



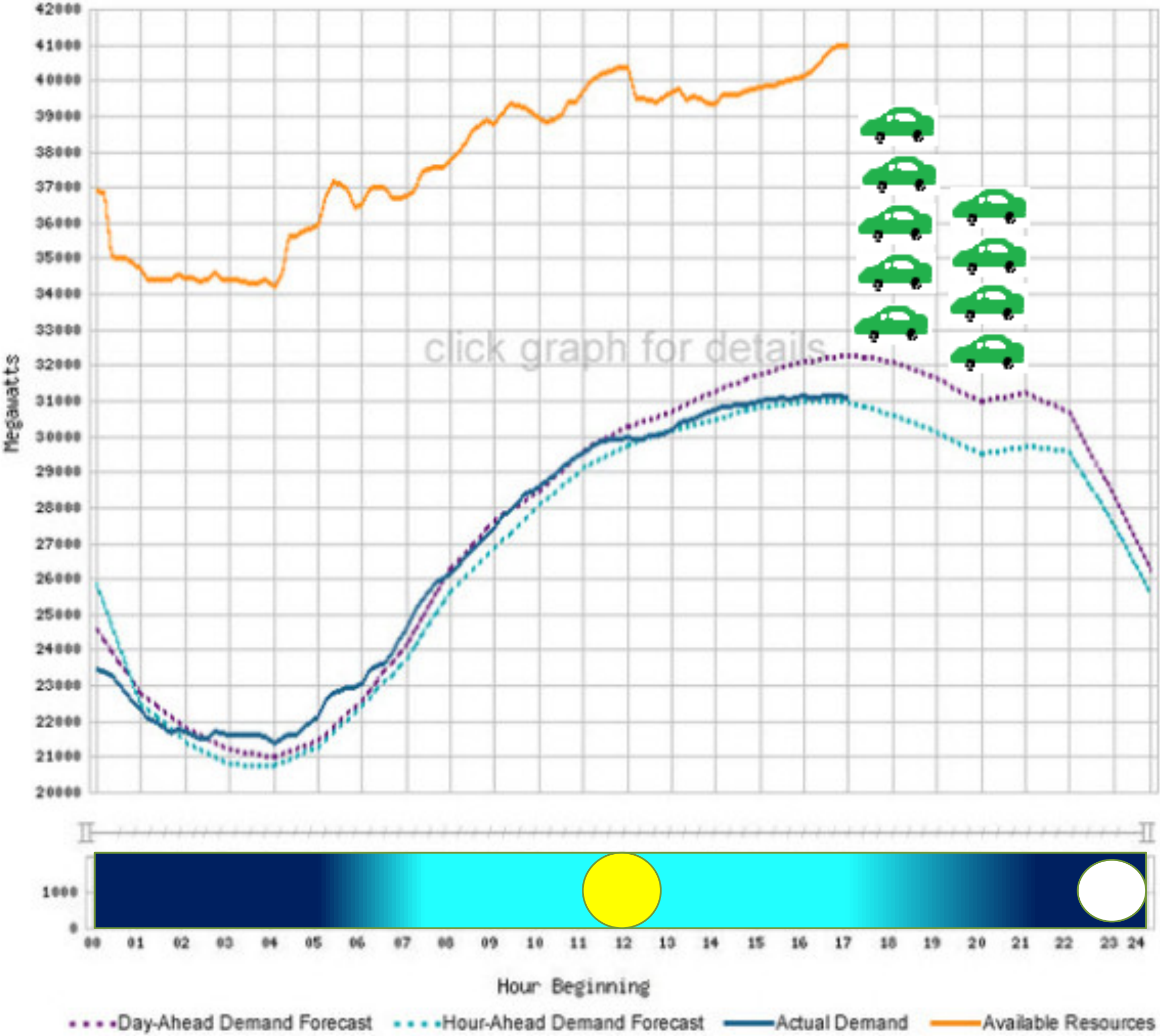
The Potential for EV
Managed Charging

FlexCharging

Brian Grunkemeyer
Founder & CEO - FlexCharging

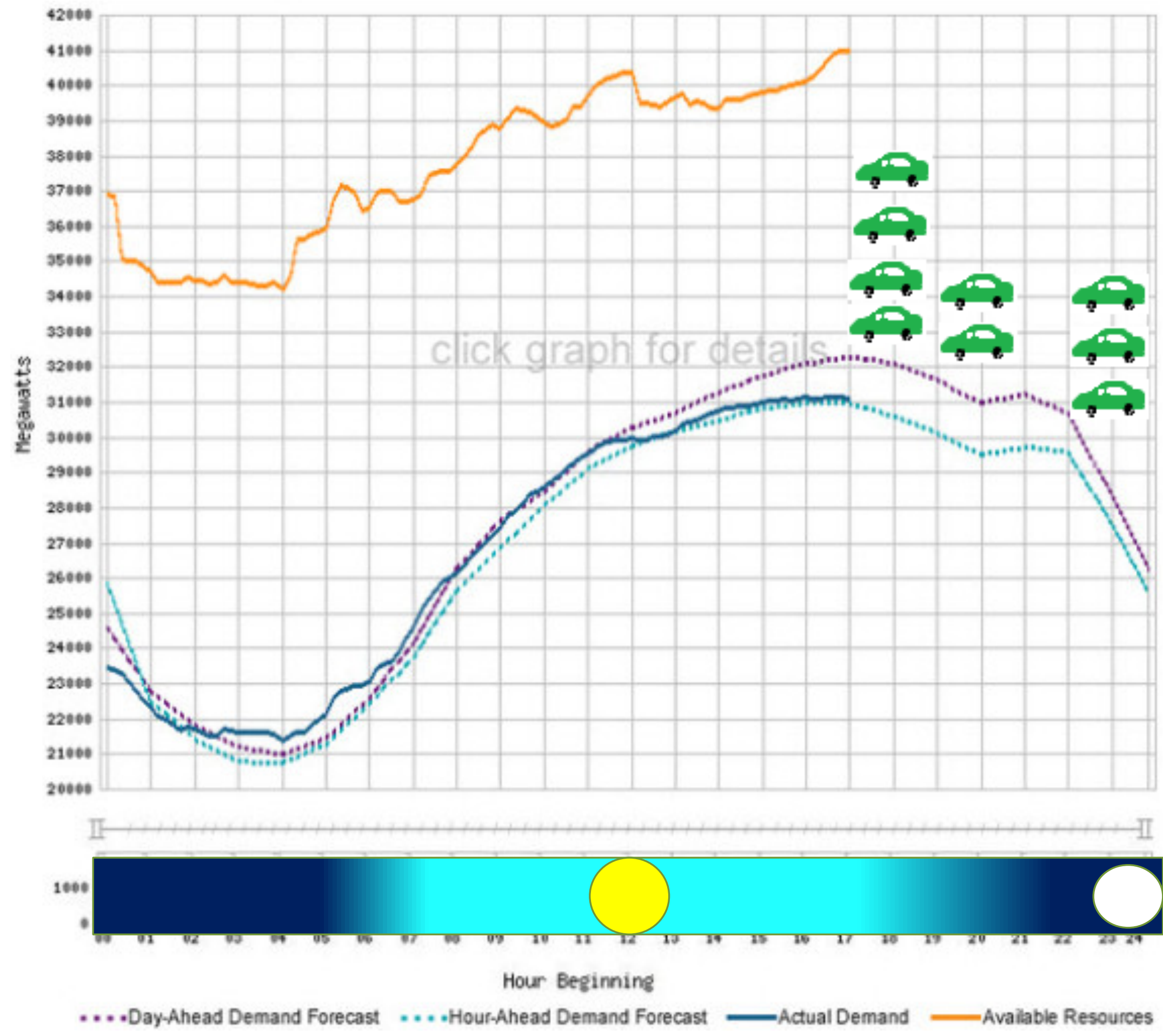
November 2019

WHEN DO EV'S CHARGE?



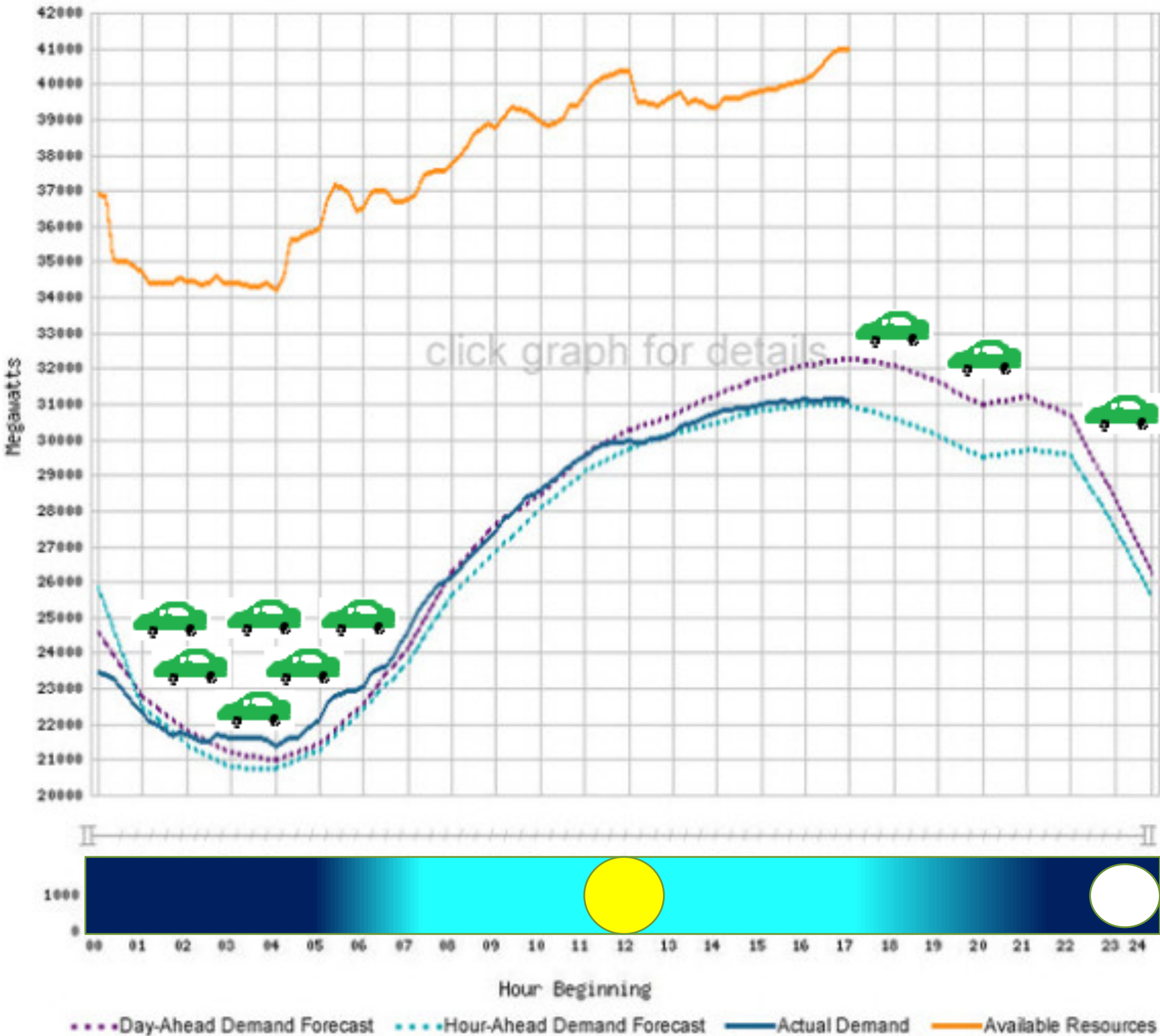
TIME - OF - USE RATES TO THE RESCUE?

3



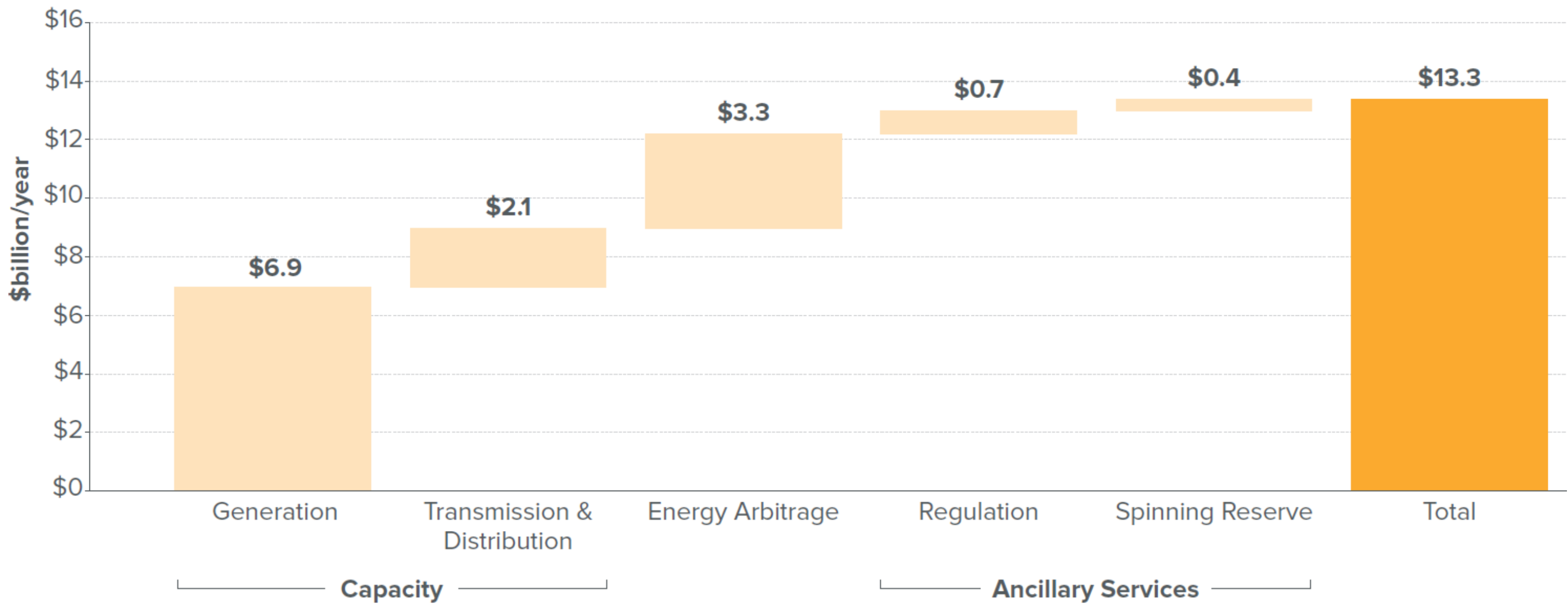
FLEXCHARGING

WHAT IS POSSIBLE?






Demand Flexibility

ESTIMATED AVOIDED U.S. GRID COSTS FROM RESIDENTIAL DEMAND FLEXIBILITY



**Individual components do not add to total because of rounding*

-  Rocky Mountain Institute:
“Economics of Demand Flexibility”
-  EV load can be served cost-effectively.
-  SMUD: In a high EV penetration scenario, may spend \$50-70M/year on distribution grid upgrades in 2025

FLEXCHARGING PLATFORM



DRIVER FIRST

- Driver experience is key
- Driver Confidence => Acceptance
- Driver constraints first



DATA-DRIVEN INSIGHTS

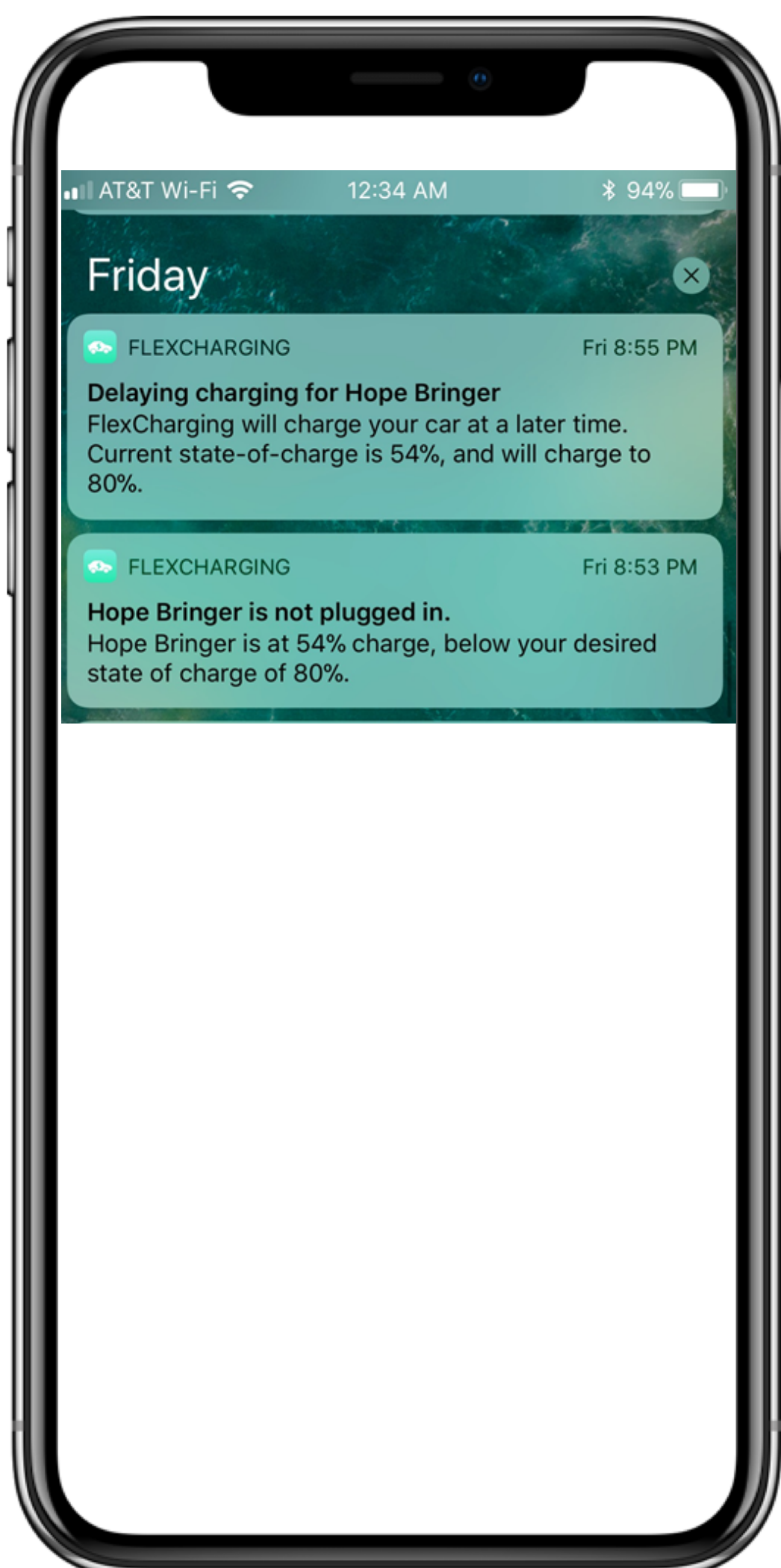
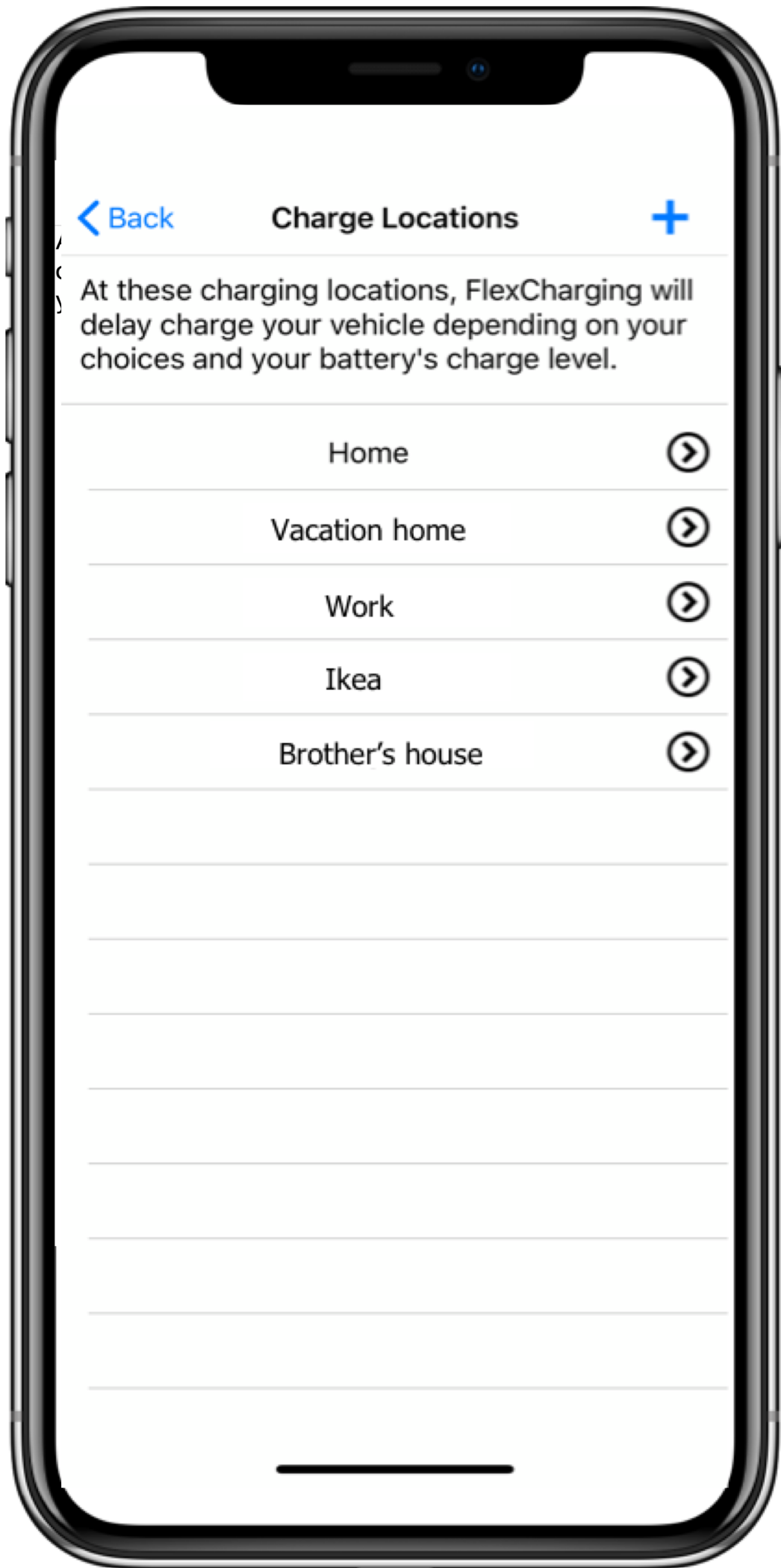
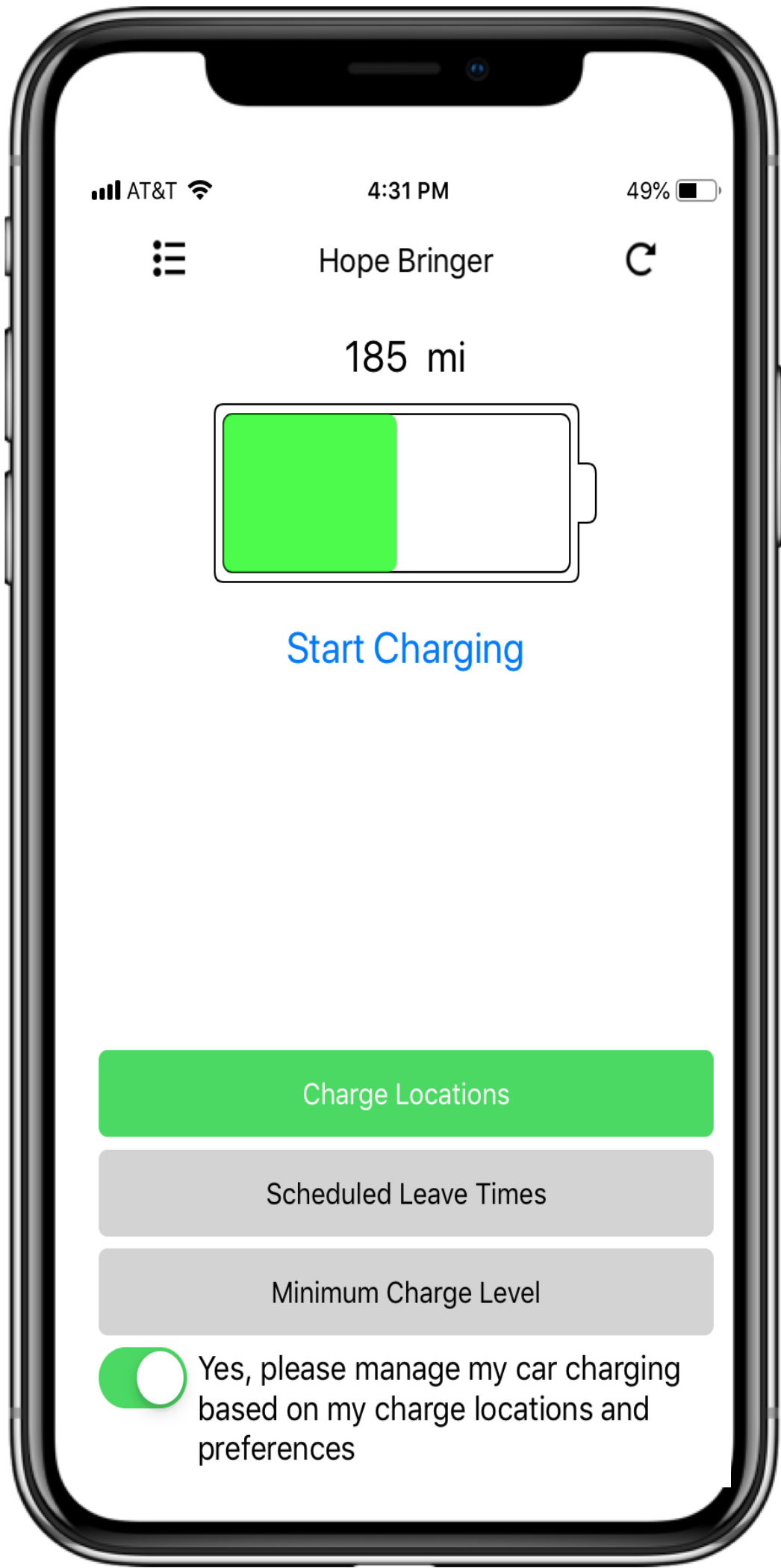
- Observe driver behavior
- Monitor all interactions with battery & charging



MANAGED CHARGING

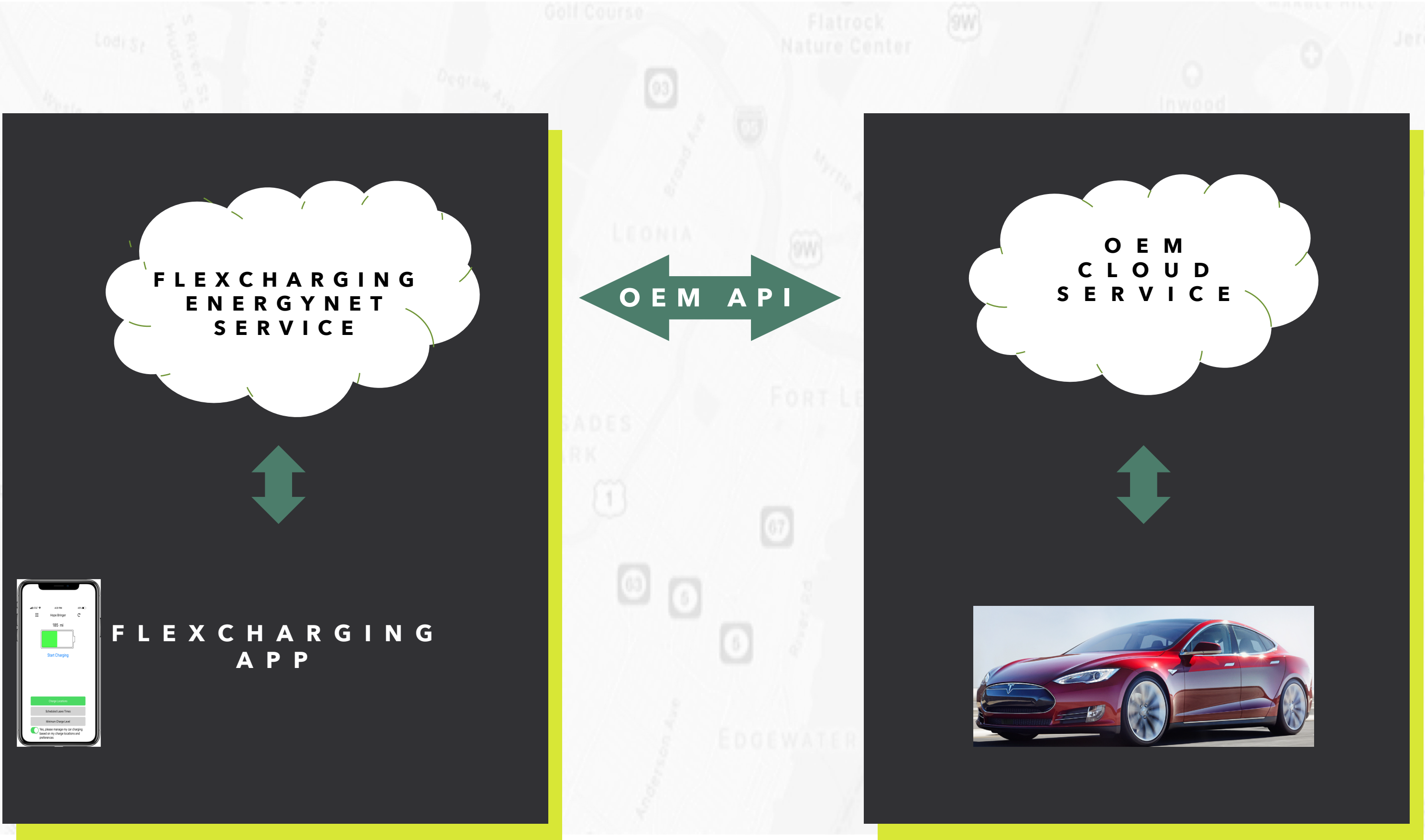
- Use a behavior selection algorithm for determining when drivers *intend* to opt out of smart charging

FLEXCHARGING APP FOR ANDROID AND APPLE PHONES

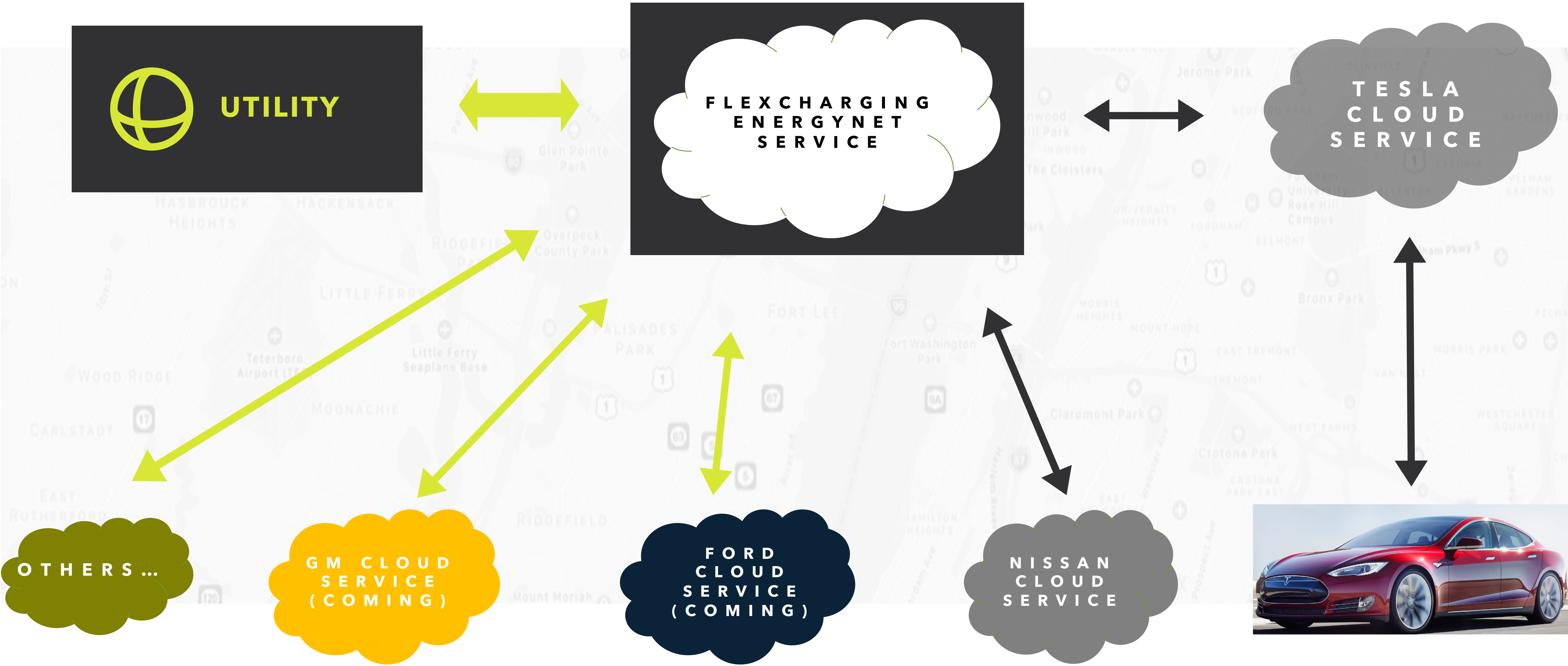


COMMUNICATION AND CONTROLS

NO-HARDWARE SOLUTION



MULTI-OEM SOLUTION



FLEXCHARGING: DATA PILOTS

"Organic" FlexCharging EVs

- EVs signed up directly through FlexCharging

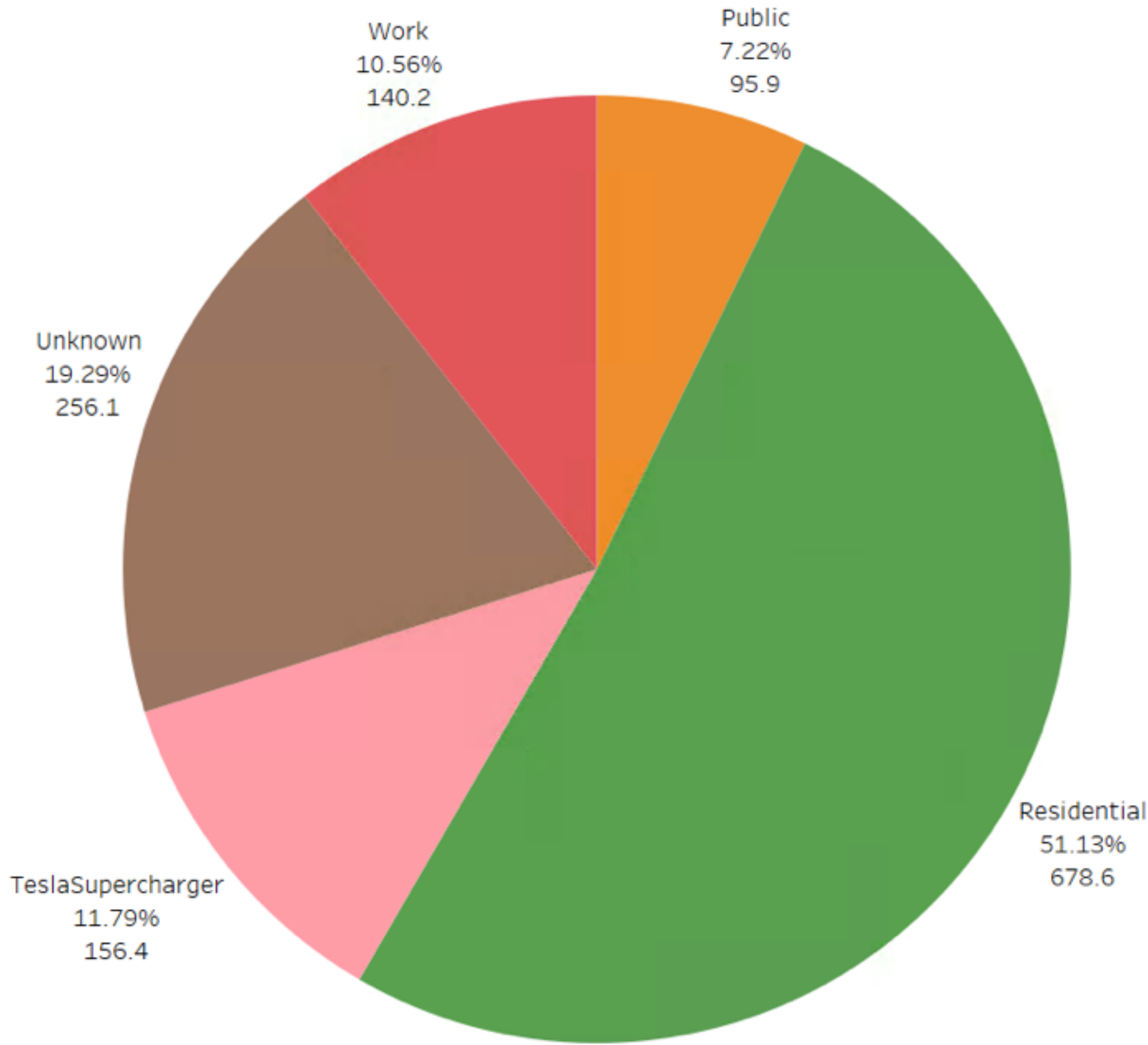
Rocky Mountain Power - Data Pilot

- A group pilot between the utility, a transportation network company, Utah State University, and a national lab
- EV drivers incented to participate

Utility Consortium Data Pilot

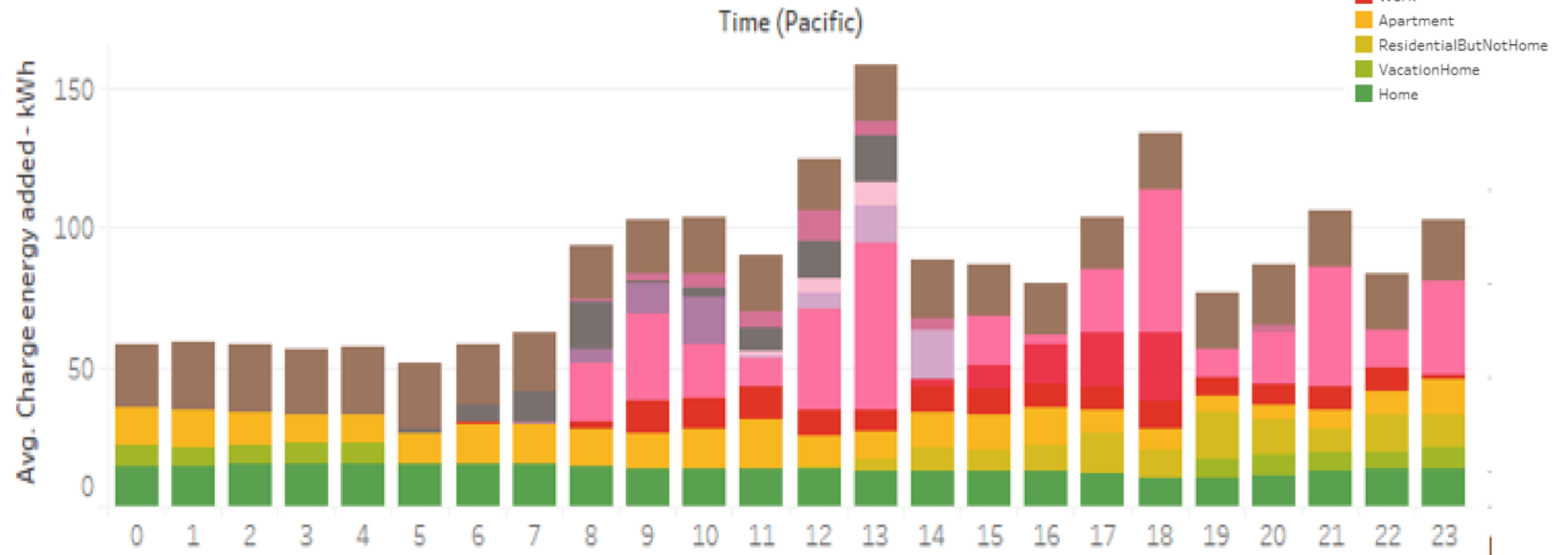
- Utility membership organization with 10 participant members each with up to 10 EVs
- Ramping up EV drivers and planning phase 2

WHERE DO PEOPLE CHARGE?



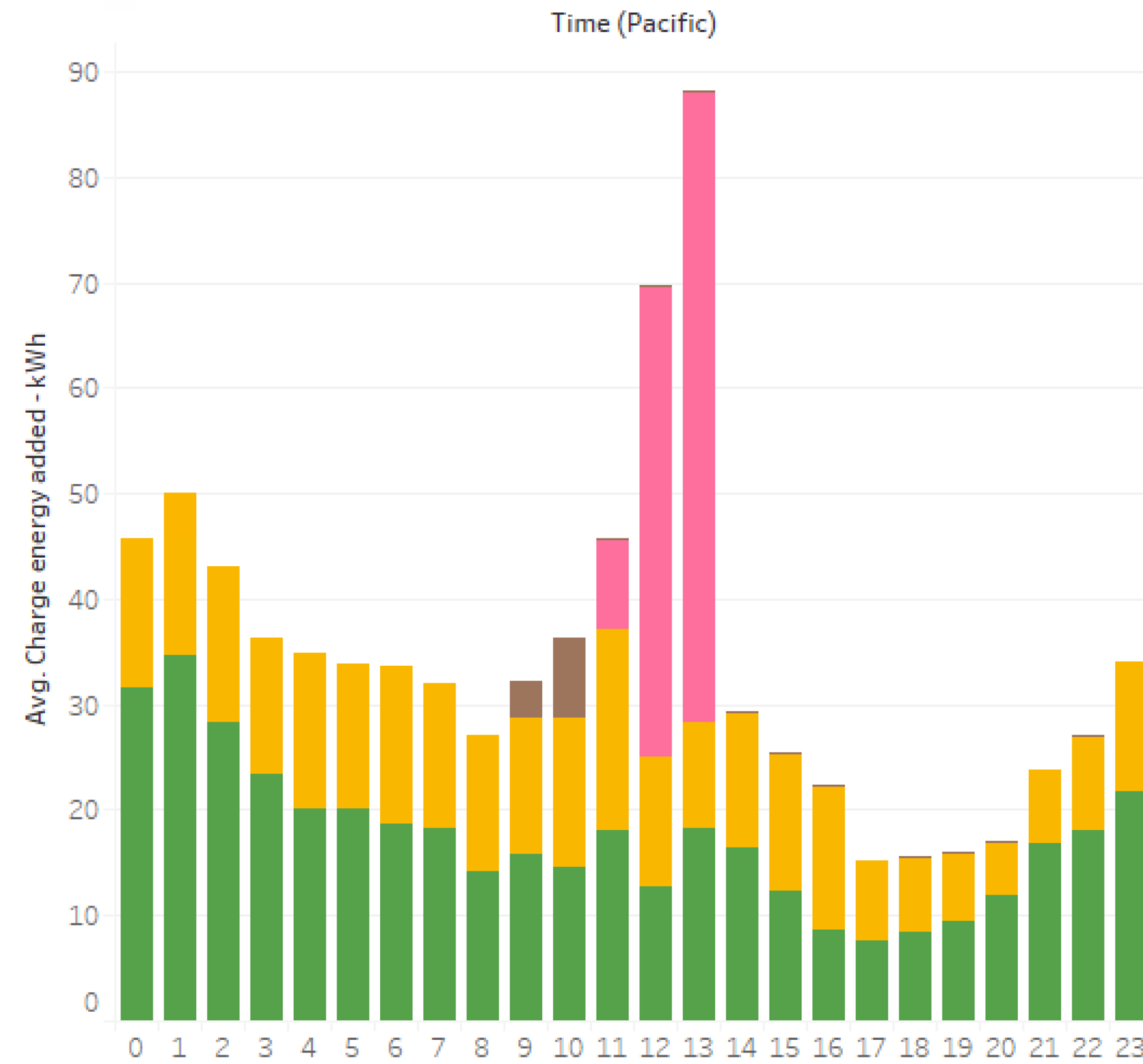
UNDERSTANDING CHARGING

Average Charging Energy Added per Hour by Location Type

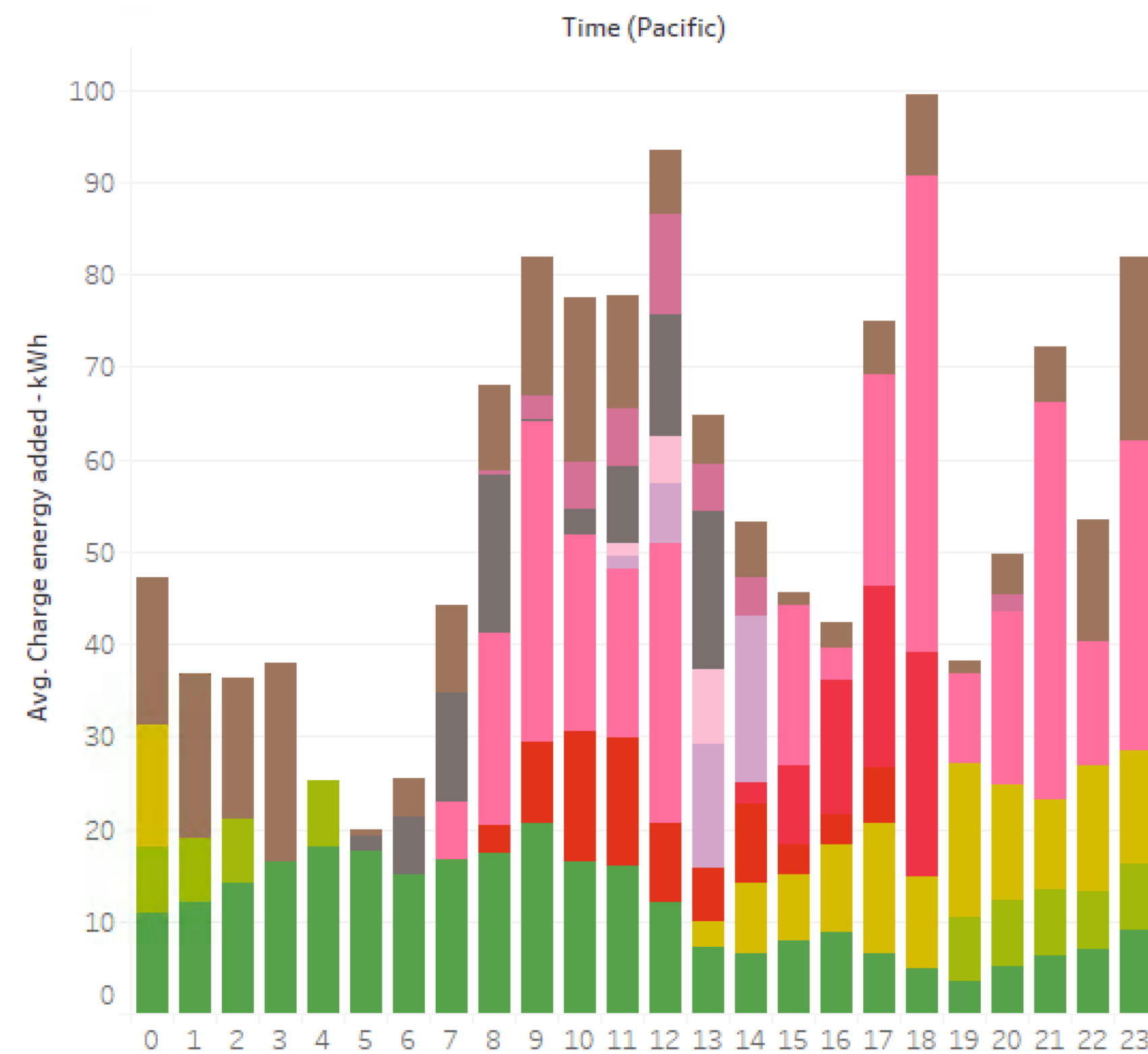


UNDERSTANDING CHARGING

Average Charging Energy Added per Hour by Location Type



Average Charging Energy Added per Hour by Location Type

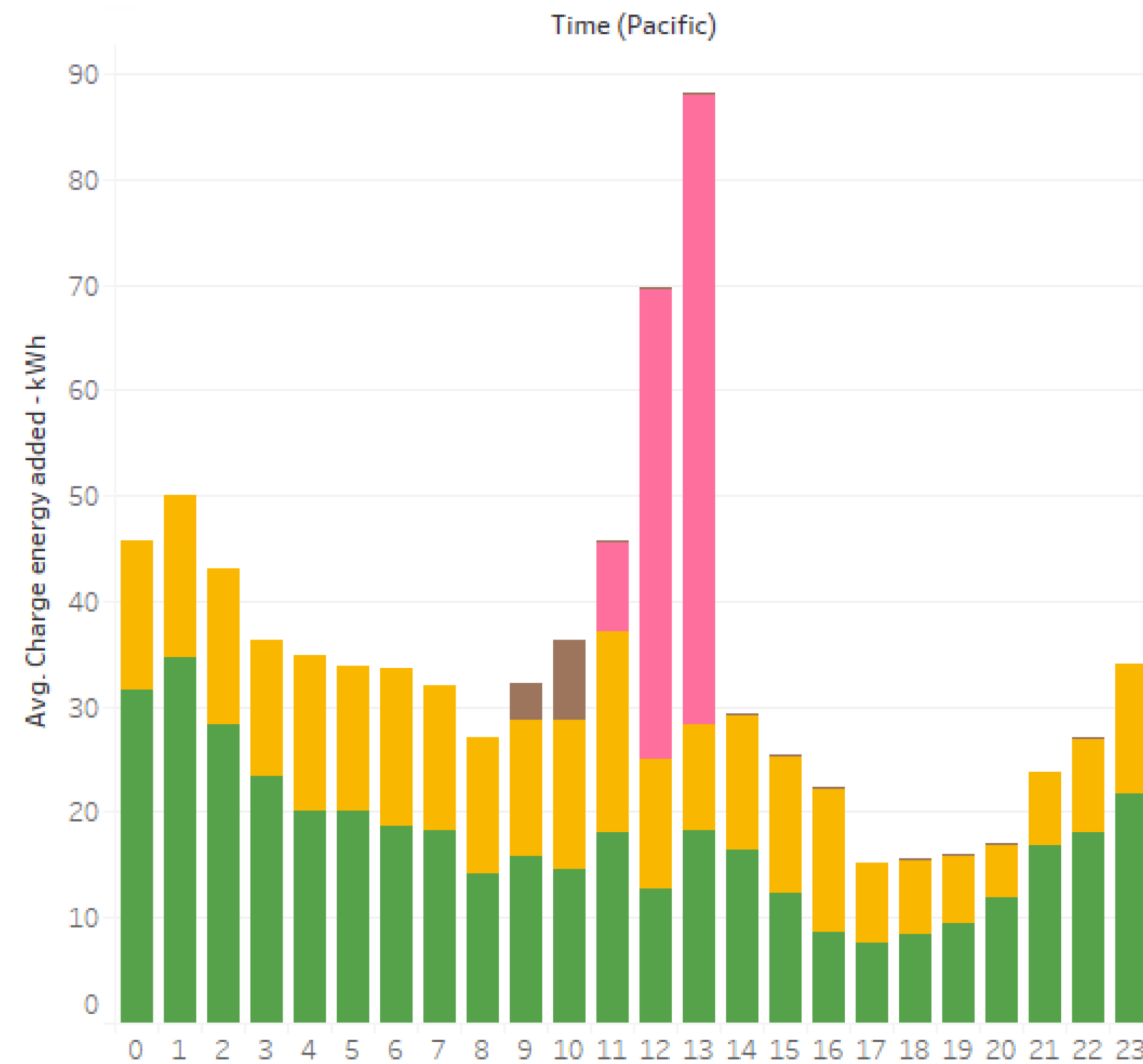


- LocationTypeUnknown
- Unknown
 - Shopping
 - BusinessCustomerParking
 - RetirementHome
 - AutoServiceCenter
 - School
 - TeslaSupercharger
 - Public
 - Work
 - Apartment
 - ResidentialButNotHome
 - VacationHome
 - Home

FLEXCHARGING

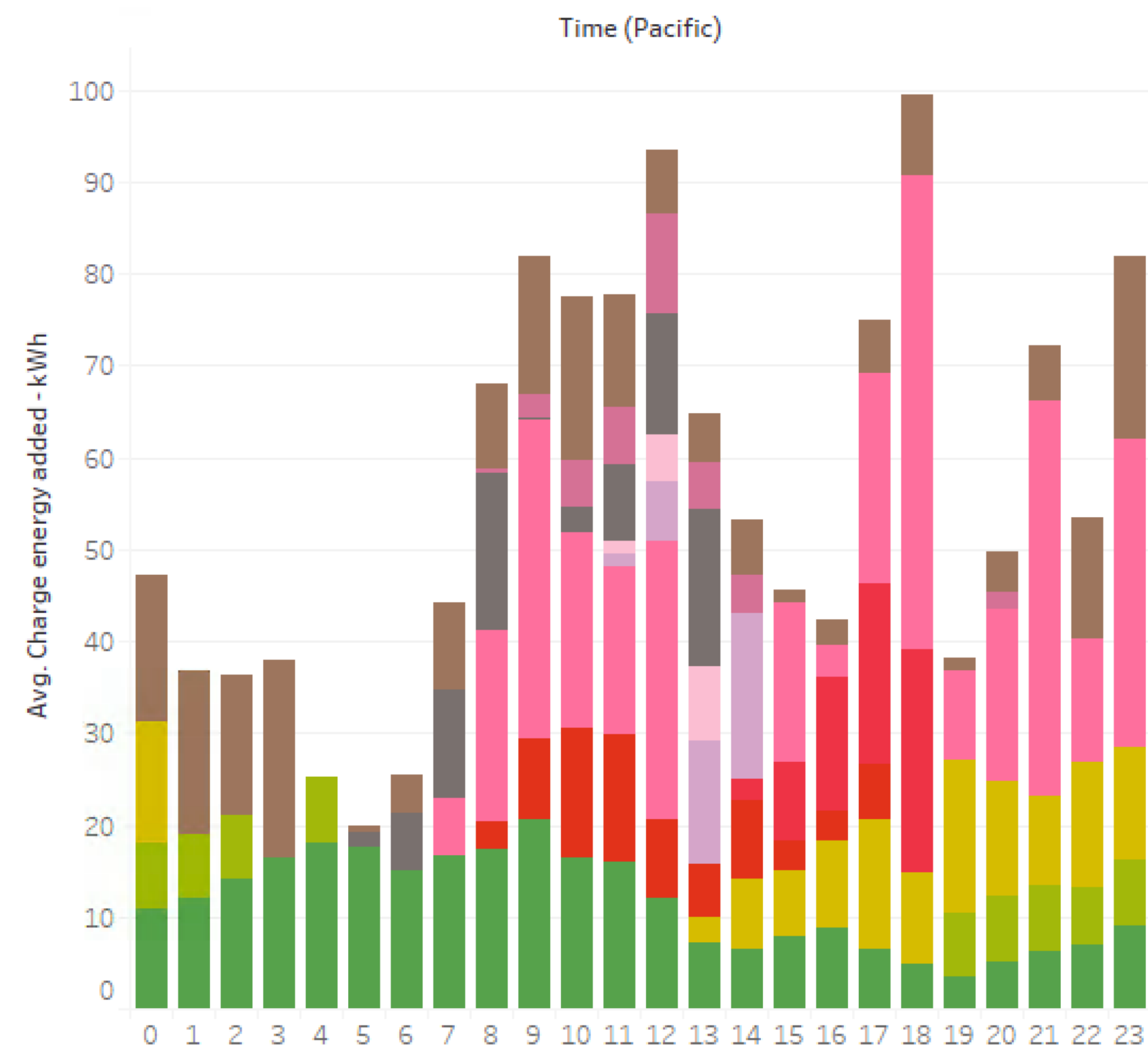
UNDERSTANDING CHARGING

Average Charging Energy Added per Hour by Location Type



SHARED MOBILITY DRIVING PROFILE

Average Charging Energy Added per Hour by Location Type



ORGANIC EV DRIVING PROFILE

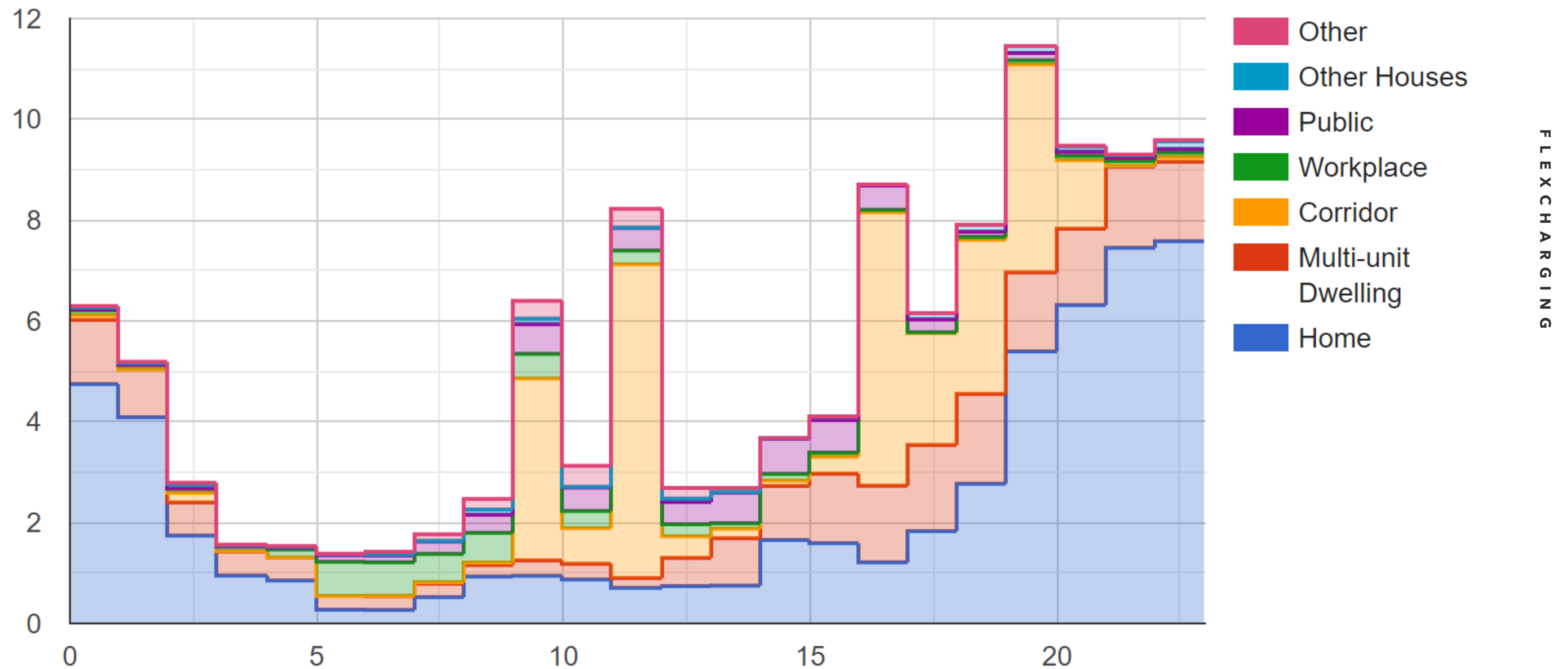
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FLEXCHARGING

IS CHARGING SEASONAL?

OCTOBER DATA

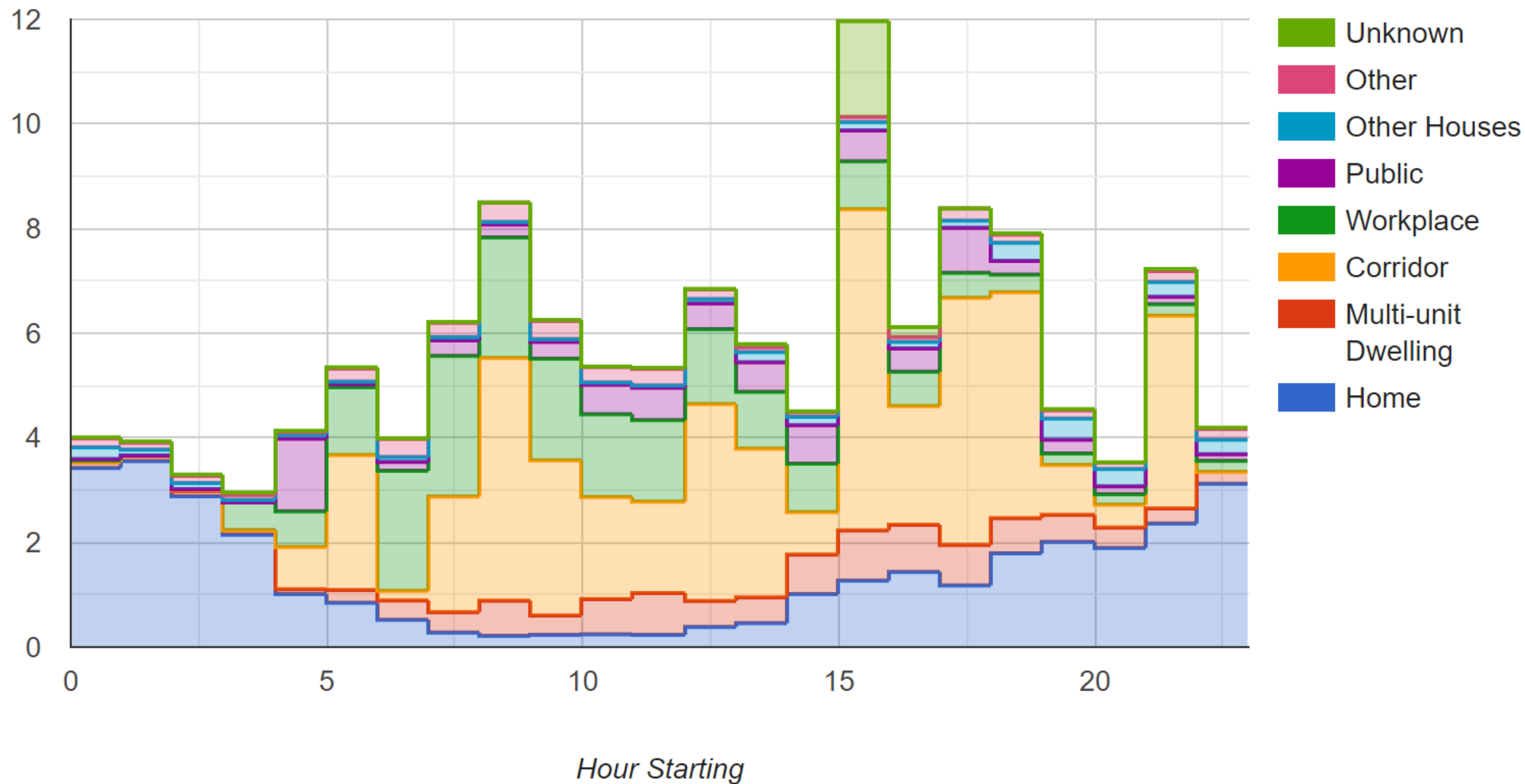
Average Charging Power Per Car By Location Type, starting 10/1/2019 12:00 AM



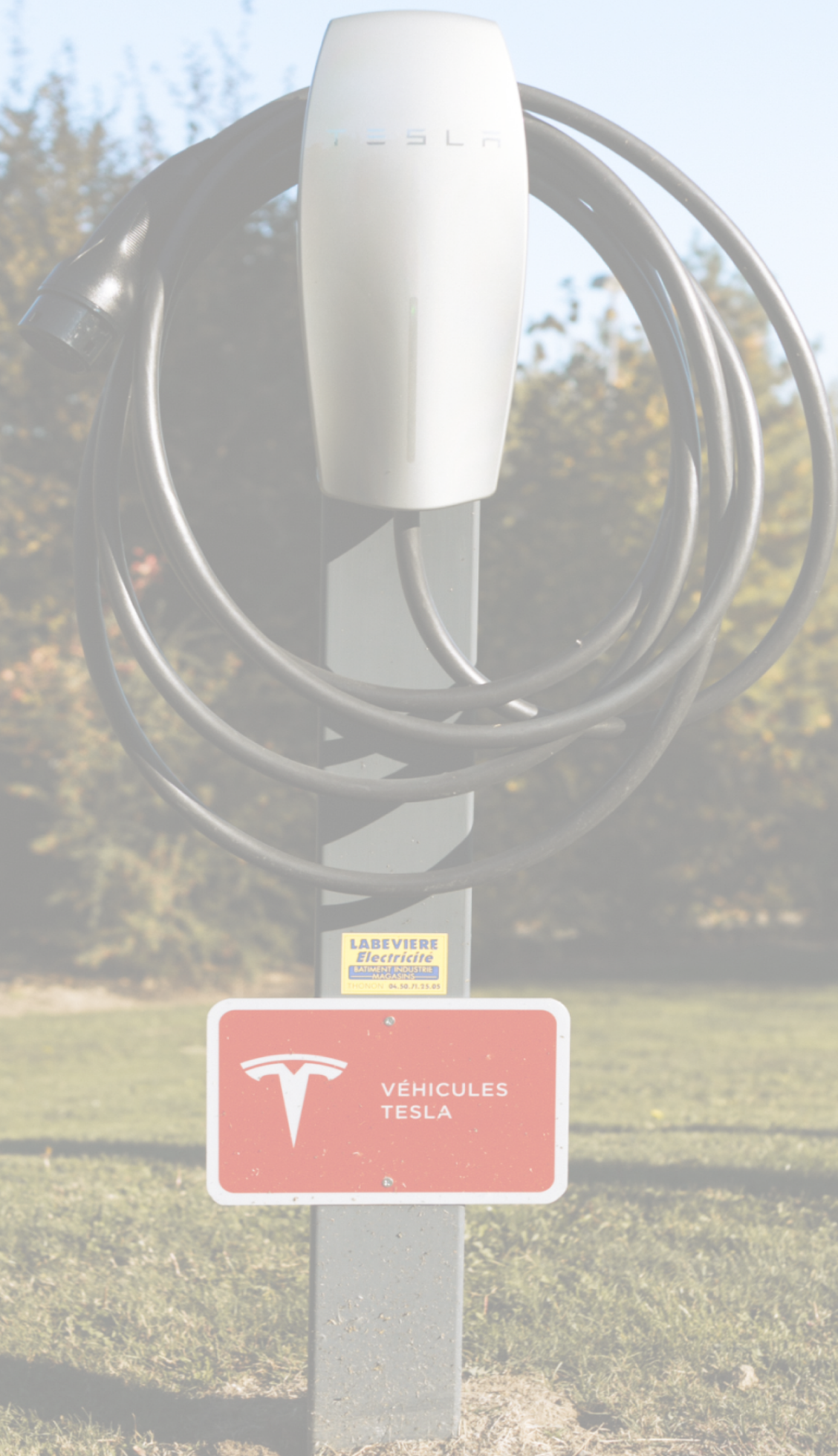
IS CHARGING SEASONAL?

NOVEMBER DATA

Average Charging Power Per Car By Location Type, starting 11/1/2019 12:00 AM



FLEXCHARGING: WHAT'S NEXT



- Continue working with our partners to build pattern recognition/classification mechanisms
 - Seasonality
 - distribution system information
 - Experimental incentive structures
- Ingest and integrate Day-Ahead Price Signals with Open DSRIP
- Pilot Demand Response Capabilities
- Develop or ingest Counterfactuals/Base Case data
- Ingest and integrate Day-Ahead Carbon Signals



T H A N K Y O U