Fleet integration of previously owned electric vehicles

Analysis of utilization trends and consumer response

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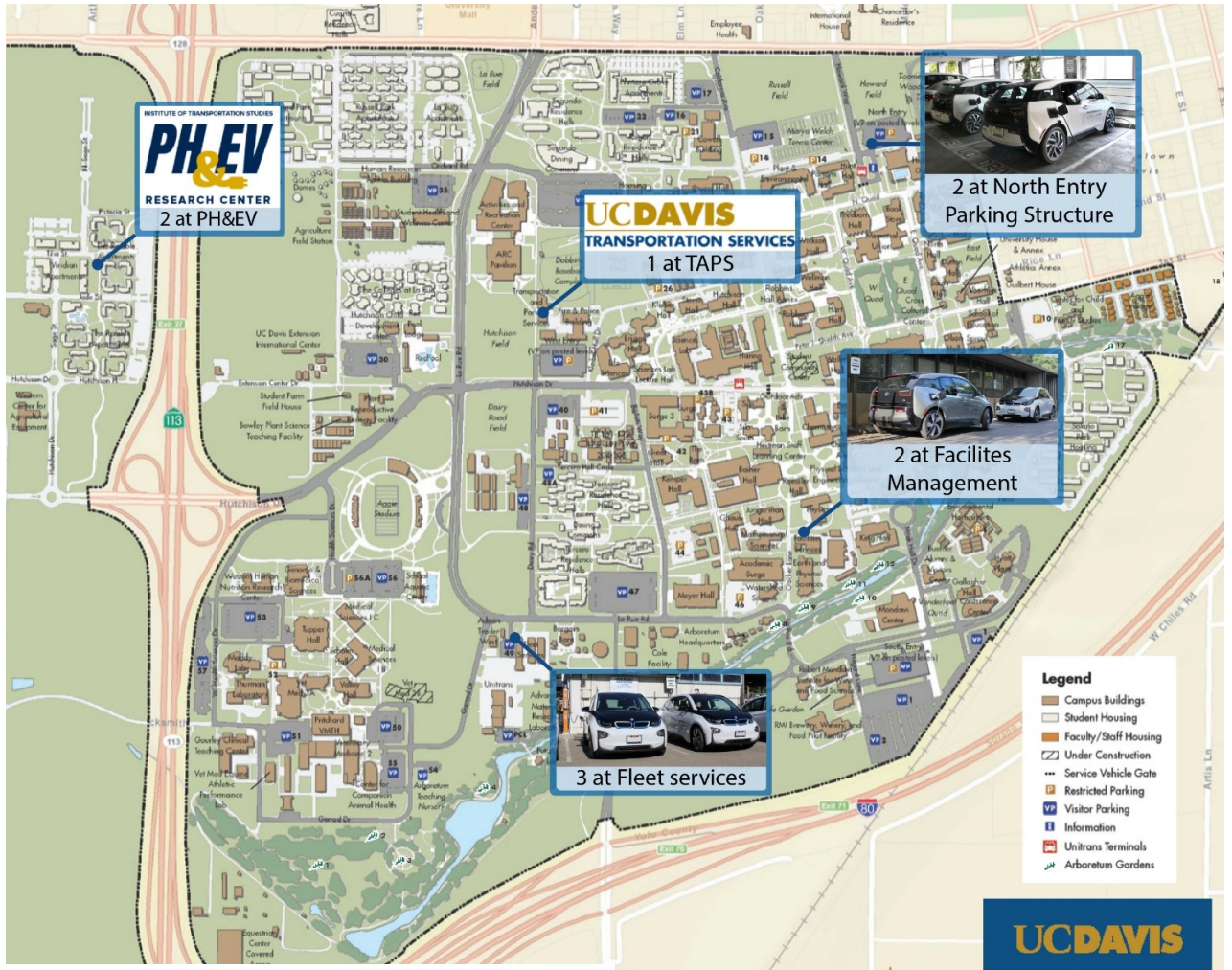
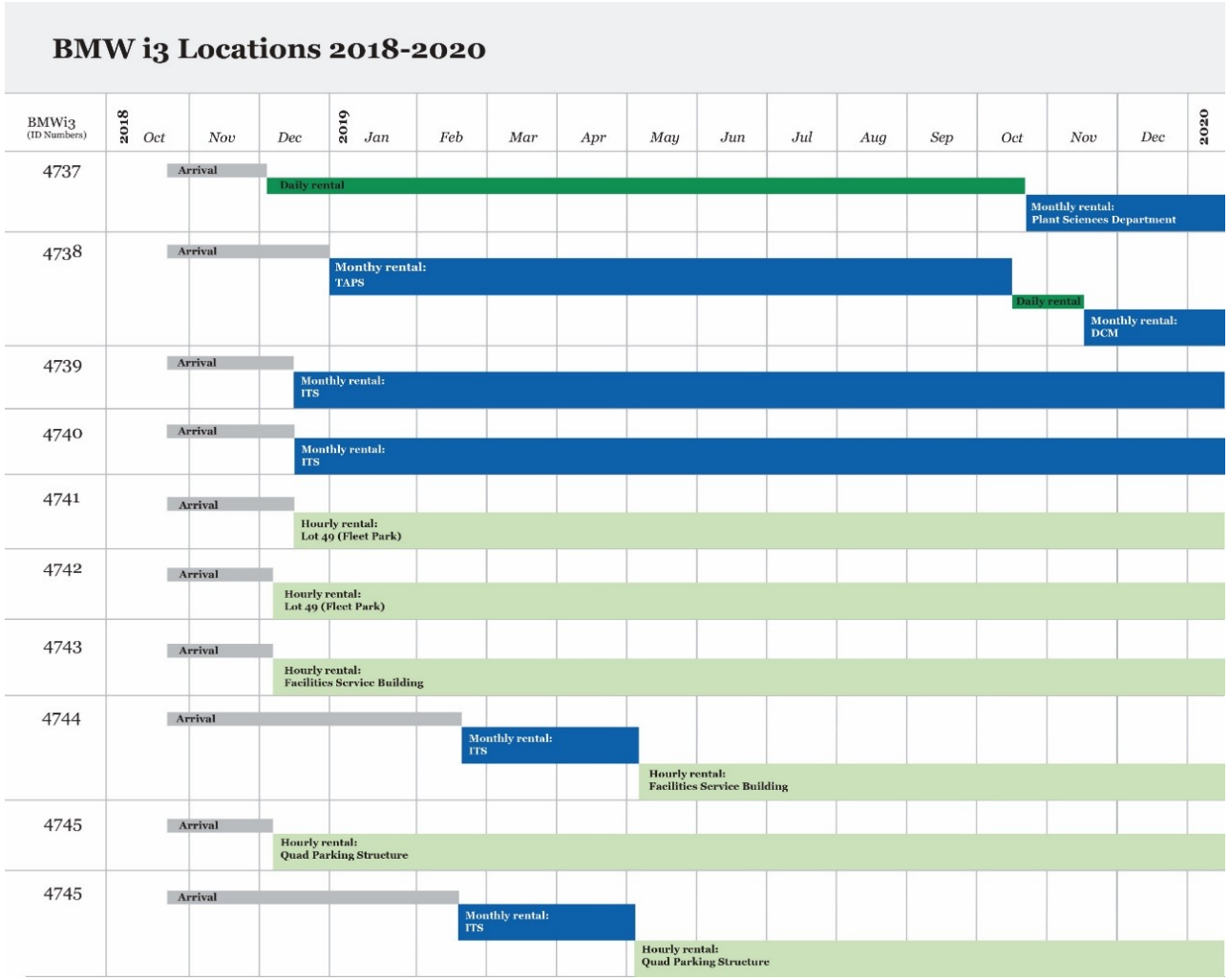
EVS35 OSL2022

Project Introduction

- **Project goal:** to understand the integration of used EVs into CA state fleets, and potential challenges
- **Project motivation:** Senate bill 498 (2017) requires that CA state operated fleets are rapidly electrified
- 10 vehicles integrated into fleet between Dec. 2018 – May 2019, reassigned as needed
- Each vehicle has charging available at its “home base”
- Job assignment changed as needed, but all were in service through March 2020.



Project Introduction: Vehicle Distribution



- BMW i3 EVs distributed based on the deployment of charging infrastructure and departmental need.
- 3 main fleet applications:
  - UC Drive (Hourly rentals – light green)
  - Daily Rentals – dark green
  - Departmental assignments (Monthly rentals - blue)
- <u>Same rental fees</u> in all applications
- Dedicated charger for all UC Drive BMW i3 EVs

BMW i3 EV Utilization

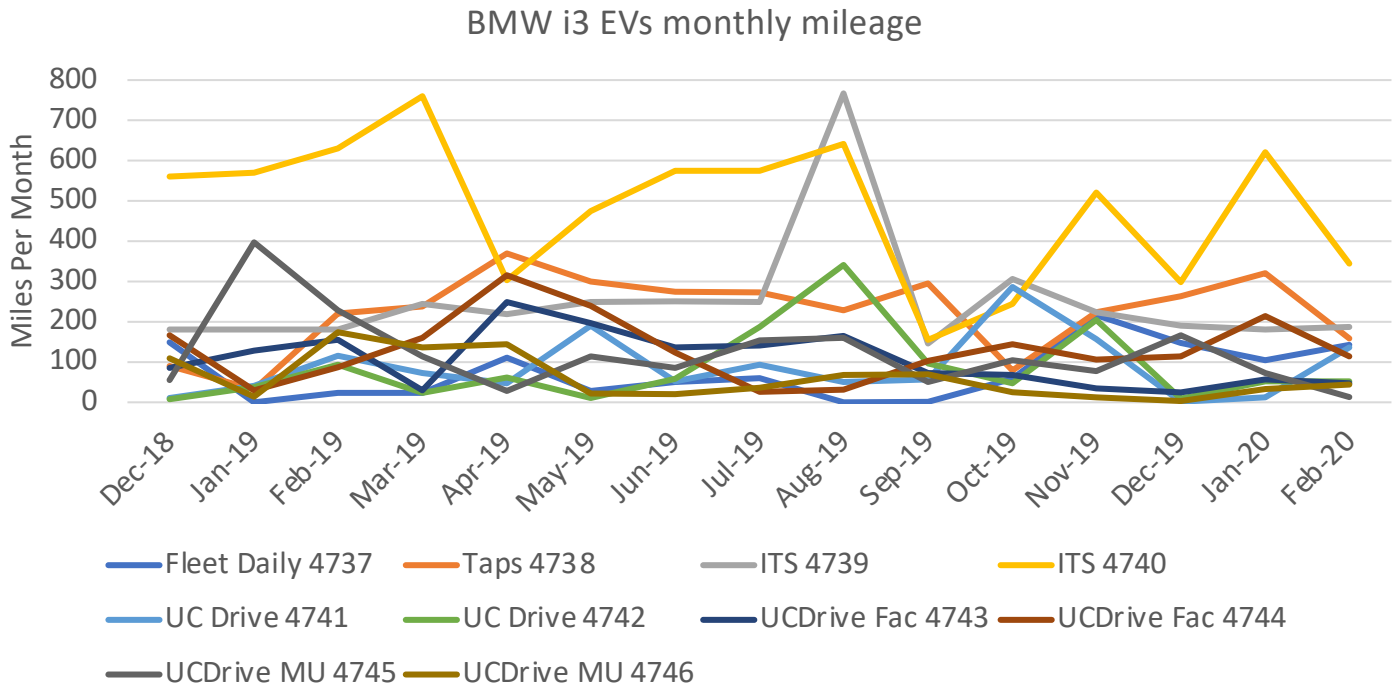
Monthly Average Travel	mi	km
Avg. departmental assigned mileage (monthly rentals)	320	515
Avg. daily rental mileage	51	82
Avg. UC Drive mileage (hourly rentals)	99	159

Key Takeaways

- Vehicle utilization depended heavily on finding the 'right' application. Hourly rentals and department assigned vehicles saw the most rentals and miles driven.
- Daily rental vehicles saw lower utilization rates, indicating this was not an ideal application for an 80-mile range EV.
- BMW i3 EVs drove over 18,000 miles

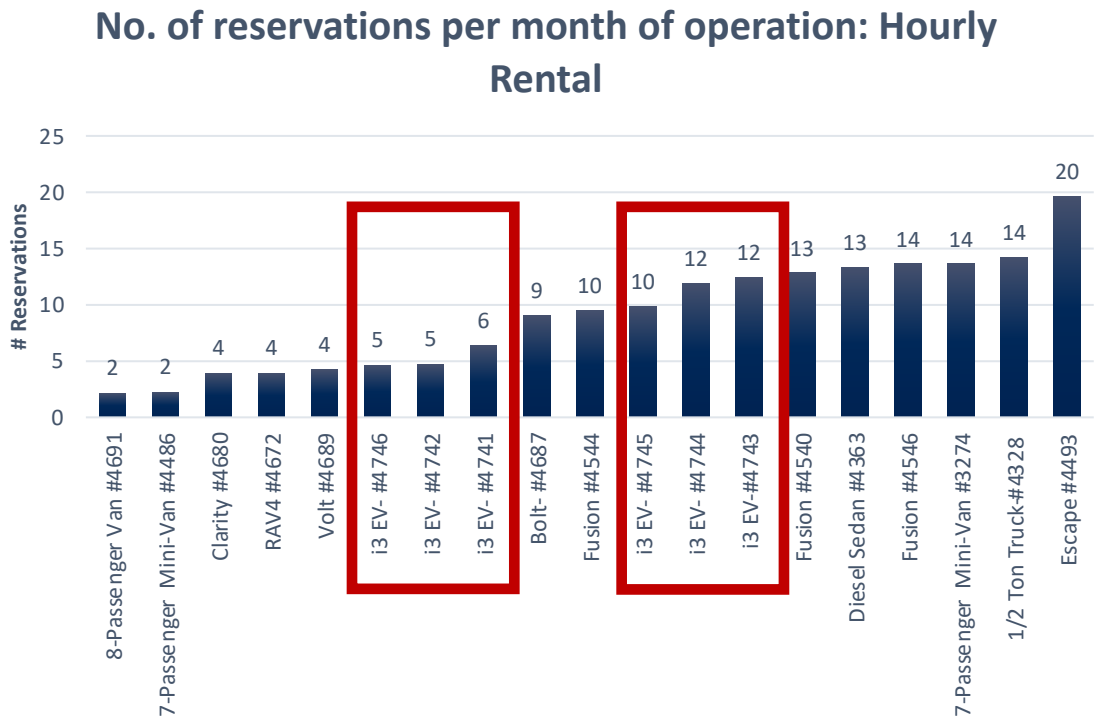
BMW i3 EV Utilization

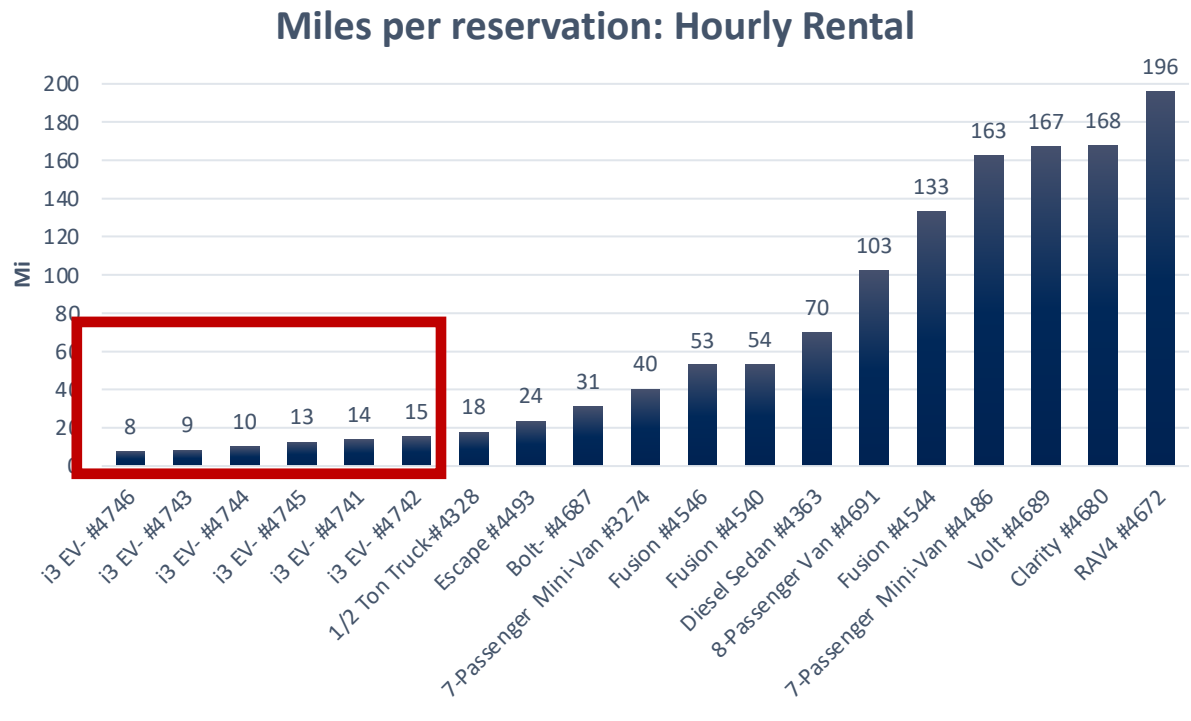
- Vehicle utilization varied with campus schedules, with noticeable decreases in use during March, Jun. and Dec.
- Daily rental vehicles were reassigned to departments as soon as possible after low use.



- The six BMW i3 EVs assigned to UC Drive (hourly rental) were regularly used with the total vehicle miles traveled accumulating to 6,474 mi. There were a total of 212 unique UC Drive users and approximately 550 reservations between Jan. 2019 and Feb. 2020.

BMW i3 EVs and others in UC Drive





Key Takeaways:

- Similar number of reservations, but significant difference in average trip distance
- Matching trip purpose to vehicle type is important to minimizing gas miles.

Driver/User Surveys

Survey Topics:

- Rental purpose and destination
- Satisfaction with the vehicle rented
- Private purchase experience and consideration
- Sociodemographic information

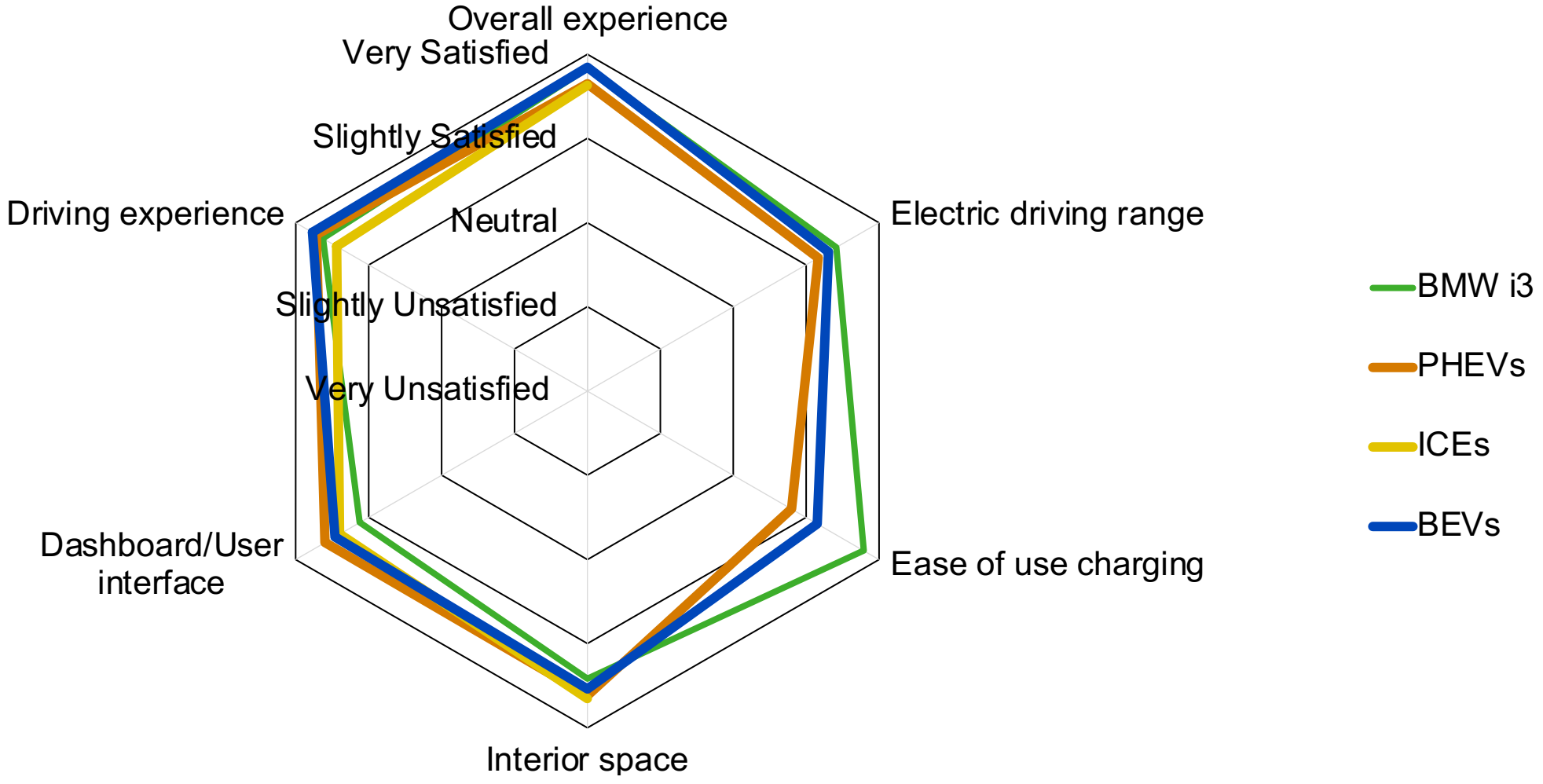
Survey Sample:

- 242 respondents
- 24 unique renters of BMW i3 EVs

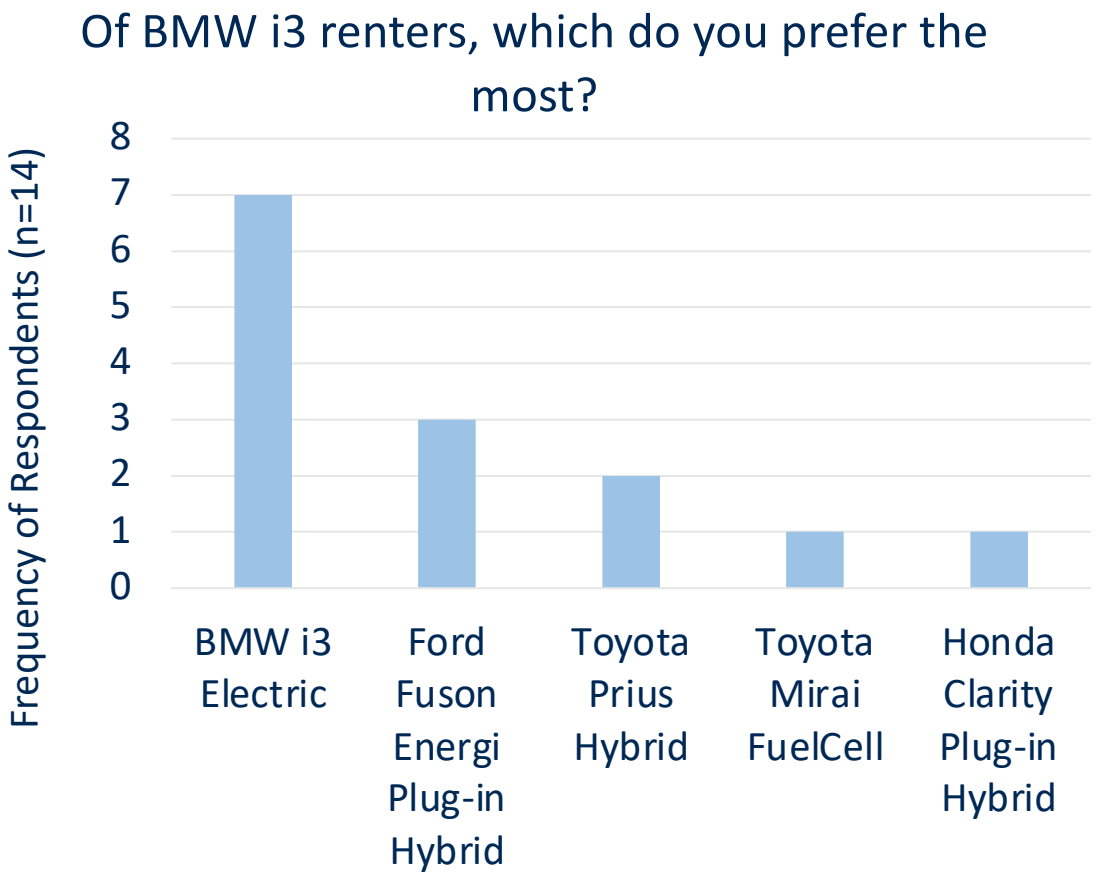
Vehicle Type	Number of renters in sample
Full-size van ICE	57
Chevrolet Volt Plug-in Hybrid	30
Gasoline Sedan	27
BMW i3 Electric	24
Pick-up Truck ICE	17
'Other' vehicle*	16
Minivan ICE	16
Honda Clarity Plug-in Hybrid	15
Chevrolet Bolt Electric	12
Gasoline SUV	11
Ford Fusion Energi Plug-in Hybrid	9
Toyota Prius Plug-in Hybrid	7
Mitsubishi i-MiEV ES Electric	1

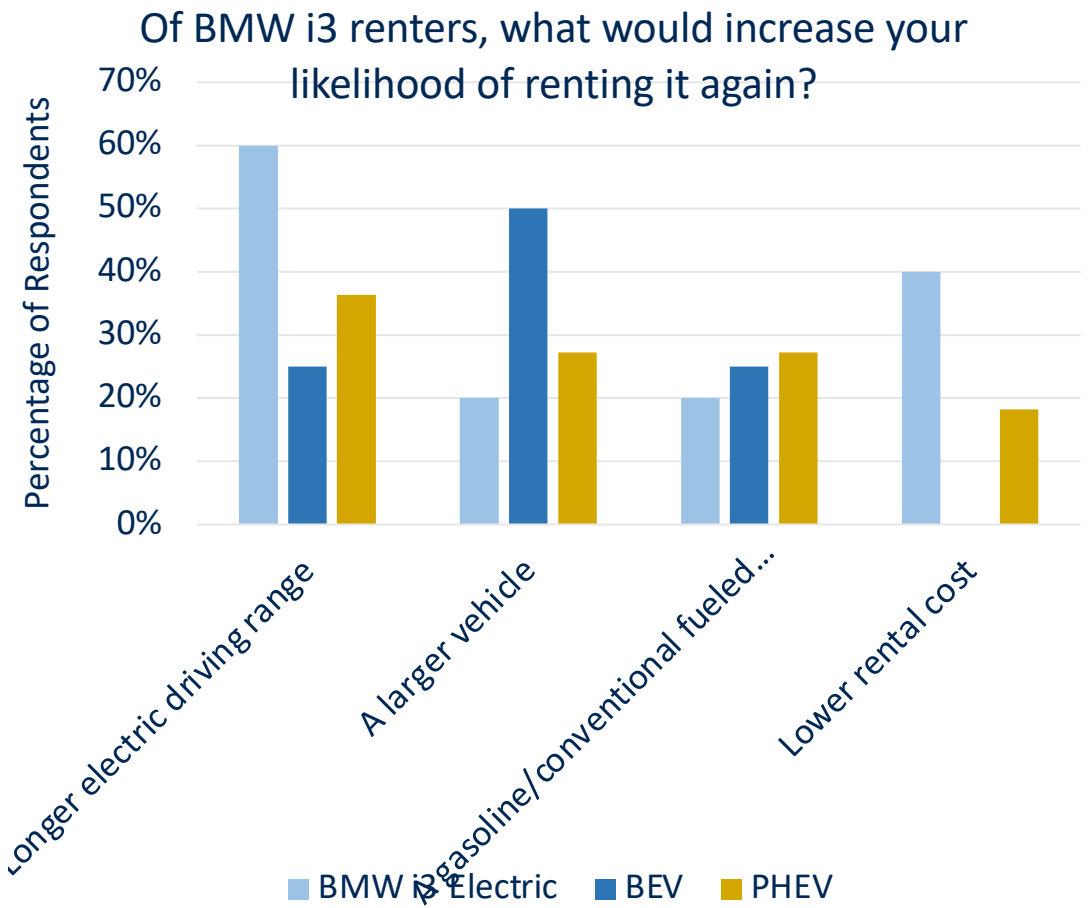
*Other vehicles includes vehicles those that responded did no know the make and model of, could not remember, or vehicle was not listed (e.g. Honda Civic Hybrid, Toyota Rav4, Van, SUV)

Satisfaction with vehicle rented

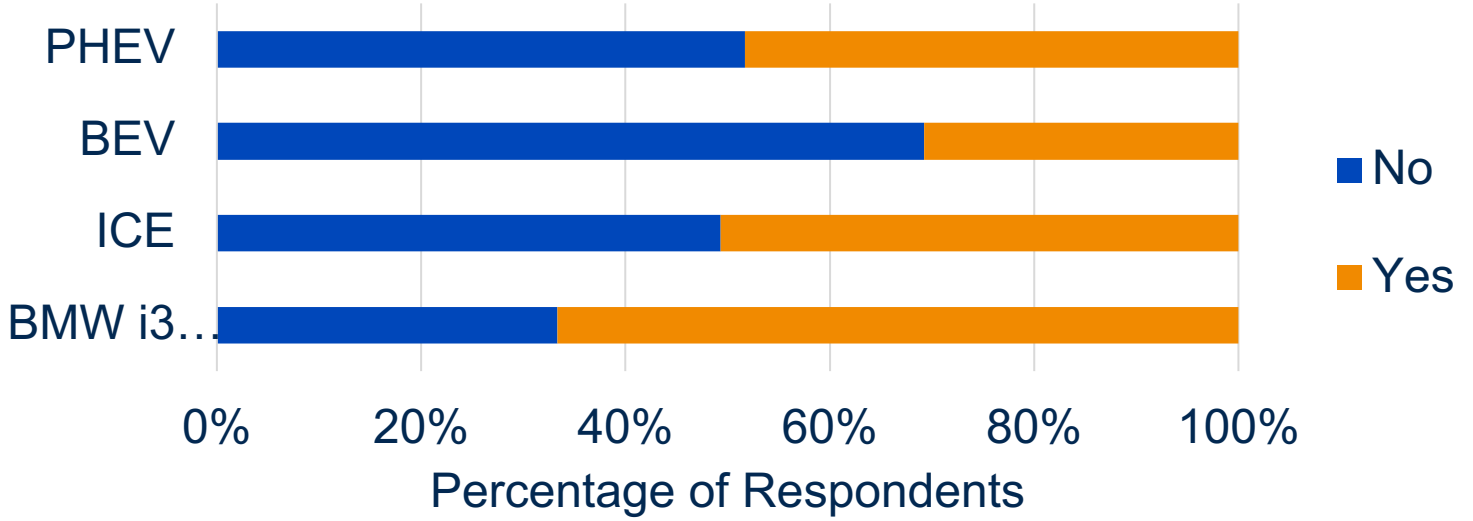


The BMW i3 was the preferred vehicle for renters, though 60% want more range

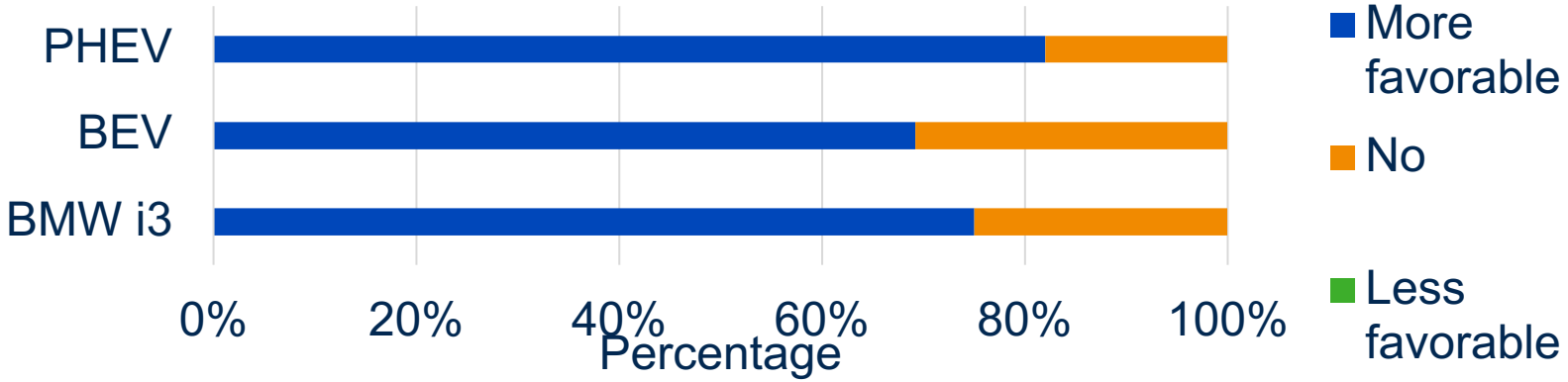




Prior Experiences with BEVs



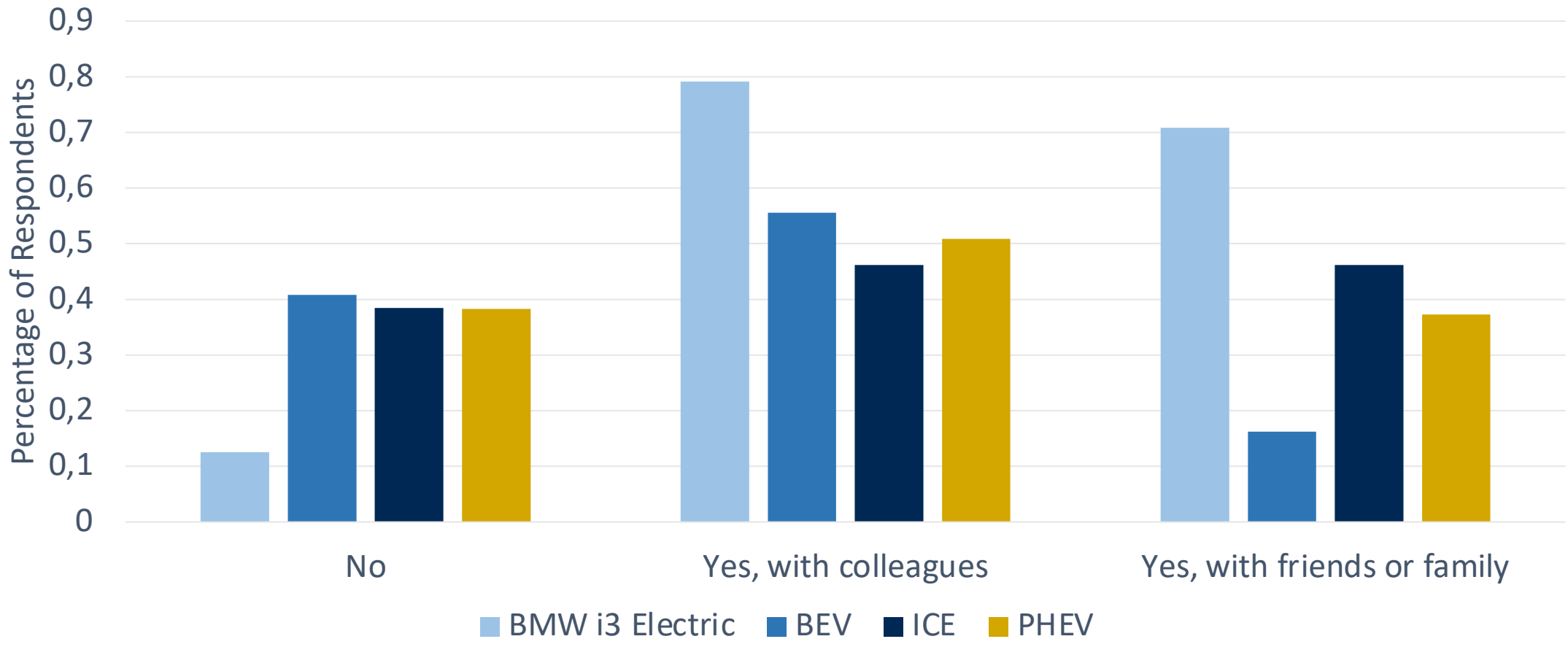
Change in preferences towards BEVs



Key Takeaways:

- Fleet rental offered an opportunity to many who had no prior experience with BEVs
- Fleet experience had either no impact or improved impression of BEVs

Did you discuss your rental with others?



Driver/User Survey Summary

Key Takeaways:

- Experience with i3 EV rentals is generally positive
- Respondents indicate longer range could increase likelihood to rent again
- The i3 EV was the most preferred vehicle (no one preferred a gas car)
- More i3 EV users have previous experience with a BEV (those with preexisting experience may be more willing to use the vehicles)
- Many discussed the rental with friends, family, and colleagues. The rental improved preferences toward BEVs and may promote word-of-mouth effects

Project Findings

- In the UC Davis application, vehicles were well-used and positively reviewed – possibly because they were luxury vehicles.
- Used EVs, even with lower range than new EVs, can be used effectively if their integration is well-planned and executed.
- Vehicles need to be matched to the right use applications. Driver experience likely will lead to more utilization.
- Infrastructure installment is costly and time consuming; once installed, time and effort to charge does not seem to be an issue.
- Fleet purchase decisions are driven primarily by compatibility of use, maintenance costs, and fleet-wide standardization, rather than TCO
- TCO analysis of the used i3 EVs in the UC Drive hourly rental application show that they are a good value for fleets; maintenance costs over the long term is a big unknown.
- Adopting used EVs into fleets requires fleet managers to make two major operational changes:
    - First – to buy an electric vehicle, an unfamiliar or unproven technology
    - Second – to buy a used vehicle, an unfamiliar purchase process

Thank you!

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