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Electrified Transportation:
Infrastructure Analysis

March 2019

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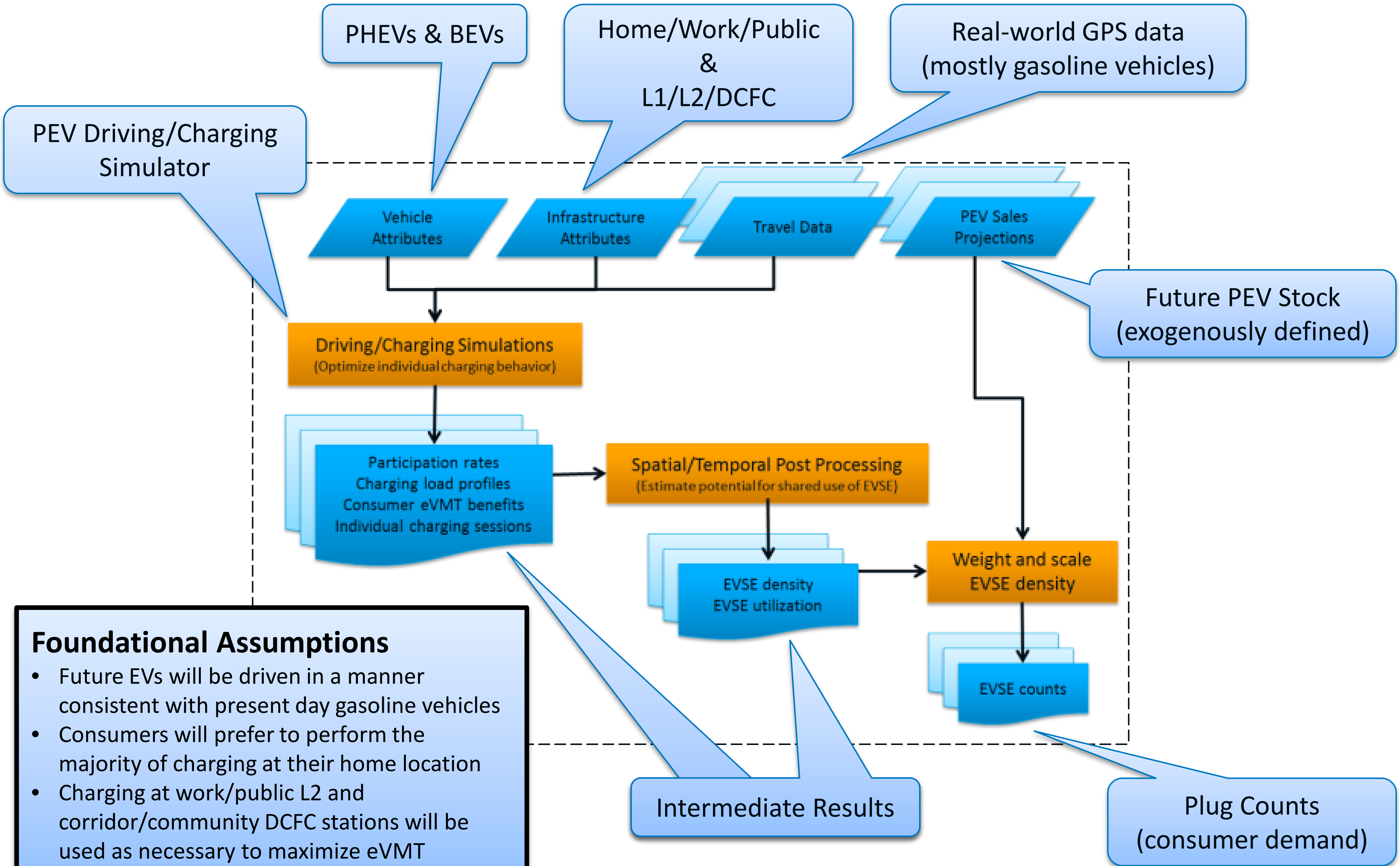
Electric Vehicle Infrastructure Projection Tool (EVI-Pro)

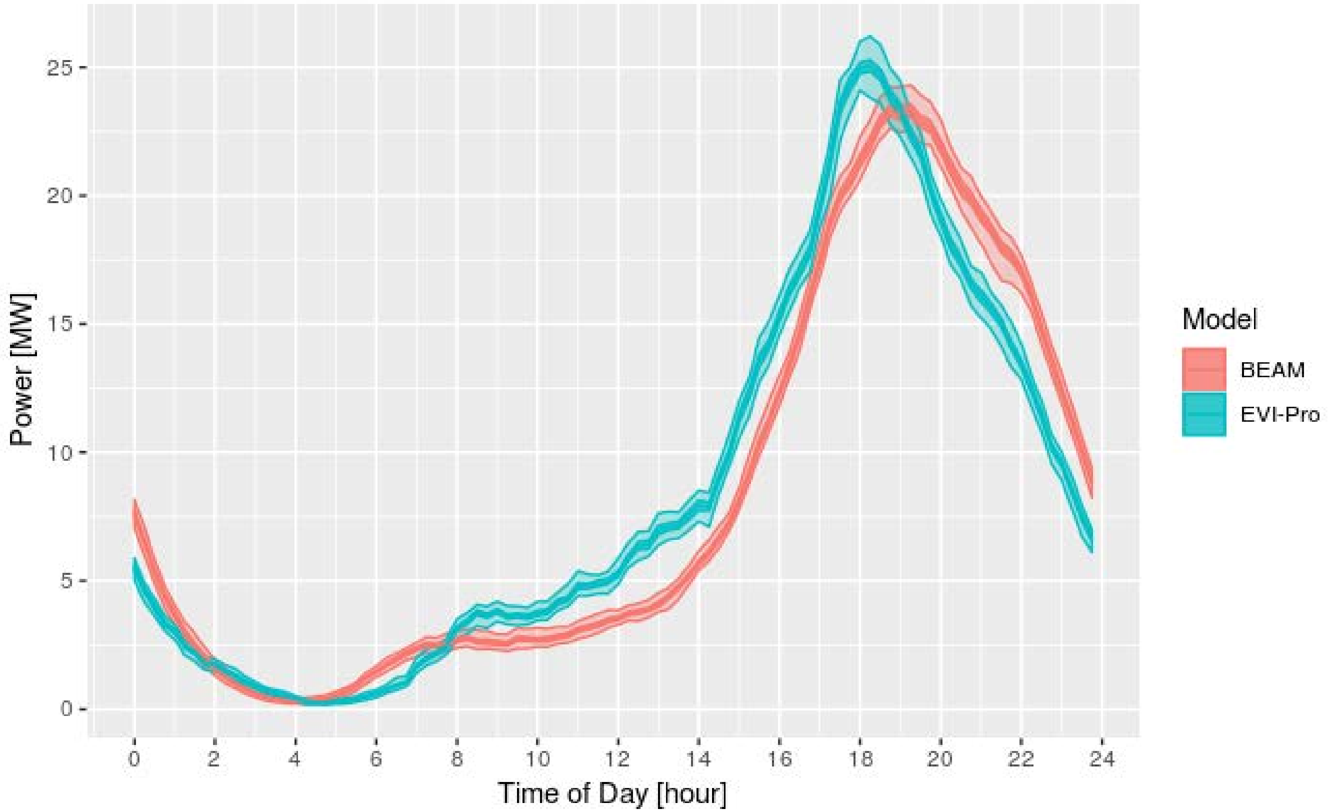


Foundational Assumptions

- Future EVs will be driven in a manner consistent with present day gasoline vehicles
- Consumers will prefer to perform the majority of charging at their home location
- Charging at work/public L2 and corridor/community DCFC stations will be used as necessary to maximize eVMT

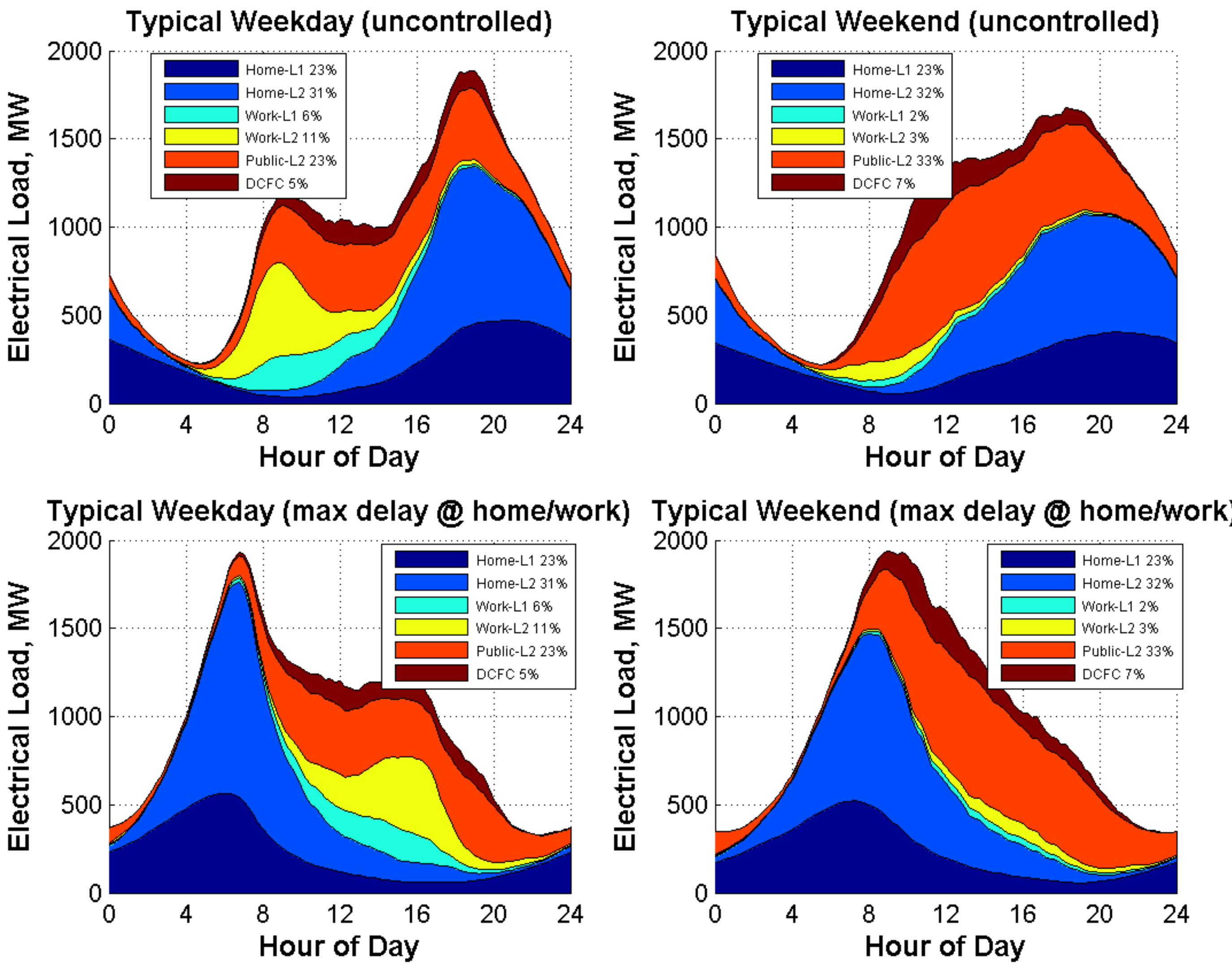
BEAM / EVI-Pro Comparison

- In collaboration with Lawrence Berkley National Laboratory and Humboldt State University, load profiles from EVI-Pro were contrasted with the BEAM model
  - BEAM is an agent-based transportation simulator that has been used for EV infrastructure studies in the San Francisco Bay Area
- A high degree of similarity in charging behavior and aggregate load profiles was observed between EVI-Pro and BEAM



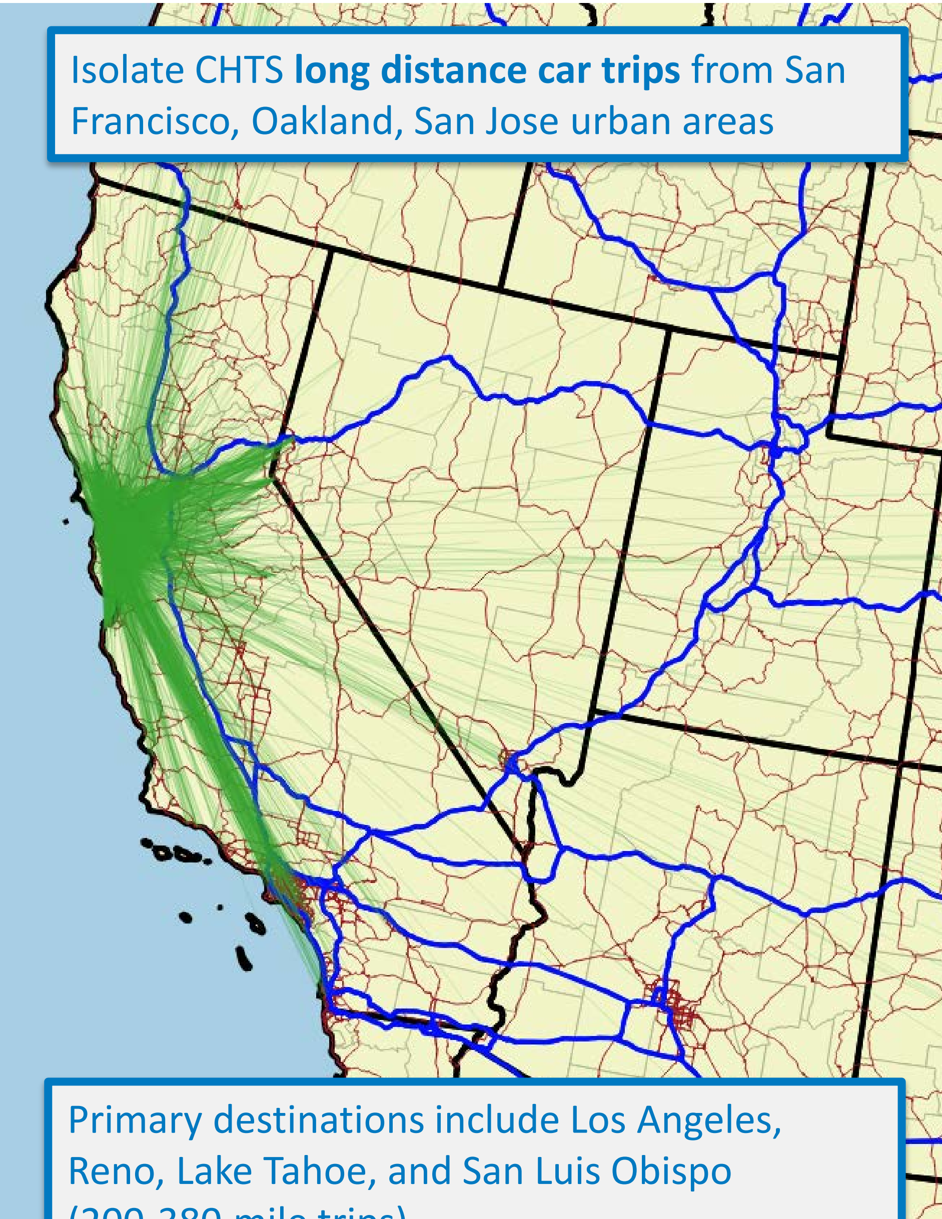
Load Flexibility: Managed Charging

Simulated load from 2M EVs



Long Distance Travel: DCFC Demand

Isolate CHTS **long distance car trips** from San Francisco, Oakland, San Jose urban areas

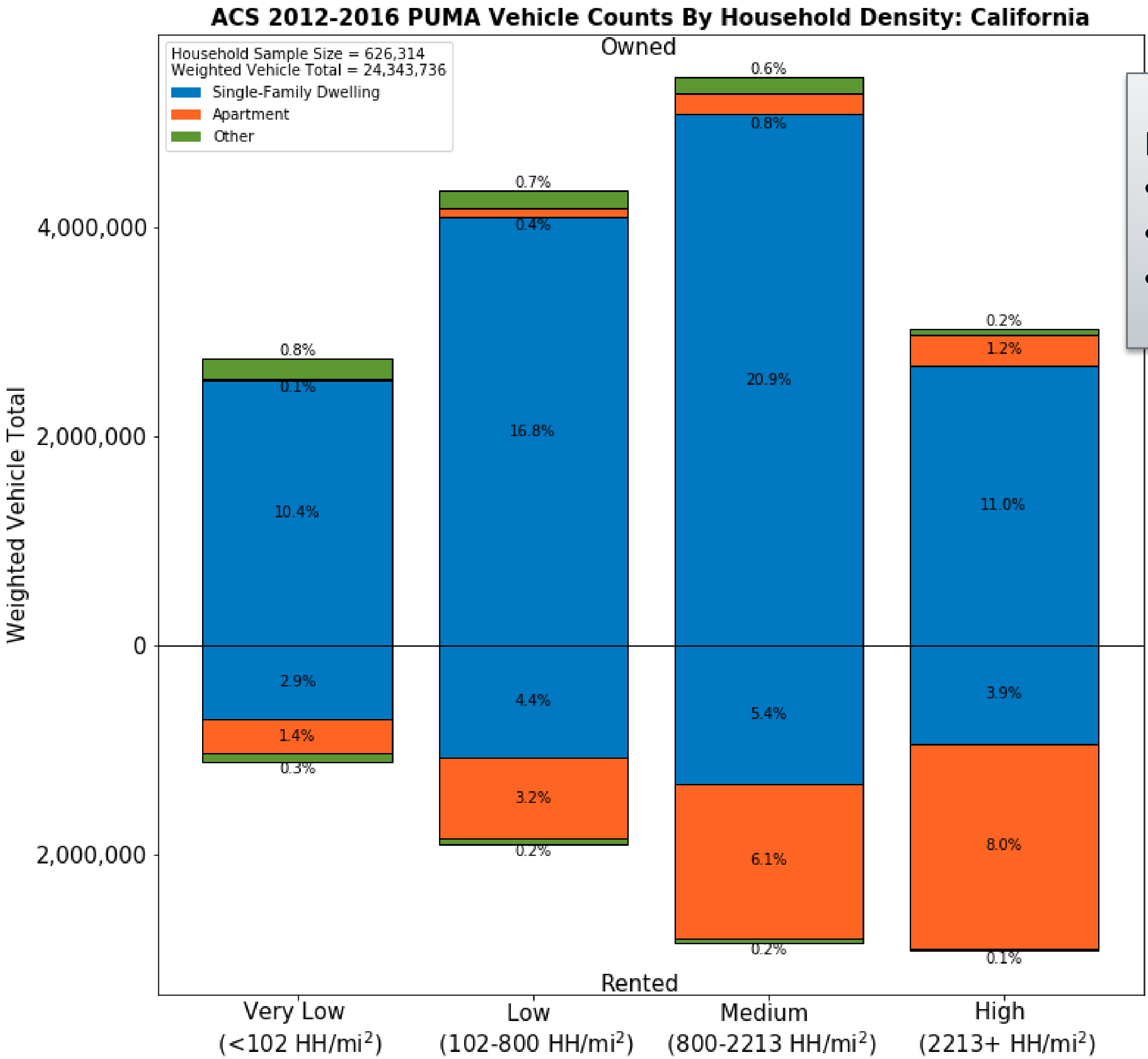


Primary destinations include Los Angeles, Reno, Lake Tahoe, and San Luis Obispo (200-380 mile trips)

Isolate CHTS **long distance car trips** from Los Angeles, Long Beach, Anaheim, Riverside, San Bernardino urban areas

Primary destinations include San Francisco, Las Vegas, Phoenix, and Mammoth Lakes (270-380 mile trips)

Residential Charging Availability



Estimate of CA LDV stock by

- Housing density
- Residence type
- Tenure

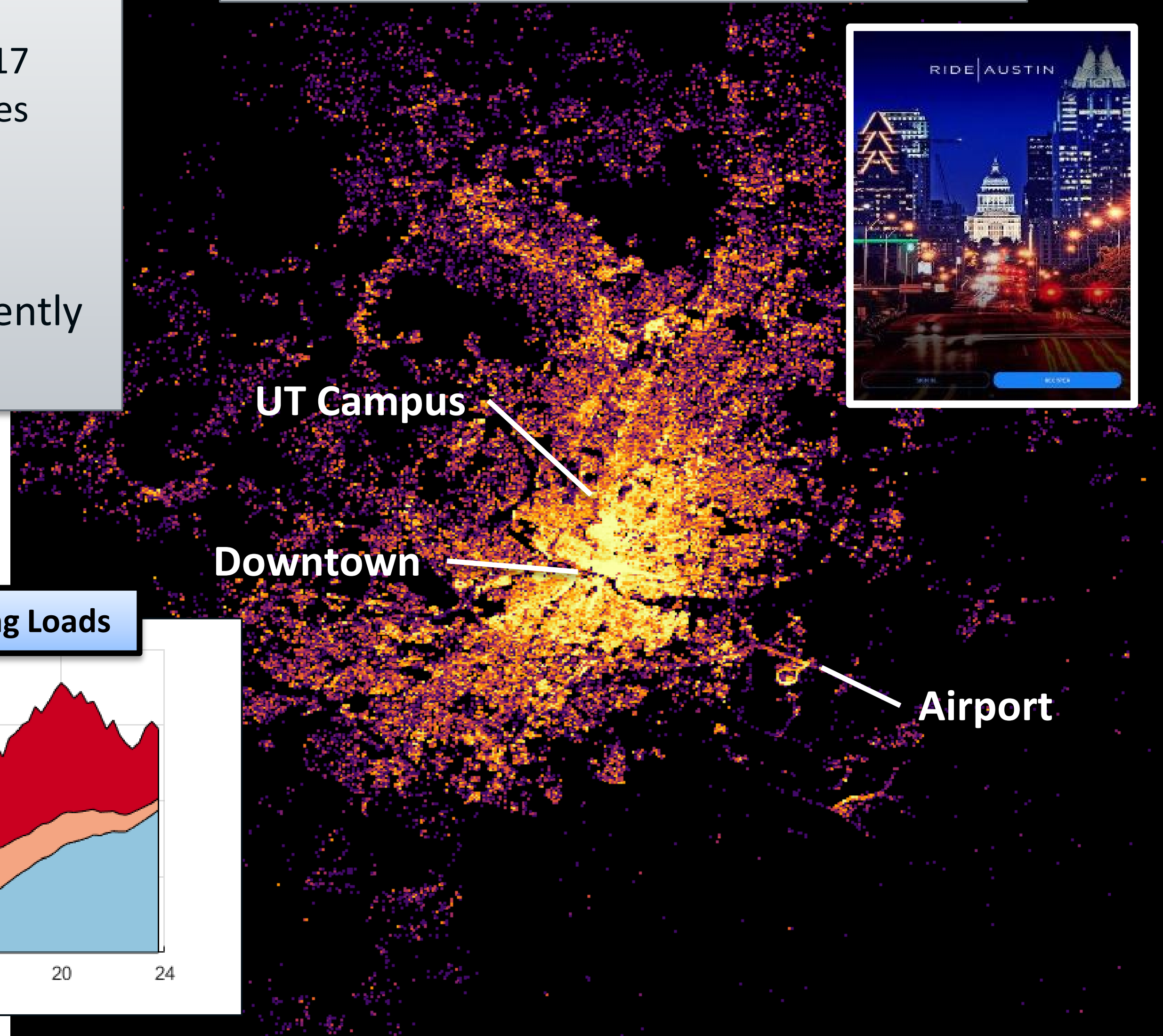
Electrification of TNCs: A Case Study on RideAustin

By the numbers

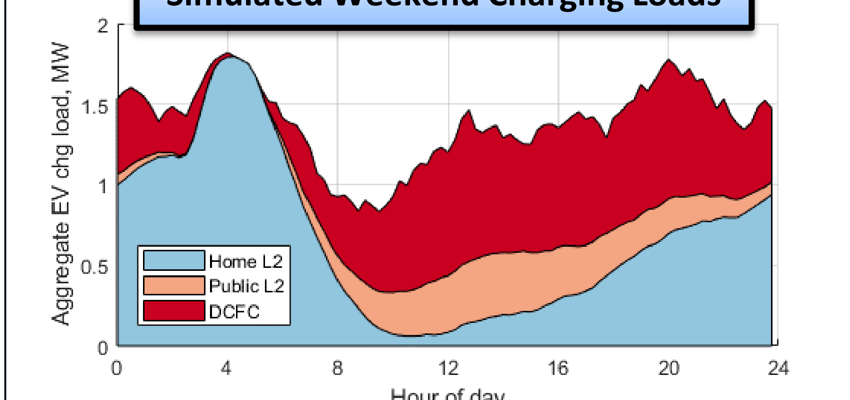
- Sample duration: 10 months
- Period: June 2016 to April 2017
- 4,961 unique drivers & vehicles
- 261,000 unique riders
- 1.49 million trips

Largest US TNC dataset currently available to researchers

Heatmap of RideAustin trip destinations

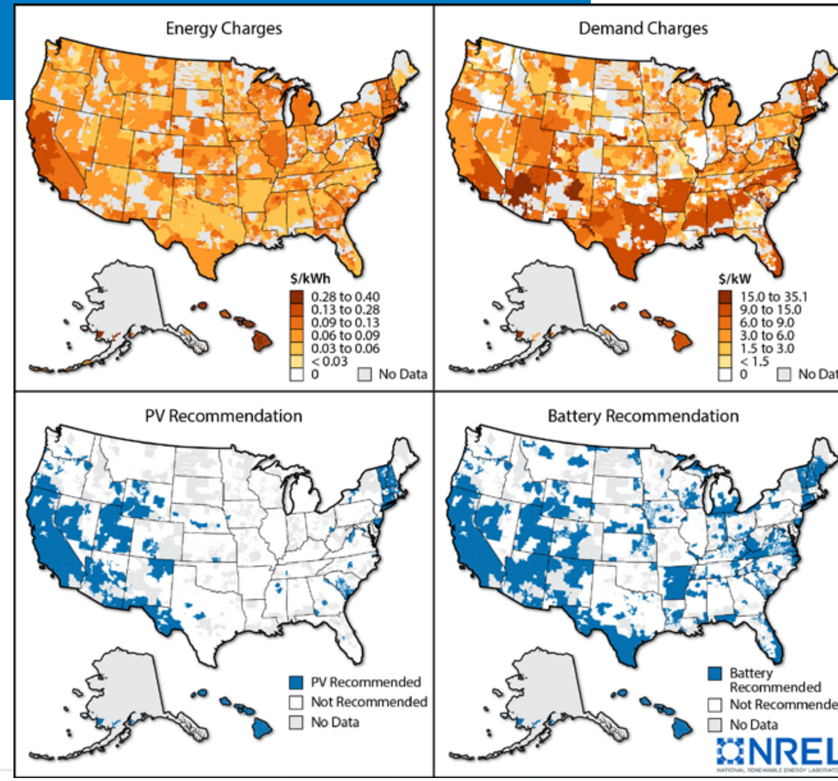


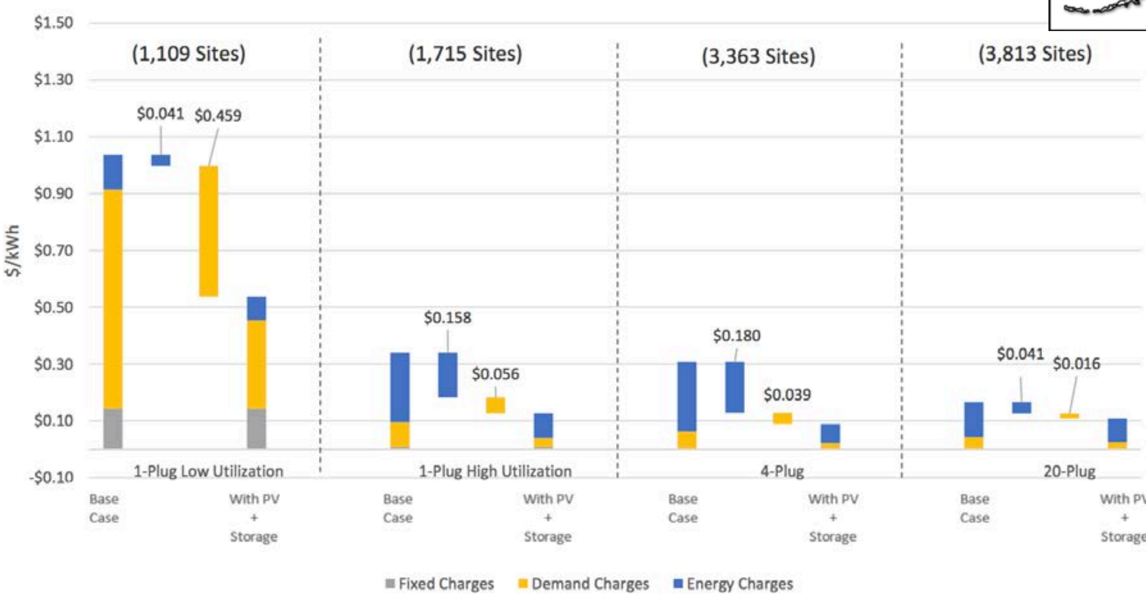
Simulated Weekend Charging Loads



Technology Solutions to Reduce Cost of DCFC

- Analysis examines **over 7,500 electricity rates** to understand DCFC costs and mitigation opportunities.
- **Demand charges** are significant cost for low-utilization stations but become much less important as utilization increases
- Energy storage (battery) can mitigate high **demand charges**
- Photovoltaic (PV) energy can mitigate high **energy charges**, even in areas with lower solar irradiance (e.g., Vermont)





Technology solutions are **effective at reducing electricity cost** for DCFC:

- Co-location helps small stations (high fixed charges)
- PV and batteries can support locations with high energy and/or demand charges

Thanks! Questions?

This work was funded by the California Energy Commission and the US Department of Energy Vehicle Technologies Office.