The Potential for EV Managed Charging

FlexCharging

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WHEN DO EV'S CHARGE?
TIME-OF-USE RATES TO THE RESCUE?
WHAT IS POSSIBLE?

[Graph showing electricity demand with annotations for Day-Ahead Demand Forecast, Hour-Ahead Demand Forecast, Actual Demand, and Available Resources.]
Demand Flexibility

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

*Individual components do not add to total because of rounding
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

- Start Charging

Charge Locations
- Home
- Vacation home
- Work
- Ikea
- Brother's house

Yes, please manage my car charging based on my charge locations and preferences

Delaying charging for Hope Bringer: FlexCharging will charge your car at a later time. Current state-of-charge is 54%, and it will charge to 80%.

Hope Bringer is not plugged in. Hope Bringer is at 54% charge, below your desired state of charge of 80%.
COMMUNICATION AND CONTROLS

NO-HARDWARE SOLUTION
Multi-OEM Solution

- Nissan Cloud Service
- Ford Cloud Service (Coming)
- GM Cloud Service (Coming)
- Tesla Cloud Service
- Flexcharging EnergyNet Service
- Others...
- Utility
- Flexcharging
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?

- Residential: 51.13% (678.6)
- Tesla Supercharger: 11.79% (156.4)
- Unknown: 19.29% (256.1)
- Work: 10.56% (140.2)
- Public: 7.22% (95.9)
Average Charging Energy Added per Hour by Location Type

Time (Pacific)
Understanding Charging

Average Charging Energy Added per Hour by Location Type

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

10 Day Data - Sept 28 - Oct 7, 2019
Understanding Charging

Shared Mobility Driving Profile

Organic EV Driving Profile

Average Charging Energy Added per Hour by Location Type

Time (Pacific)

Avg Charge energy added - kWh

Location Type
- Unknown
- Shopping
- Business/Customer/Parking
- Retirement/Home
- AutoServiceCenter
- School
- TeslaSupercharger
- Public
- Work
- Apartment
- Residential/But/Not/Home
- Vacation/Home
- Home

10 Day Data - Sept 28 - Oct 7, 2019
IS CHARGING SEASONAL?
OCTOBER DATA

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

- Other
- Other Houses
- Public
- Workplace
- Corridor
- Multi-unit Dwelling
- Home
IS CHARGING SEASONAL?

NOVEMBER DATA

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

- Unknown
- Other
- Other Houses
- Public
- Workplace
- Corridor
- Multi-unit Dwelling
- Home
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
THANK YOU