



Low Load Factor Delivery Rate for EV Charging

Prepared for: Ontario Energy Board

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Background:

EVI Delivery Costs



- Ontario Energy Board (OEB) is undertaking activities to facilitate efficient adoption of electric vehicles (EVs) through the EV Integration (EVI) initiative
 - One workstream pertains to delivery costs and how current rate design may impact EV deployment in Ontario
- Power Advisory provided a report in April 2023 examining the current electricity delivery rates for EV charging and alternative rate design options that could support the efficient integration of EVs in Ontario
- Since delivering the April 2023 report, Power Advisory has provided further research and analysis to OEB
 - Responding to stakeholder feedback
 - Improving data sources and analytical methods
 - Exploring different design options
- Today's presentation focuses on a variant of the Low Load Factor rate which is implemented only on Retail Transmission Service Rates (RTSR)

April 2023 EVI Delivery Cost Study Activities

- Quantitative assessment of cost of current electricity delivery rates for commercial EV fleets and public direct current fast charging stations (DCFCs) in Ontario
- Qualitative analysis with respect to potential challenges for commercial EV fleets and public DCFCs, consisting of:
 - Semi-structured interviews with a selection of EV charging service providers, commercial EV fleet owners and services providers, and local distribution companies (LDCs) in Ontario
 - A literature review and jurisdictional scan to review rate design alternatives that have been considered, piloted, or implemented in other North American jurisdictions
- Development and evaluation of alternative rate design options for commercial EV fleets and public DCFCs, including:
 - Evaluation of options using principles of good rate making and OEB objectives per *Ontario Energy Board Act, 1998*
 - Calculation of the economic impact of each alternative for commercial EV fleets and public DCFCs in Ontario, as well as impacts on other customers
- Other considerations, including options for customers to mitigate delivery costs and qualitative evaluation of the rate design options from the perspective of other customers

Key Concepts for Low Load Factor Rate

- Demand charges reflect the maximum amount of power that a customer used over a specific interval - usually 15 minutes - during a billing cycle
- Retail Transmission Service Rate (RTSR) is a demand charge reflecting the distributor's cost of transmission service; this cost to the distributor is based on coincident demand at a transmission station
- Direct Current Fast Charging (DCFC) is an electric vehicle charging technology generally offering over 50 kW of power, often intended to be used by the public for sessions as short as 10 to 15 minutes
- Coincident Peak Contribution (CPC) is a metric defined for this analysis expressing the ratio between a customer's contribution to coincident demand – and RTSR costs for the distributor – relative to their noncoincident demand
 - RTSR recovers costs associated with coincident demand, but customers are charged RTSR based on their noncoincident demand
 - Customers whose CPC is much lower than average, including low load factor customers, contribute more to RTSR than appropriate
 - Low Load Factor rate seeks to unwind this cross-subsidization by offering a discount on RTSR for low load factor customers

April 2023 Report – Stakeholder Feedback and Refinements

Improved Data

- A single load profile was used to represent General Service > 50 kW customers which may have been “flatter” than the actual customer mix
- The main source for public DCFC load profiles was a simulation study
- Data sources were improved in this analysis. Customer-level smart meter data is used to characterize General Service customers and a large dataset of empirical measurements are used for DCFCs

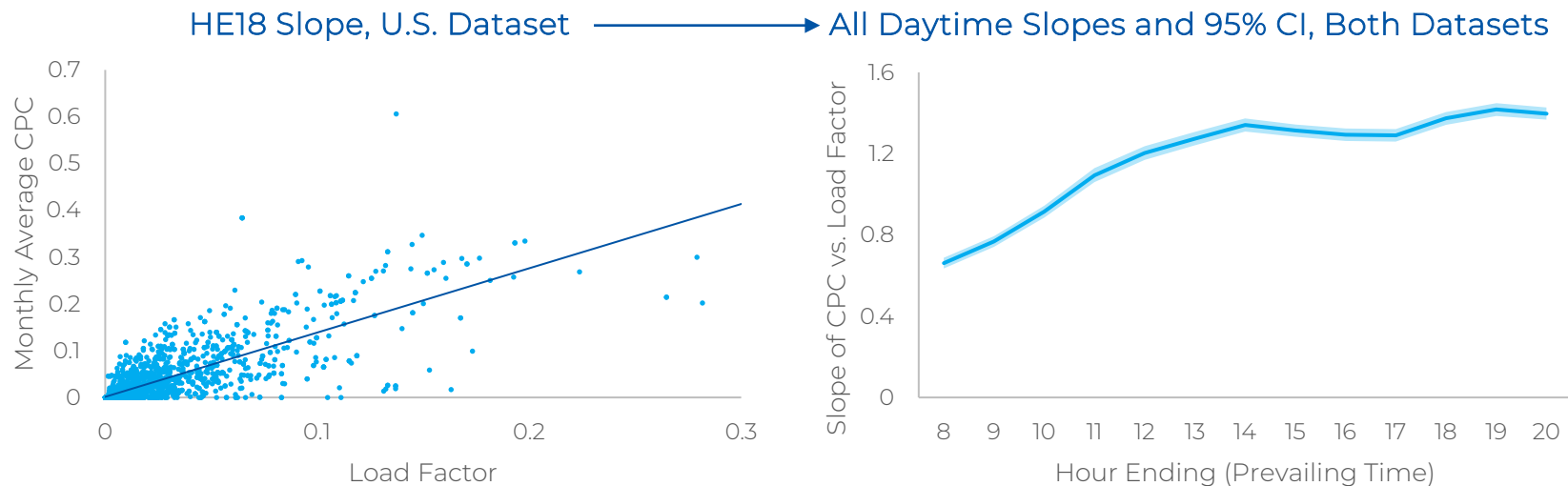
Energy Charge

- Option 2c, the demand transition rate, did not provide justification for the energy (\$/kWh) component of the rate design
- In this analysis, Option 2c has been replaced with an energy-only rate that is tied to cost causation

Detailed Demand Definition

- The timing of peak varies between distributors
- Peak timing will likely evolve over time, and more stations and distributors may become winter-peaking
- Network and Connection transmission service charges are based on different definitions of demand
- This analysis continues to use a single peak demand window and definition of coincident peak demand
- Bill impact is now calculated for all LDC rate zones

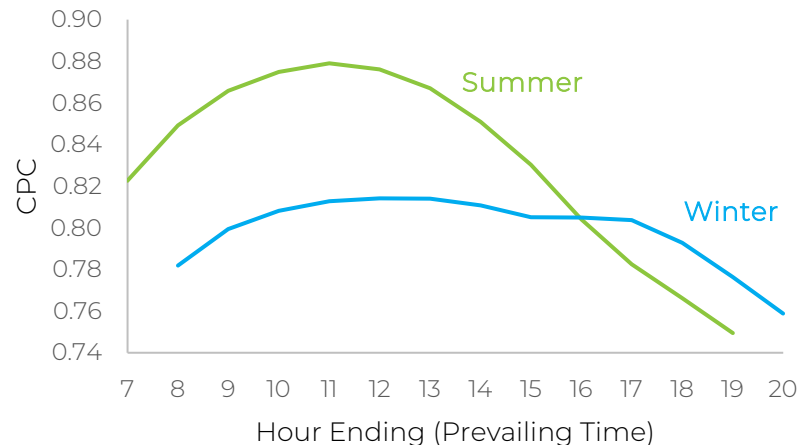
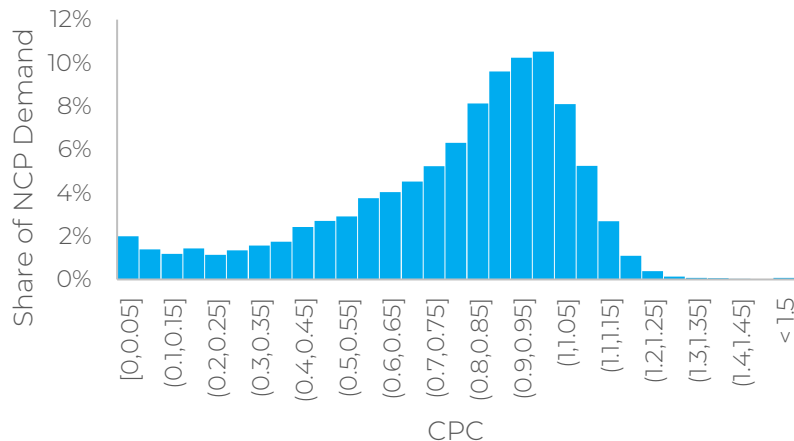
Load Research – Public DCFCs



- Data Source: U.S. data from EV WATTS; finding validated with non-public Canadian data from major charging network
- Load factor and peak hour consumption (i.e. CPC) have a linear relationship
- In the afternoon and evening period generally associated with coincident peak, CPC is 1.3 to 1.5 times higher than load factor

Load Research – General Service >50kW Customers

HE18, Summer → Daytime Average, Summer and Winter



- Data Source: hourly smart meter data from multiple Ontario LDCs
- There is a broad range of CPC for General Service customers; many customers have limited peak contribution but high noncoincident peak
- Average CPC in the afternoon/evening period is in the 0.75 to 0.80 range

Defining the Demand Charge Discount

Ideal ratio between coincident peak-related demand charges for low load factor DCFC and other customers

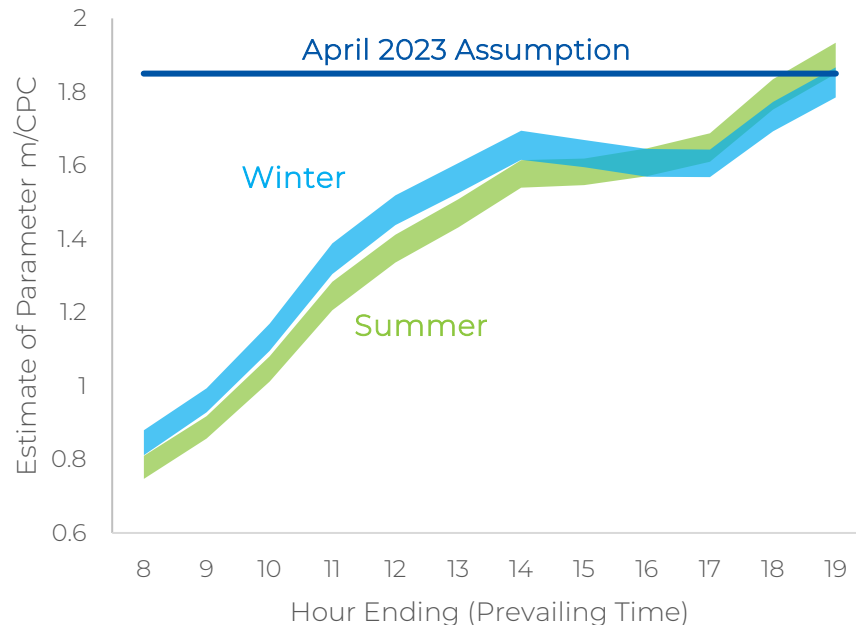


$$\text{LLF RTSR} = \frac{m}{CPC_{\text{Other}}} * LF_{DCFC}$$

DCFC Load Factor



Parameter derived from load research: slope (m) for DCFCs and average CPC for other customers



Revised Rate Design Options

- Suppose RTSR is \$5.65/kW and customer has a 10% load factor:
 - Option 2a (Reduced demand charge, single-tier): $0.13 * \$5.65 = \$0.73/\text{kW}$
 - Option 2b (Reduced demand charge, multi-tier): $0.16 * \$5.65 = \$0.90/\text{kW}$
 - Option 2c (Energy-based recovery): $1.7262 * \$5.65 / 730 \text{ hours} = \$0.0134/\text{kWh}$

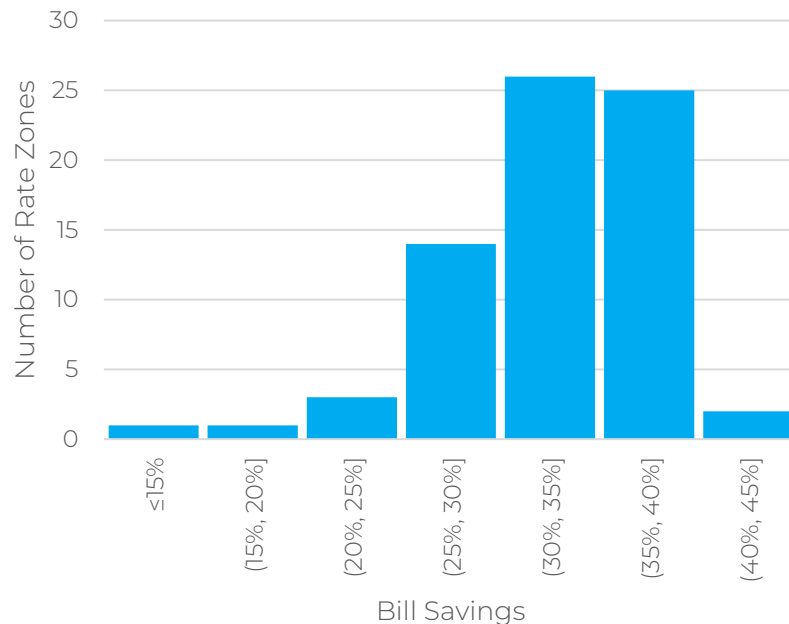
Load Factor	Option 2a (Share of RTSR)	Option 2b (Share of RTSR)	Option 2c (Share of RTSR)	Option 2c (\$/kWh)
0 to 3%	0.13	0.03	0	$\frac{1.7262}{\text{Number of hours in billing period}}$
3 to 7%		0.09	0	
7 to 11%		0.16	0	
11 to 15%		0.22	0	
above 15%	1	1	1	0

Bill Impact – Eligible Low Load Factor Customers

- Savings for low load factor customers are substantial
 - For an eligible 5% load factor customer, bill savings range from 13% to 42% compared to status quo rates
 - In some LDCs, RTSR is a small share of the total bill, leading to limited (relative) savings from reducing RTSR
- Relative savings decrease as load factor increases

Load Factor	Minimum (%)	Average (%)	Maximum (%)
5%	13%	31%	42%
10%	10%	22%	30%
15%	8%	17%	22%
20%	7%	13%	17%

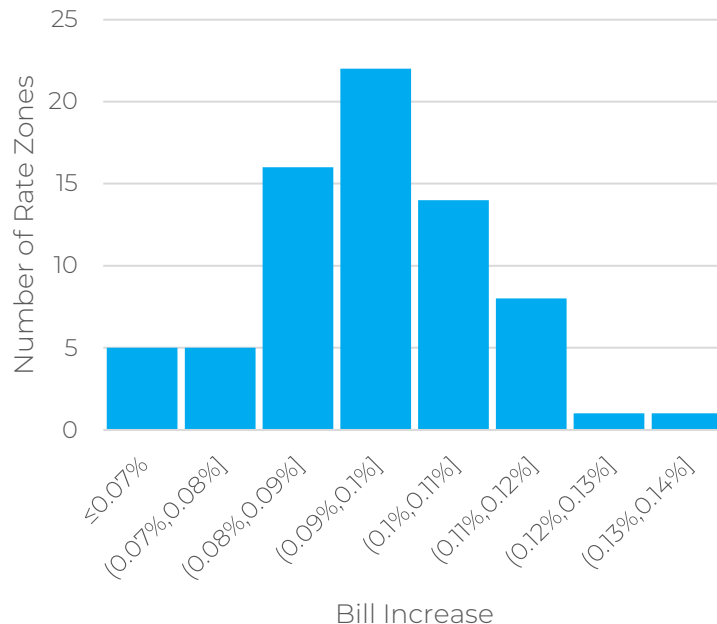
Option 2c Savings (%), by Rate Zone, 5% Load



Bill Impact – Other Customers

- Anticipated bill impact in 2026 is small
 - Increase averaging 0.1% of total bill for non-participating customers
 - Assumes change in RTSR from low load factor customers is collected from all other LDC-connected customers
 - There are few public DCFCs currently operating in Ontario
 - Bill impact increases with number of DCFCs and if DCFC load factors are lower
- Some design choices could increase bill impact
 - If costs are recovered only from other General Service Greater than 50 kW customers, bill impact would be greater
 - If all low load factor customers, not just public DCFCs, are eligible, bill impact would be greater and more immediate
- Bill impact is from better aligning rates with cost causation

Typical Customer Bill Impact in 2026



Summary and Discussion

- The Low Load Factor rate design reduces the cross-subsidization that occurs when noncoincident demand charges are applied to low load factor customers to recover costs associated with coincident demand
- A set of revised rate design options has been developed
 - Customer-level smart meter data and empirical measurements of public DCFC consumption were used to set parameters that are reasonably applicable throughout Ontario
- The impact of the rate on customers and distributors varies depending on design decisions:
 - **Mechanism:** recovering RTSR for low load factor customers through a single-tier demand charge, multi-tier demand charge, or energy charge
 - **Eligibility Threshold:** there is a risk of a sudden increase in electricity bills for customers which transition out of the low load factor rate; a higher threshold would reduce the magnitude of this step
 - **Eligible Customer Type:** limiting the rate to public DCFCs may require eligibility verification procedures, and rate design principles generally do not support end-use specific rates. However, allowing all low load factor customers to access the rate would increase the bill impact for other customers.
 - **Recovery:** the reduction in RTSR collected from low load factor customers could be recovered from all LDC-connected customers or only General Service greater than 50 kW customers



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Appendix

Abbreviations

- CPC: Coincident Peak Contribution
- DCFC: Direct Current Fast Charging
- EV: Electric Vehicle
- LDC: Local Distribution Company
- LLF: Low Load Factor
- OEB: Ontario Energy Board
- RTSR: Retail Transmission Service Rate