



WHEN TRUST MATTERS

Evaluating utility electric vehicle managed charging programs

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Discussion Overview

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Introduction to Managed EV Charging

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SmartCharge Rhode Island Program Overview

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Findings and Implications for Program Design



Managing the grid impacts of EVs requires effective program design and interventions to influence charging patterns

Shift charging off-peak

Influence customers to move some or all of their vehicle charging at **times that are beneficial or non-detrimental** to the electric grid

Minimize the addition of charging during peak

Reduce the impact of EVs by effectively managing the associated load to occur non-coincident with system peak or other grid-constrained times

Assess driver responsiveness to program signals

Understand how rebates influence participant charging patterns to **inform effective program design**

Approaches to EV Charging

Unmanaged Charging

- Not exposed to price or other program signals
- Drivers can charge where and when they want
- Utility has no insight into when charging may occur on the system



Passive Managed

- Leverages monetary incentives and behavioral messaging to influence driver behavior
- Aims to delay charging to off-peak hours

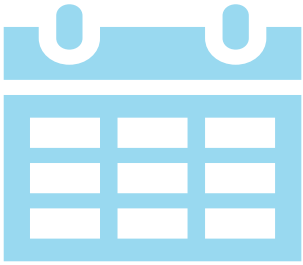






Active Managed

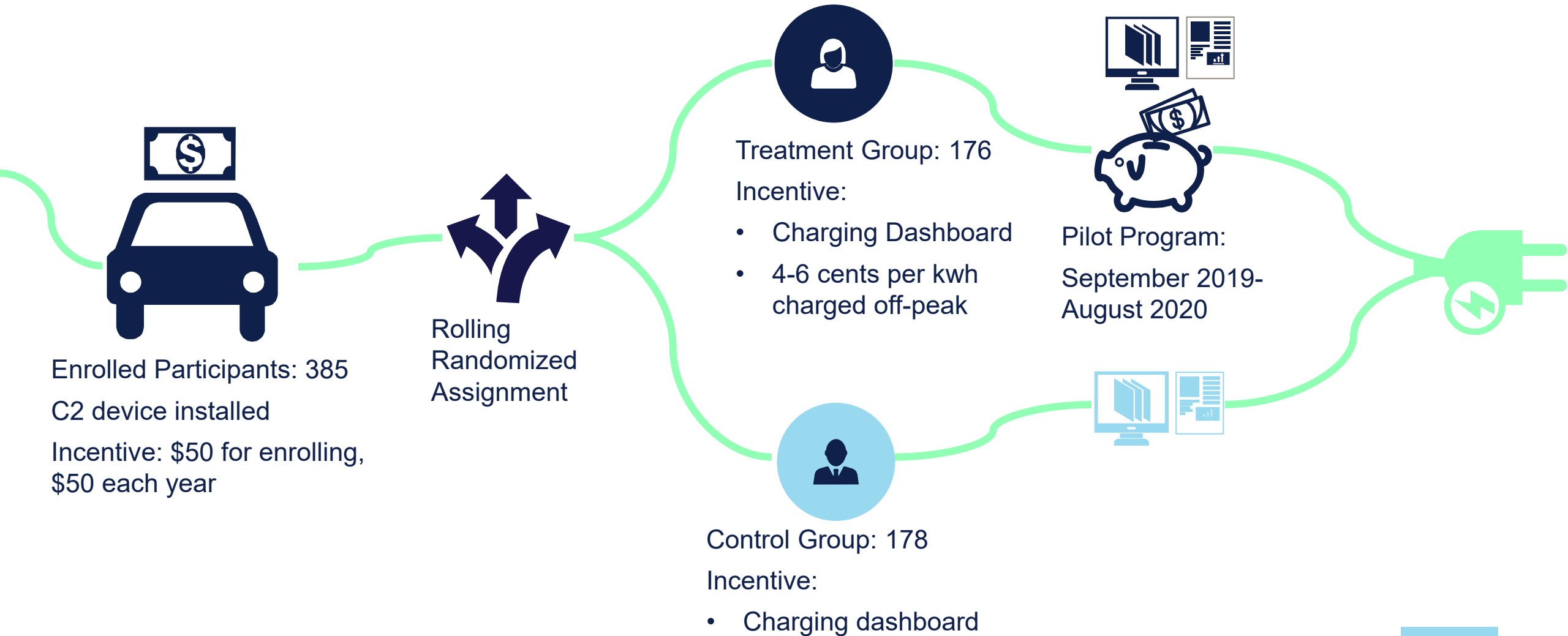
- Utility or aggregator controls EV charging
- Can be used for demand response, load flexibility, and ancillary grid services



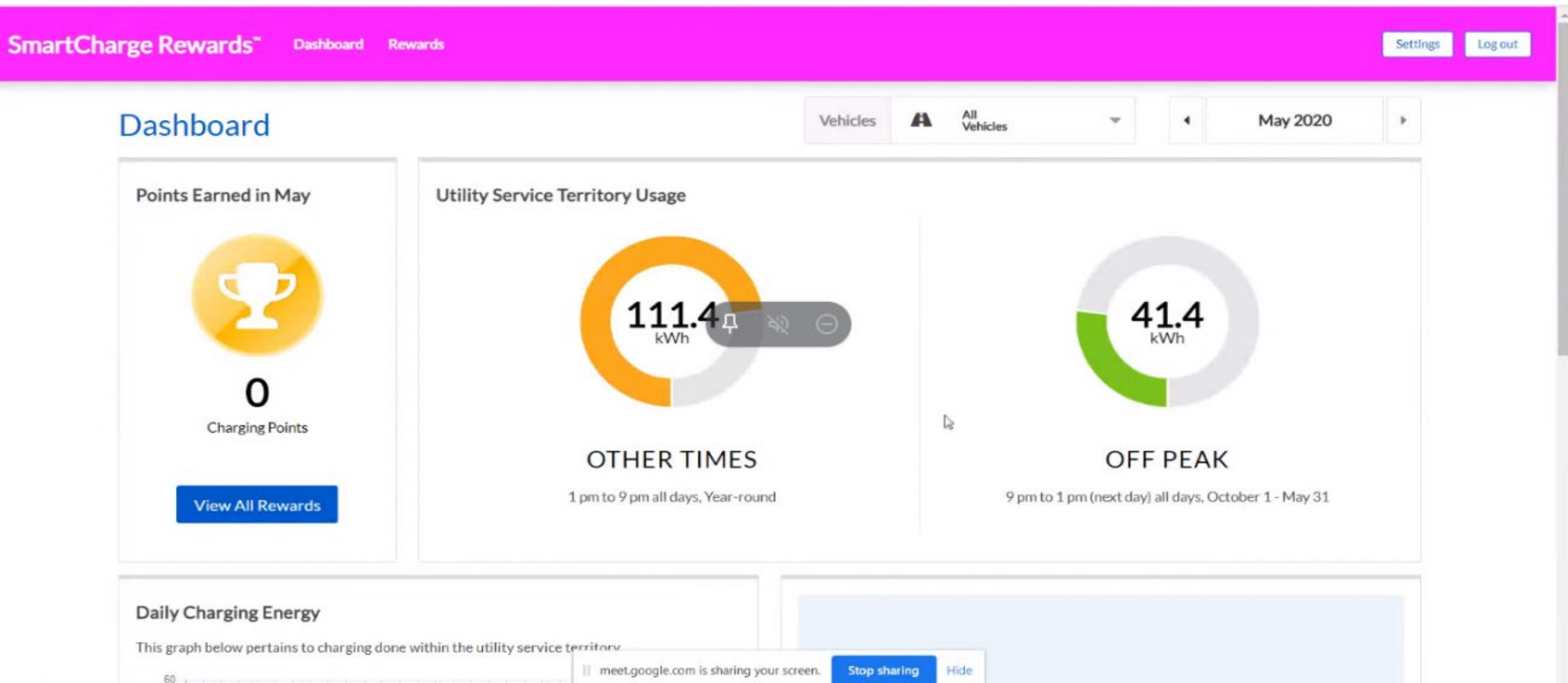
National Grid's SmartCharge Rhode Island Program

				
Recruitment: Began in June 2019	Target Customers: Known or likely EV drivers, including BEVs and PHEVs	Program peak: 1pm-9pm on all days	Data Collection: Each participant got a C2 system to record data while charging and transmit wirelessly	Incentive: All charging was eligible for rebates, including charging outside RI territory

Pilot Program Evaluation Design



Participant Charging Dashboard



Charging Data Analysis Approach

Vehicle and Program-level Statistics

- Total kWh charged
- Number of charging sessions by month/group/vehicle type



Per-vehicle Charging Load Profiles

- 15-minute resolution
- Aggregated by group and vehicle type
- Segmented by month and day type

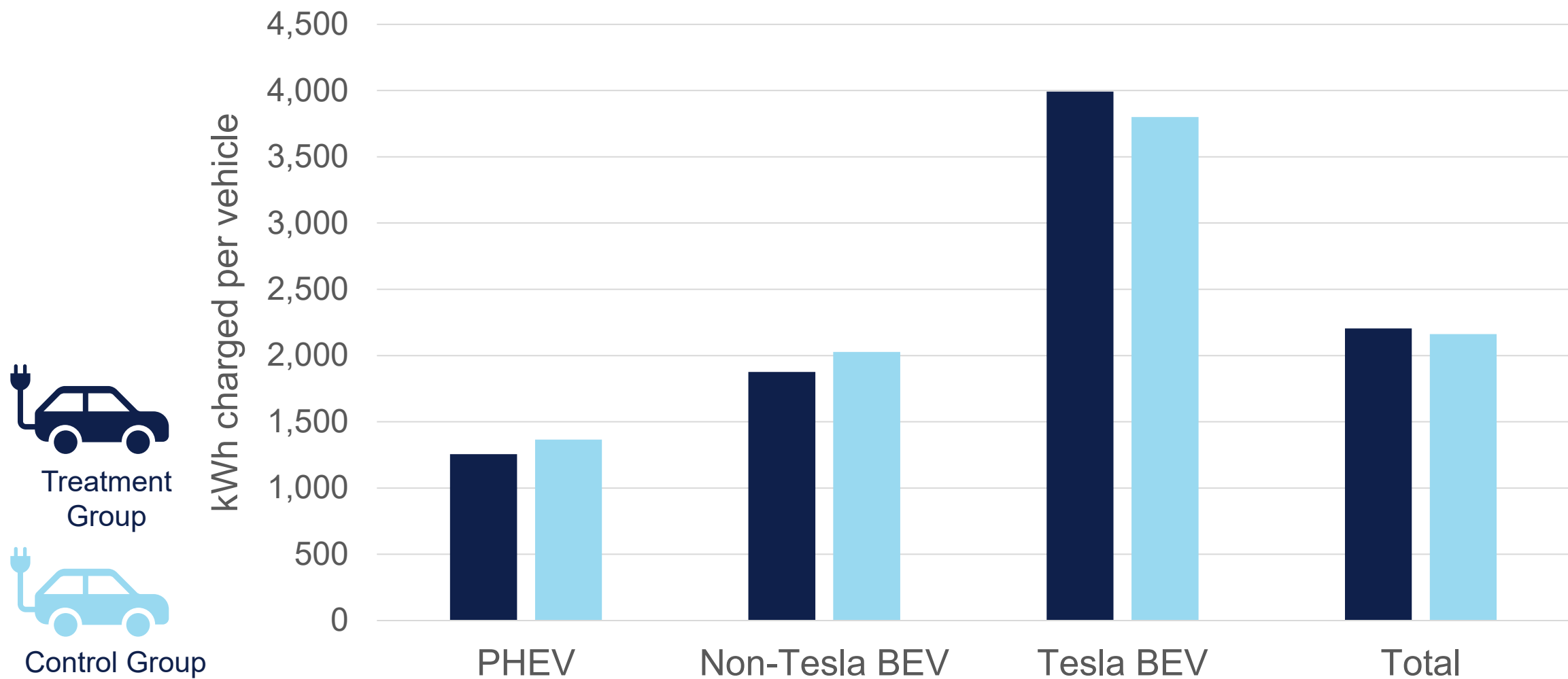


Program Effectiveness

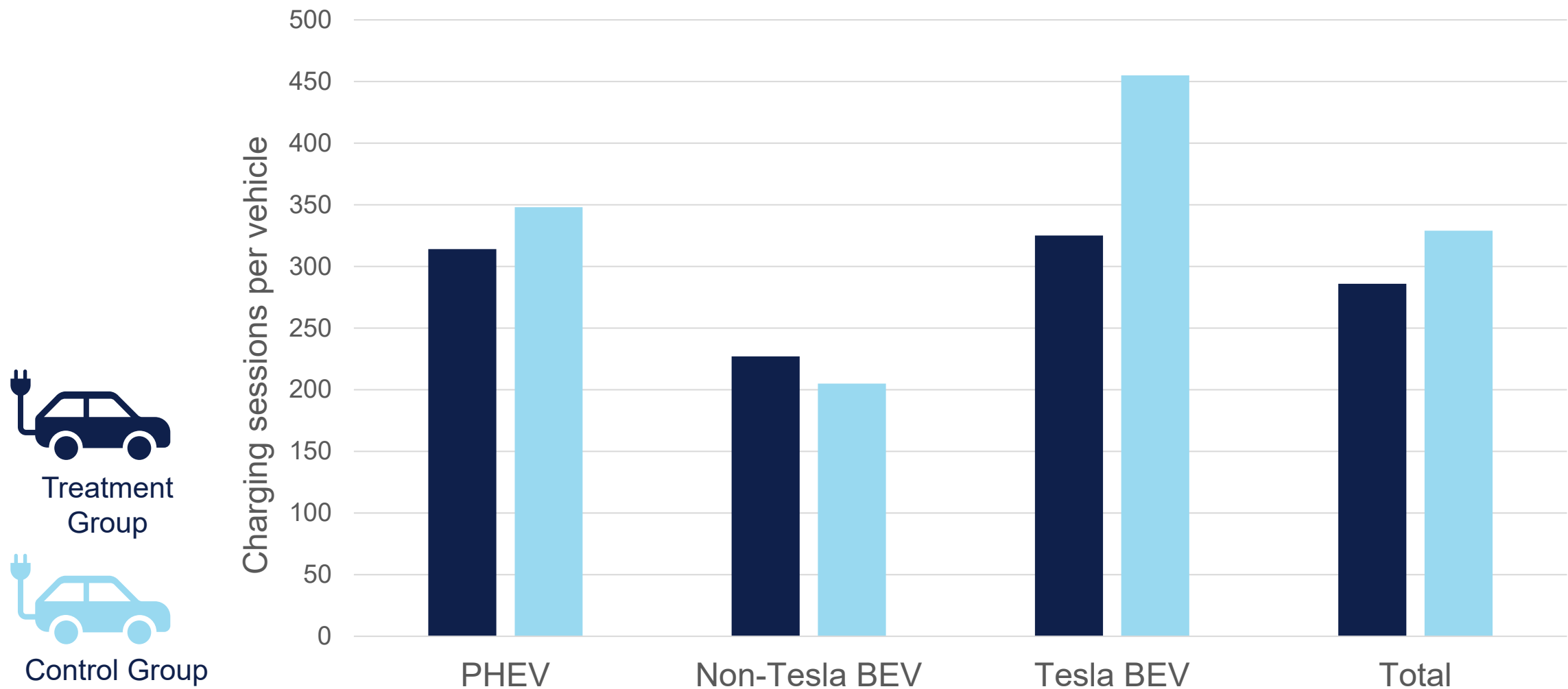
- Percent of kwh charged off-peak
- Percent of charging sessions initiated off-peak



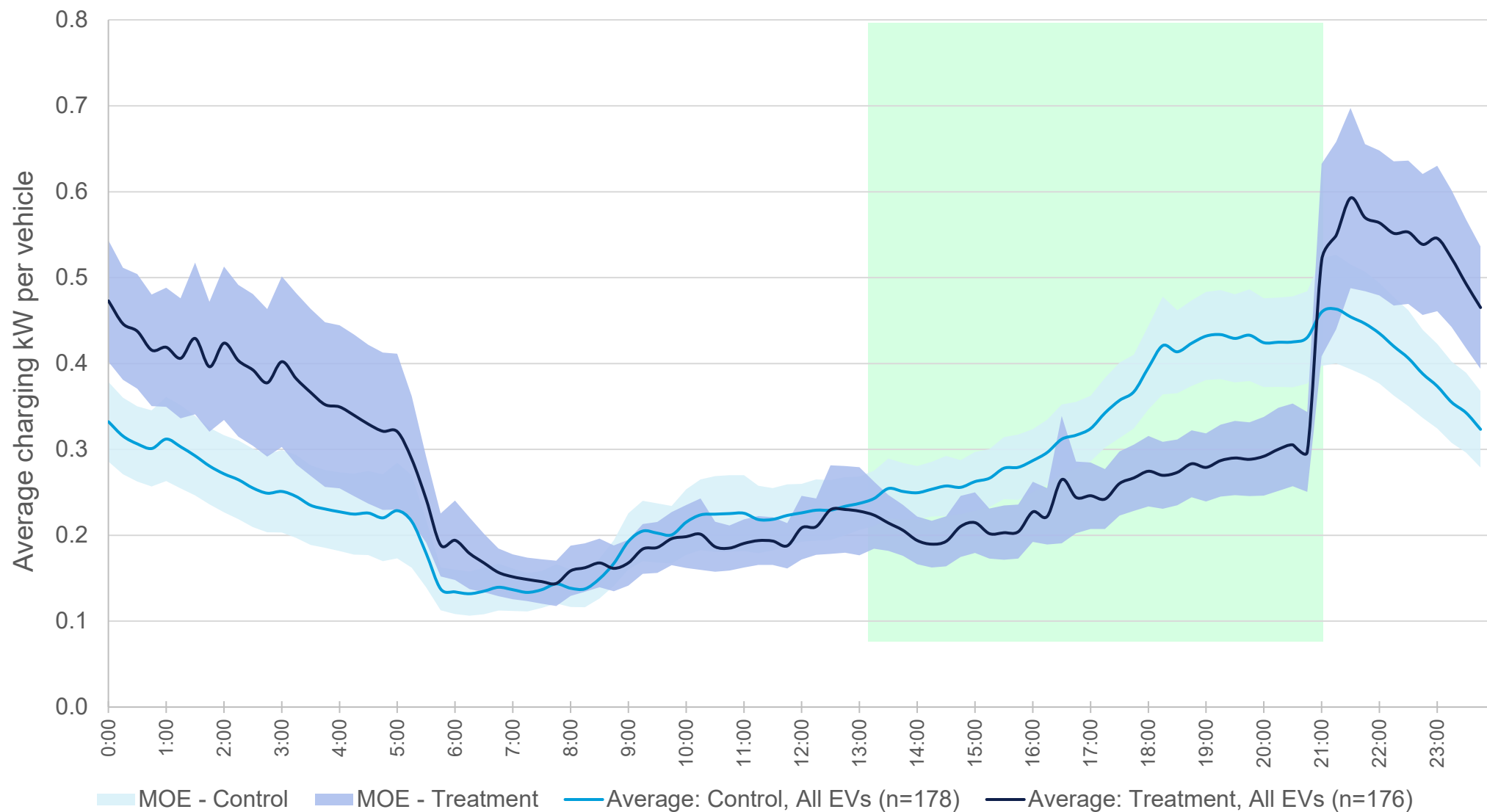
Program Year 1 Summary Statistics- kWh Charged



Program Year 1 Summary Statistics- Charging Sessions

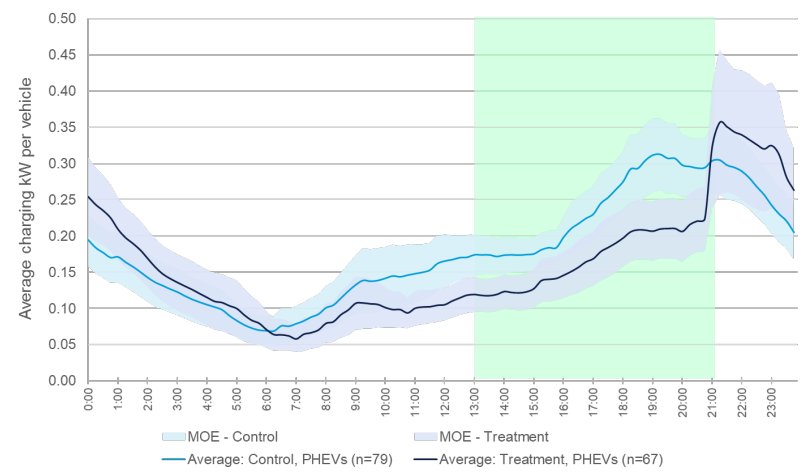


Charging Load Profile: All EVs

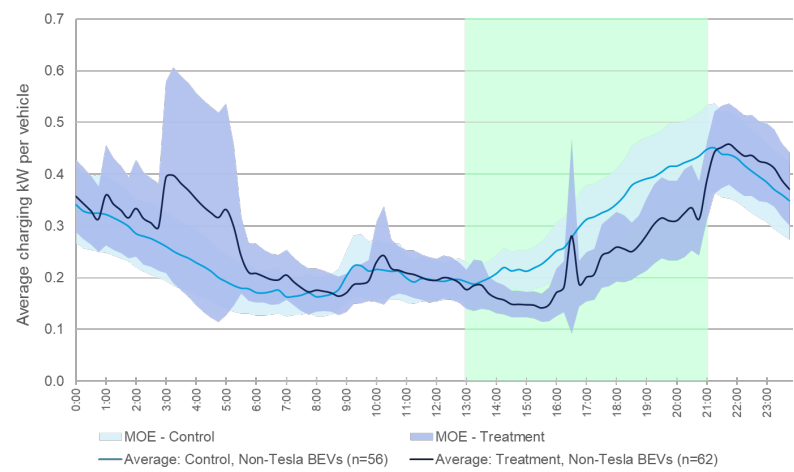


Demand Reduction by Group and Vehicle Type

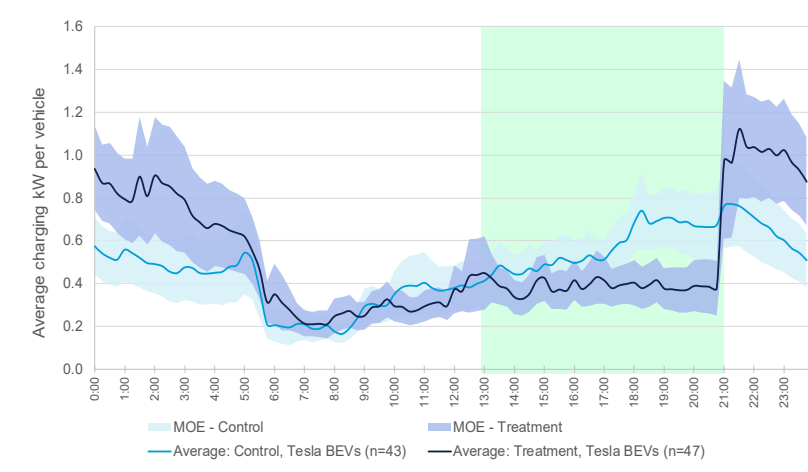
PHEV



Non-Tesla BEV



Tesla BEV



Vehicle Type	Demand Reduction Relative to Control Group	
	Peak Period: 1pm-9p	Later Peak Period: 5pm-9pm
PHEV	28.7%*	29.1%*
Non-Tesla BEV	25.8%	26.9%
Tesla BEV	31.6%*	40.9%*

kWh Regression Model

- Evaluated percent kwh charged off-peak
- Reflects program design which rewards drivers for off-peak charging

Vehicle Type	Control	Treatment
PHEV	53%	63%*
Non-Tesla BEV	61%	72%*
Tesla BEV	58%	78%*

Session Start Regression Model

- Evaluated percent of sessions initiated off peak
- Better captures how well the participants internalized the program intent

Vehicle Type	Control	Treatment
PHEV	41%	48%*
Non-Tesla BEV	38%	57%*
Tesla BEV	50%	68%*

More charging starts and occurs during the off-peak period amongst the treatment group, indicating **the price signal is having an impact**

Findings and Program Design Implications

Off-Peak Rebates Work

- Shifted 49,848 kwh off-peak
- Approximately 10-20% more kwh were charged off-peak in the treatment group
- 69% of Treatment participants reported charging overnight compared to 35% of control

The program succeeding in reducing peak coincidence charging

Off-Peak Shifts are not Uniform

- BEV owners in the treatment group initiate more charging sessions off-peak than PHEV owners

Despite success in the BEV category, programs should continue to focus on their engagement as they grow market share

Vehicle Type Impacts Off-Peak Charging Performance

- PHEVs charge more often than BEVs
- 76% of BEVs were aware of tools to manage charging compared to 35% of PHEV

Vehicle technology likely has a large impact of the drivers ability and ease to shift charging off-peak

Questions?

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