# Distribution Planning for Electric Vehicles Fleets

## Session 2: Transportation Electrification

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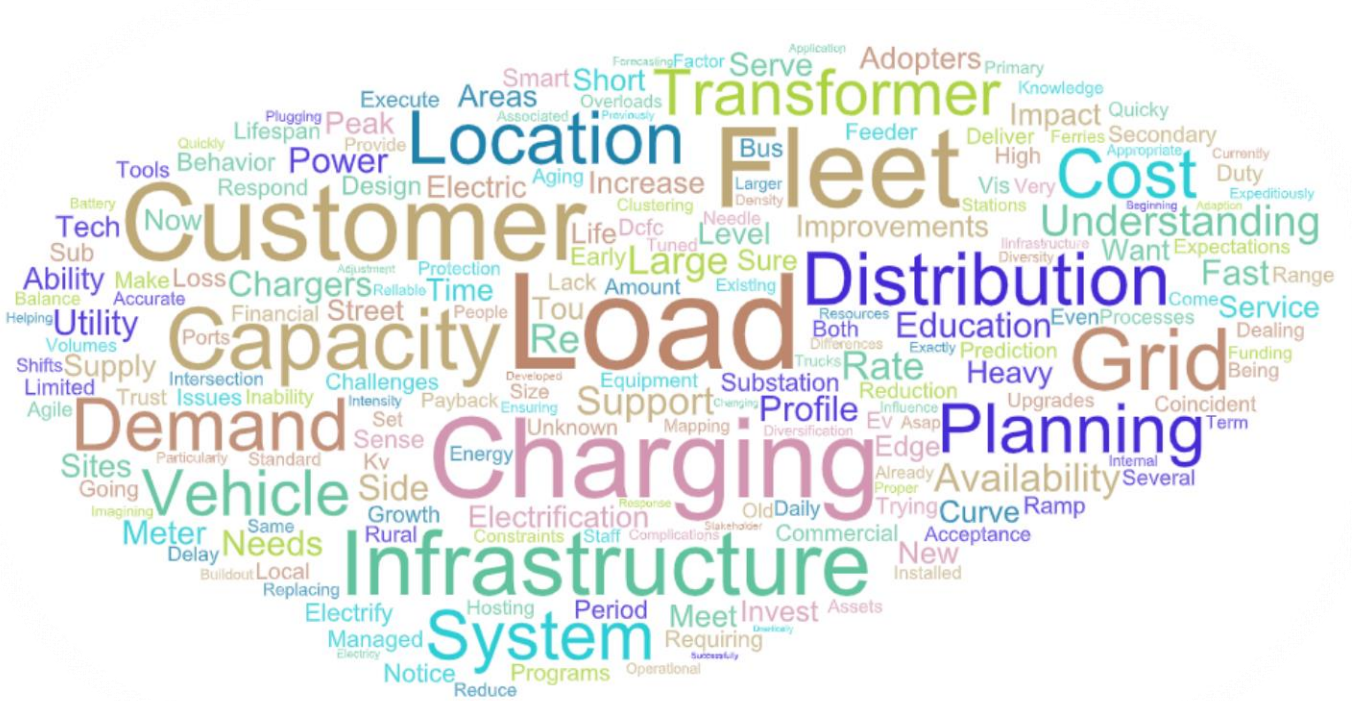
ESIG June Workshop
Denver, CO
June 13th, 2023

# Outline

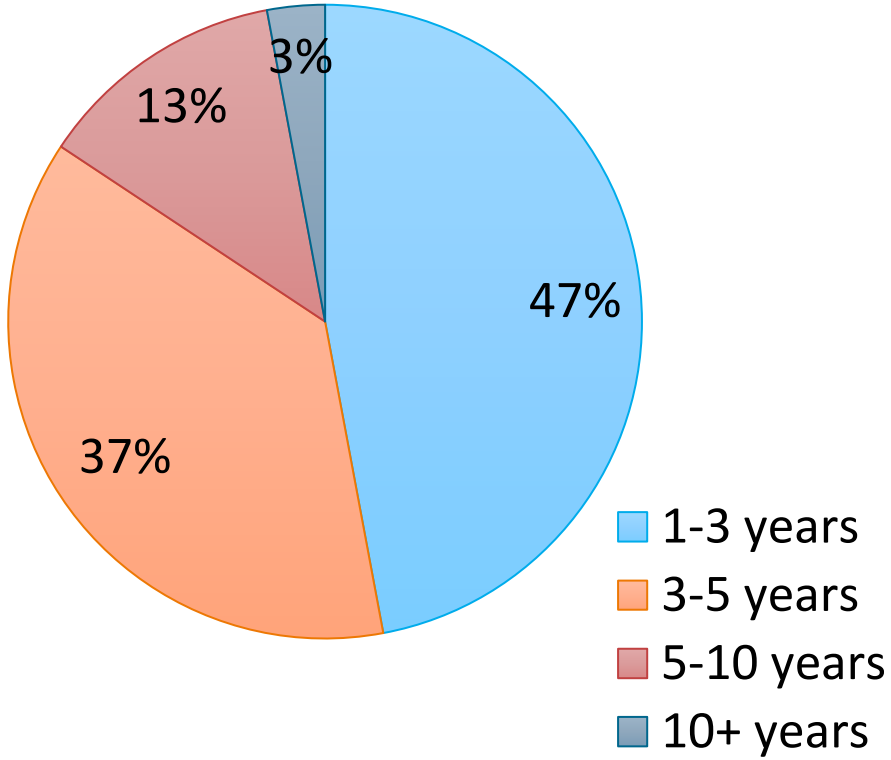
- Why focusing on MD/HD vehicles?
- Assessing Future Fleet Electrification
- Modeling MDHD-EV vehicles
- On-going collaborative EPRI project

# Feedback from Distribution Planners

## In a few words, what's on your mind?




## How Soon Will EV Charging Become a concern?



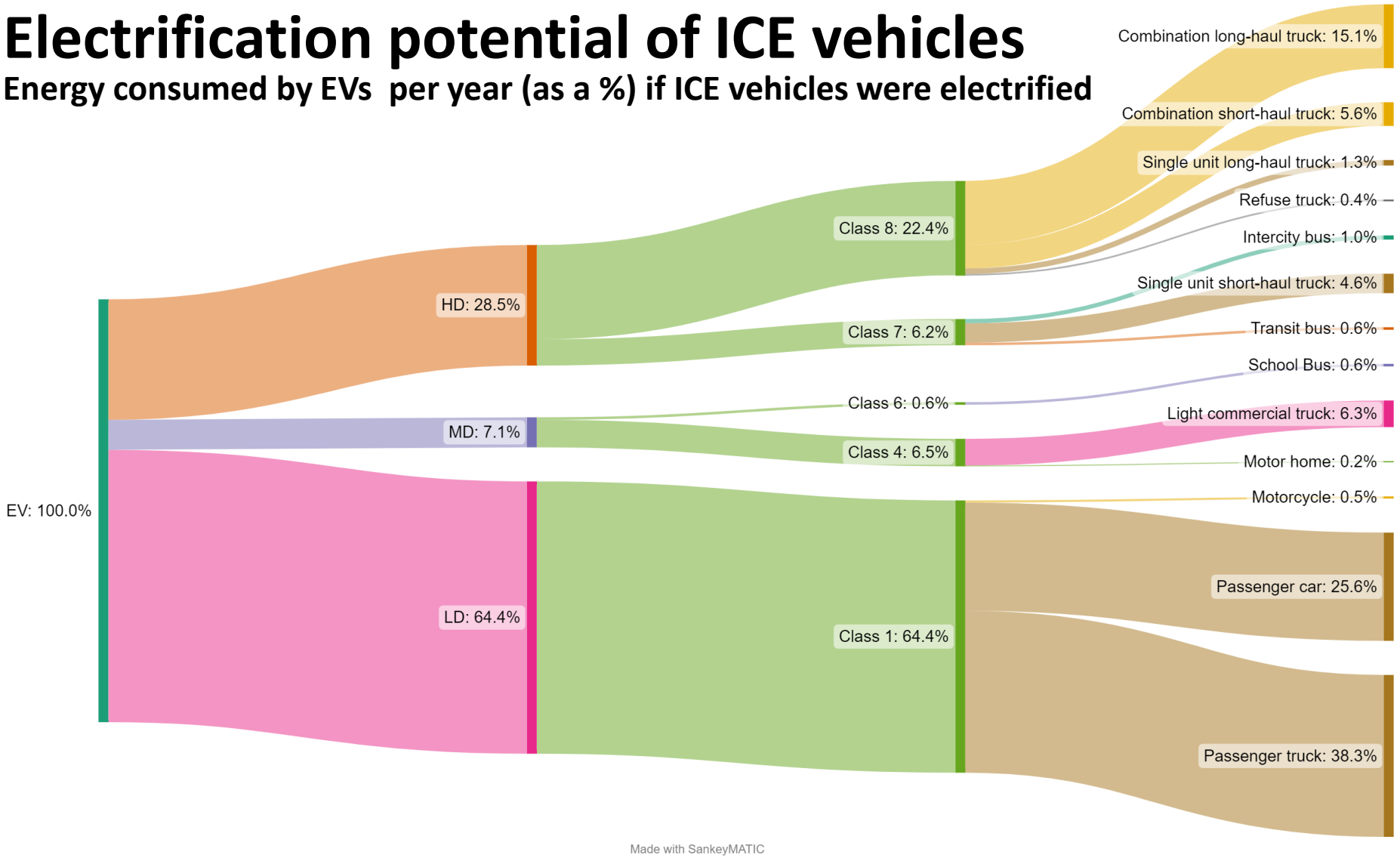

Number 1 Ranked Priority by Distribution Planners

Planning tools for forecasting and assessing fleet electrification

# How much energy will it take to electrify transportation?

## Electrification potential of ICE vehicles

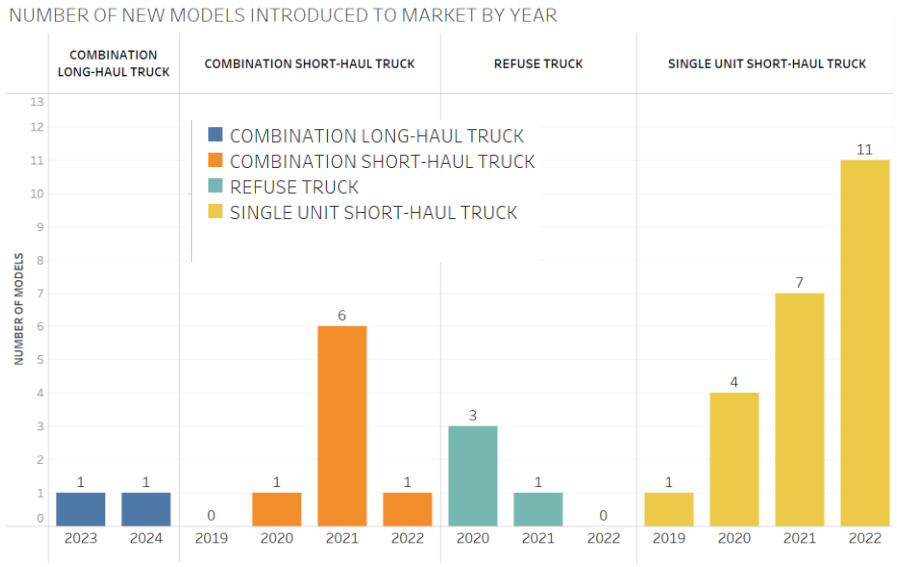
**Energy consumed by EVs per year (as a %) if ICE vehicles were electrified**

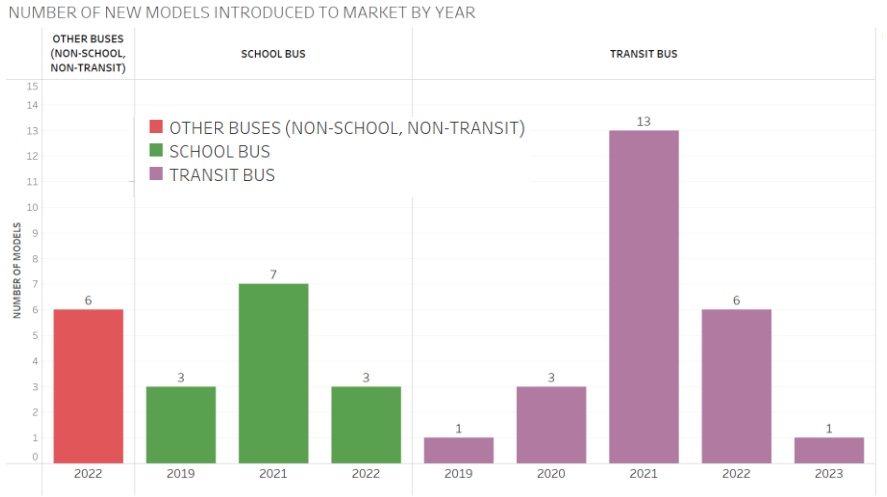



**1880.4 TWh/year**

- **63.9% Light Duty**
- **35.4% MDHD**
- **0.7% Motor Home and Motorcycle**

# Why are Medium and Heavy-Duty Vehicles different than Passenger vehicles?




## How are MDHD vehicles different than the light duty vehicles?

- ✓ Use more kWh/mile
- ✓ Commercial Vehicles have more regular patterns
- ✓ They aren't 'emotionally purchased' they are 'spreadsheet purchased'
- ✓ One person may purchase many at one time
- ✓ They may all charge at one place
- ✓ They may charge at higher power -1MW




https://corporate.walmart.com/newsroom/2022/07/12/walmart-to-purchase-4-500-canoo-electric-delivery-vehicles-to-be-used-for-last-mile-deliveries-in-support-of-its-growing-ecommerce-business, September 2022

https://www.aboutamazon.com/news/transportation/amazons-electric-delivery-vehicles-from-rivian-roll-out-across-the-u-s, September 2022

https://newsroom.fedex.com/newsroom/global/fedex-continues-advancing-fleet-electrification-goals-with-latest-150-electric-vehicle-delivery-from-brightdrop, September 2022

# **Identifying Future Fleets** | Where, When, How Many?

## Where?

- **Where** are the fleets dwelling?
- **Where** are likely warehouses that may have electric vehicles?
- **Where** would they charge en-route?

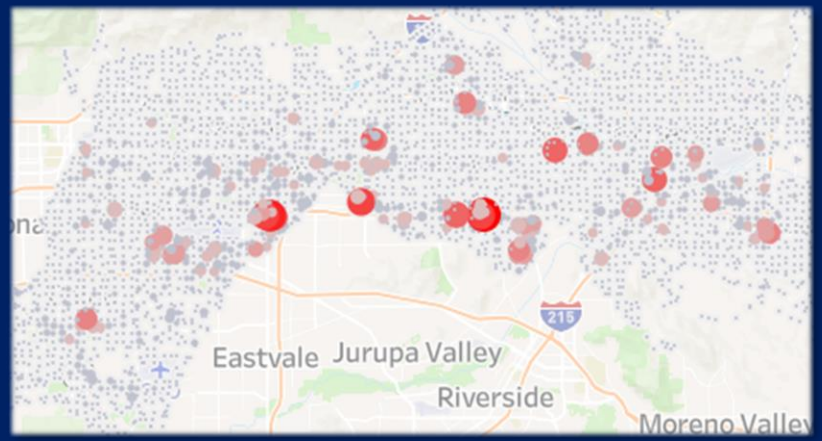



*Figure: Vehicle activity maps*

## When?

- **When** would fleets most likely charge?
- **When** would we expect different vehicle fleets to electrify?
- **When** would it be best for vehicle to charge?

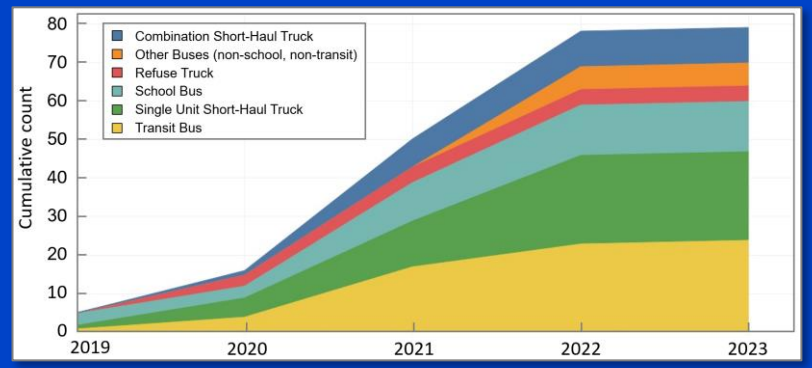



*Figure: Technology Maturity*

## How Many?

- **How many** MDHD vehicles are there currently?
- **How many** vehicles would be located at one location?

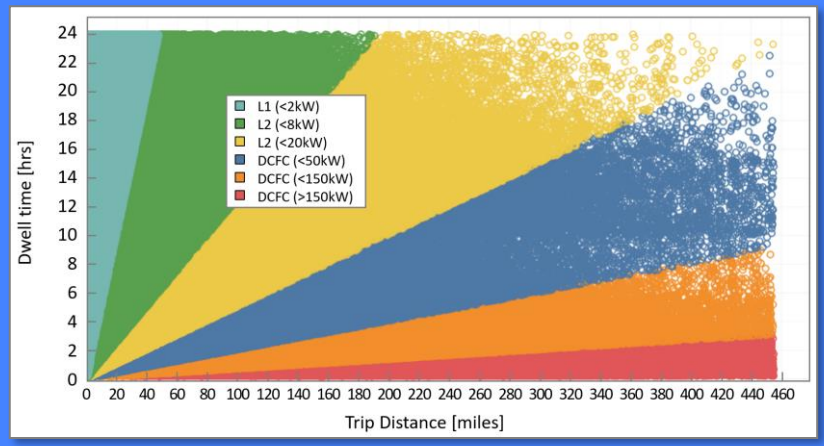
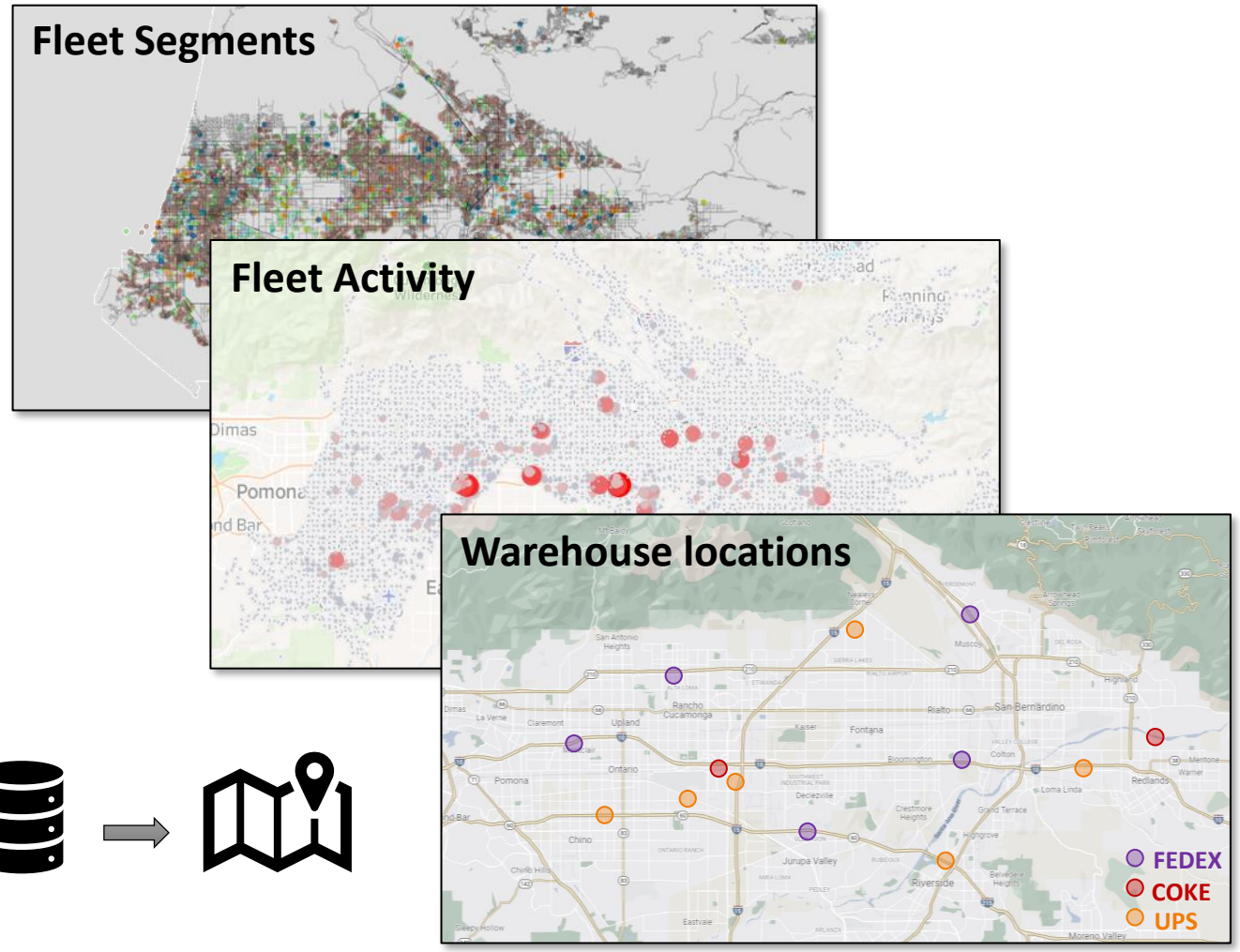



*Figure: Charging Needs*

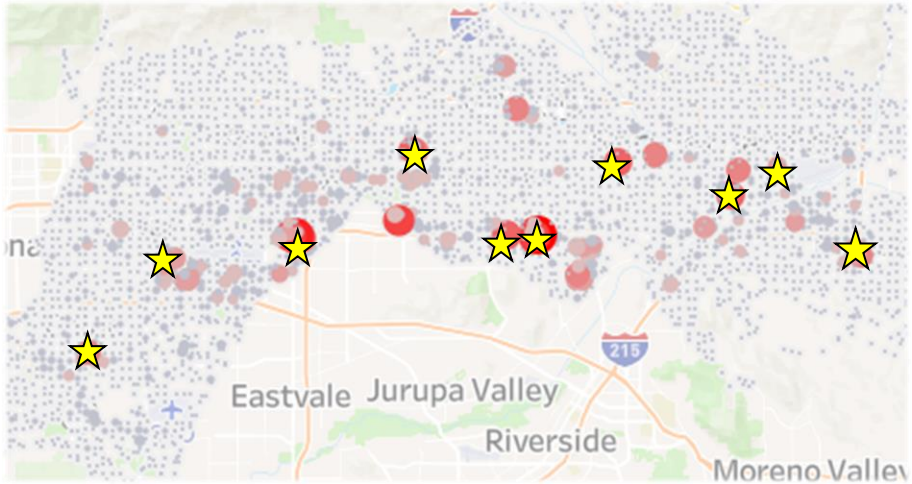
All these questions vary by vehicle segment

# Future Fleet Electrification Assessment

## Locating fleets

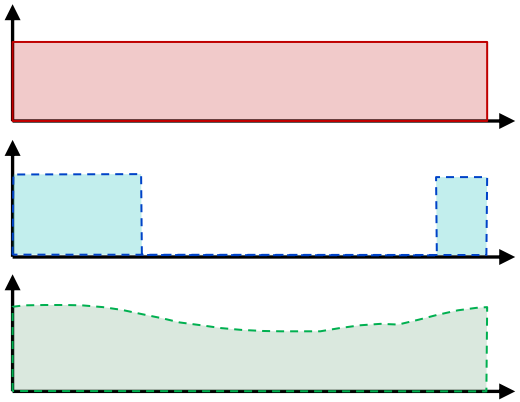



## Characterizing fleets



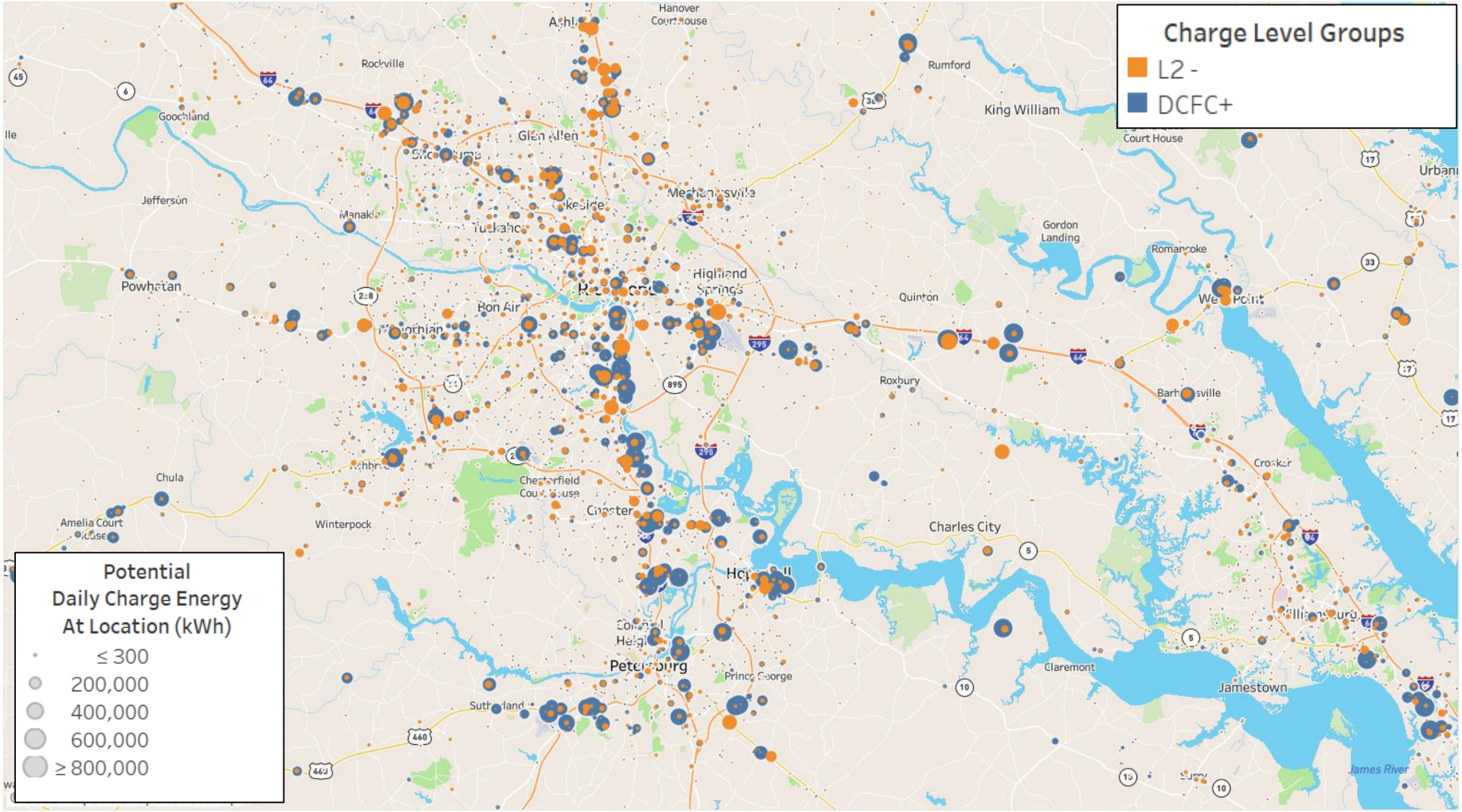

EPRI tool: **FleetCalc**

**Load profile:**

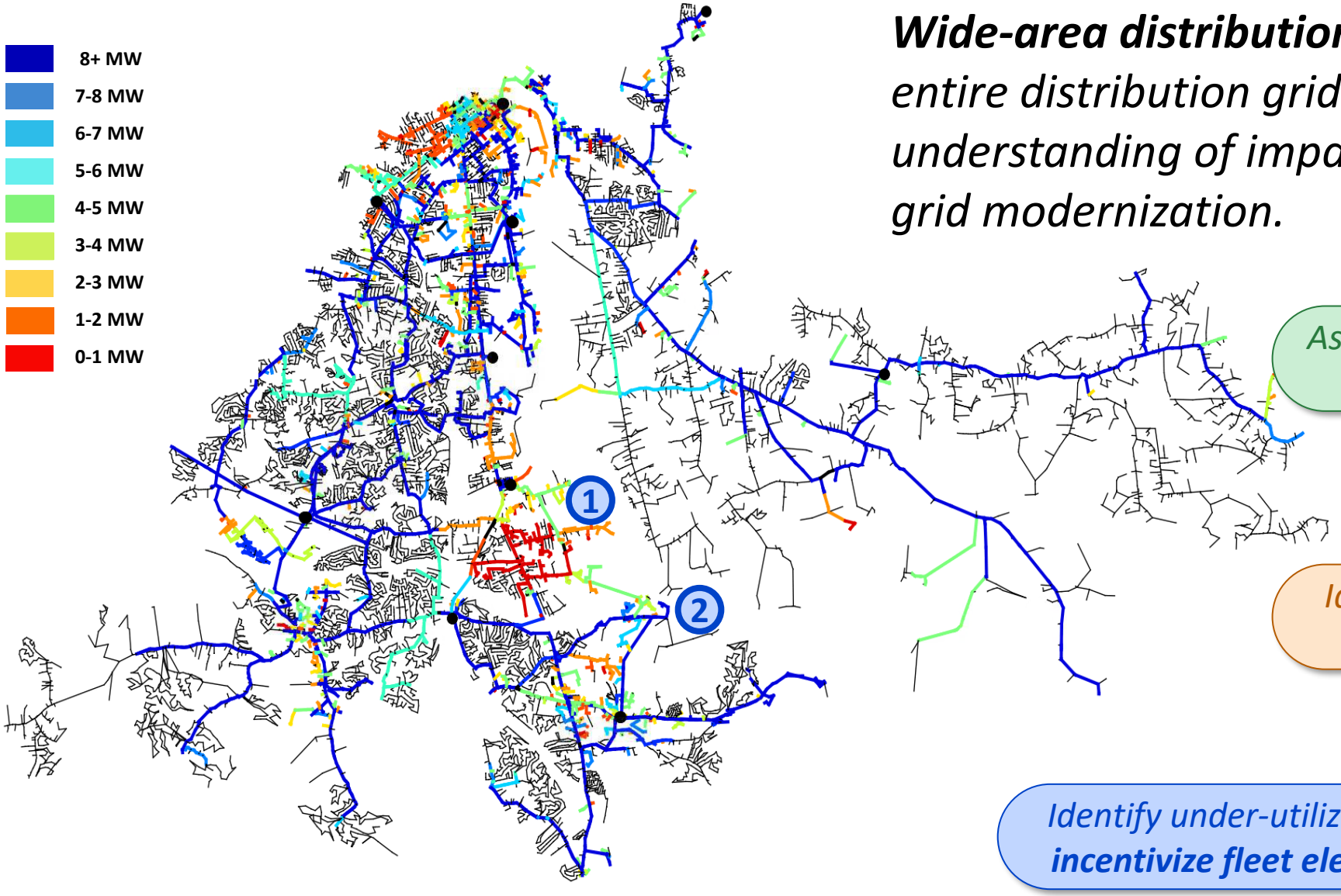


# **Future Fleet Assessment** | Fleet activity maps

*Based on their dwell time, what will their charging needs be?*



# **Grid Assessment** | Available capacity




***Wide-area distribution assessments*** *study the entire distribution grid to provide a holistic understanding of impacts and benefits from grid modernization.*

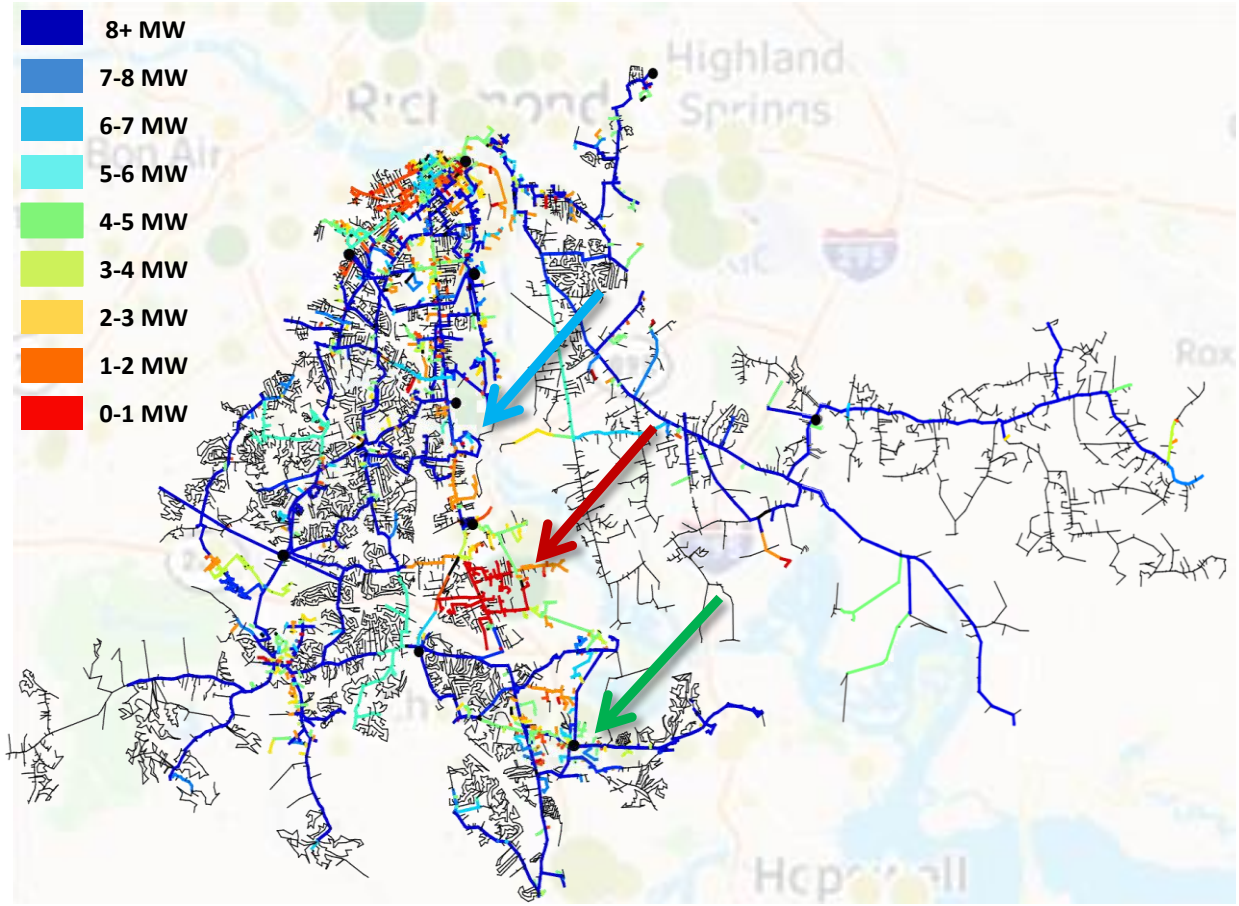
*Assessing* ***electrification opportunity*** *across a utility's territory*

*Identify high-priority feeders for* ***grid-strengthening measures***

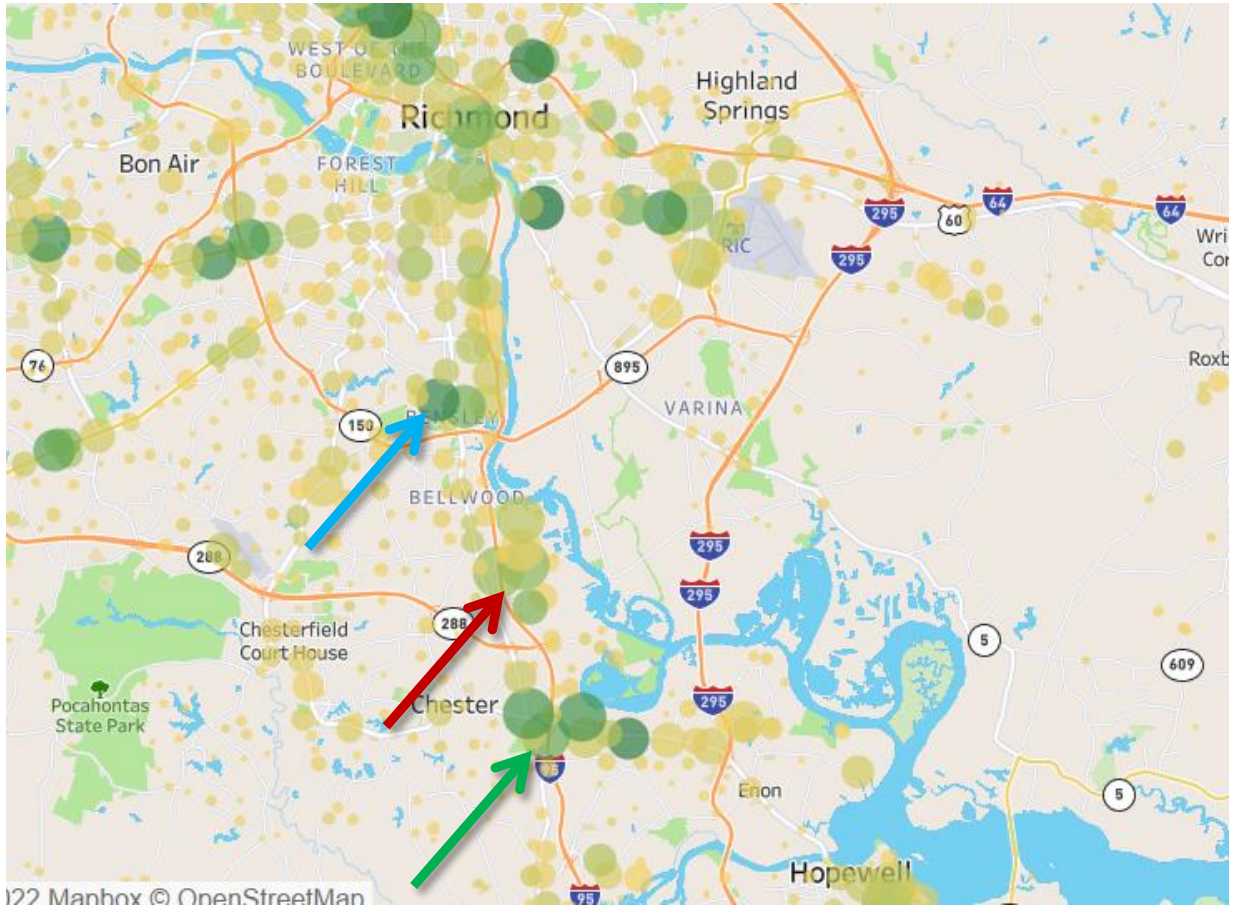
*Identify under-utilized assets to* ***incentivize fleet electrification***

# Grid Readiness and Integration Assessment

*Is there capacity where vehicles are dwelling?*



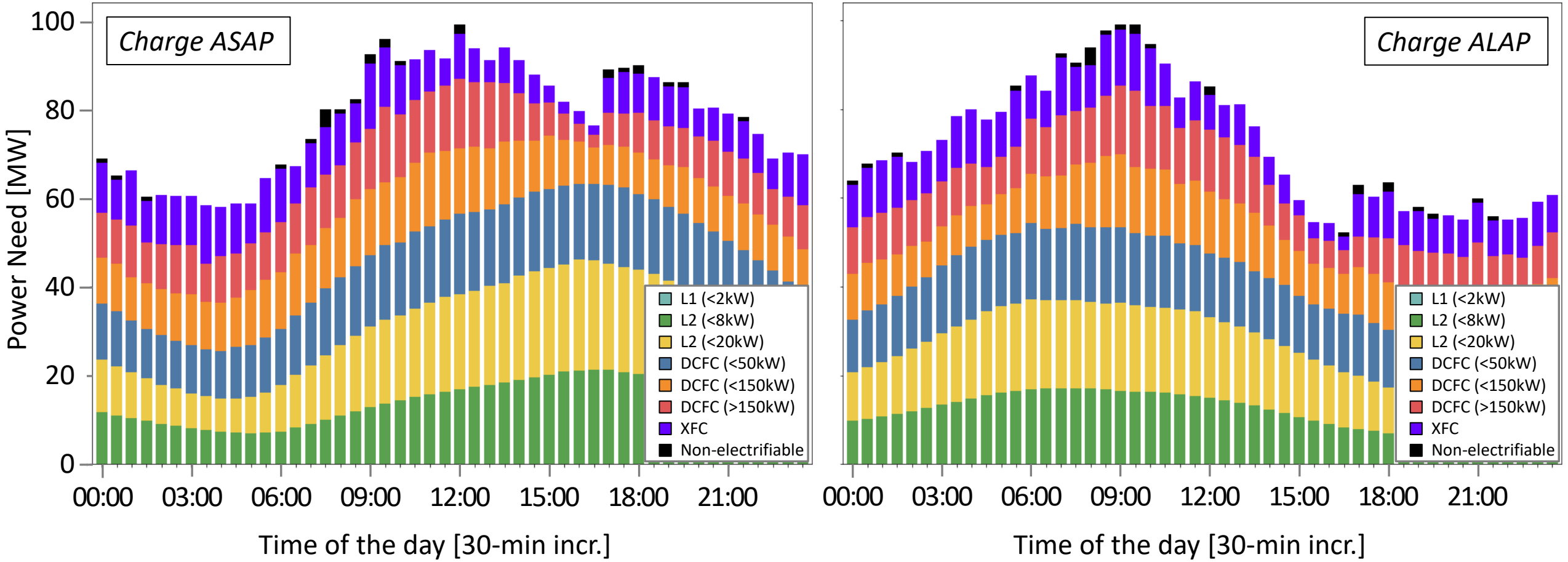

**Hosting Capacity for new load**




**Fleet Activity**

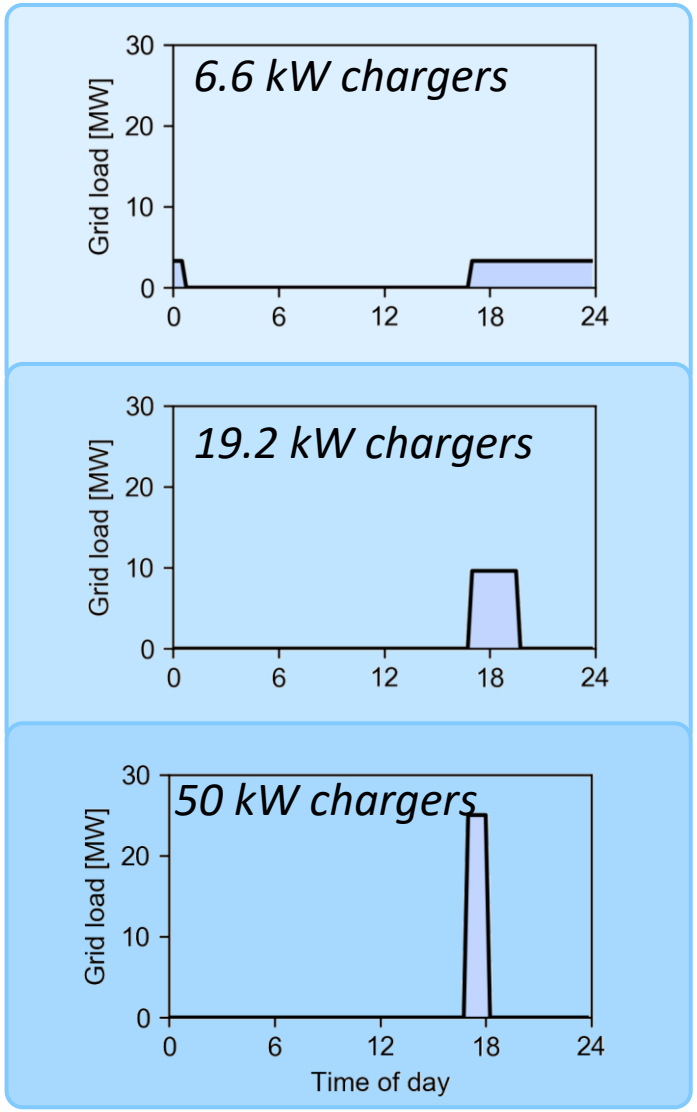
# Understanding Fleet Needs | Aggregated Loadshape

Even with identical fleet characteristics (vehicle count, miles driven, vehicle type, dwelling time), the loadshape that could manifest itself on the system can still vary drastically depending on the specific ***charging strategy***.

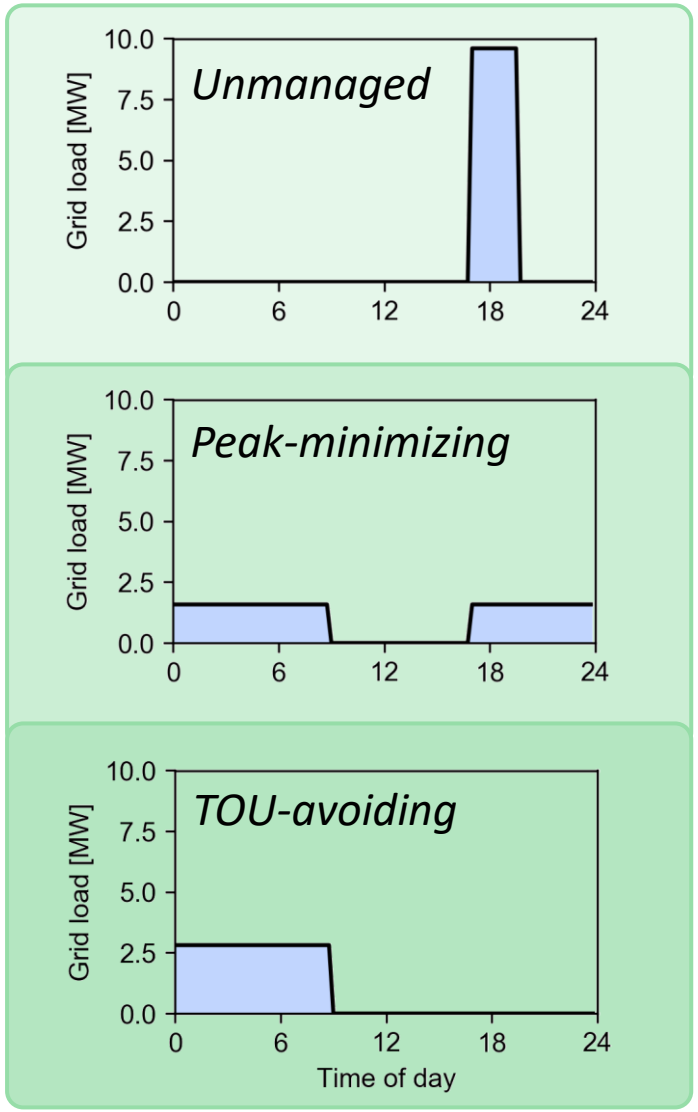


# Fleet charging loadshape can vary significantly

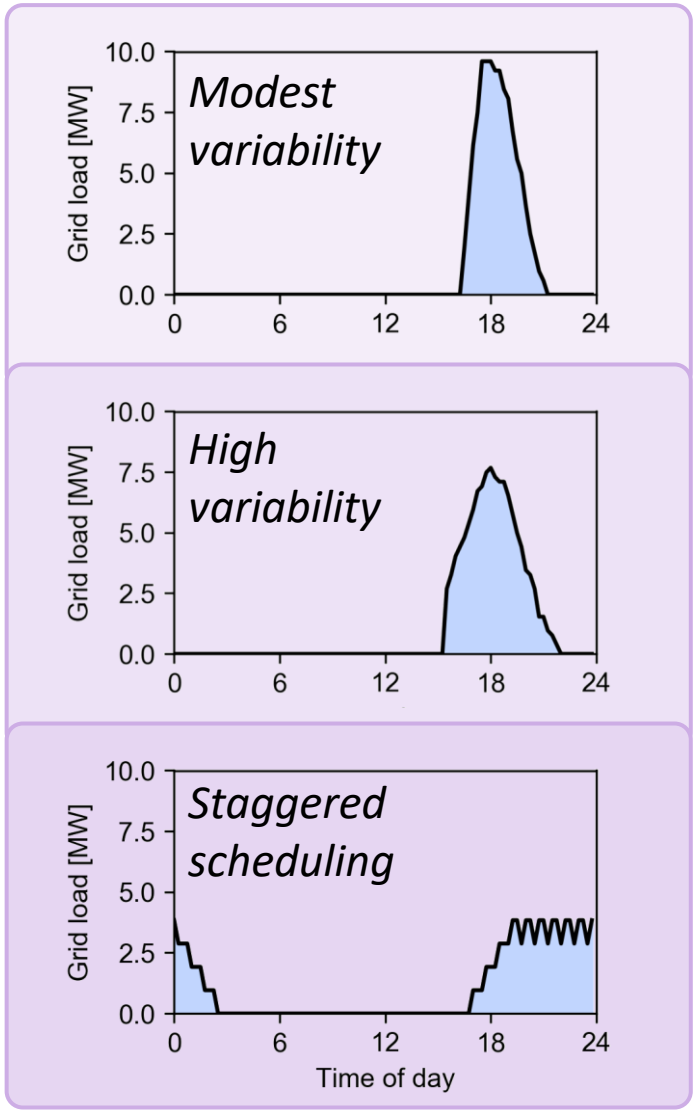
Loadshape can vary based on the **size of chargers**




Loadshape can vary based on the **load management strategy**




Loadshape can vary based on the **scheduling variability**



# On-Going Collaborative Project:

*Fleet Electrification Planning and Assessment*

[Jan 2022 – Dec 2023]

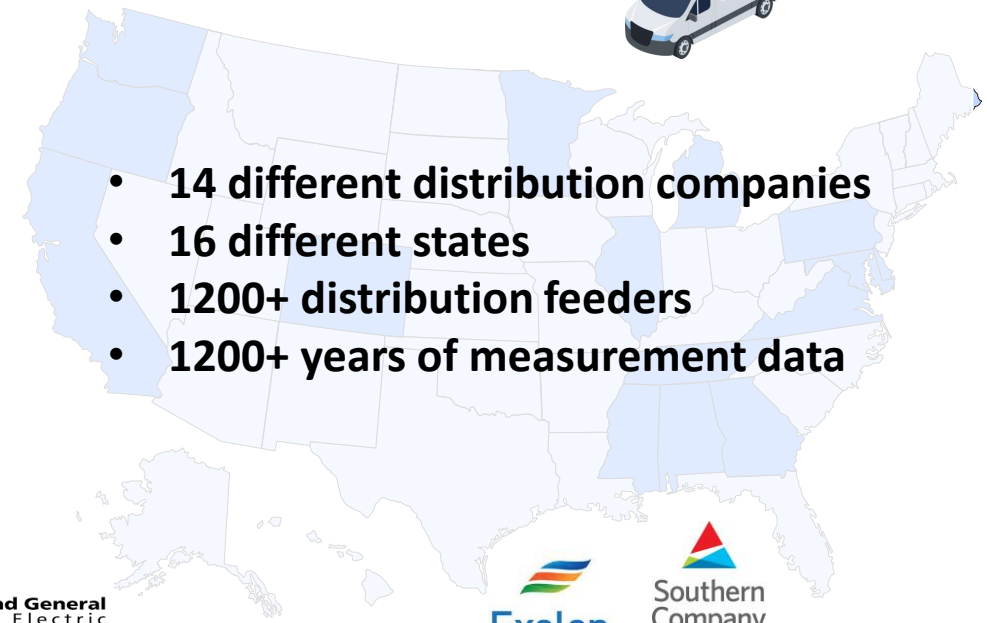
**Contact**
Jeremiah Deboever


**Objectives**: Supporting utilities in planning and preparing the grid for fleet electrification using advanced analytics and tools

**Approach**:

- Fleet Electrification Characterization
  - *Fleet Travel Patterns and Needs Assessment*
  - *Technology Maturity Assessment*
  - *Charging Strategies and Applications*

- Grid Planning for Fleet Electrification
  - *Assess system-wide grid electrification opportunity*
  - *Future fleet electrification assessment*
  - *Grid readiness and integration assessment*

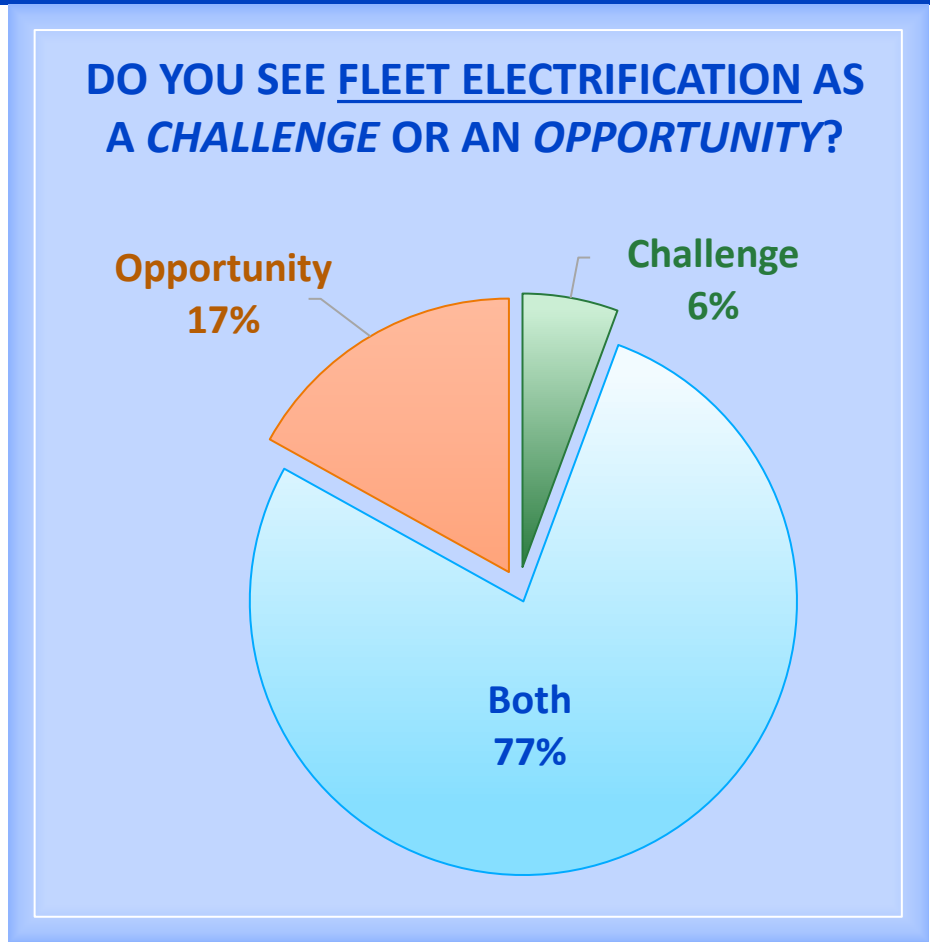


- **14 different distribution companies**
- **16 different states**
- **1200+ distribution feeders**
- **1200+ years of measurement data**

Portland General Electric · Exelon · Southern Company · Consumers Energy Count on Us · Seattle City Light · LA DWP · Xcel Energy · TVA · Dominion Energy

# Final Thoughts

- Fleet electrification will **impact the grid differently** compared to traditional load growth.
- **Utility planning practices** may need to evolve to consider this flexible demand.
- Grid capacity may be available during off-peak hours.




*Early customer / electric utility interaction will be paramount for an efficient and effective large-scale integration of electric vehicles.*

# Q & A / Discussion

Contacts

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