance criteria.

The IESO has indicated its openness to including standalone and aggregated resources of less than 1 MW in future procurements - a step toward leveraging more DERs to meet system needs.

Provide a pathway for small customers with DERs to participate in and be appropriately compensated in the wholesale energy markets

The dynamic price signals in the wholesale energy market generally provide efficient incentives for DERs, and changes under the Market Renewal Program will sharpen those price signals.

The IESO should continue to work with stakeholders to develop wholesale market participation models to enable participation of aggregated residential and small commercial customers.

Account for DER attributes consistently across DER incentives

Attributes such as visibility, availability and performance, and flexibility can enhance the value of DERs to the system. All else being equal, DERs with more desirable attributes should receive high compensation.

As a longer-term goal, Ontario should aspire to ensure that these attributes are clearly defined, communicated, and applied consistently across all compensation mechanisms. This may require a full study and valuation of DER attributes.

Recommendations for Programmatic Mechanisms

Leverage DER programs to unlock DER value streams and to provide important grid services

A DER program can bridge gaps within existing mechanisms and can enable market participants or DERs that currently do not fit neatly into existing mechanisms.

Coordination across the IESO, OEB, LDCs, and other key stakeholders could help to improve efficiency and the participant experience. Efforts should focus on high-priority, high-impact programs.

Continue to incorporate non-wires solutions (NWS) in distribution system planning

NWS utilize DERs to defer or avoid more expensive infrastructure costs. The OEB has taken steps to facilitate the integration of cost-effective NWS into distribution planning to meet system needs (e.g., Benefit-Cost Evaluation Framework, NWS Guidelines).

The OEB should continue its work to support LDCs' consideration of cost-effective NWS as they become a core part of distribution system planning.

Continue to incorporate NWS in regional transmission planning

The IESO has established a structured process for identifying NWS for transmission needs through the Integrated Regional Resource Planning process.

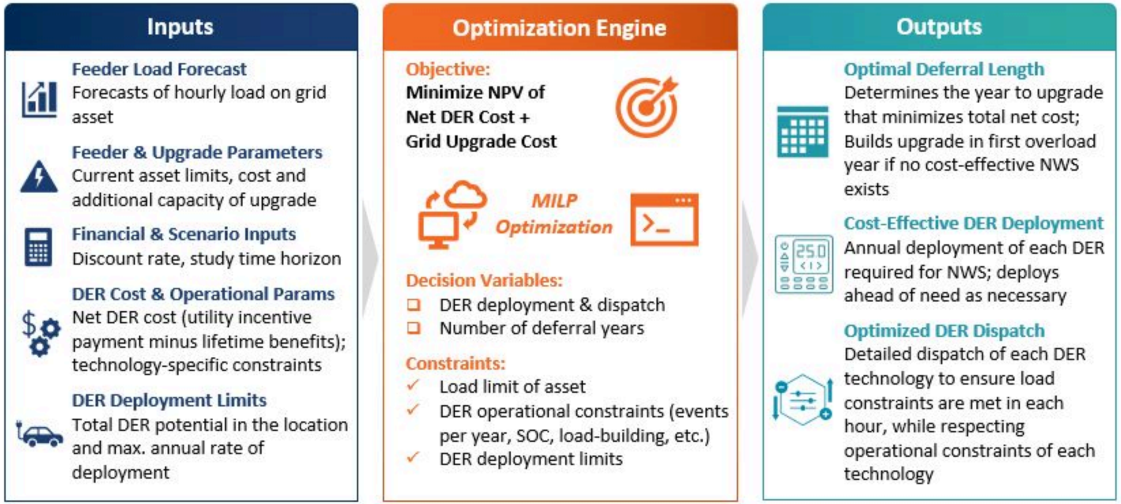
When transmission NWS options are viable, the IESO should continue to explore how existing or new mechanisms can be appropriately utilized to enroll transmission NWS participants.

While DERs are utilized relatively well to reduce system peak, they are not widely utilized for managing distribution constraints

The OEB recently took number of steps for LDCs to integrate cost effective NWAs into distribution planning processes, but the uptake has been slow. *This may be party due to not fully exploring/appreciating the distribution system value of DERs*

- **Clean Energy Canada** commissioned a study to address this gap, and retained the **Brattle Group** to demonstrate the potential distribution grid deferral value of DERs in Ontario by using **Essex Powerlines System** data to illustrate the value. The final report will be released in April 2026
- Controlling and dispatching DERs to mitigate distribution grid constraints is likely to require LDC investments in DERMS or partnership with third-party aggregators supported by enabling regulatory models

Overview of DEFER Model



Clarity in the face of complexity

Brattle

CLEAN ENERGY CANADA

Distributed Energy Resource (DER) Potential in British Columbia

Webinar: Unlocking DER Potential in Canada

March 10, 2026

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Introduction

Why DERS?

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A solution for emerging needs

1. **Meet emerging system needs:** Mitigate peak impacts, defer infrastructure upgrades (NWAs) and balance the grid.
2. **Cost-effective, quick-to-deploy and right-sized:** Scalable to the required pace while minimizing overbuild risks and ratepayer impacts
3. **Customer-empowering/buy-in:** Transform consumers into active participants in energy management

Breaking the Barriers

Historically, DERs were typically…

- **Not considered** in planning processes, and when they are, they are viewed as a "load modifier" not a resource class.
- **Not valued/eligible** for participation or compensation for all the benefits they contribute to across the generation, transmission and distribution systems
- **Not coordinated** across the system; with the operations, dispatch and interoperability between T&D systems restricting ability to extract the full value out of DERs.

Solutions

- Planning for DERs
- Enabling DERs
- Integrating DERs

DER Planning is Evolving

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Canadian utilities and system operators are increasingly:

- **Integrating DERs into utility programs and planning.** Load flexibility using DERs is becoming a core DSM priority.
- **Enabling participation through procurement and market rules.** Many jurisdictions are updating procurement and interconnection frameworks to enable DER participation.
- **Understanding DER reliability and system value.** Utilities are assessing how DERs perform as dispatchable resources compared with traditional resources.

DERs contributions are growing across Canada

- Hydro-Québec: ~5.5% of peak demand (2024–2025)
- IESO: projecting 4-9% of peak by 2032
- Utilities across Canada are planning DER Roadmaps, regulatory updates, and setting ambitious targets

Load flexibility in BC

- DR contributions are approaching **1% of peak capacity** savings for BC Hydro and FortisBC.
- BC Hydro projects ~270 MW (**1.9% of peak**) by 2030.
- BC's DSM programs have expanded only in the past ~5 years, yet have already delivered meaningful savings and strong growth potential.

Study Overview

Objectives

Study Objectives

- **Identify** technically feasible, cost-effective DERs that are appropriate to meet the needs of BC's electricity grid.
- **Quantify** the technical, economic and achievable potentials for DERs over the 2025-2040 period.
- **Assess** the impact of electric demand growth and policy support on DER potential through scenario analysis

Scope and Limitations

- This study is focused on the adoption and **demand side impact** of DERs, as represented by the potential capacity benefits they offer.
- The analysis **focuses on DERs' ability to reduce peak demand**, but does not fully account for supply side limitations such as prolonged variable renewable generation shortfalls, or additional DER benefits such as ancillary services or energy arbitrage.
- **Assessed system-wide benefits** - more granular locational and distribution level benefits to provide NWA were not assessed.

Study Scope

Customer archetypes

Residential
- Single Family
- Multi-unit

C&I
- Small Commercial
- Large Commercial
- Industrial

Study horizon: 2026-2040

This timeframe broadly aligns with BC Hydro's long-term planning horizon (20 years), while remaining close enough to support near- and mid-term policy, program, and investment decisions without relying on highly uncertain long-term assumptions.

Measure List

Residential

- BTM battery storage
- Smart thermostat (electric furnace)
- Smart thermostat (HP)
- Smart thermostat (electric resistance)
- Water heater controls (resistive)
- Water heater controls (HP)
- EV managed charging
- Vehicle-to-grid (V2G)

C&I

- C&I thermal storage
- Commercial curtailment
- Industrial curtailment
- BTM battery storage

Measures selected represent a high-level yet comprehensive set of commercially available technologies, consistent with those considered in comparable DER studies. New and emerging DER technologies that could be deployed over the study period were not extensively considered due to their inherent uncertainty.

Scenarios

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This study assesses the potential for DERs in BC under three different scenarios:

1

Reference

What will be the potential for DERs under business-as-usual policies and market conditions?

2

Accelerated

How much more could DERs contribute in a high electrification / high load growth future?

3

DER-Centric

How much could DERs contribute if they were prioritized as a primary solution to meet increasing electricity demand in BC?

Methodology

DER potential can be expressed in several ways:

Potential	Definition	Constraints
Technical	The total capacity of all controllable load devices	Reflects **the quantity of controllable loads on the system**, but does not consider system needs
Economic	The portion of controllable loads that offers cost-effective load reduction opportunities	
Achievable	The DER adoption and portion of controllable loads that can realistically be enrolled in initiatives.	**Reflects both enrolled capacity and projected potential** considering opt-outs, overrides, connectivity issues, and other factors that may reduce performance during peak events
Effective	The resulting system-wide peak load reduction, accounting for utility load shape constraints	Reflects the actual peak load reduction experienced by the utility, **considering all hours of a typical peak day**

Assessing DER Cost-Effectiveness

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Method: Utility Cost Test (UCT)

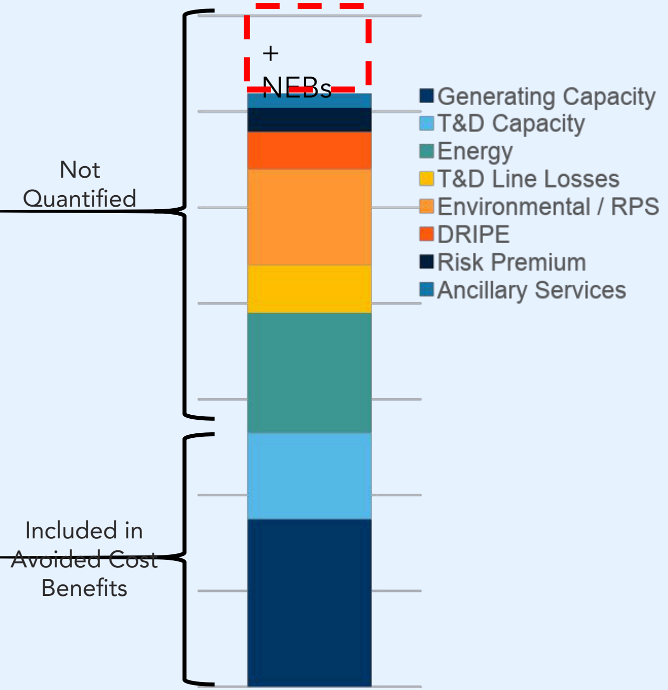
- Evaluates DERs from the utility system perspective
- Compares program costs (incentives + administration) with BC Hydro's avoided supply-side capacity costs
  - Avoided cost value: ~$410/kW-yr, from BC Hydro's 2025 integrated resource plan
- A DER is considered cost-effective if its cost is lower than building equivalent generation and T&D capacity

DER Value Stack

- The analysis captures capacity value only (generation + T&D)
- DERs can provide additional system and societal benefits not included in the test

Key takeaway: Even without quantifying these additional value streams, assessed DER measures proved cost-effective based on avoided capacity benefits alone.

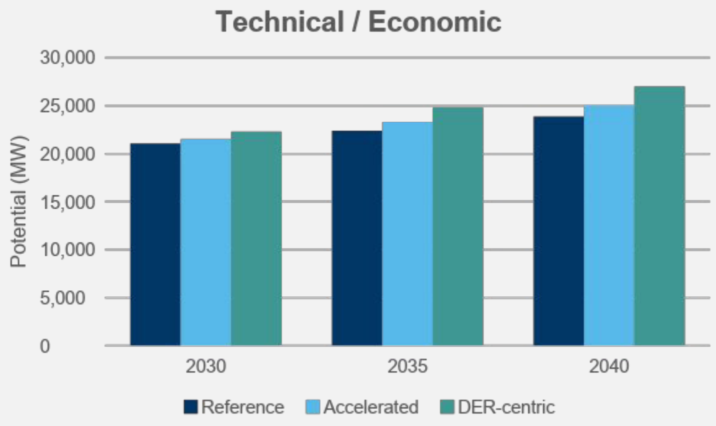
Typical DER Value Stack

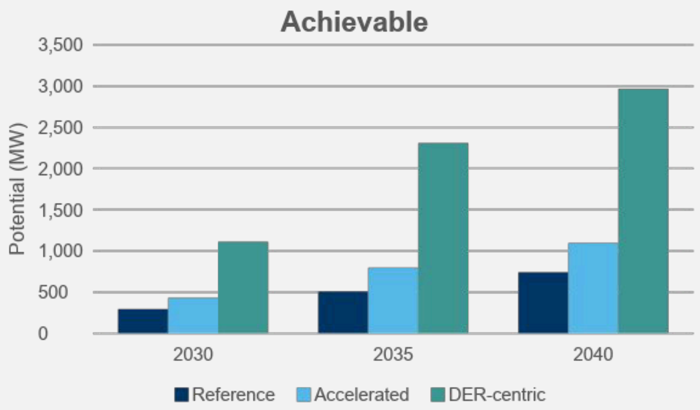


This figure is illustrative only. The relative sizes of value components are an approximation and do not represent actual or modeled values.

Results

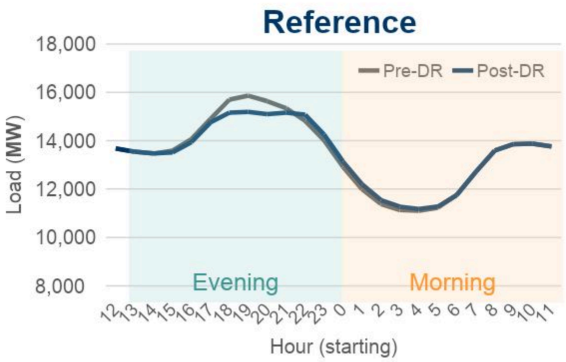
Scenarios Comparison – Potential

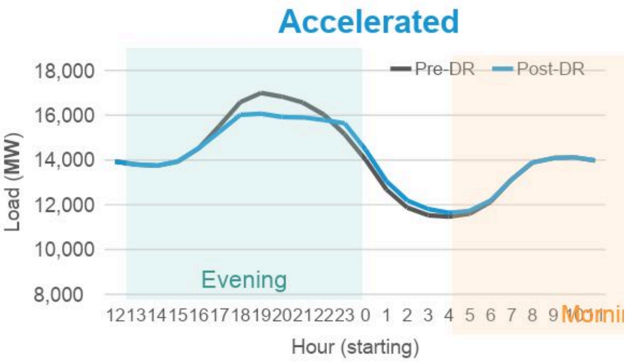


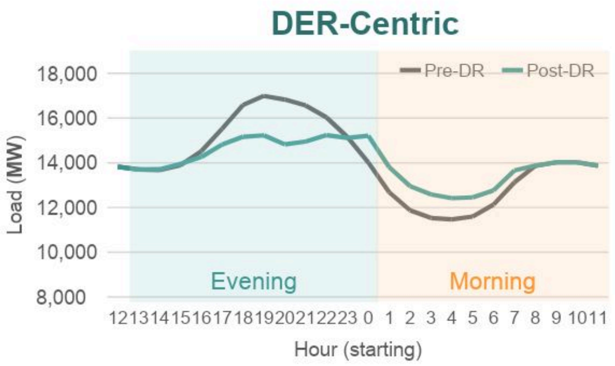


- In all scenarios, the most significant DER measures by 2040 are:
  - EV Load Management (including V2X)
  - C&I Curtailment
  - Solar Paired Storage
- Increased load growth from Reference to Accelerated increases DER potentials, primarily related to the increased electricity end-uses and equipment penetrations that can be controlled (heat pumps, EVs etc.)
- Moving from Accelerated to DER-Centric carried increased incentives and policies that drove Solar paired Storage to become the top measure, and substantial growth in residential water heating controls.

Representative Peak Day – 2040







- 670 MW (4.2% of peak) of effective peak reduction
- 930 MW (5.5% of peak) of effective peak reduction
- 1,760 MW (10.4% of peak) of effective peak reduction

DERs materially reduce system peak demand across all scenarios. However, Increasing DER penetration on the grid leads to lower Effective Load Carry Capacity, when assessed against the standard peak day load curve, dropping from 90% under the Reference scenario to 59% under the DER-Centric scenario.

Deeper investigation over the full 8,760 hourly load curve, considering the full set of DER benefit streams would add further precision to the ELCC and cost-effectiveness assessment for utility resource planning.

Scenarios Comparison – Program Costs

- Program costs per kW remain below BC Hydro avoided cost value for all scenarios. This holds even without quantifying additional DER value streams (e.g., ancillary services).
- DER programs deliver strong net system value. Avoided cost benefits exceed program spending in all scenarios.
- In the Reference and Accelerated scenarios, benefits are more than double costs across all modeled years.
- In the DER-Centric scenario, benefits and costs are more closely aligned, reflecting higher incentives approaching the upper bound of cost-effectiveness.
- Accounting for the effective kW of peak reduction increases the cost per kW, but values stay within the avoided cost constraint.

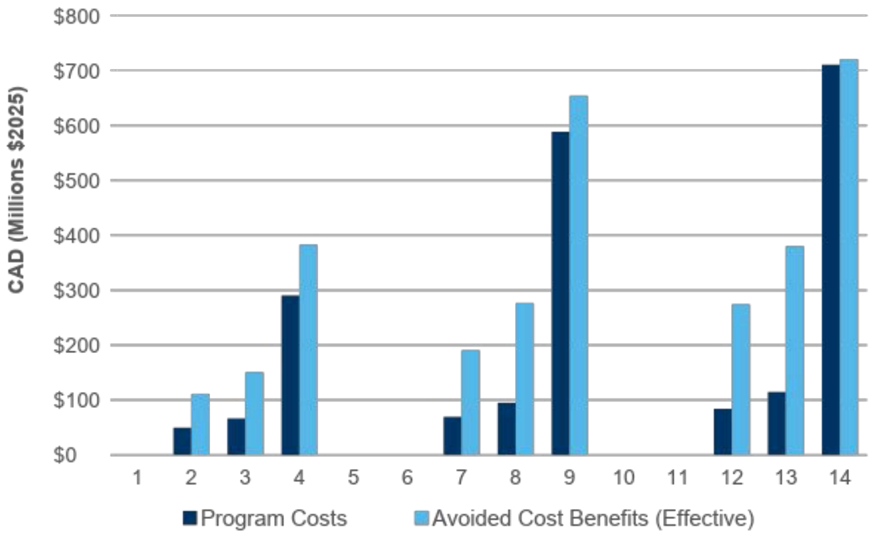


Figure: Total program costs and avoided cost benefits by scenario.

	Estimated Program Costs (2040)		BC Hydro Avoided Cost
Scenario	Achievable Potential	Effective Peak Load Reduction	
Reference	117 $/kW	130 $/kW	*$410/kW*
Accelerated	107 $/kW	127 $/kW	
DER-Centric	243 $/kW	404 $/kW	

Conclusion

Key Takeaways

1

BC Hydro is on solid footing for expanding DER contributions. The Reference scenario forecasts roughly 670 MW of effective peak reduction by 2040 (4.2% of peak). This scenario aligns closely with the DER contributions projected in BC Hydro's 2025 IRP through 2030 and reflects meaningful progress supported by the utility's current programs and planning. With increasing load growth under the Accelerated scenario, this increases further to 930 MW..

2

Avoided cost for capacity have risen substantially — rendering *all* individual DERs cost-effective.[1] Given BC Hydro's updated avoided costs of capacity every DER measure included in this study is cost-effective. **This creates an opportunity** to increase incentives to expand DER adoption, and to implement supporting policies, as assessed under the DER-Centric scenario.

3

With stronger incentives, the role of DER's in meeting BC's emerging grid needs could be transformative. The DER-Centric scenario yields a *~90% increase* in potential compared to the Accelerated scenario, demonstrating that there is room to unlock significantly more DER capacity. This would entail ambitious policies such as code requirements for controllable water heaters, and incentivizing batteries for all solar NEM customers, ultimately moving DERs from a supplemental resource to become a central load growth solution that can be rolled out instep with BC's decarbonization efforts.

1. It is important to note that this does not imply that all DER measures are cost-effective at all times or under all conditions (e.g., when multiple measures are called in combination). In practice, only a subset of measures may be cost-effective at a given time, depending on system needs and other variables.

Where can BC go from here?

Understanding DERs' locational value, flexibility, and reliability will help BC utilities deploy them strategically and at scale.

Locational value and Non-Wires Alternatives (NWAs)

DERs can defer or avoid grid upgrades in specific constrained areas. BC Hydro is already exploring DERs for NWA initiatives.

Next step: continue to explore where, and to what degree DERs can offset T&D infrastructure investment

Grid balancing beyond peak demand

This study focused on annual peak capacity reduction, but DERs provide broader grid value, including balancing supply and demand throughout the year.

Next step: broader assessment of DER value to the grid, by modeling DERs as part of the supply mix.

Reliability and operational integration

In the right conditions, DERs perform as a reliable system resource to support grid operations.

Next step: Further assessment of factors that improve or erode DER performance, as well as DER's impact on system reliability

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