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ComEd EV Companion Phase 1 Close Out

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Objectives

1. Analyze the value of a software-based solution to inform ComEd customers on charging patterns and DR events and effectiveness of customers
2. Collect qualitative feedback on the tools / telematics and the ability to easily connect regards of vehicle type
3. Benchmark other EU EV optimized charging programs
4. Inform the development of ComEd's future managed charging pilots under the BE (EV Companion)

How viable is a software-only solution through vehicle telematics to manage EV charging?

What are the benefits and limitations of this approach?

Inform the development of ComEd's future managed charging pilots under the Beneficial Electrification Plan (EV Companion 2)

How does EV Companion compare to other Exelon managed charging offerings? How can ComEd leverage lessons learned from other Exelon offerings to inform the development of EV Companion 2?

What lessons can ComEd learn from the customer experience with EV Companion to inform the development of EV Companion 2?

What considerations should ComEd take into account when selecting metrics to measure the performance of EV Companion 2?

Approach

Benchmarking

- Identify key performance metrics and lessons learned across Exelon managed charging offerings
  - Five interviews were conducted with program staff from Exelon's managed charging technical assessments and pilots; two were conducted with implementers who executed the programs
  - Interviews covered a total of nine unique assessments and pilots

Demand Event Participant Assessment

- Leverage EV companion telematics data to understand charging patterns and load management opportunities and inform metrics to measure DR performance
- Conduct in-depth interviews with EV Companion participants to understand the customer experience and the effect of the pilot on charging behaviors

Benchmarking - EU EV Program Descriptions

BGE EV TOU – A passive load control program where BGE implements an EV only TOU rate and bills using EV telematics and EV chargers as submeters

BGE Rebate & PHI Rebate – Data gathering programs where customers receive an upfront rebate of $300 to share their charging data

BGE Off-Peak Home Charging Incentive & PHI Off-peak Off-bill Program – Passive load control programs where customers share their charging data and receive a $50 ongoing incentive for charging more than 90% off-peak

BGE and PHI SmartCharge Management – A dynamic optimization program where customers' charging is optimized using EV telematics based on driver preferences and grid needs. Has 3 components: residential, commercial/fleet and public

ComEd EV Companion – A two-part program, consisting of a passive load control component where customers receive reports on charging patterns as well as alerts before Peak Time Savings and capacity events. Also includes a small direct load control component comprised of ten friends and family participants, where ComEd uses direct load control to curtail charging during events

ComEd Electric Vehicle Managed Charging Demonstration – A lab-based simulation utilizing load banks that enables ComEd to test a variety of managed charging approaches and technologies. This includes passive load control, direct load control which includes building integrations with a variety of EVSE vendors, and V2X

ComEd Super Smart Charging Technical Assessment – A rates program that sends a time-varying rates signal to ChargePoint chargers, the charger directly optimizes charging based on that signal and the cost of charging for the customer as well as customer charging preferences

Considerations - EU EV Optimized Charging Programs

- **Balancing metrics with customer experience**
  - Charging data collection may lead to battery drainage
  - Need to adapt metrics to evolving programs
- **Manage charging is a dynamic environment**
  - Currently there is no standard evaluation approach or metrics for EV load management offerings, especially for programs further along on the evolution diagram (see appendix)
  - Program designs and traditional metrics need to evolve to reflect the unique aspects of managed charging
  - Currently, there are no success criteria associated with managed charging metrics and no clear baseline definitions

Learnings - EU EV Optimized Charging Programs

Program Design and Implementation	▪ Explore partnership models with aggregators that offer managed charging services to avoid costly integrations with OEMs and charger vendors
Incentives	▪ Consider providing incentives for customers who already own a charger by partnering with vendors that control chargers directly and/or leverage vehicle telematics to manage L2 charging ▪ Consider offering performance incentives to encourage EV owners to stay connected
Customer Experience	▪ Consider partnering with OEMs (either independently or through aggregators) at the point of sale ▪ Establish relationships with EV owners to build trust and work to understand managed charging attitudes and perceptions among the general population, beyond early adopters
Telematics vs. Charger	▪ Pilot and implement programs that include both EV telematics and charger direct load control capabilities to maximize market coverage ▪ Emphasize customer experience, market share coverage, and scalability of EV telematics when presenting software solutions to regulators
Second Meter	▪ If including an EV TOU rate in future filings, reference recent CA EV TOU legislation and the benefits of submetering highlighted by the CPUC
Untapped Opportunities	▪ Investigate opportunities to manage charging outside of the home and its impact on the customer experience ▪ Seek to understand the multi-family EV owner including their charging patterns and barriers to charging access ▪ Consider developing a tech assessment or pilot to explore V2X use cases and value propositions

Demand Event Recruitment

The program implementer, Rolling Energy Resources (RER), sent recruitment e-mail communications

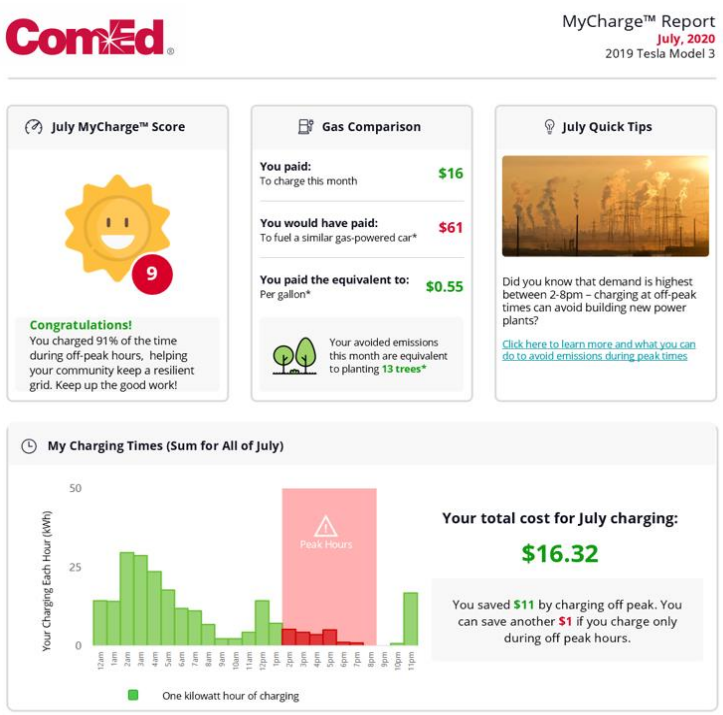
- Sent to 4,525 self-reported EV owners (provided from ComEd)
- No monetary incentives offered to enroll or perform

Participant Basics

RER has the capability to remotely manage EV charging and gather charging data through vehicle telematics

RER provides **MyCharge Reports**, a customized monthly report that outlines charging details to all participants:

- 279 participants enrolled in the EV Companion Program (298 vehicles)



Car Make	Participant Cars
Audi	5
BMW	7
Chevrolet	26
Chrysler	2
Ford	8
Hyundai	1
Jaguar	3
Jeep	1
Nissan	4
Tesla	238
Volkswagen	2
Volvo	1
Total	**298**

Participants fell into 4 groups:

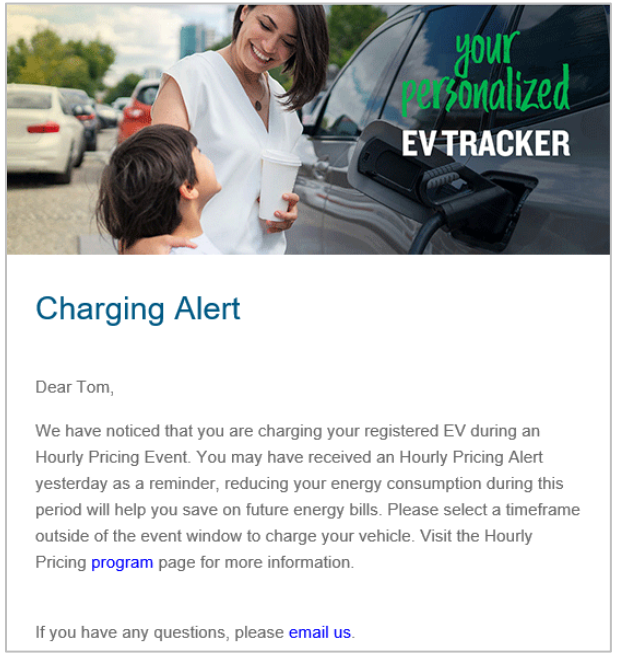
- Hourly Pricing Participants (n=157)
- Peak Time Savings (PTS) Participants (n=19)
- Both (n=100)
- Friends and Family exclusively (n=3)*

*There were 14 total Friends and Family participants, the 11 additional participants fell under Hourly Pricing and are included in that group

Demand Notification (DN) Participant Basics

Behavioral Demand Response Events (“Passive Optimized Charging”):

- Customers received notifications asking them to avoid charging during DR event periods
  - Hourly Pricing Participants: Received a reminder notification for 12 capacity events
  - Peak Time Savings (PTS) Participants: Received a reminder notification for one PTS event
  - Both: Received a reminder notification for both events (13 events)
- PTS and capacity participants received additional event notifications to remind them not to charge if they appeared to be charging during an event

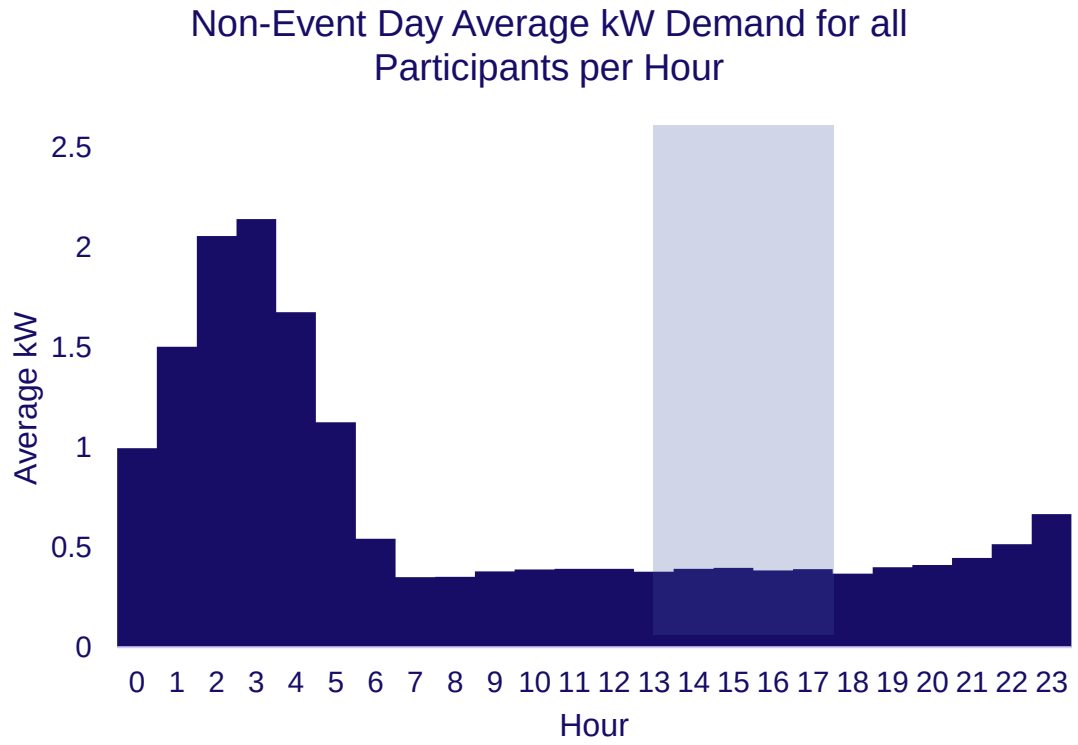


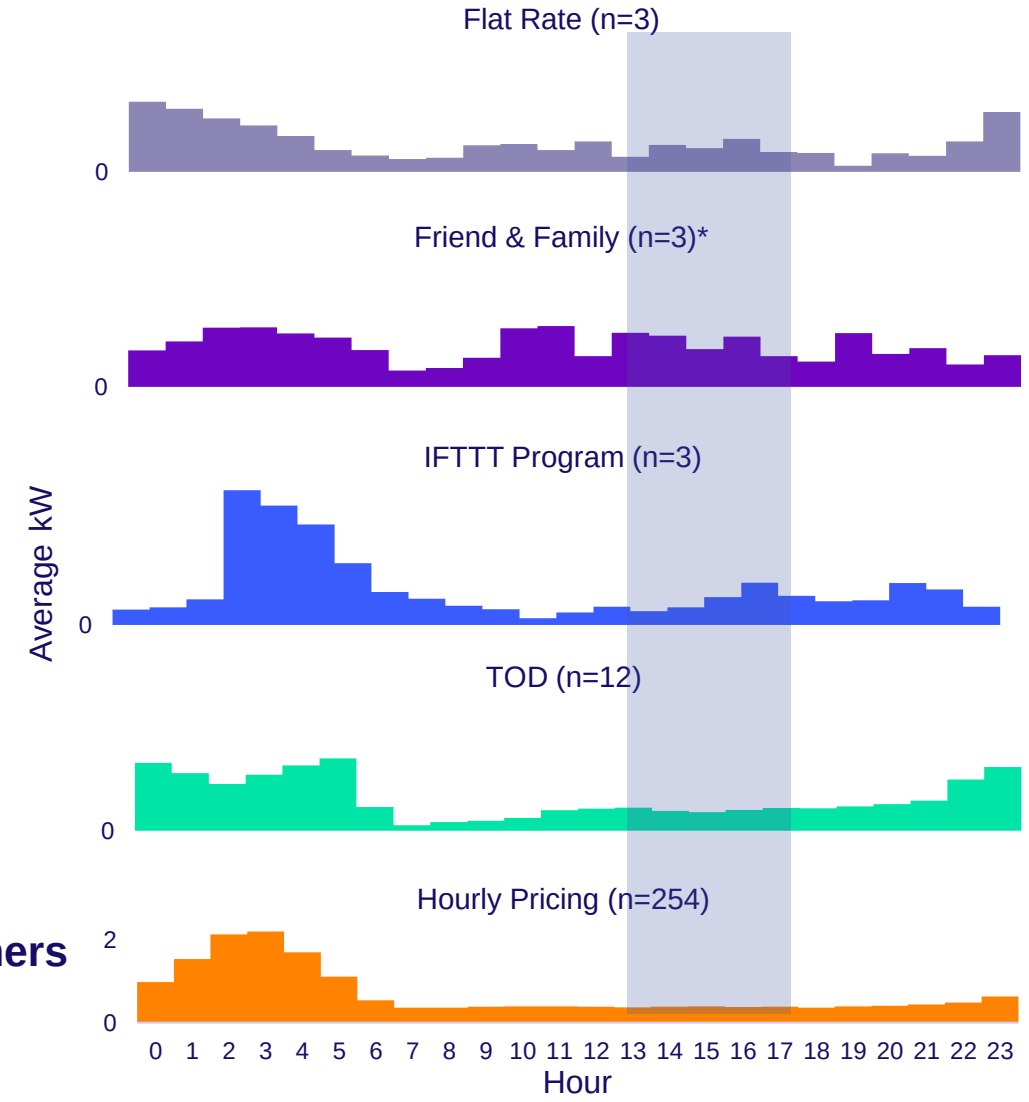
Demand Response (DR) Participant Basics

Direct Load Control Events (“Active Optimized Charging”):

- Friends and Family:
  - A subset of participants (14) engaged with a direct load control (DLC) component implemented in Fall 2022 after the general event season was completed (8 ‘manufactured’ events called from mid-Sept through October)
    - Charging curtailed during event and restarted after
    - Notifications sent at 24 hours prior, 30 minutes prior, and at end of event

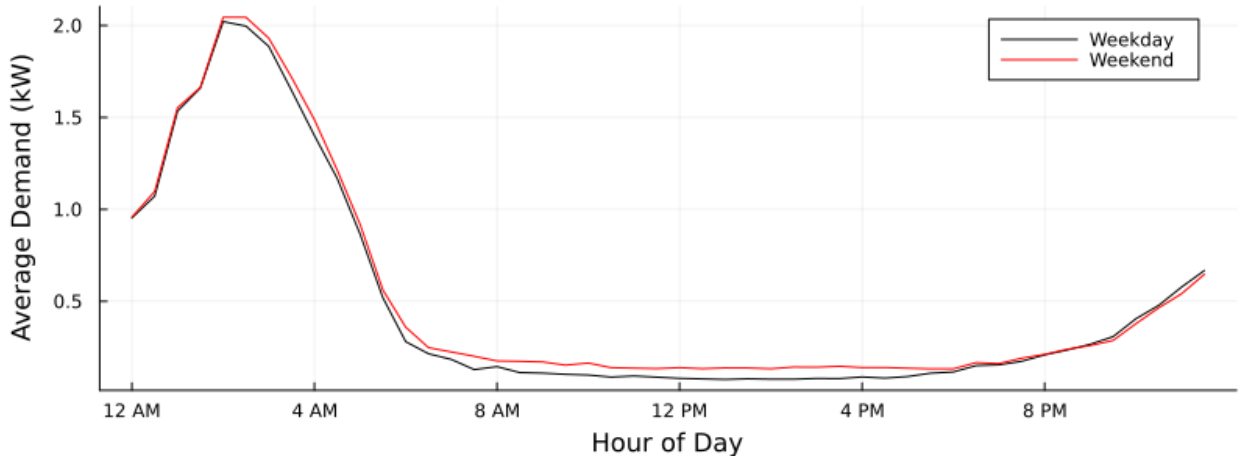
Participant Charging Patterns

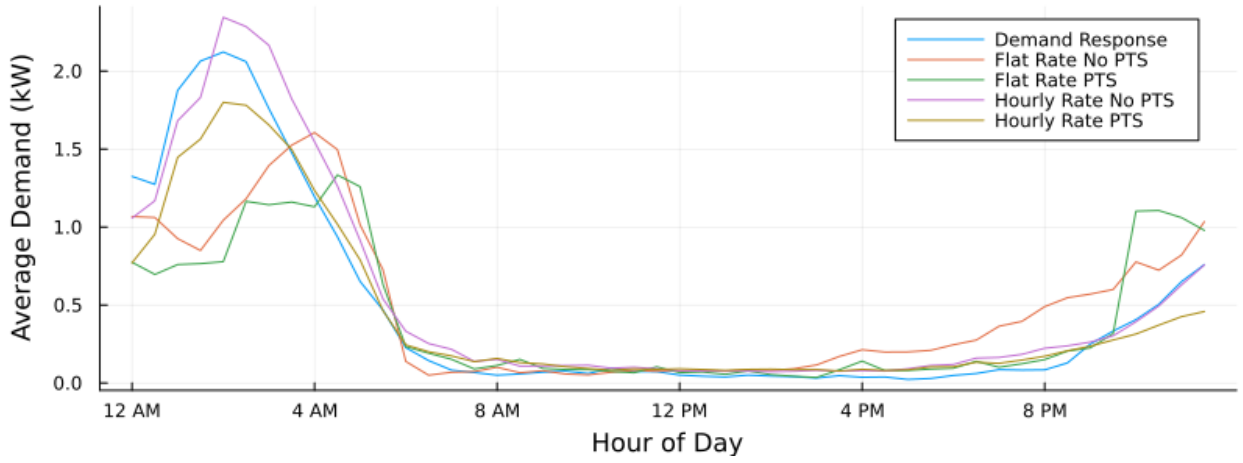


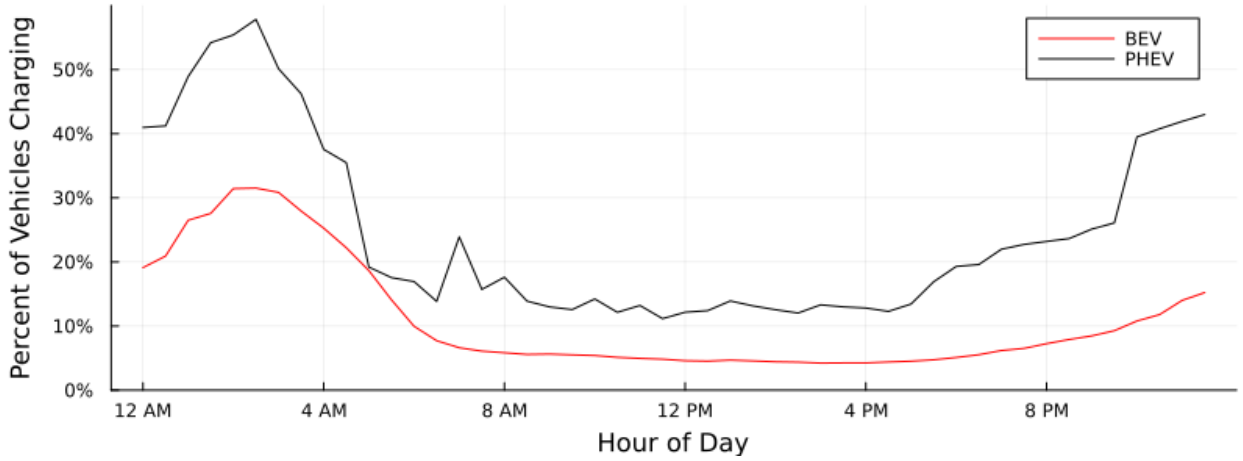


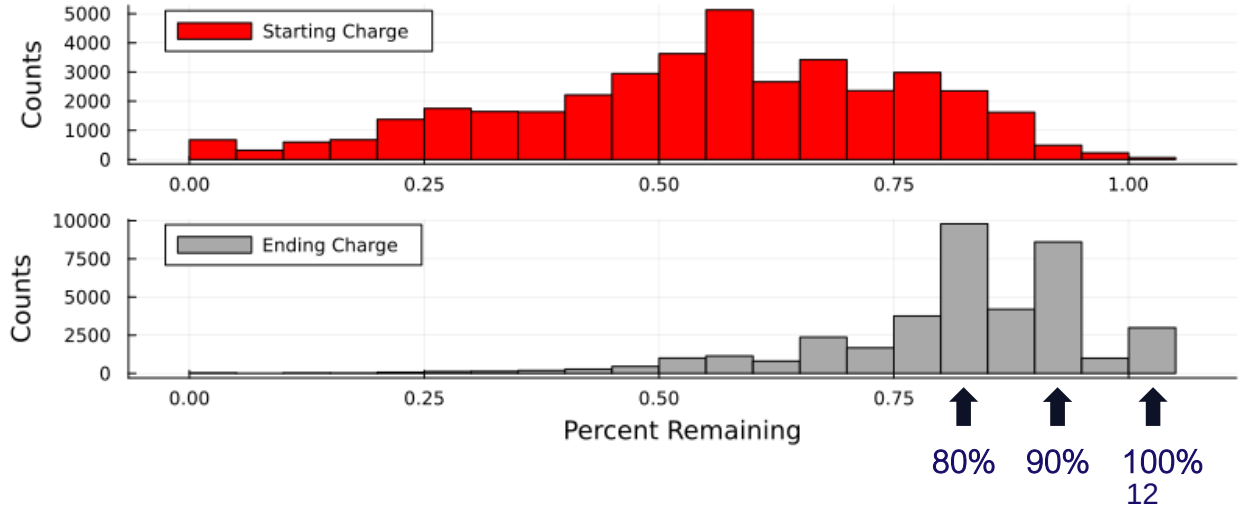
EV Companion participants are primarily charging overnight and during off-peak times, particularly hourly pricing customers

Participant Load Shapes





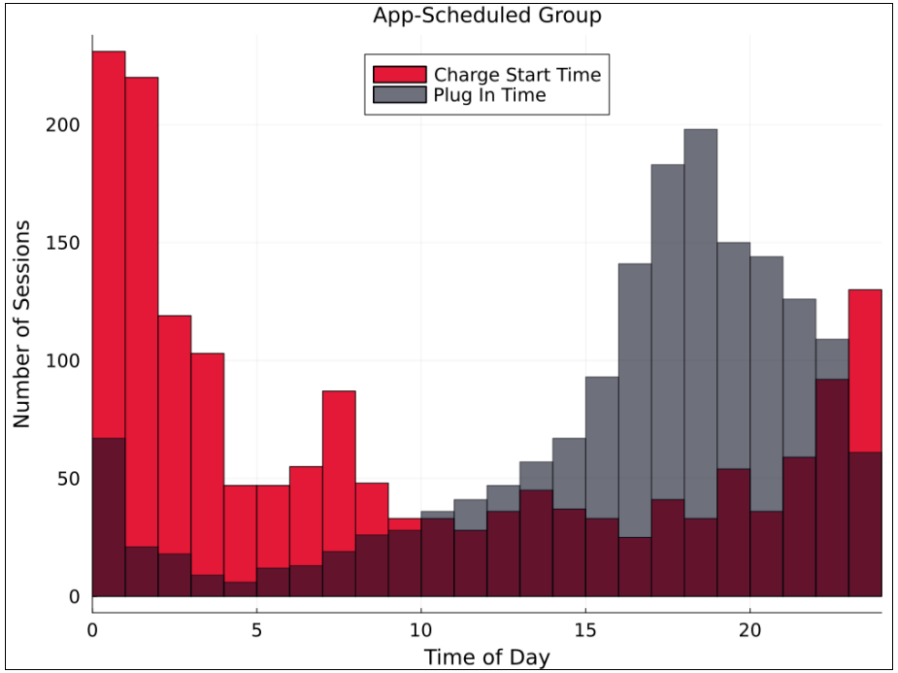




Participant Charging Schedules

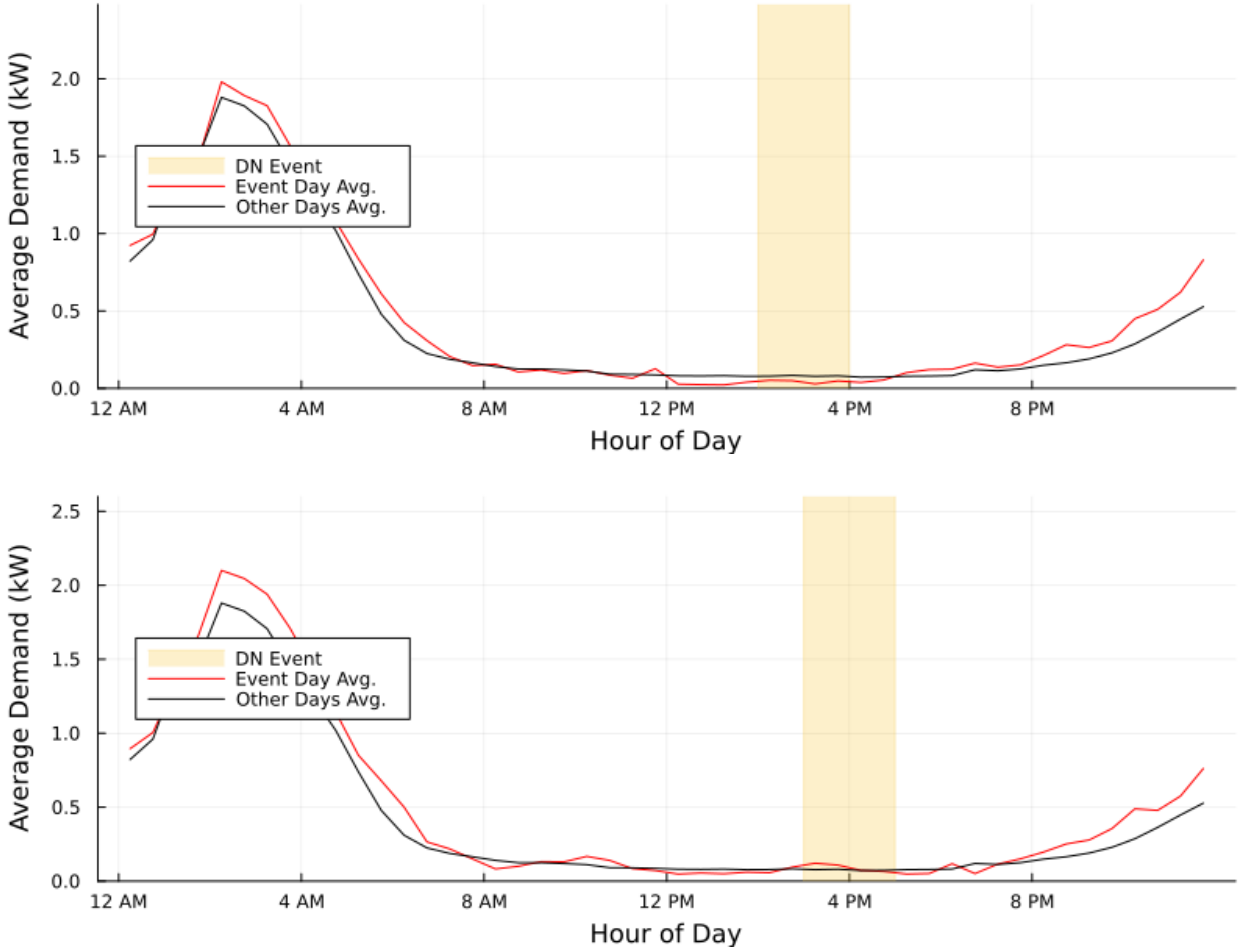
Plug In Session Group	# of Sessions	Average Starting Time of Charge	Average Duration of Charging (hours)	Average Time Plugging In	Average Time between Plug and Charge (hours)	Average Demand when Charging (kW)
Non-App-Scheduled	195	11:14 PM	4.8	11:03 PM	0.02	6.8
App Scheduled	1,672	1:17 AM	3.5	6:21 PM	7.9	9.4
Long Term Plugged In	1,052	8:13 PM	4.5	7:01 PM	47.7	8.2

- *Drivers plug in on average after 6 PM, consistent with returning home from work or daily activities*
- *Charging is already delayed until after 1 AM, consistent with best times for hourly pricing*
- *Charger level is slightly higher than other session types*
  - *Team assumes more Tesla wall chargers paired with Tesla app*
- *Duration of charging is slightly lower than other groups, consistent with regular plug-in behavior*



"App Scheduled" group represents approx. 60% of charging sessions

Load Reduction (Demand Notifications)

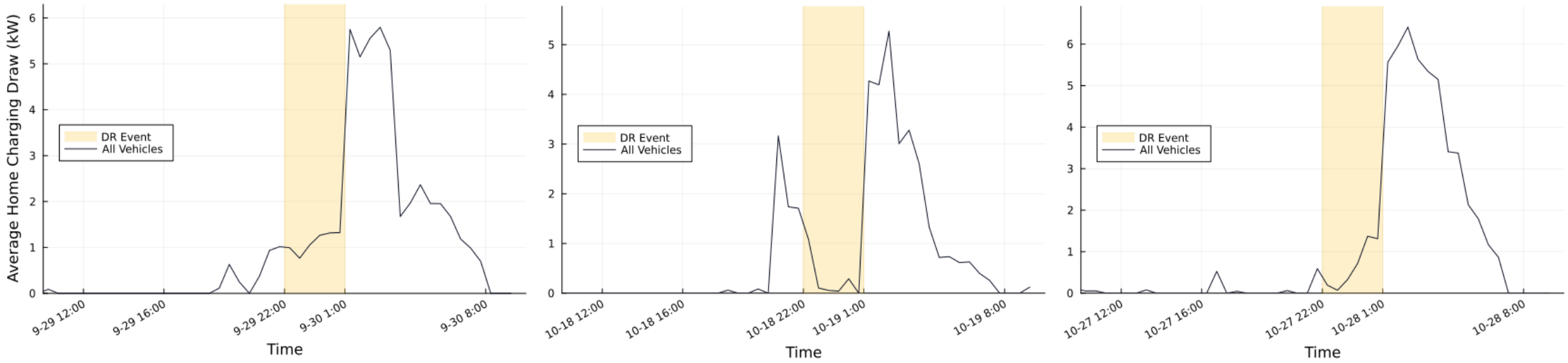


- Minimal detectable impact due to summer DN events, as expected because:
  - 98% (258 of 264) of these customers were already incentivized to charge off peak, either through HPE, TOU, or PTS
  - DN events occurred in the middle of the day when customers are typically not charging at home

Load Reduction (Demand Response)

For vehicles charging at home

- Successfully curtailed charging across event window
- Successfully restarted charging after event window
- Events curtailed up to 6 kW per vehicle on average*



*Note that the DR participants ("Friends & Family" group) were **asked** to plug in nightly, so true DR event achievement may not be equivalent

Charging Behaviors Overview

- Most participants charge overnight and fall into two categories:
  - Participants who always plug in at the same time
  - Participants who plug in and charge when they need it
- Charging patterns vary by:
  - Rate
  - Type of intervention in which they are enrolled (e.g., Hourly Pricing vs. Friends & Family)
- Event performance was limited because:
  - Participants regularly charged off-peak; consequently, the differences in average demand for the peak period was minimal between event and non-event days
  - 93% of Pilot participants were already enrolled in an Hourly Pricing rate
  - For participants who did participate in events, opt-out rates were generally low (3–6% across all events, depending on calculation methodology)
- Measuring performance:
  - There are unique challenges to constructing baselines given participant charging behavior
  - Telematics data carries benefits and risks from an evaluability perspective

Learnings – Demand Events

- There is no “one size fits all” approach for managed charging offerings, but there are opportunities to tailor customer targeting and education to support load flexibility potential
- Ensure participants have appropriate education about charging and events, and their implications on the grid
- There is high interest in all program types, but education and outreach efforts will be needed to address customer concerns about managed charging programs
- There are opportunities to improve event communications
- EVs pose unique challenges for developing baselines and evaluating load impacts
- Vehicle telematics data offers opportunities to design targeted load management interventions, but may have quality concerns

EV Companion Next Steps

Program and Technology Design

- Continue to explore partnership models with third party aggregators that offer managed charging services to avoid costly and time-intensive integrations with OEMs and charger vendors
- Consider providing incentives for customers who already own a charger or are in the process of purchasing one by partnering with vendors that control chargers directly and/or leverage vehicle telematics to manage L2 charging
- Consider offering performance incentives to encourage EV owners to stay connected
- Consider partnering with OEMs and other marketplace vendors (either independently or through aggregators) at the point of sale, to allow EV owners to enroll in a managed charging offerings at the vehicle and charger points of sale
- Establish relationships with EV owners to build trust and work to understand managed charging attitudes and perceptions among the general population, beyond early adopters

Pilot Opportunities

- Pilot and implement programs that include both EV telematics and charger capabilities in order to maximize market coverage
- Emphasize customer experience, market share coverage and scalability benefits of EV telematics in when presenting software solutions to regulators

Untapped/Early-Stage Considerations

- Investigate opportunities to manage charging outside of the home context to understand the impact on customer experience and willingness to participate
- Seek to understand the multifamily EV owner including their charging patterns and barriers to charging access to better develop pilots that fit the needs of this customer segment
- As V2X is still in a nascent stage, consider developing a tech assessment or pilot to explore V2X use cases and value propositions

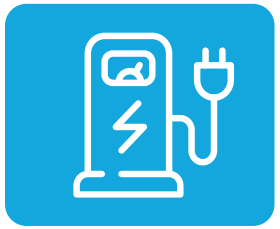
EV Companion Phase 2 Considerations

Path 1: Active Optimized Charging

Entails remotely curtailing EV charging via vehicle telematics by calling DR events during peak periods

Path 2: Expanding Vehicle Telematics Use Cases (“Dynamic Optimization”)

Additionally exploring other grid management opportunities associated with leveraging vehicle telematics to manage EV charging beyond peak load management – mitigating distribution system impacts. optimizing for customer preferences, distribution system impacts, CO2 reductions



Path 3: Hardware Component

Add on option for managing EV charging using the charger directly in addition to using vehicle telematics