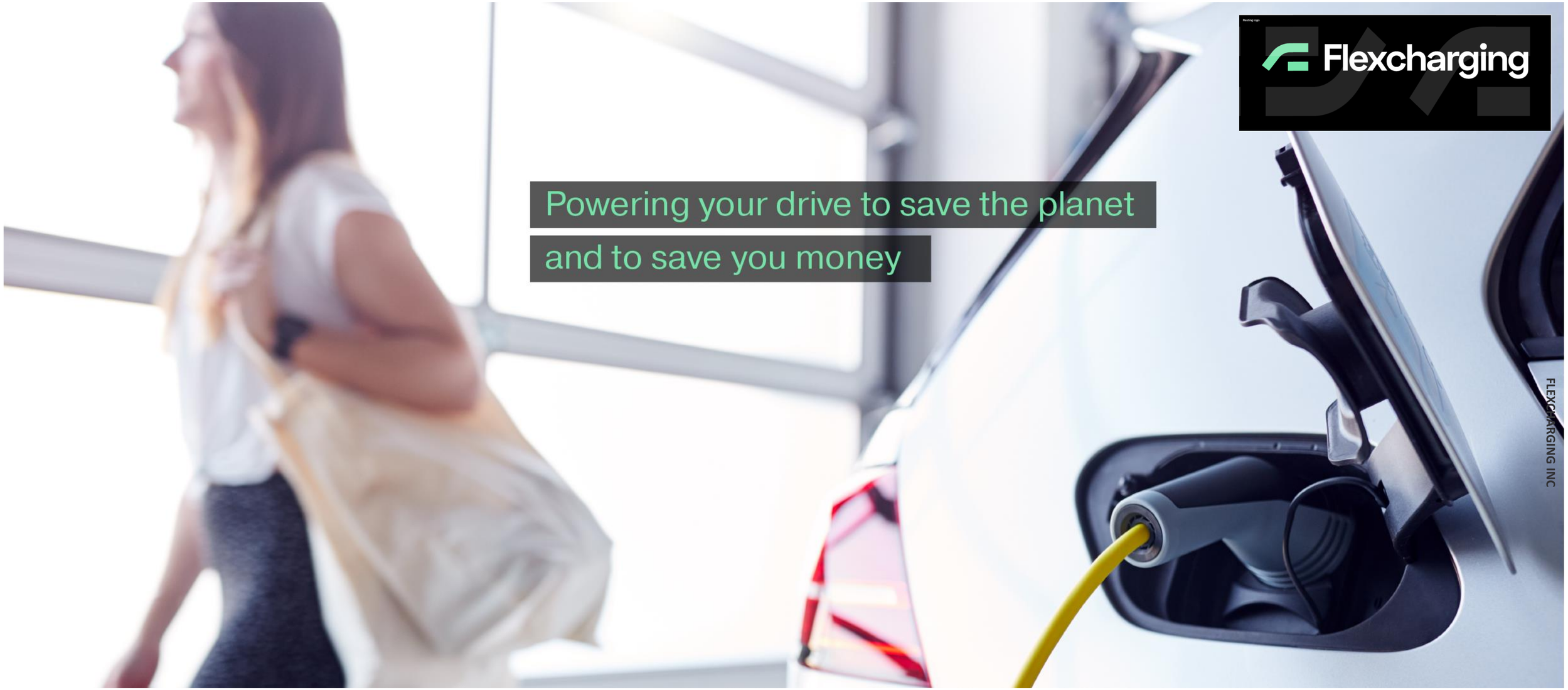


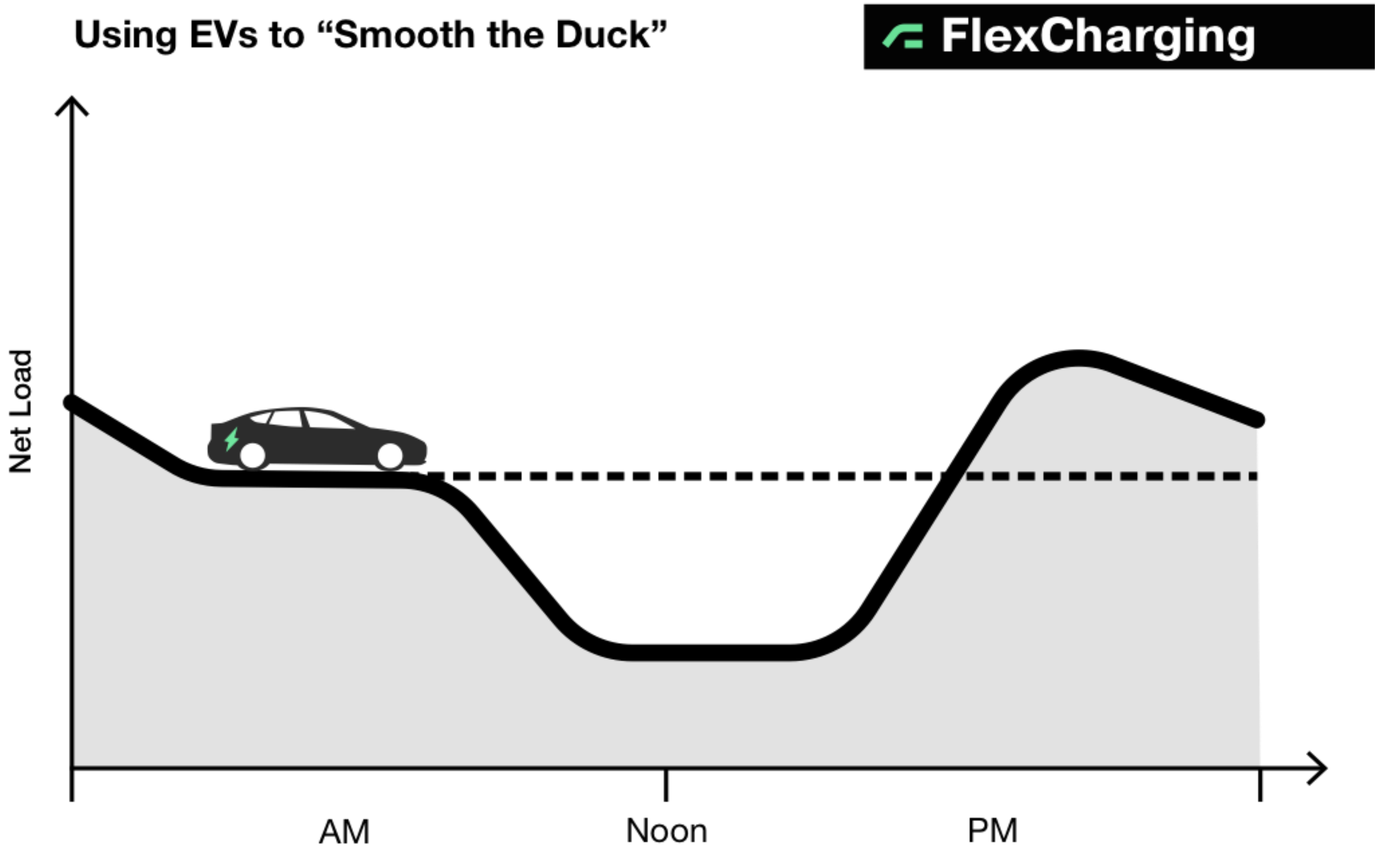
Brian Grunkemeyer, CEO

November 4, 2020

Managed Charging
DoE EV Future Initiative

What can EV data tell us about how to use EVs to help the grid

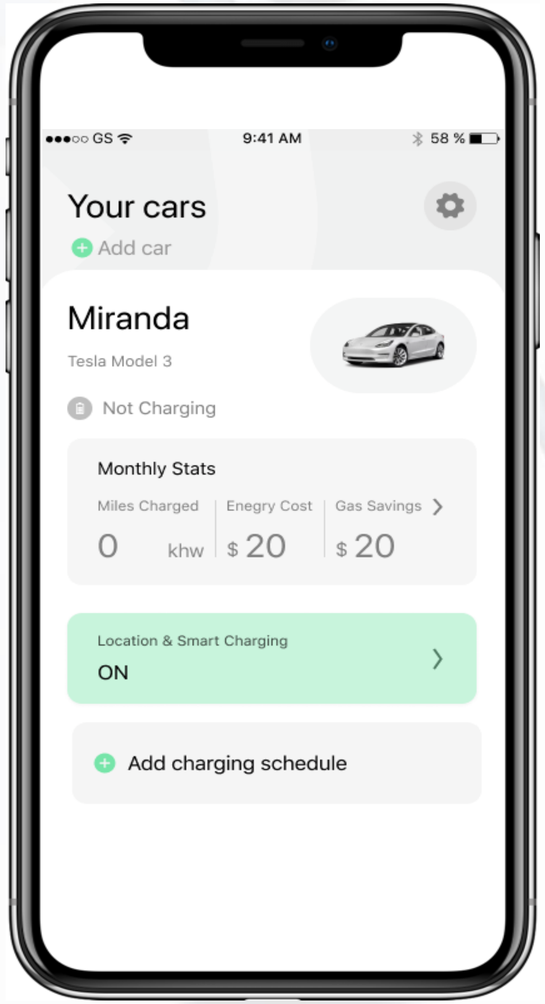
Energy & Transportation Disruption



- Variable Energy Resources require Demand Flexibility
- EVS can be a Demand Flexibility Asset – **TODAY**
  - *Easily*
  - *Quickly*
  - *Cheaply*
- Utilities can signal when to charge via Rate Schedules or Dynamic Price Curves.
- This will minimize costs, promote energy arbitrage, lower peak capacity needs, and integrate renewables.
  - *After meeting driver constraints*

How Does It Work: Mobile Phone App and Cloud Platform

- Drivers sign up
- Provide charge algorithm constraints
- Drivers receive charging notifications
- Drivers save money (and working on carbon)
- Utilities get data and minimize peak charging



How Does It Work: Connected Car APIs

FLEXCHARGING ENERGYNET SERVICE

AUTOMAKER API

AUTOMAKER CLOUD SERVICE

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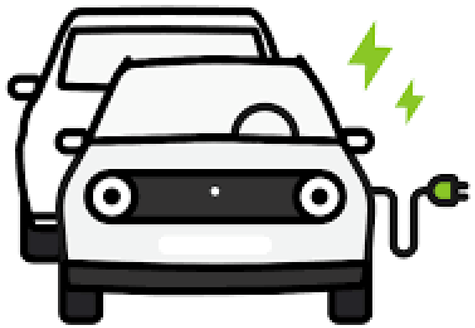
Data Pilots



ORGANIC DRIVERS - Ongoing

- Those who find the FlexCharging app and install it without a utility partner incentive
- Use the app to help manage charging to the cheapest or best times of the day for the grid

ROCKY MOUNTAIN POWER – Ongoing – Phase 2 Planning

- A group pilot with a transportation network company, Utah State University, and Idaho national lab
- Grant coming for a larger project, including 100 Tesla pilot

PENINSULA CLEAN ENERGY – Ongoing – Phase 2 Planning

- Pilot project for load management, and reporting for Low Carbon Fuel Standard credits

ELECTRIC POWER RESEARCH INSTITUTE – R&D Project - Complete

- Providing thought leadership and proof-of-concept on a new building & EV control protocol, integrating day-ahead hourly price curves

UTILITY CONSORTIUM – POC Project - Complete

- 10 participant utilities

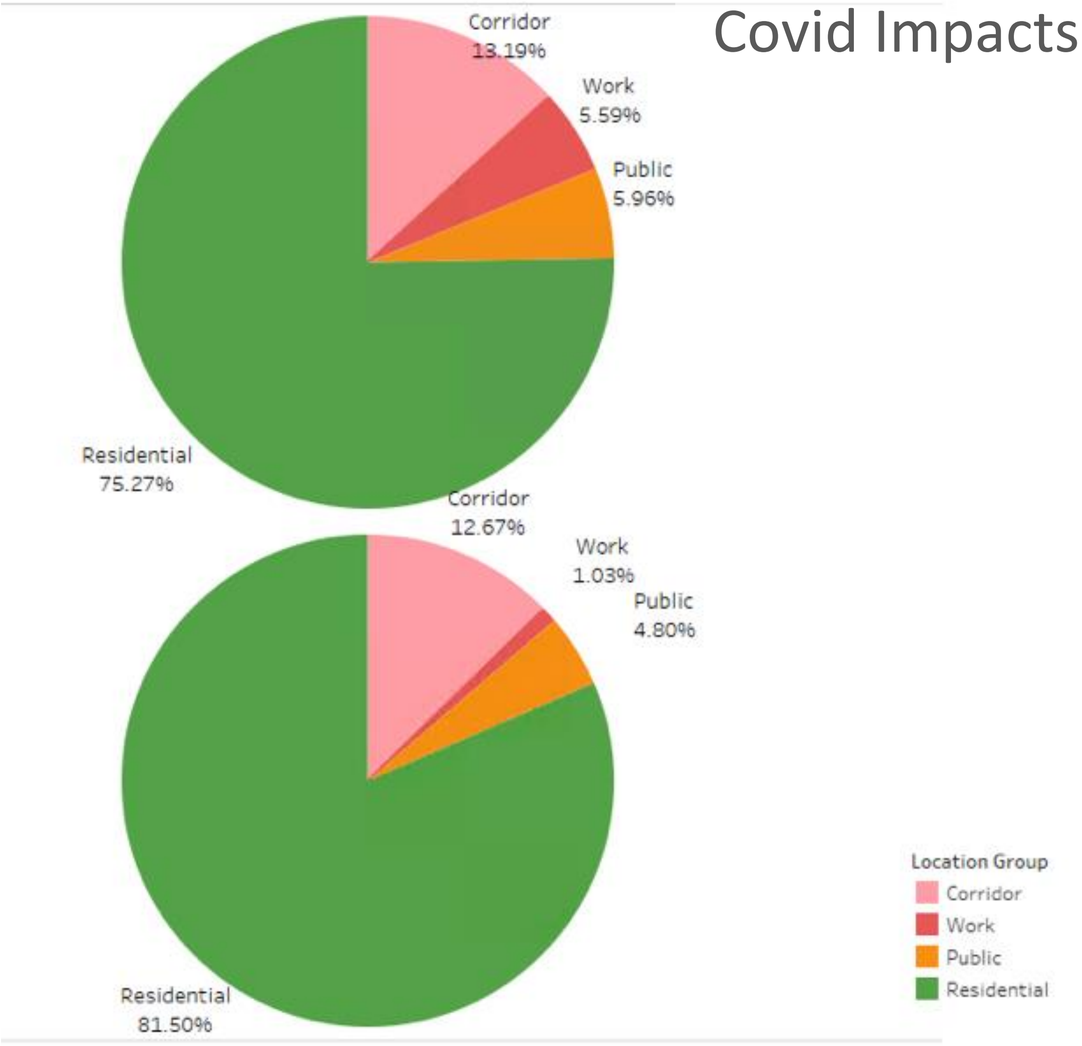
What Happened?

- Past 12 Months
  - ~510,000 Charging Records
  - Energy added - 213,080 kwh
  - Trip miles - 293,343*
  - Average miles/day 19
    - Pre - 28 mi/day
    - Post – 12.9 mi/day

- Average energy added per EV Vehicle Day 11.6 kwh/Vehicle Day
  - Pre – 16.4 kwh/Vehicle Day
  - Post – 7.5 kwh/Vehicle Day

*Tesla Only

Covid Impacts



EVs Charging

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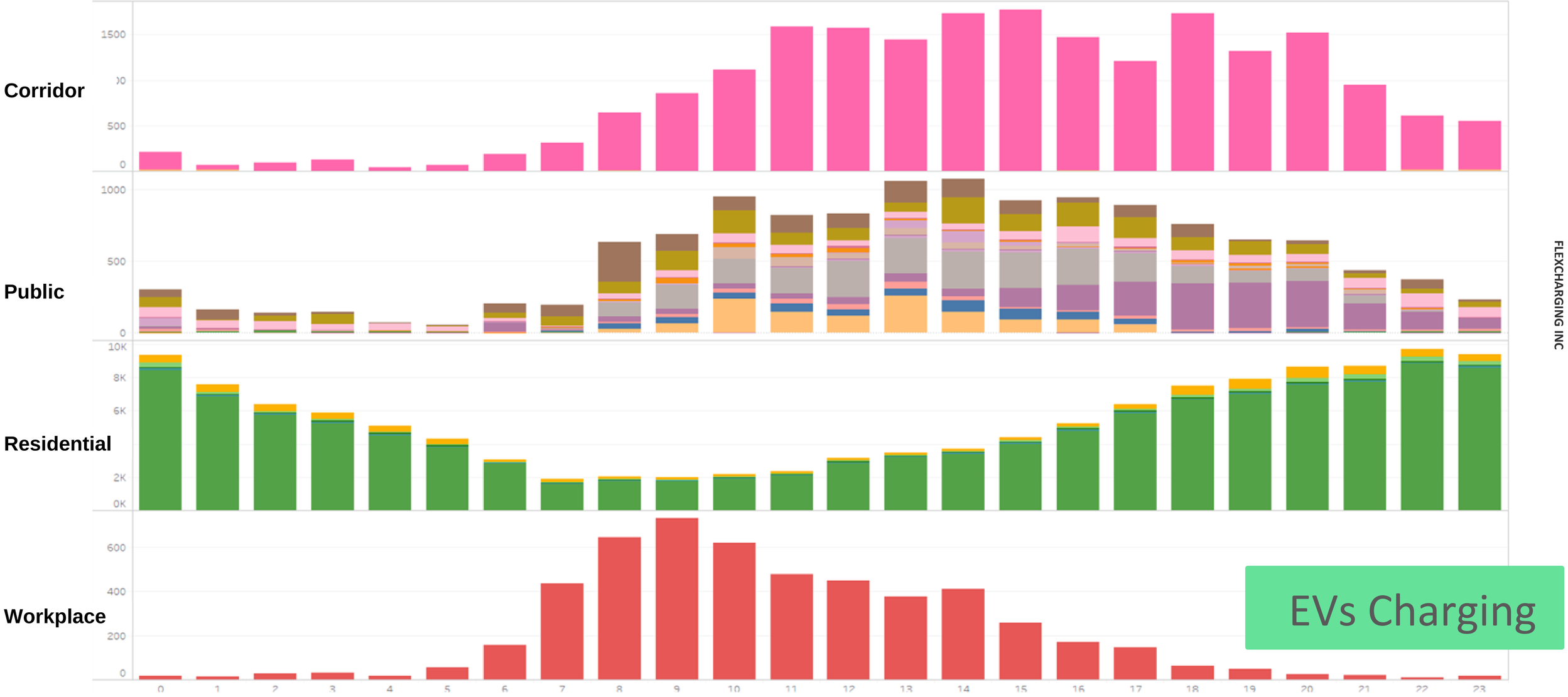
What Happened?



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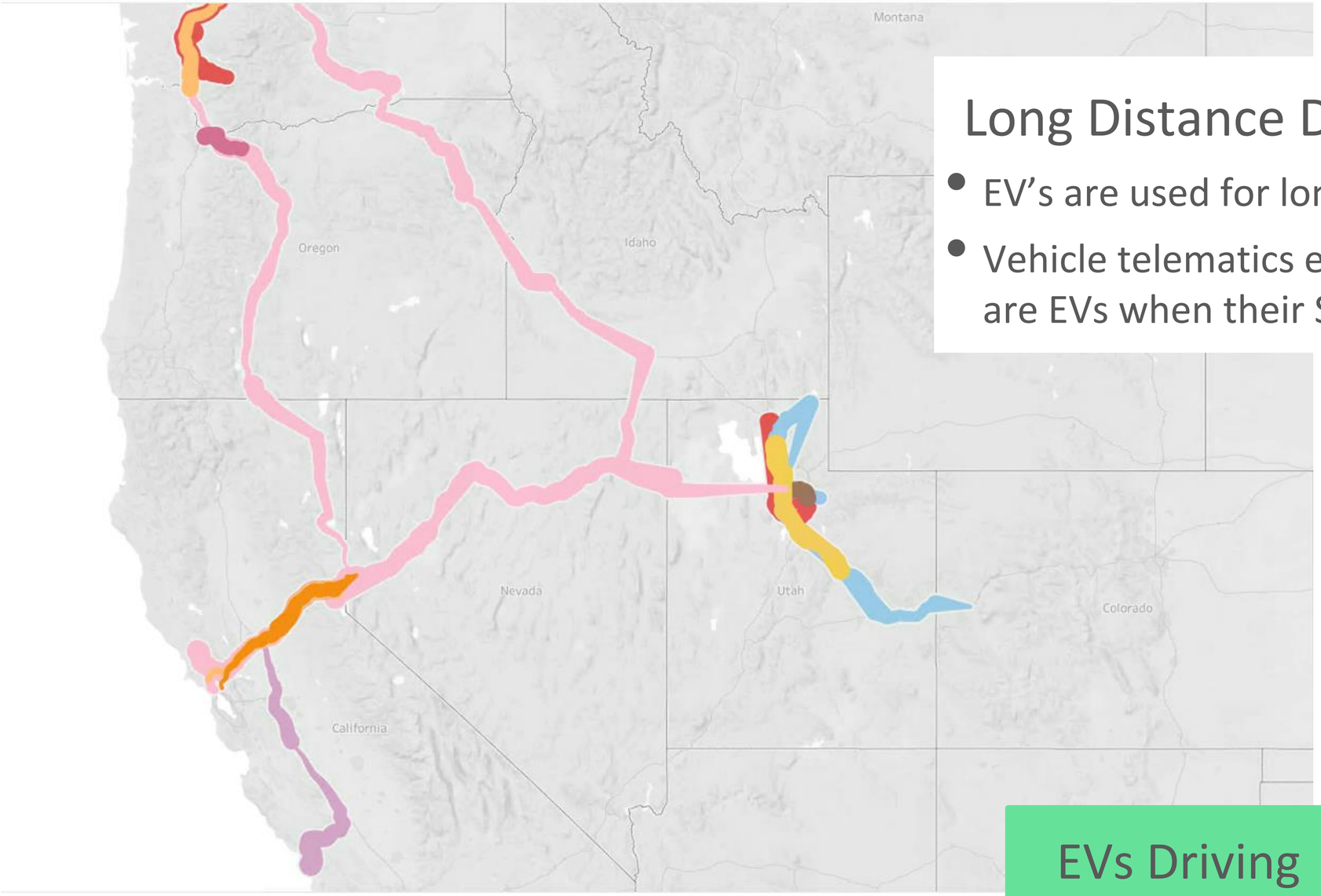
What Happened?



Long Distance Driving Analysis

- EV's are used for long road trips.
- Vehicle telematics enable questions like "Where are EVs when their SOC <30%"

EVs Driving

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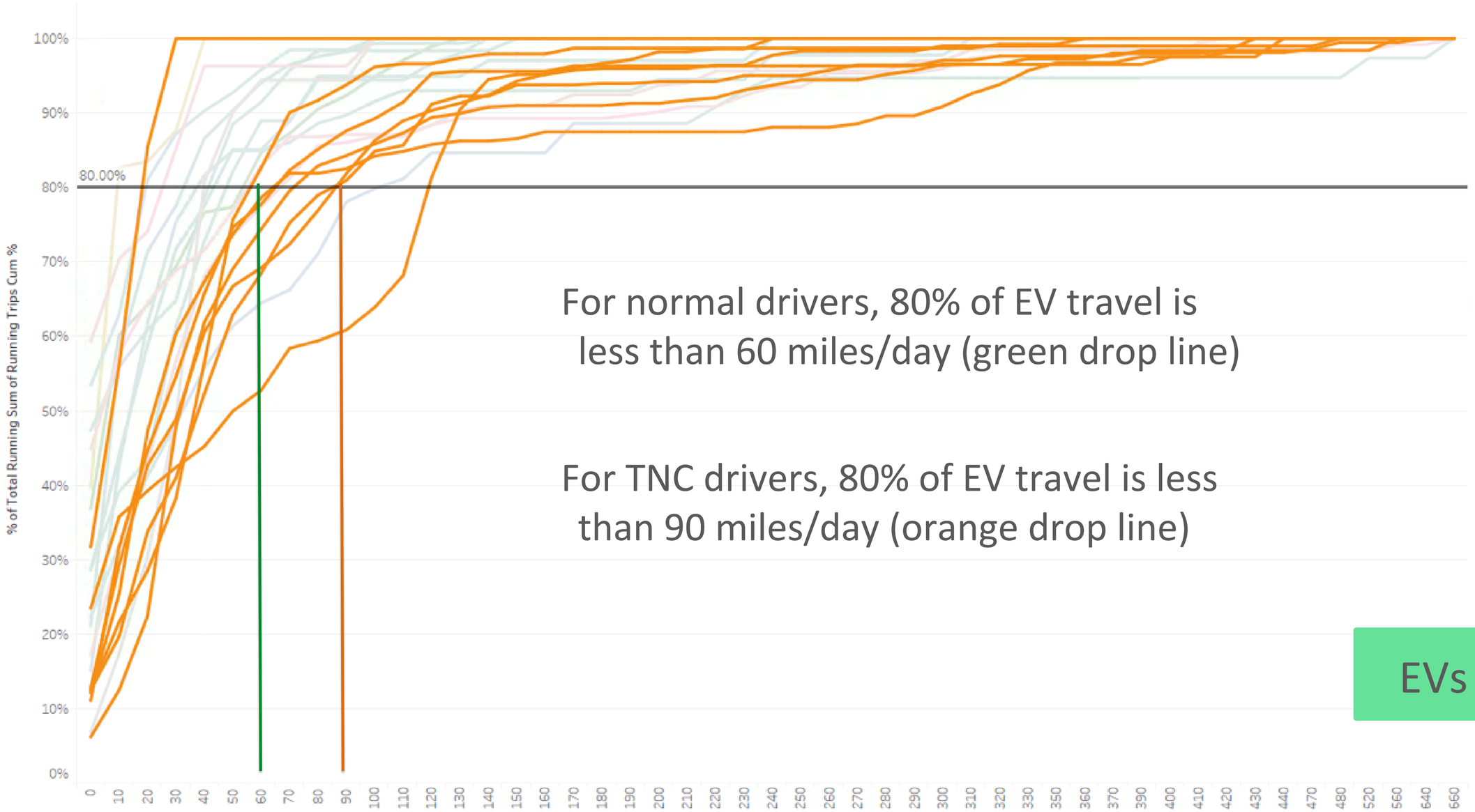
What Happened? Driver Segments Drive Differently



For normal drivers, 80% of EV travel is less than 60 miles/day (green drop line)

For TNC drivers, 80% of EV travel is less than 90 miles/day (orange drop line)

EVs Driving

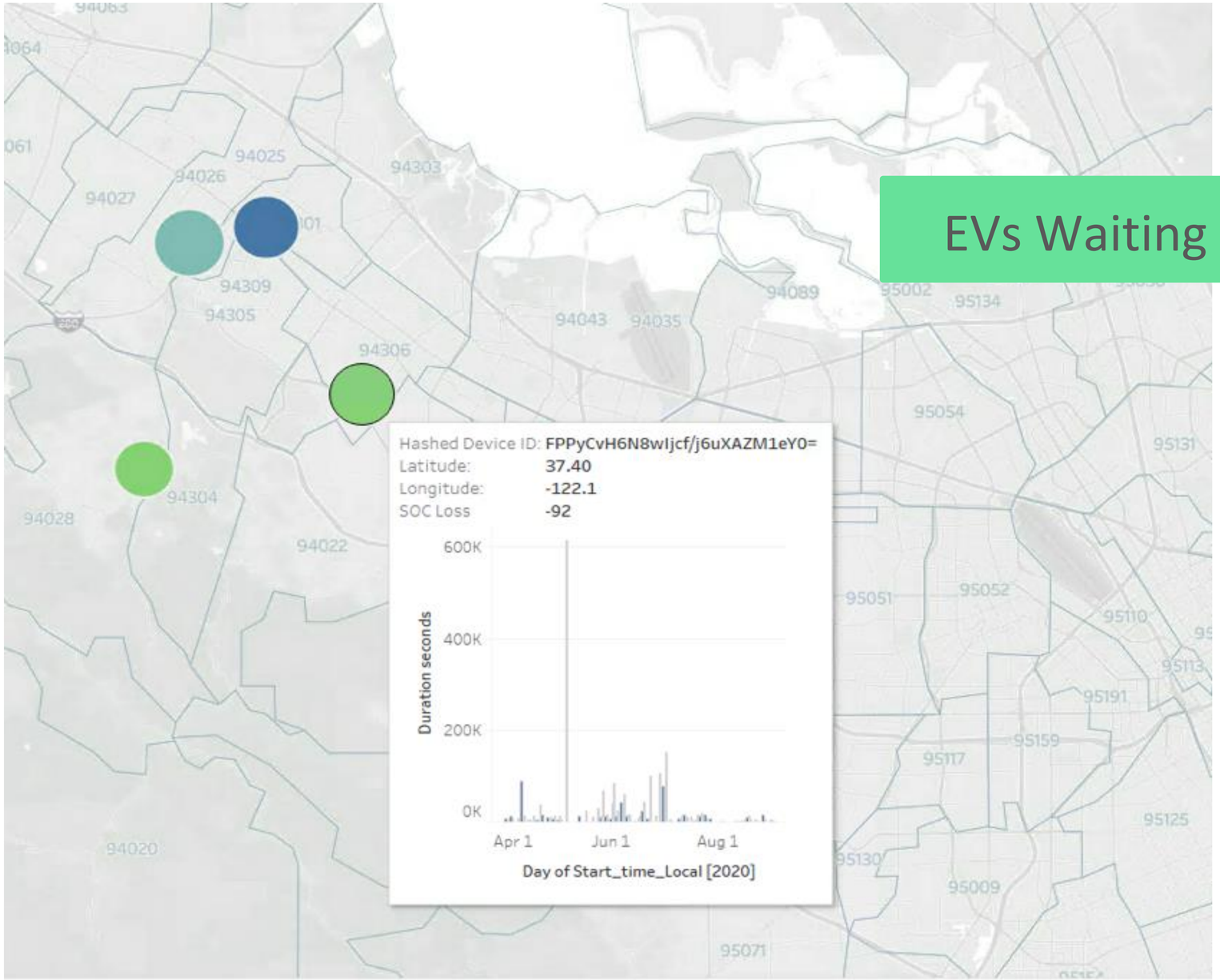
FLEXCHARGING INC

EVs Waiting

Where are EVs “dwelling” for long periods of time WITHOUT charging?

- Determine location types – multi-family; business
- Analyze for placement of public and fast charging

What is the typical vehicle SoC at these locations?



April 1 – September 1, 2020

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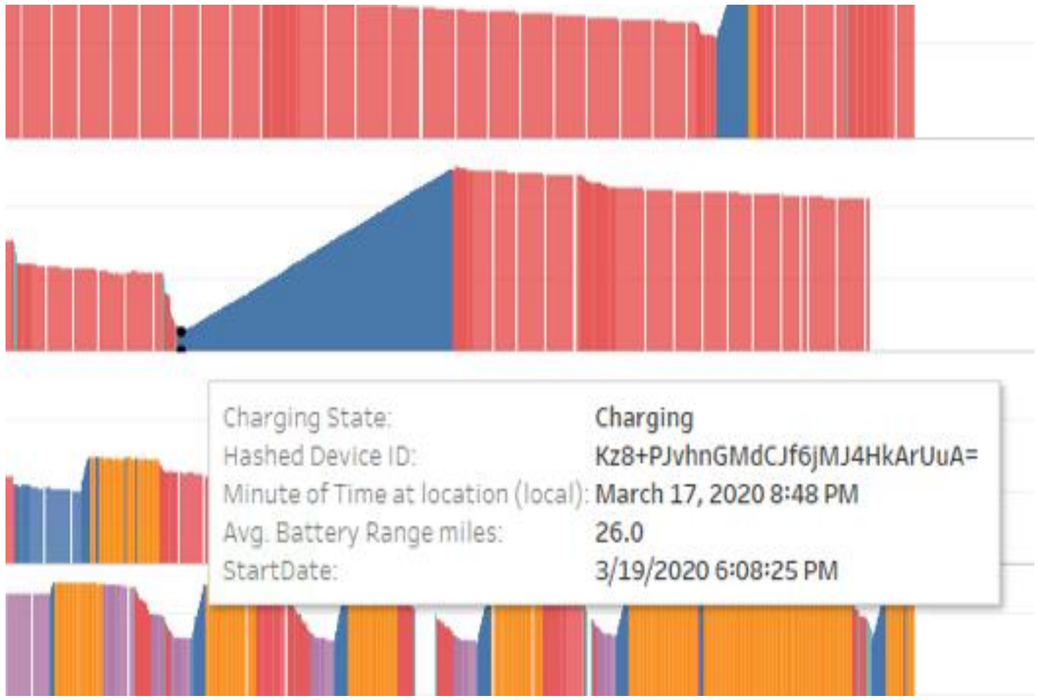
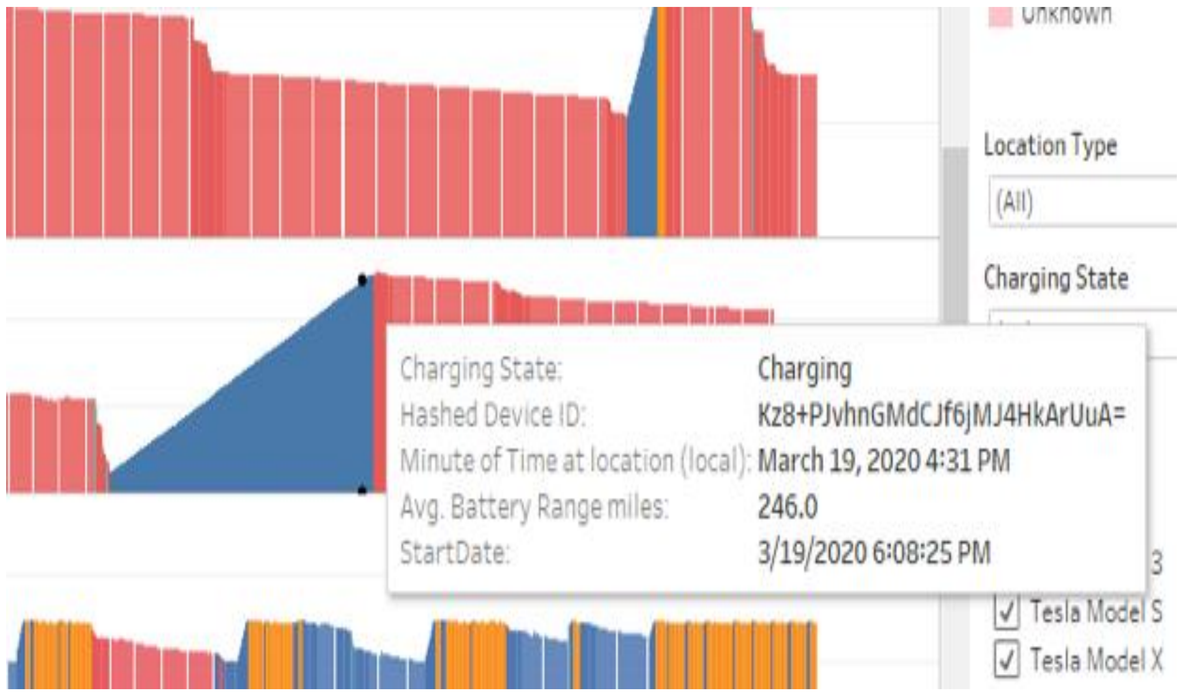
What Does it Mean? To Drivers?

Simple Question – What did my charge session cost?



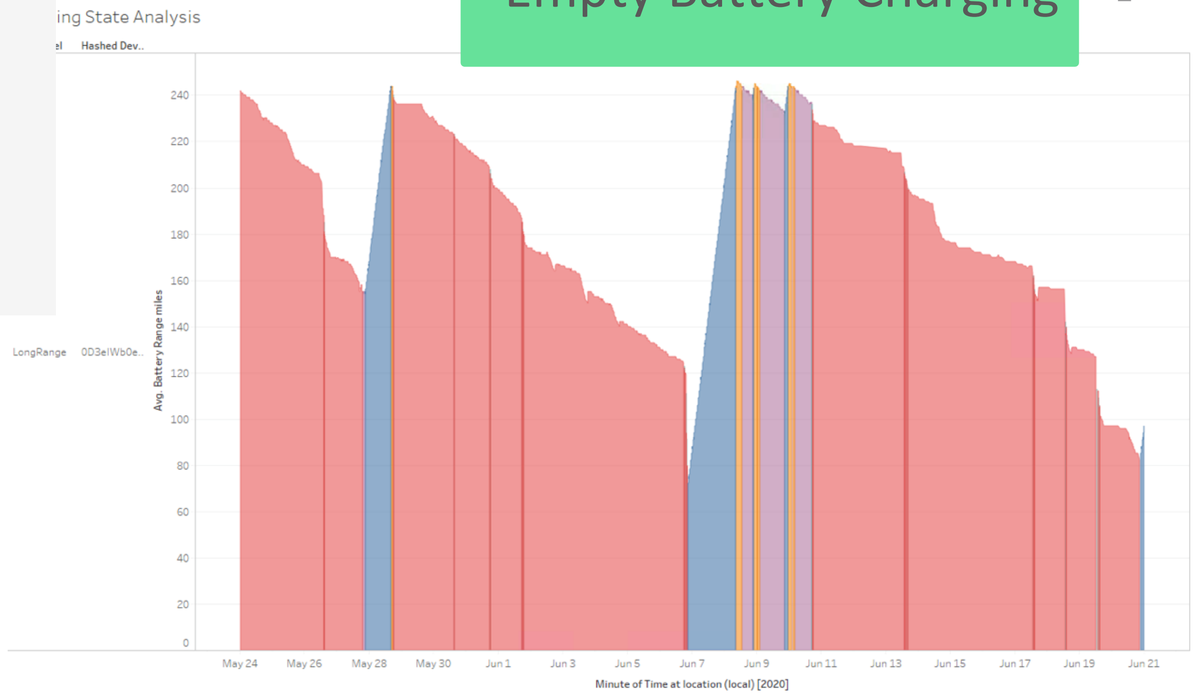


Complex Answer: Using the PG&E EVA rate schedule, that session would have been priced at anywhere from a high of $0.3890/kwh to a low of $0.1460/kwh and a midpoint of $0.230/kwh.

What Does It Mean? To Utilities

Periodic Charging

Empty Battery Charging



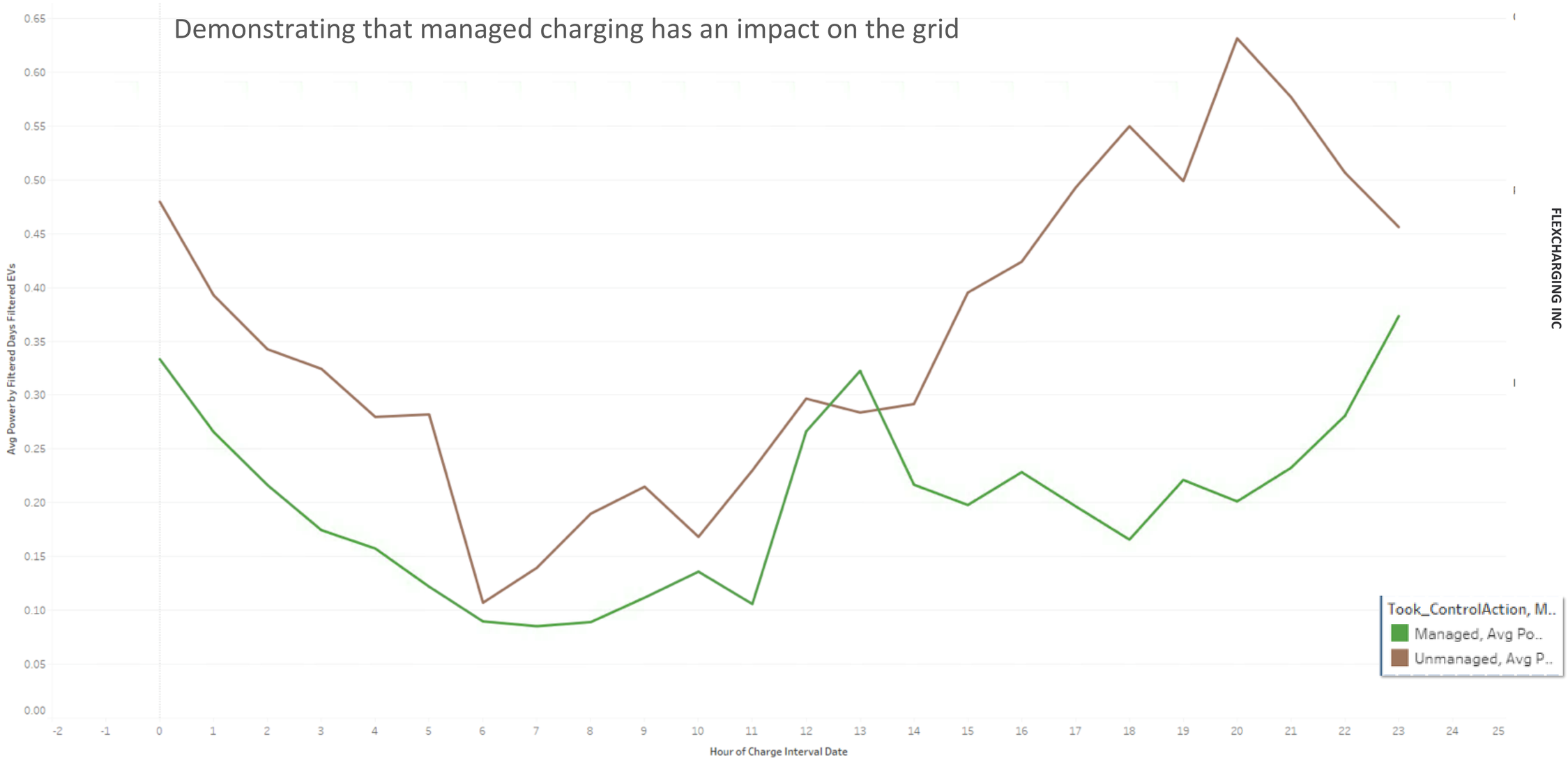
- How to craft Programs and Incentives given different charging styles
- A/B Testing to move “Empty Battery” to “Periodic”

What Does It Mean? To Utilities

GlobalFilterHours : 7/1/2020 12:00:00 AM to All Local Time Program: Organic, Partner 3, Partner 1

FlexCharging

Demonstrating that managed charging has an impact on the grid



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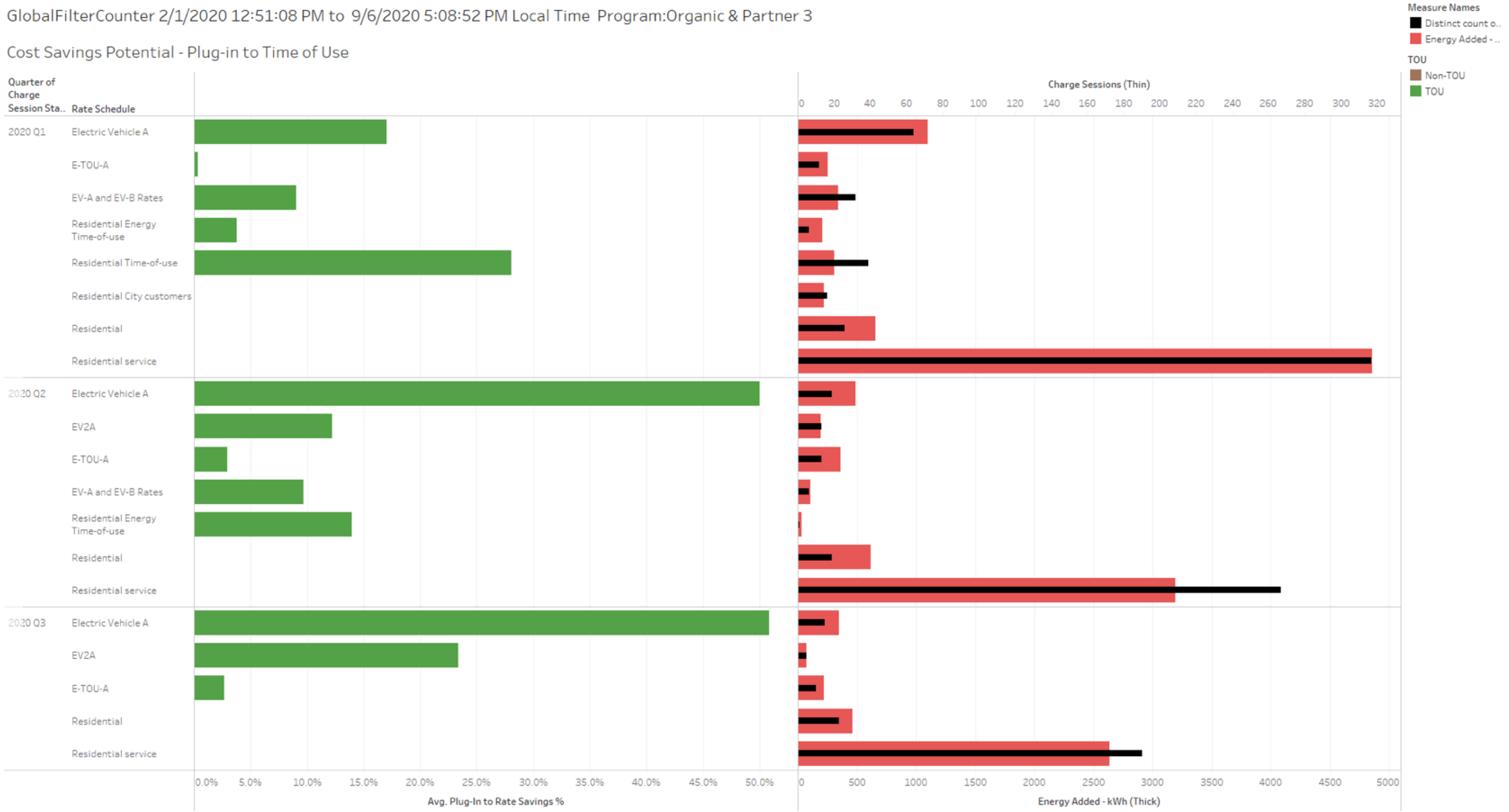
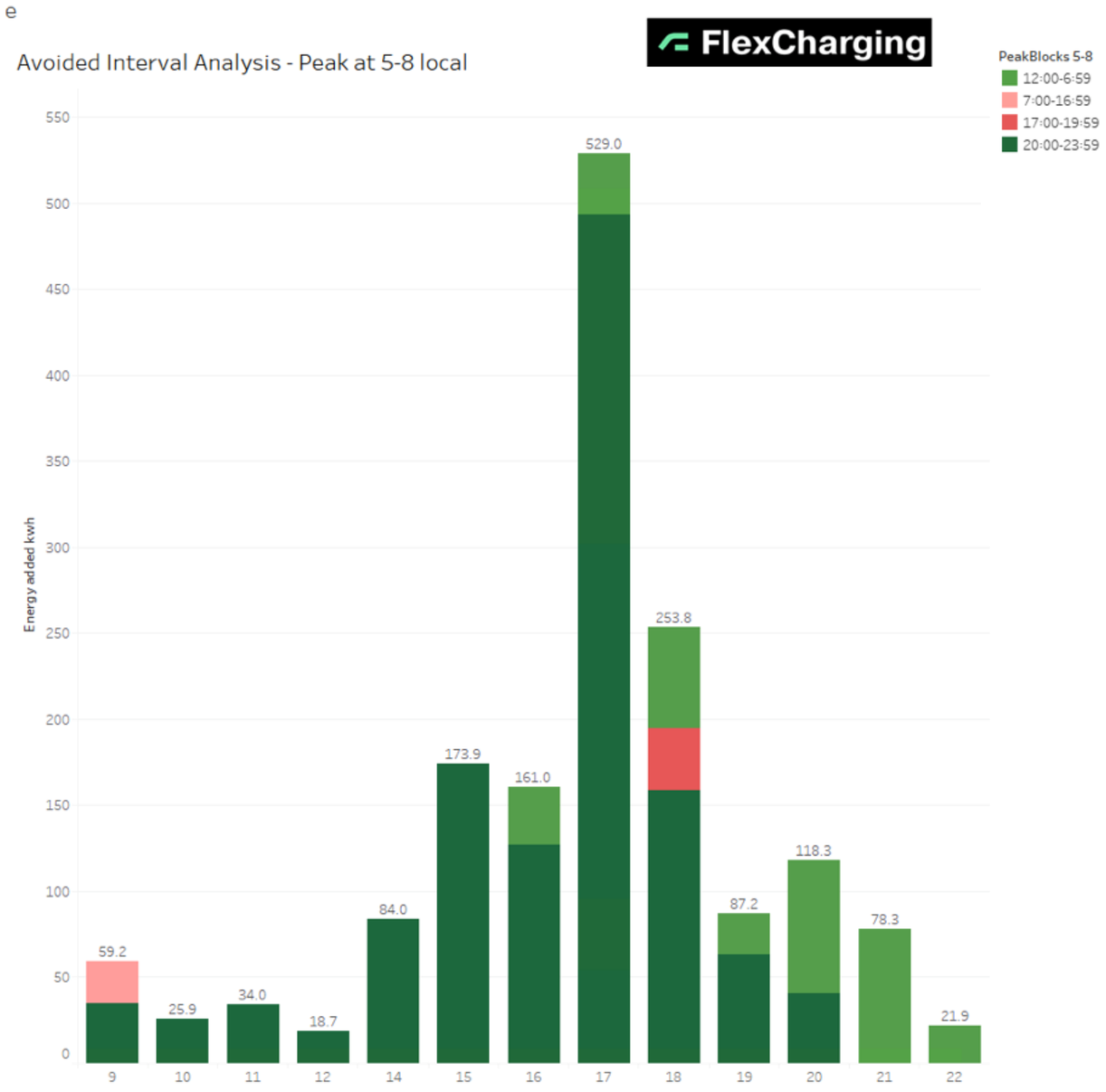
So What? Reduce driver cost of charging

Beginning the analysis of cost savings for reporting to drivers and utilities

- **Significant** cost savings seen based on the rate schedule used



So What? – Impact – Avoided Energy Shifted to Off-Peak Times



So What? – Impact – Avoided Carbon Emissions & Air Pollution

Managed Charging can reduce CO2 emissions

- WattTime marginal CO2 emissions forecast
- Early estimate: ~30% reduction

EV adoption avoids air pollution

NOx, Particulate matter, formaldehyde, carbon monoxide

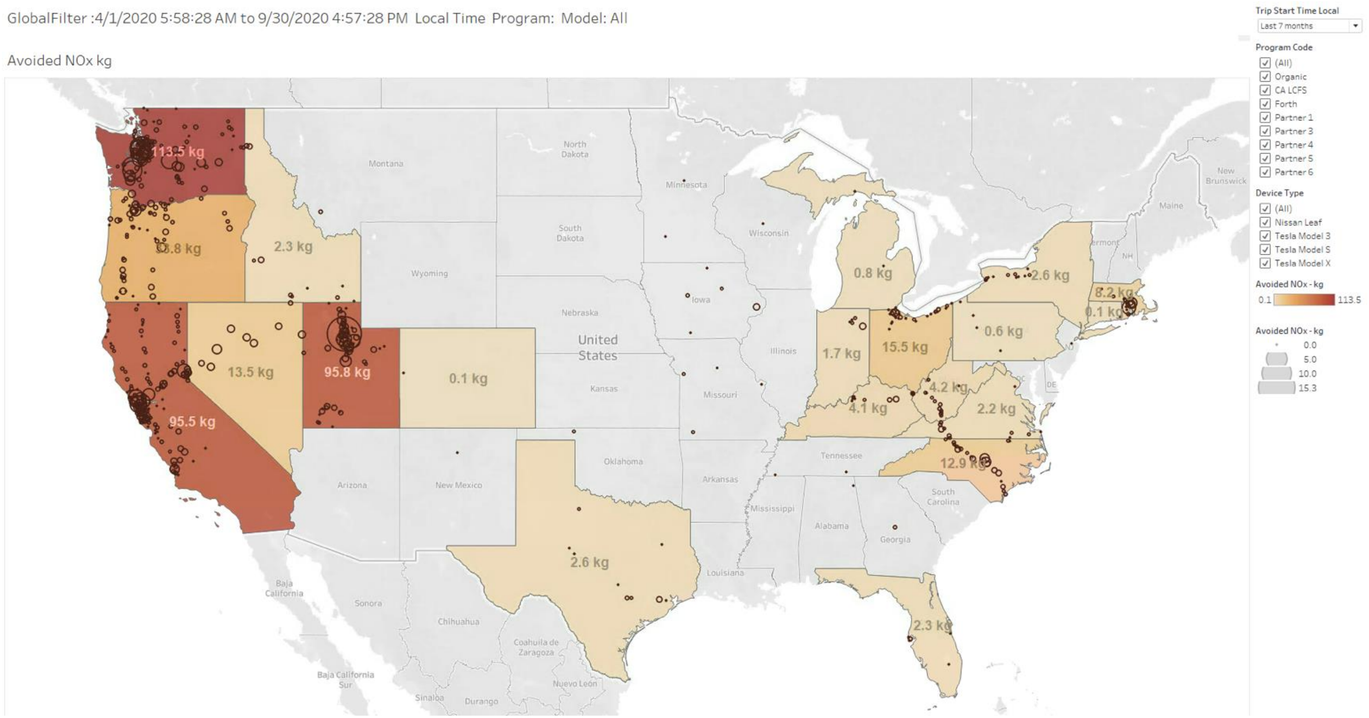
EV's improve air quality

Reduces healthcare expenses

and saves lives *in*

disadvantaged communities

Time to set policy goals!



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EV Managed Charging Learning

Drivers (even Tesla drivers) use L1 charging

- Much more than was anticipated prior to data pilots

Drivers won't always tell you what you need to know

- No utility and/or rate schedule – but request managed charging
- Make intelligent decisions about how to manage those sessions

Telematics data requires data analysts/data scientists

- Data analysts paired with EV Program Managers yields the most value
- Domain expertise in energy will add to actionable intelligence around data inference

Regulatory and Policy Implications

- Managed Charging + marginal CO2 forecasts will lower CO2 emissions
- Telematics data can quantify effectiveness of EV adoption investments on air pollution
- Data allows for equity opportunities such as claiming of LCFS credits around charging

THANK YOU

Brian Grunkemeyer

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