

# Modeling Potential Rate-Payer Benefits Associated with EV-Ready Retrofit Incentives

## Context and Study Objectives

---

Residents of Multi-Unit Residential Buildings (MURBs), which make up approximately one-third of all private dwellings in Ontario, face persistent challenges in accessing electric vehicle (EV) charging. The lack of EV-ready infrastructure, combined with the high costs of incremental and uncoordinated upgrades, presents a significant barrier to adoption.

There are two main approaches to retrofitting parking spaces for EV charging. The first is a business-as-usual model, where spaces are retrofitted incrementally on a piecemeal basis. The second is a comprehensive EV-ready approach, which involves a one-time electrical upgrade that future-proofs every parking space with an adjacent outlet capable of Level 2 charging.<sup>1</sup>

This memo presents the results of analyses that assessed whether, and to what extent, a utility or province-wide incentive program for comprehensive EV-ready retrofits in MURBs delivers net value to electric utility ratepayers compared to fragmented, uncoordinated deployment. The study helps justify a more proactive approach to retrofitting EV parking spaces. By providing evidence of the costs and benefits of coordinated, utility-supported programs, the findings can inform policy, program design, and regulatory decisions aimed at making EV charging more affordable, scalable, and grid-friendly.

---

<sup>1</sup> Comprehensive “100% EV-Ready” futureproofing retrofits have emerged as a promising strategy to provide “at home” EV charging for MURB residents. This strategy involves a one-time, significant electrical upgrade that future-proofs each residential parking space with an adjacent outlet (e.g. a wired junction box or a receptacle) capable of “Level 2” (208V/240V) charging. The costs of electric vehicle supply equipment (EVSE) are deferred until households adopt EVs, at which time they can readily install an EV charger at the EV-Ready outlet adjacent to their parking space. Designs are typically predicated on significant use of load-sharing and EV energy management systems (EVEMS). Use of load sharing and EVEMS usually typically allows all parking spaces to be futureproofed without upgrading the utility service to the building. The CAPEX per parking space of an EV Ready retrofit is relatively low, averaging approximately \$1600 per parking space in programs supporting 100% EV Ready futureproofing. Previous analysis by Dunsky has shown that this approach delivers lower life-cycle costs for residents, and can result in lower coincident peak demand, compared to ad hoc piecemeal additions of home charging or public charging. [Comprehensive and Cost-Effective EV Futureproofing for Multifamily Communities - Dunsky](#)

## Study Approach

---

We developed a model to estimate the incremental system-wide costs and benefits associated with two contrasting deployment scenarios:

1. **Uncoordinated Expansion:** A status quo approach where individual residents install EV chargers independently or rely on public charging infrastructure. While some home charging is managed, a significant portion of this load cannot be controlled to avoid system peaks, exacerbating grid strain.<sup>2</sup>
2. **Comprehensive EV-Ready Futureproofing:** In this scenario, rate-payer funded incentives of \$600 per EV-Ready parking space are provided to eligible buildings to implement a 100% EV-Ready retrofit. In return for this incentive, users are automatically linked to the EVEMS and enrolled in utility DR programs. The use of EVEMS enables not only load-sharing at the building-scale, but also demand response to avoid utility peak loads.<sup>3</sup>

The analysis proceeded in three main steps:

1. **Establish Incremental Energy and Peak Load Impacts:** Estimate the additional annual energy consumption and coincident peak demand resulting from EV charging under each scenario.<sup>4</sup>
2. **Evaluate Incremental Costs and Benefits:** Assess the incremental costs imposed on the utility system and the incremental revenue under each scenario.<sup>5</sup>
3. **Calculate Net Impacts on Rates:** Compare the incremental costs and benefits to calculate the net return or impact on utility rates, providing a transparent estimate of the relative value of futureproofing versus uncoordinated expansion.<sup>6</sup>

---

<sup>2</sup> In the accompanying Excel workbook, this scenario is labeled as Scenario 1 – Uncoordinated Expansion. It provides estimates of EV adoption, incremental system peak impact, rate impacts, and ratepayer benefits. These outputs can be found in Scenario 1, under the Output section.

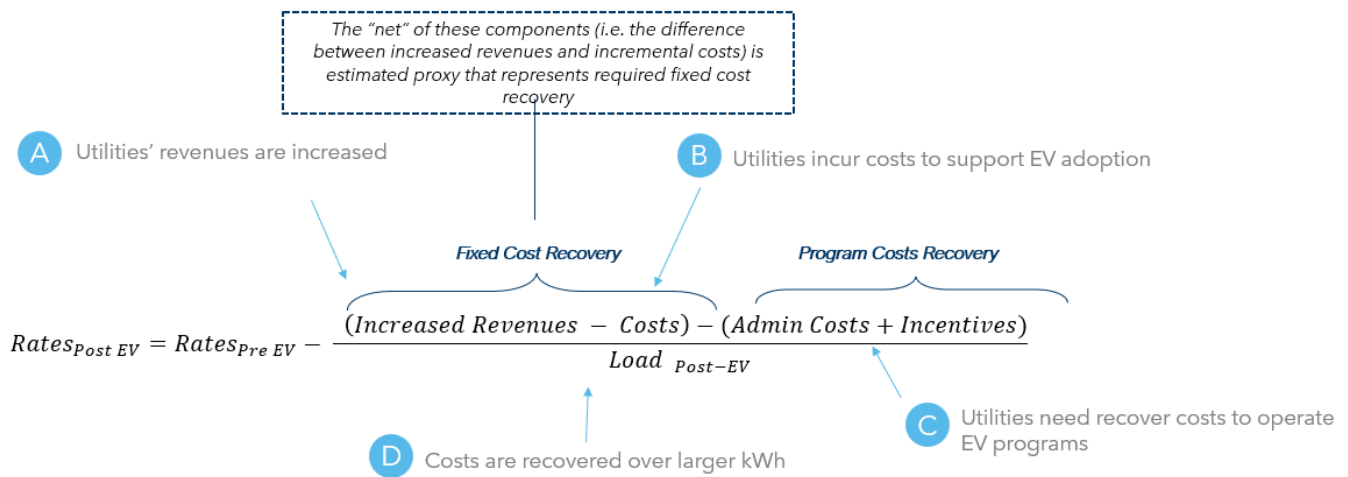
<sup>3</sup> Results for this scenario are presented in the accompanying Excel workbook under Sheet “Scenario 2”, within the Output section.

<sup>4</sup> The incremental energy and peak load impacts from the two scenarios—Uncoordinated Expansion and Comprehensive 100% EV-Ready Upgrades—are calculated in the accompanying Excel workbook under Sheet “EV Adoption and Load Impact”, within the Assumptions section. This sheet includes the EV Adoption Forecast, Energy Demand Forecast, and EV Peak Load Forecast, which together inform estimates of the peak load impacts on both the generation/transmission system and the distribution system.

<sup>5</sup> The calculations for transmission, distribution, and generation costs—expressed in both \$/kW-year and \$/MWh terms—are provided in the accompanying Excel workbook under Sheet “Marginal Cost”, within the Assumptions section.

<sup>6</sup> The incremental energy and peak load impacts from the two scenarios—Uncoordinated Expansion and Comprehensive 100% EV-Ready Upgrades—are calculated in the accompanying Excel workbook under Sheet “EV Adoption and Load Impact”, within the Assumptions section. This sheet includes the EV Adoption Forecast, Energy Demand Forecast, and EV Peak Load Forecast, which together inform estimates of the peak load impacts on both the generation/transmission system and the distribution system.

Figure 1: Rate and Bill Impact Modelling Framework



The model is designed to generate high-level estimates of net ratepayer impacts, incorporating Ontario-relevant default assumptions. These inputs can be adjusted by users, such as utilities, policymakers, or program designers, to reflect their system characteristics or to evaluate the potential for replication in other jurisdictions. The model is structured to support informed discussions on whether utility-funded incentives for EV-ready retrofits are justified from a ratepayer perspective.<sup>7</sup>

## Key Findings

### Finding 1: A comprehensive EV-ready strategy could reduce marginal system cost increases by around 60% through peak demand management.

Under both deployment scenarios, increased EV adoption places upward pressure on marginal utility system costs, specifically on electricity supply, transmission, and distribution systems. However, the magnitude and composition of these cost increases differ significantly depending on the scenario:

- In the Uncoordinated Scenario, marginal system costs rise steadily over time, reaching approximately 3.5% of baseline system costs by the 2040s.<sup>8</sup> This is primarily due to

<sup>7</sup> The framework and calculation methods used in this model were selected to ensure they are relevant across all Canadian provinces and territories. While the model relies on Ontario-specific defaults, the core benefit areas include avoiding or deferring transmission and distribution upgrades, improving the use of variable renewable energy, and supporting grid reliability through dispatchable peak capacity. Most jurisdictions will find these concepts adaptable to their own utility and regulatory contexts. However, differences in regulatory guidance, electricity pricing, cost recovery approaches, and data availability may require some minor adjustments.

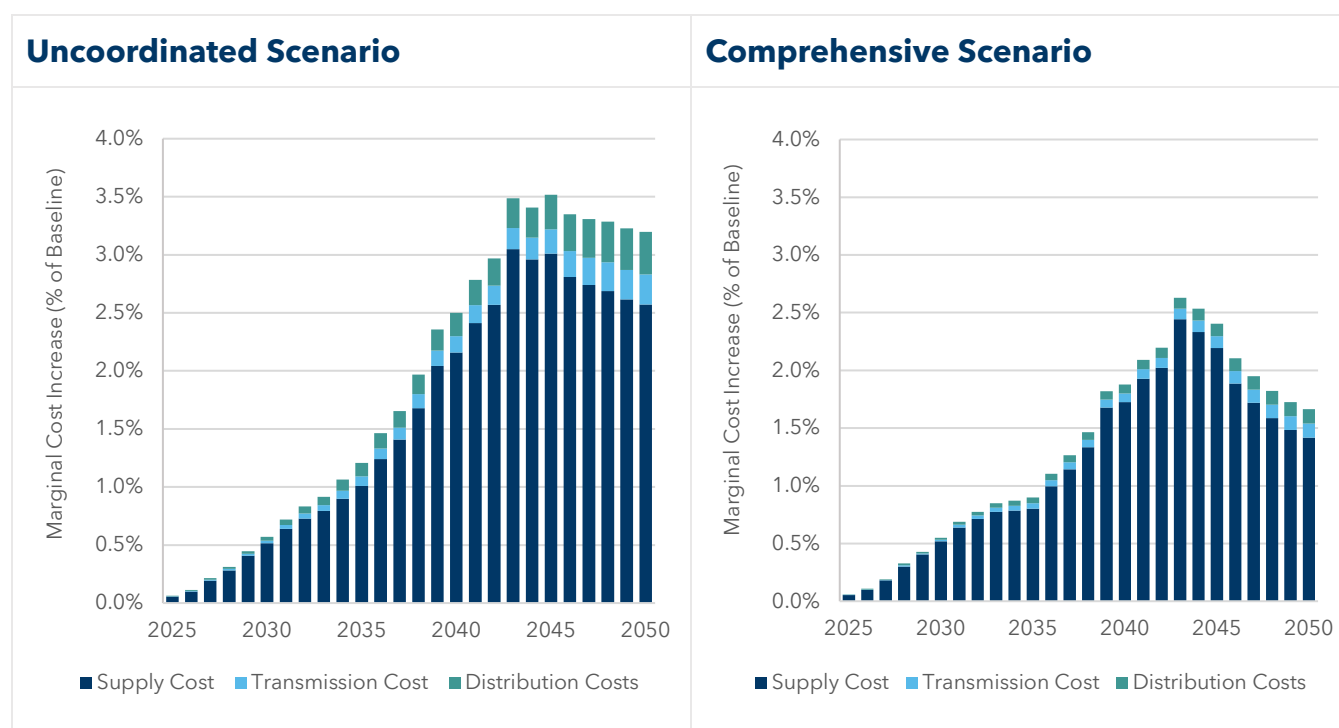
<sup>8</sup> In this model, the baseline scenario assumes no additional electric vehicle (EV) deployment between 2025 and 2050. Baseline costs are estimated by calculating supply, transmission, and distribution revenues under this "no-EV" case. For supply and transmission, which are province-wide in nature, the baseline is established by multiplying the 2025 average IESO Wholesale Market Price and Transmission Delivery Charges by the

unmanaged peak load growth, which drives up the need for capacity investments across the grid.

- In contrast, the Comprehensive EV-Ready Scenario caps marginal system cost increases at approximately 2.5% of the baseline, reflecting the benefits of proactive infrastructure planning and EVEMS-enabled load management. This coordinated approach helps shift charging away from peak periods, easing pressure on upstream assets.

While supply cost increases dominate in both scenarios, the Comprehensive Scenario shows significantly lower transmission and distribution cost impacts due to more efficient grid utilization. This highlights how coordinated planning can reduce infrastructure strain and defer costly upgrades.

Figure 2: Marginal cost impacts across scenarios



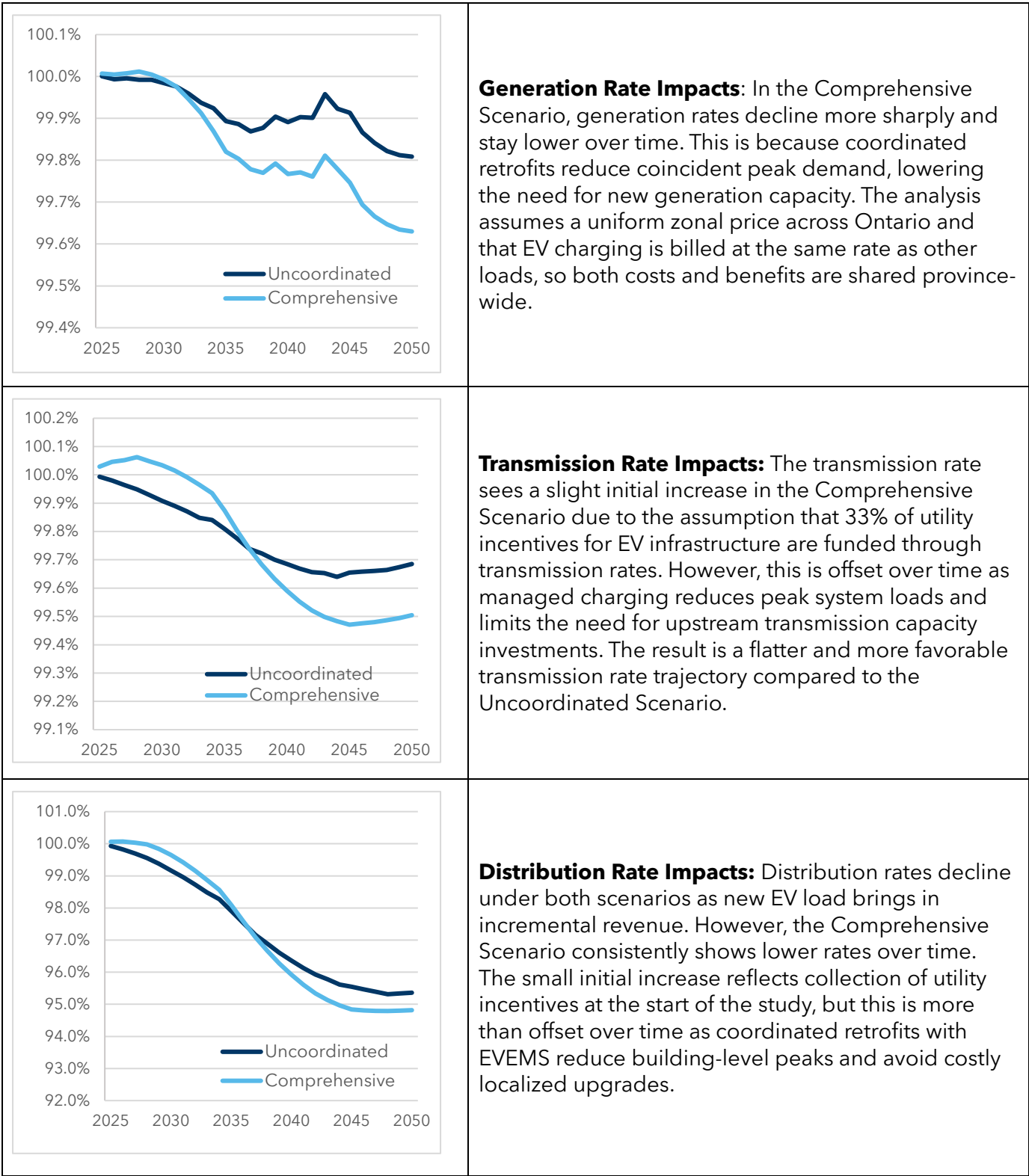
## Finding 2: Coordinated EV Deployment Exerts Greater Downward Pressure on Utility Rates Across All Components

EV adoption results in downward pressure on rates over time, as incremental revenues from increased electricity sales outweigh the associated costs. However, the magnitude of the benefit is consistently higher under the Comprehensive EV-Ready Scenario. This is because coordinated

projected net annual energy demand in Ontario from 2025 to 2050, as outlined in the 2025 Annual Planning Outlook (APO). For distribution, which is specific to rate classes, the baseline is calculated by multiplying the Small General Service (SGS) distribution rate by total retail sales to the General Service under 50 kW (GS<50) rate class. This approach reflects current rate structures and assumes flat rates over the study period for all components.

infrastructure planning and managed charging lead to lower peak demand growth, thereby reducing the need for costly system upgrades.

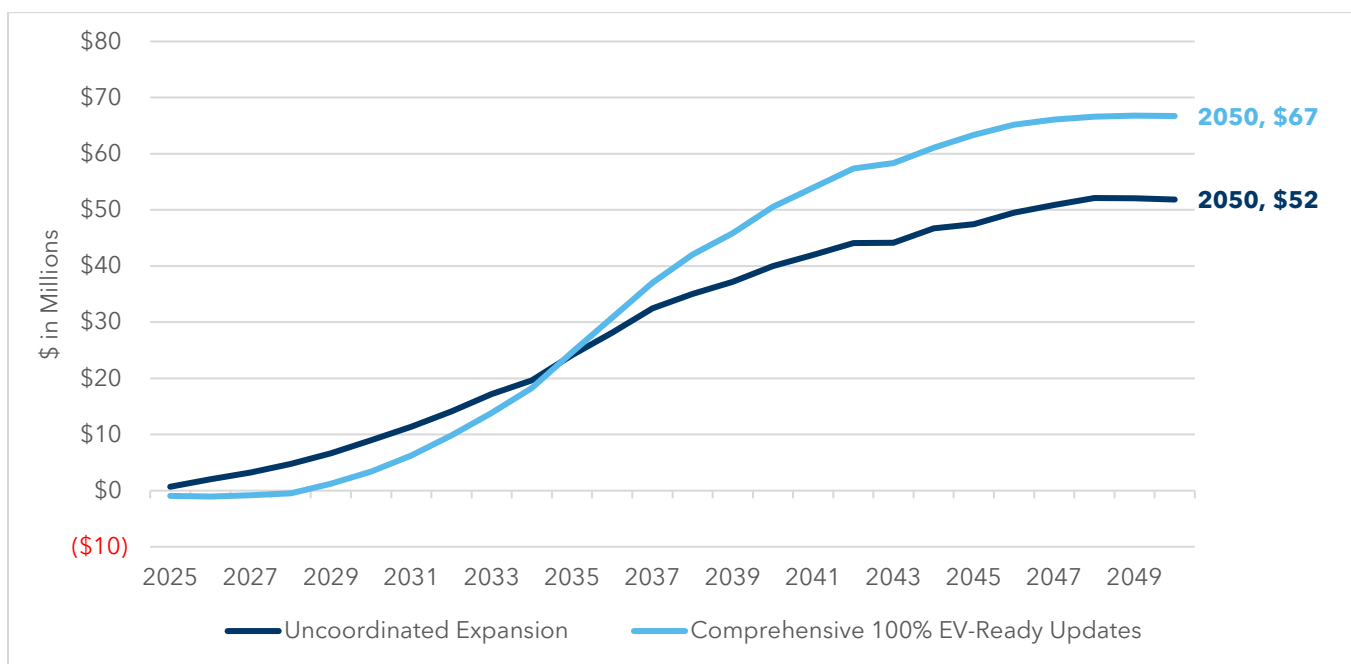
Figure 3: Rate Impacts by Scenario



### Finding 3: Comprehensive EV-Ready Deployment Delivers Greater Long-Term Ratepayer Benefits

Over the study period, both the Comprehensive EV-Ready and Uncoordinated Scenarios generate net benefits for ratepayers, as electricity revenues from new EV loads exceed the costs of serving those loads. These benefits are calculated relative to a baseline scenario that assumes no additional EV deployment in Ontario between 2025 and 2050. Importantly, the analysis accounts for the incentive costs associated with the Comprehensive EV-Ready Scenario. Even with those costs included, this scenario yields significantly greater cumulative ratepayer benefits, reaching nearly \$70 million by 2050, compared to approximately \$50 million under the Uncoordinated Scenario in Ontario.<sup>9</sup>

Figure 4: Total Ratepayer Bill Savings Across Scenarios



These enhanced benefits are driven by:

- **Higher EV adoption** made possible by improved home charging access.
- **Lower coincident peak impacts**, reducing the need for costly infrastructure upgrades.
- **Greater load management potential**, enabling utilities to optimize when and how EVs charge.

<sup>9</sup> The analysis captures both province-wide benefits (such as avoided generation and transmission costs) and local distribution system benefits. If the assessment were limited only to benefits accruing to the distribution utility, the net benefits would be substantially smaller.

Table 1: System Peak Impacts Modeled Based on EV Adoption in MURBs within a GTA Local Distribution Company (MW)<sup>1011</sup>

|             | Generation and Transmission |               | Distribution  |               |
|-------------|-----------------------------|---------------|---------------|---------------|
|             | Uncoordinated               | Comprehensive | Uncoordinated | Comprehensive |
| <b>2025</b> | 6.11                        | 4.90          | 6.21          | 5.13          |
| <b>2026</b> | 8.42                        | 6.92          | 8.97          | 7.71          |
| <b>2027</b> | 10.43                       | 4.85          | 11.52         | 6.55          |
| <b>2028</b> | 14.24                       | 12.38         | 15.91         | 14.72         |
| <b>2029</b> | 17.21                       | 8.51          | 19.69         | 12.36         |
| <b>2030</b> | 21.57                       | 10.99         | 24.96         | 16.30         |
| <b>2031</b> | 26.46                       | 14.25         | 30.86         | 21.22         |
| <b>2032</b> | 31.57                       | 16.89         | 37.02         | 25.69         |
| <b>2033</b> | 36.96                       | 20.19         | 43.52         | 30.93         |
| <b>2034</b> | 51.55                       | 23.55         | 58.76         | 36.27         |
| <b>2035</b> | 63.21                       | 26.71         | 71.96         | 41.53         |
| <b>2036</b> | 73.23                       | 30.07         | 83.53         | 46.89         |
| <b>2037</b> | 80.01                       | 33.99         | 92.09         | 52.87         |
| <b>2038</b> | 92.21                       | 36.46         | 105.46        | 57.10         |
| <b>2039</b> | 100.32                      | 39.13         | 114.83        | 61.37         |
| <b>2040</b> | 107.43                      | 41.41         | 123.05        | 65.01         |
| <b>2041</b> | 114.74                      | 43.71         | 131.49        | 68.69         |
| <b>2042</b> | 121.13                      | 45.61         | 138.87        | 71.72         |
| <b>2043</b> | 126.65                      | 47.08         | 145.26        | 74.08         |
| <b>2044</b> | 123.60                      | 48.64         | 143.24        | 76.16         |
| <b>2045</b> | 135.36                      | 48.84         | 155.31        | 76.90         |
| <b>2046</b> | 138.91                      | 49.29         | 159.42        | 77.61         |
| <b>2047</b> | 142.24                      | 49.58         | 163.26        | 78.07         |
| <b>2048</b> | 145.00                      | 49.61         | 166.45        | 78.11         |
| <b>2049</b> | 145.35                      | 49.72         | 166.85        | 78.30         |
| <b>2050</b> | 145.28                      | 49.70         | 166.78        | 78.27         |

<sup>10</sup> The analysis distinguishes between system-level and distribution-level impacts using different peak demand methodologies. System-level impacts on generation and transmission are estimated based on a coincident peak approach, which assesses incremental EV load contributions during the province-wide system peak. In contrast, distribution-level impacts are evaluated using a non-coincident peak approach, which reflects the incremental peak demand specific to the local distribution system, independent of the system-wide peak.

<sup>11</sup> In the Comprehensive 100% EV-Ready scenario, the system peak demonstrates notable volatility between 2026 and 2030. This variability is driven by the interaction between underlying hourly system load data and assumed load management characteristics associated with managed EV charging. As adoption of EV-EMS increases, more EV load is shifted away from traditional peak hours. This not only dampens the magnitude of the peak but also contributes to shifting the timing of the system peak itself.

While upfront incentive costs slightly delay benefits in the early years, the coordinated scenario's long-term payoff more than compensates. This highlights how proactive infrastructure planning and managed charging can amplify value for all customers, not just EV drivers.

Thus, coordinated EV-ready upgrades are expected to generate up to 40% more ratepayer benefit than uncoordinated retrofits by 2050.

## Key Assumptions

---

The analysis is grounded in a consistent set of assumptions that apply to both deployment scenarios. These include demographic data, EV adoption pathways, charging behavior, and cost modeling parameters:

- **EV Adoption and Readiness:** The modeling considers only existing MURBs as of 2024, excluding new construction assuming bylaws mandating 100% EV-readiness in new developments. It is assumed that 85% of MURB units currently have parking, with a gradual decline in availability over time due to evolving municipal requirements. In the Comprehensive Scenario, 60% of MURB parking spaces are assumed to be EV-ready by 2030, reaching 100% by 2035. In contrast, the Uncoordinated Scenario follows a slower and more fragmented path, achieving only 16% readiness by 2035 and 31% by 2050.
- **Charging Behavior and Load Management:** The Comprehensive Scenario assumes that 90% of EV charging is managed through building-integrated systems (e.g., EVEMS), ensuring most charging occurs overnight during off-peak hours (10 PM–7 AM). In contrast, the Uncoordinated Scenario assumes only 50% of charging is managed, with greater reliance on public and peak-period charging. Across both scenarios, 80% of EV charging is assumed to occur at home, with the remainder split between public and workplace settings. Most EVs are expected to use Level 2 chargers at home, with some use of Level 1 chargers.
- **System Level Impacts:** Peak demand impacts are assessed using the hourly load forecast from IESO's 2024 Annual Planning Outlook. Marginal capacity costs are drawn from observed values: \$113/kW-year for transmission and \$70/kW-year for distribution, in real 2024 dollars. Generation cost assumptions are based on APO energy and capacity values.
- **Rate Class Allocation:** The model assumes no cross-class subsidization. All incremental EV loads in MURBs are categorized under the General Service rate class of less than 50 kW (GS<50). While future rate design changes may be needed as EV adoption grows, this approach offers a clear and consistent basis for comparison across scenarios.<sup>12</sup>
- **EV Ready Incentive:** The model also incorporates an EV-ready incentive program starting at \$600 per parking space (43% of the upfront CAPEX for an EV-ready retrofit) and declining annually by 5% through 2035.<sup>13</sup> These incentive costs are recovered over 10 years, with 33% allocated to distribution rates and 67% shared across transmission and system operators.

---

<sup>12</sup> The analysis was conducted using data from a specific Local Distribution Company (LDC) on the condition of anonymity. The purpose was to test the hypothesis that a comprehensive, coordinated approach to EV-ready retrofits would place downward pressure on rates, rather than to assess impacts for a particular LDC or for Ontario as a whole.

<sup>13</sup> The levelization of incentives over a 10-year period is calculated in the accompanying Excel workbook under Sheet "Incentive Calculations", within the Assumptions section.



## National Implications

---

Although this analysis is grounded in Ontario-specific assumptions, the findings are relevant to utilities and jurisdictions across Canada. Multi-unit residential buildings represent a significant and growing share of the housing stock nationwide, and residents in these buildings face common barriers to home charging. The results highlight that coordinated, utility-supported EV-ready retrofits not only reduce costs for participating drivers but also deliver system-wide benefits by lowering peak demand, deferring costly grid upgrades, and improving utilization of existing assets. These benefits are broadly applicable wherever EV adoption is increasing, and multi-unit housing is prevalent.

For other Canadian utilities, this suggests a clear opportunity to evaluate or pilot EV-ready retrofit incentive programs that integrate managed charging and demand response. To strengthen the case nationally, further research could explore:

1. How regional differences in housing stock, adoption patterns, and grid costs affect program economics;
2. How rate design tools such as time-of-use pricing and demand charges influence managed charging outcomes;
3. How regulatory frameworks can enable utilities to proactively invest in EV-ready infrastructure.

Advancing these areas of inquiry would help utilities and regulators across Canada identify practical pathways to expand equitable access to charging, reduce long-term system costs, and strengthen the business case for proactive EV-ready investment.