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# DC Fast Charging in the Context of Bigger Batteries

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# DC Fast Charging in the Context of Bigger Batteries

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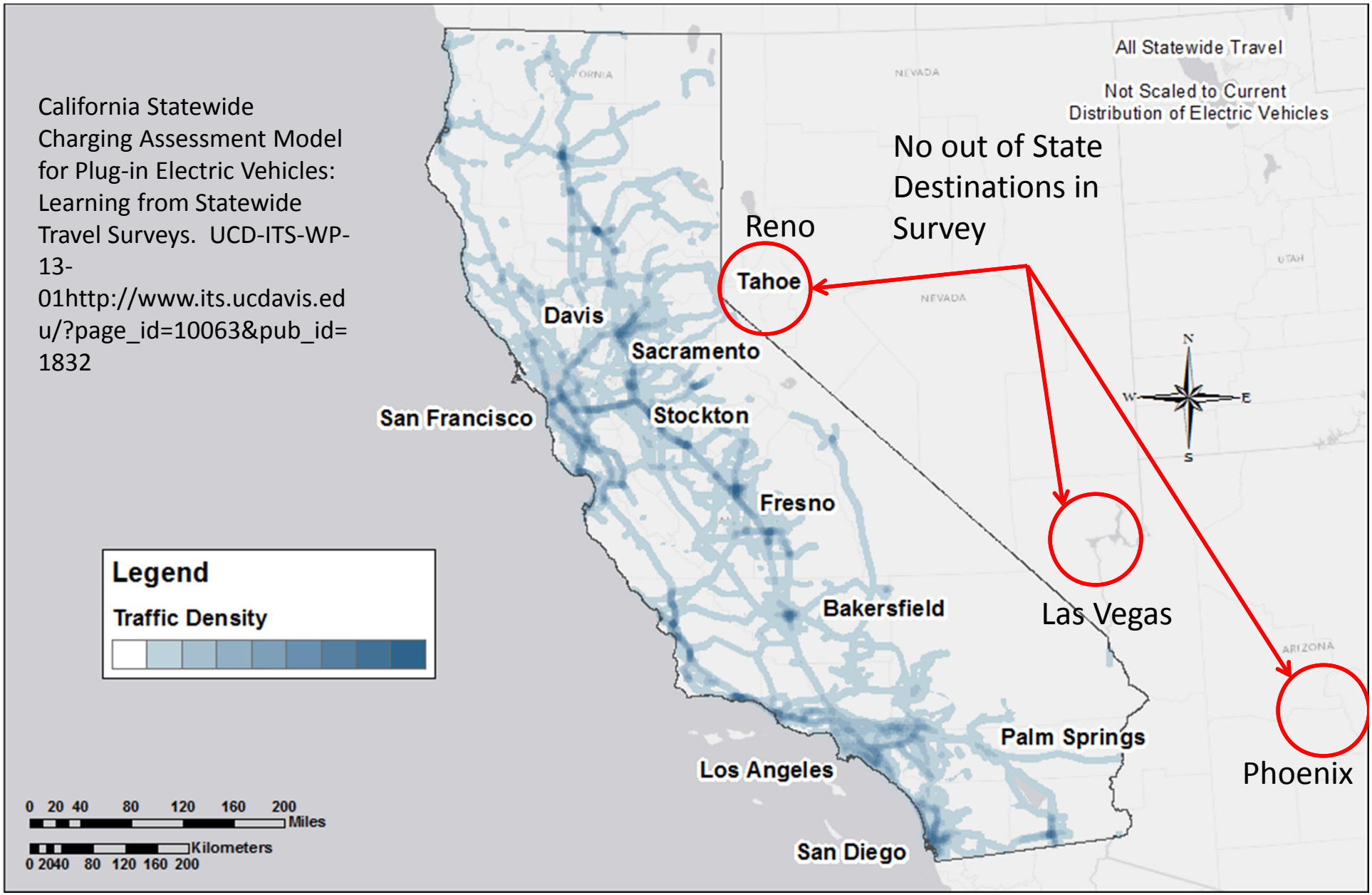
# More Questions than Answers

- Questions
  - Will larger batteries obviate the need for massive numbers of fast chargers?
  - Will fast chargers' main role be to sell cars?
  - Will larger batteries enable fast charging to replace home charging? Will the paradigm be "centralized refueling" such as in the gasoline context?
  - How many fast chargers will you need in a priced vs free scenario?
  - How much long-distance induced demand is there from free?
  - How does the spatial layout of infrastructure change with increasing battery size?

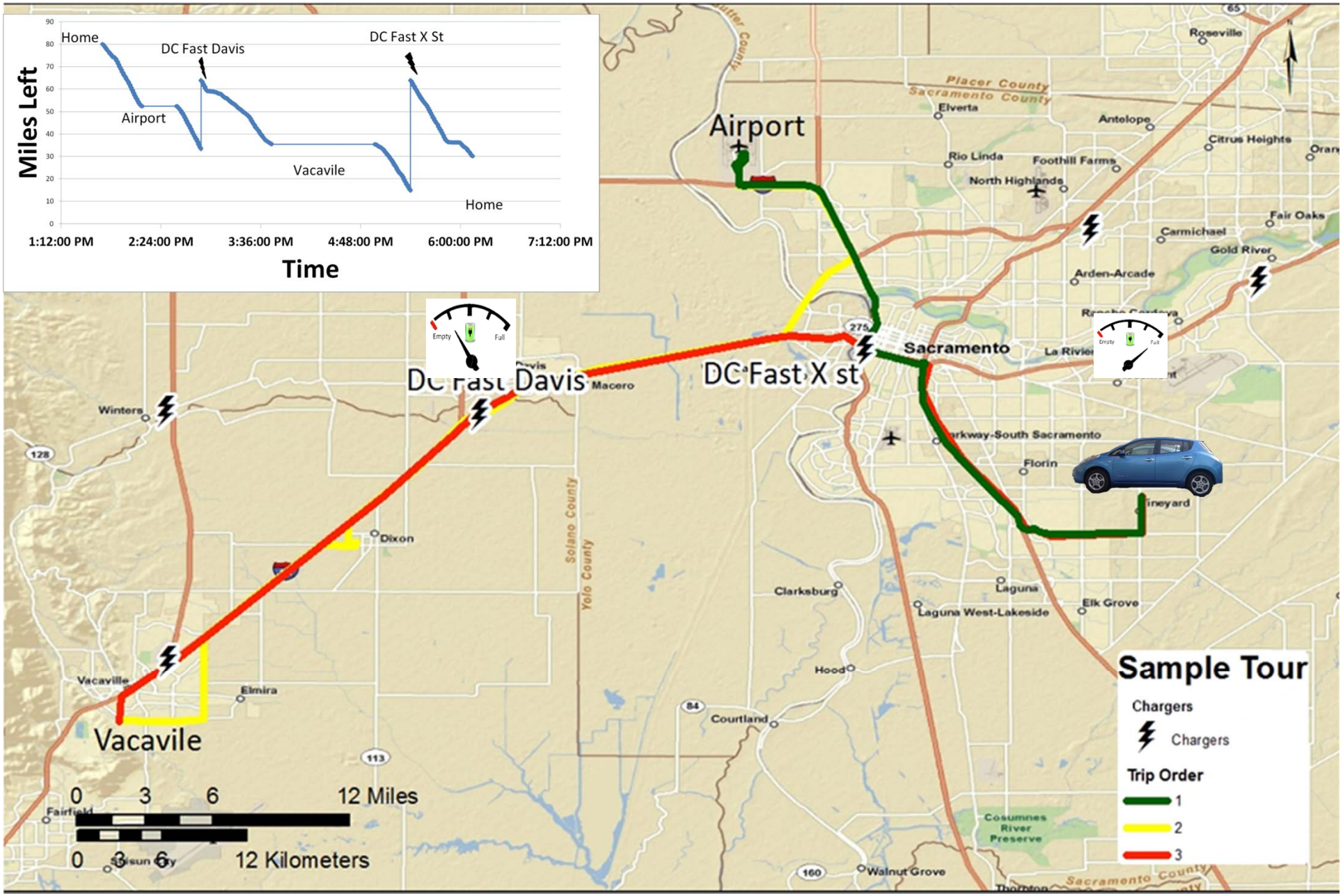
# More Questions than Answers

- Answers
  - Modeling shows that 98% of miles in the State of California can be accomplished in a BEV 300 with home charging + some other L2 (20 miles reserve). Possible undercount based on state only survey data.
  - Charging location is mostly restricted to long distance corridors
  - Two fast charge events can cover the entire state in a BEV 300

# Modeling - Our Data Set: Caltrans Travel Survey 2001. 31,898 Persons. Can Gasoline Travel be Done in an EV?



# 130 Mile Tour



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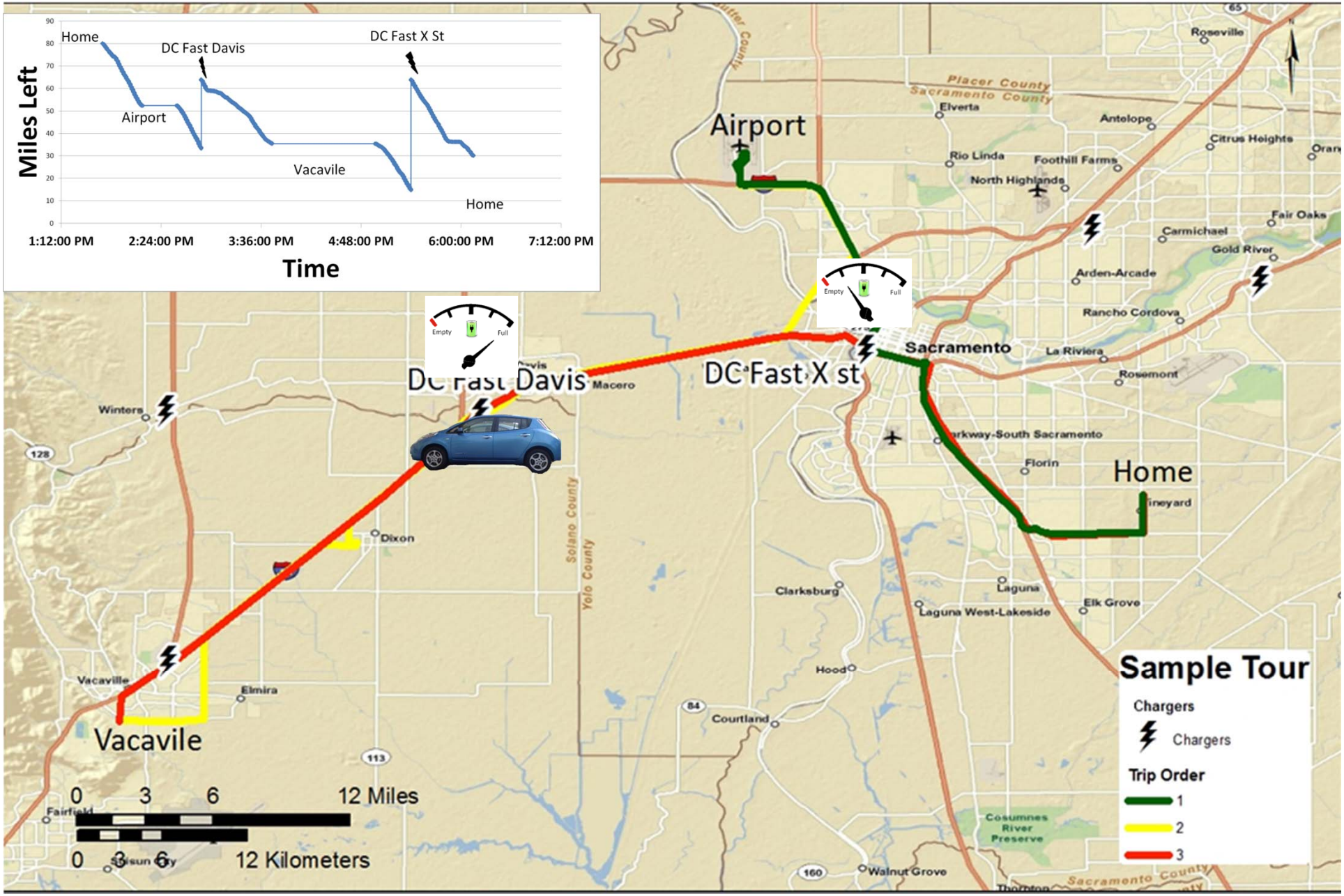

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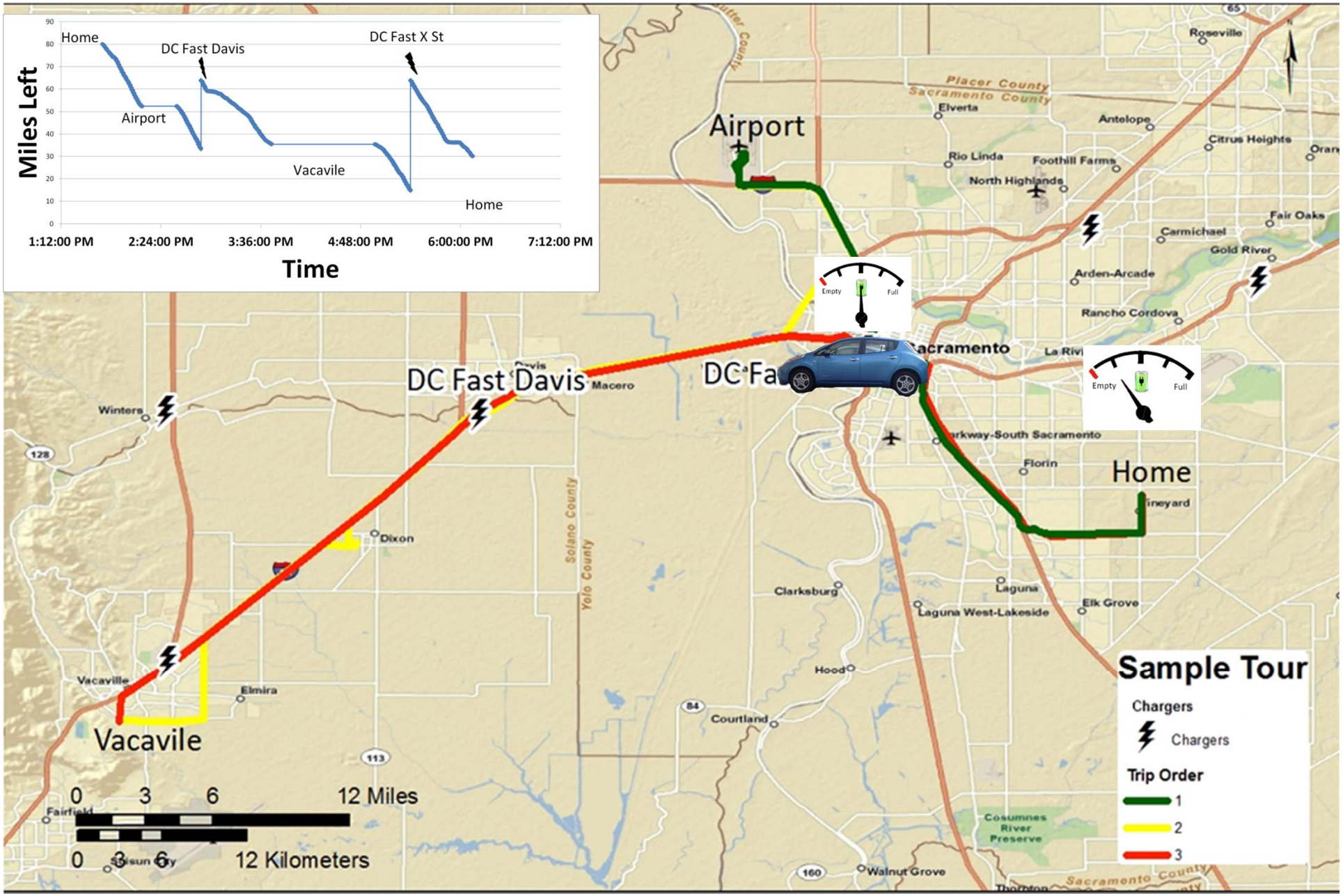
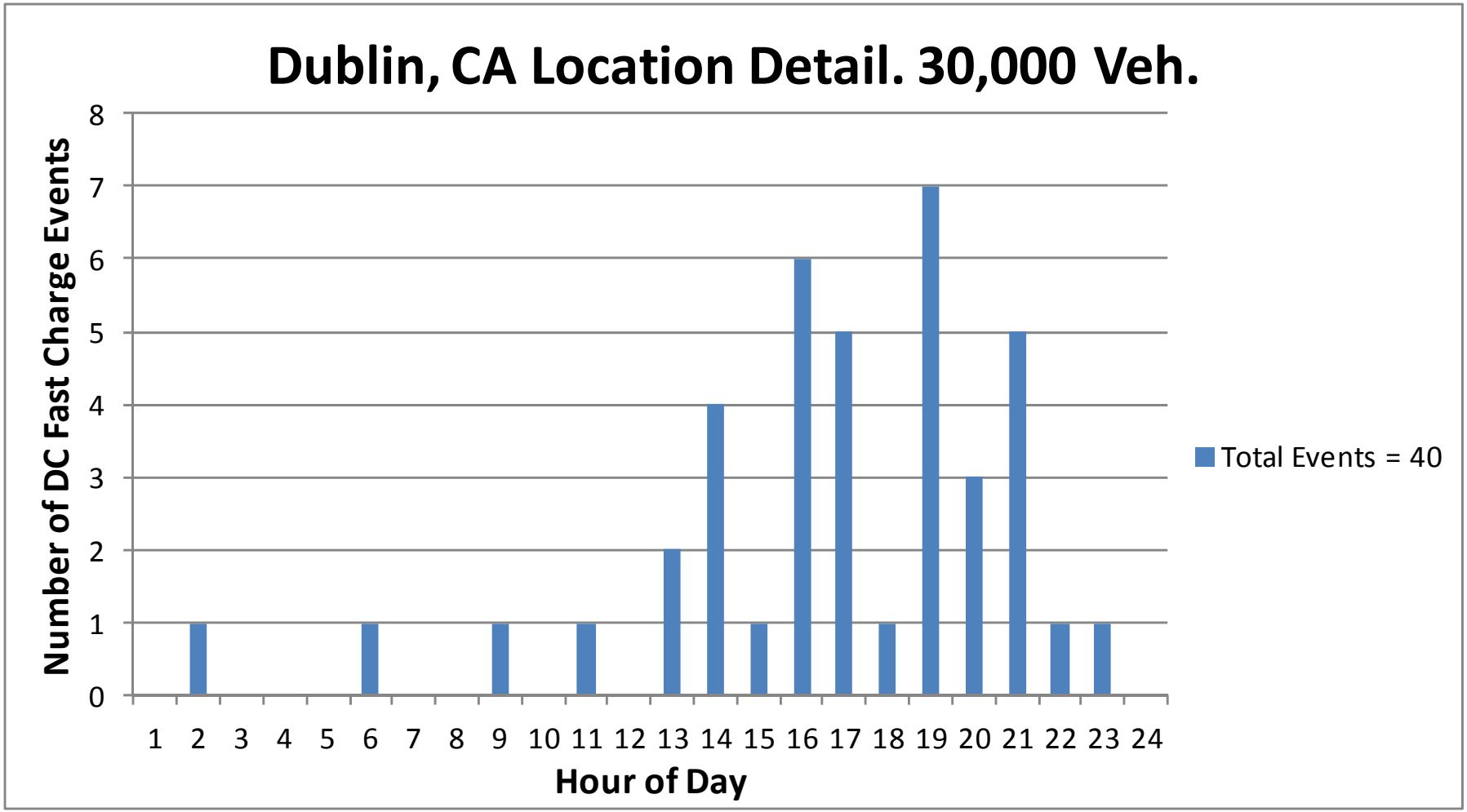
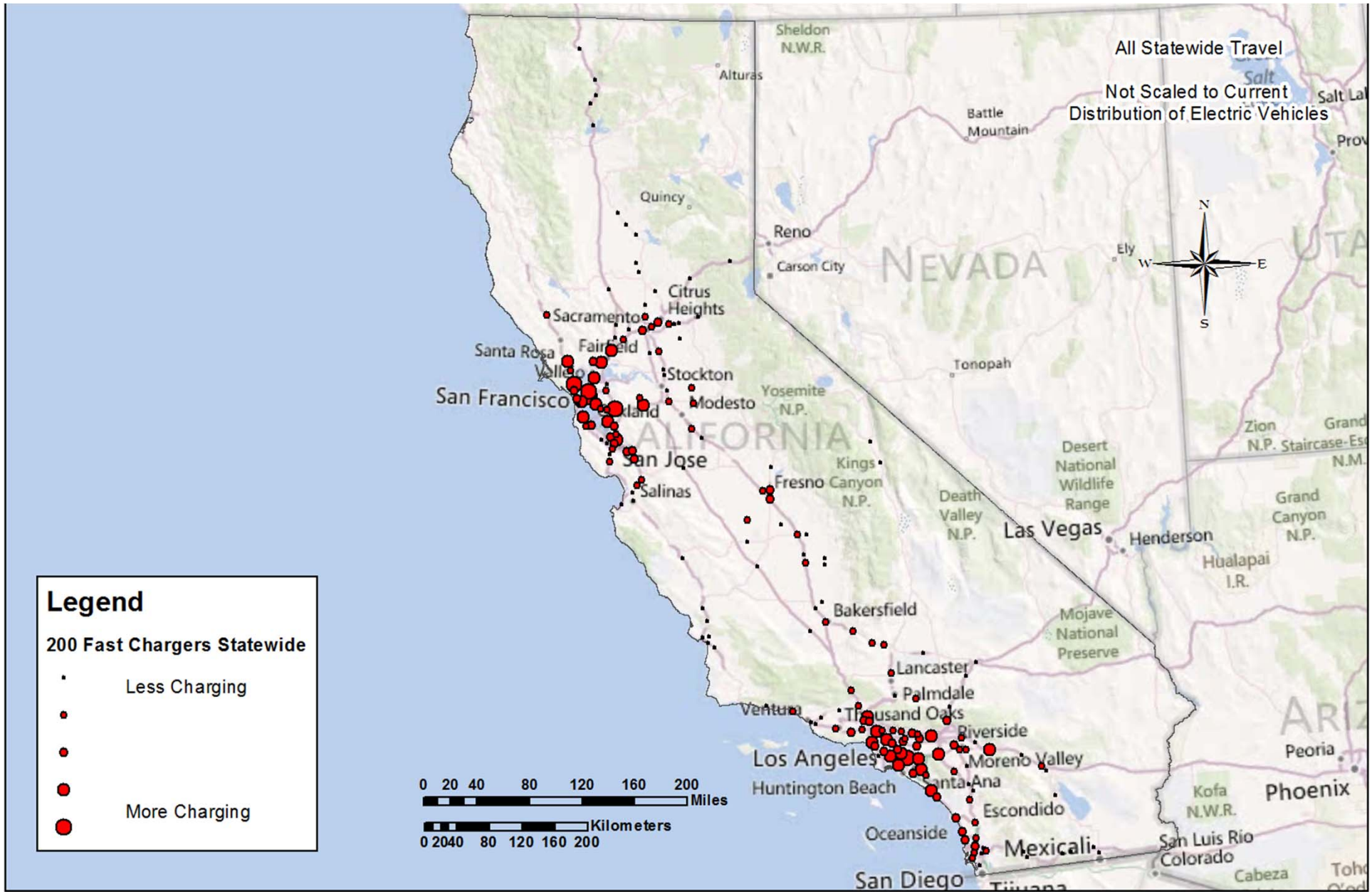


# Multiple Fast Chargers in Approx. Same Location to Deal With Peak Demand




Nicholas, Michael, Gil Tal, and Justin Woodjack. 2013, January. California Statewide Charging Assessment Model for Plug-in Electric Vehciles: Learning from Statewide Travel SurveysDavis, CA: University of California, Davis. Institute of Transportation Studies, UCD-ITS-WP-13-01.

# Completed Work. BEV80 State Demand Distribution: 200 Initial Locations (246 Chargers @30,000 BEV)



# What Return do we Get for Infrastructure Investment? (VMT/GHG)

- Home Charging VMT
  - 60 Mile Veh. = 59%
  - 80 Mile Veh. = 71%
  - 100 Mile Veh. = 79%

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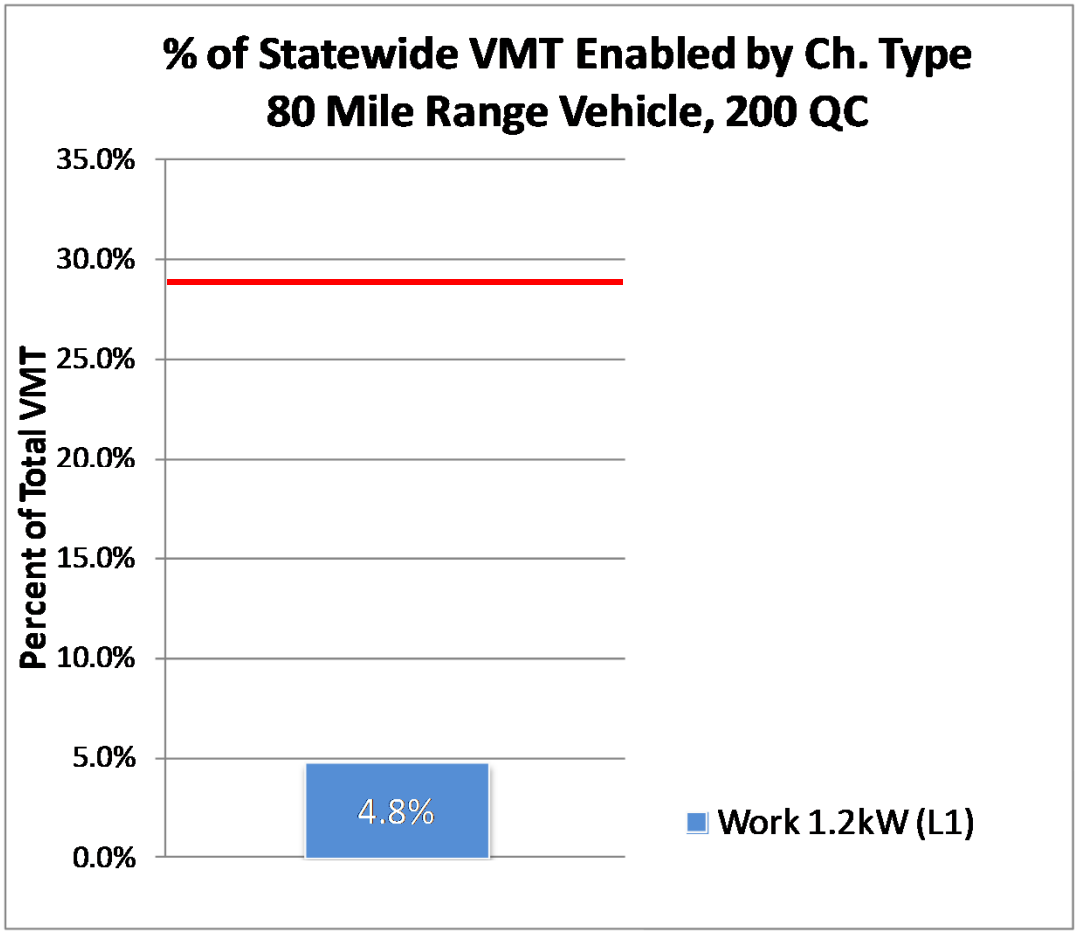

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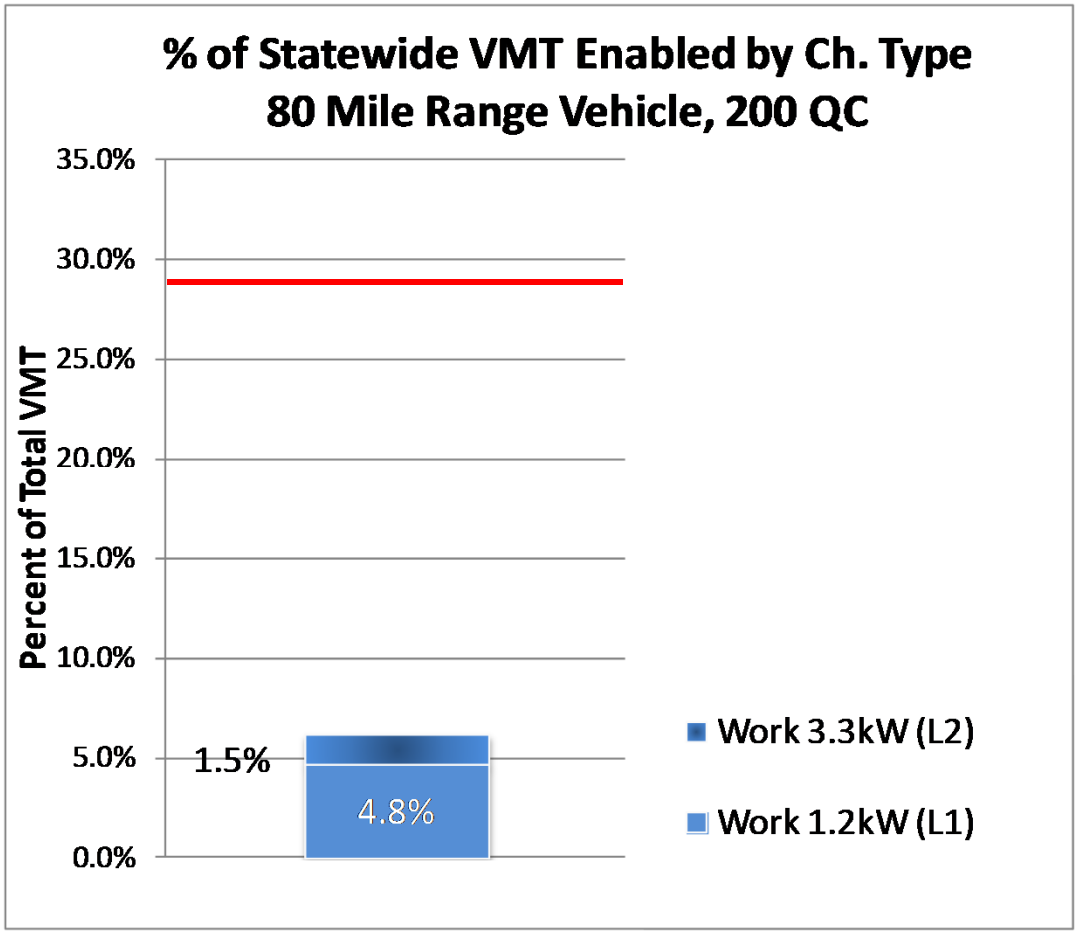

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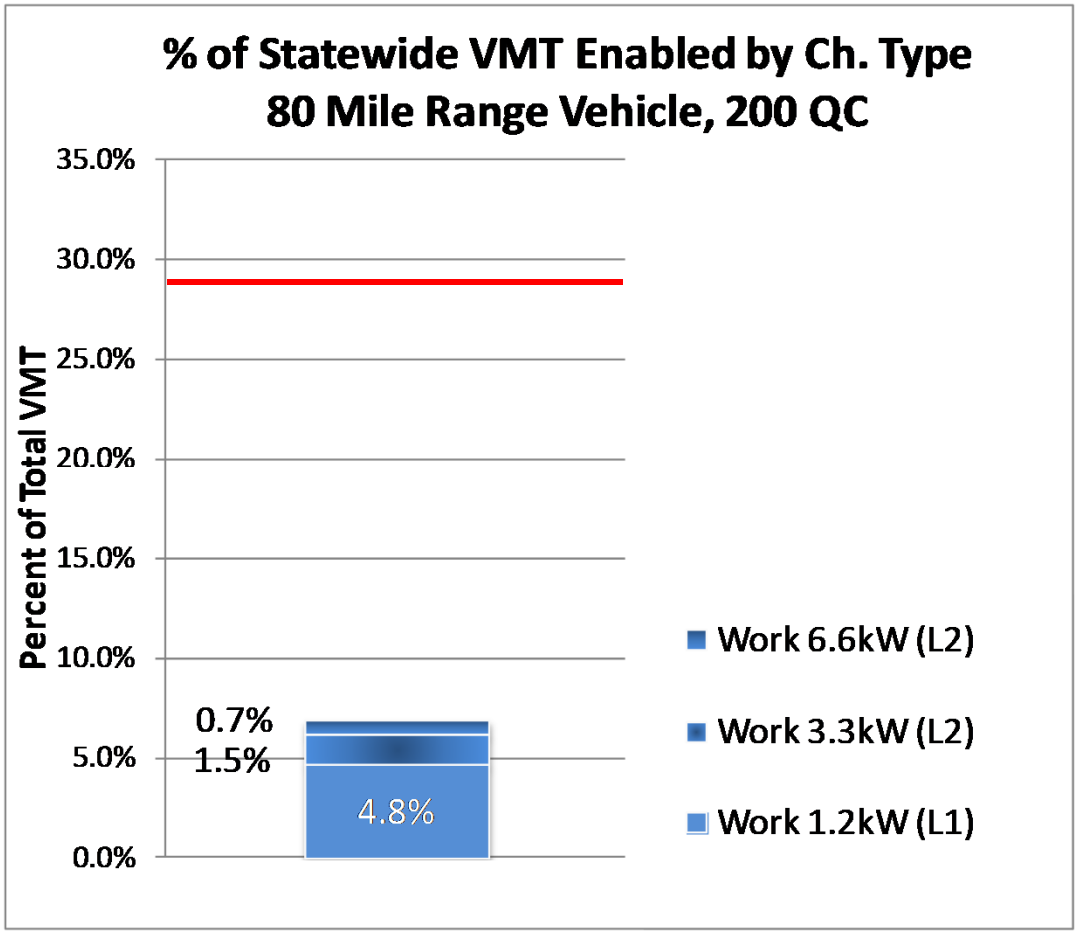

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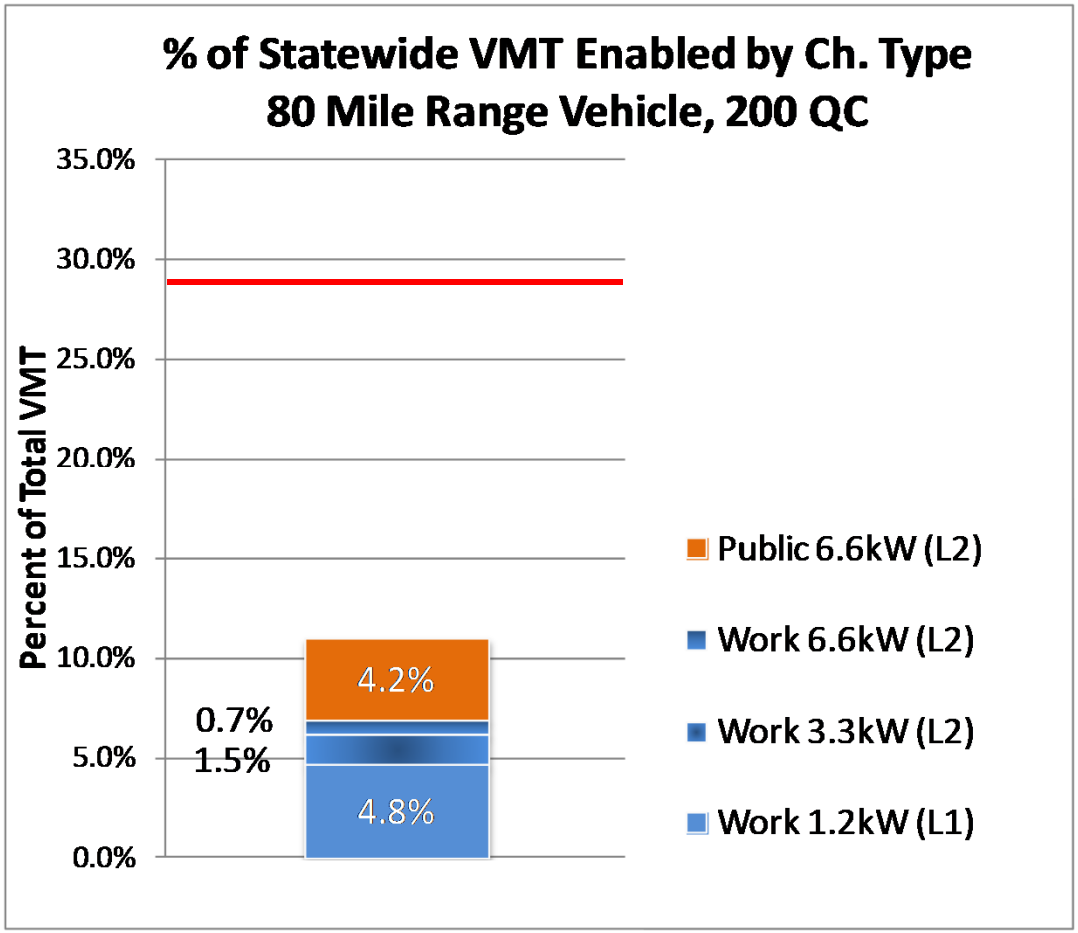

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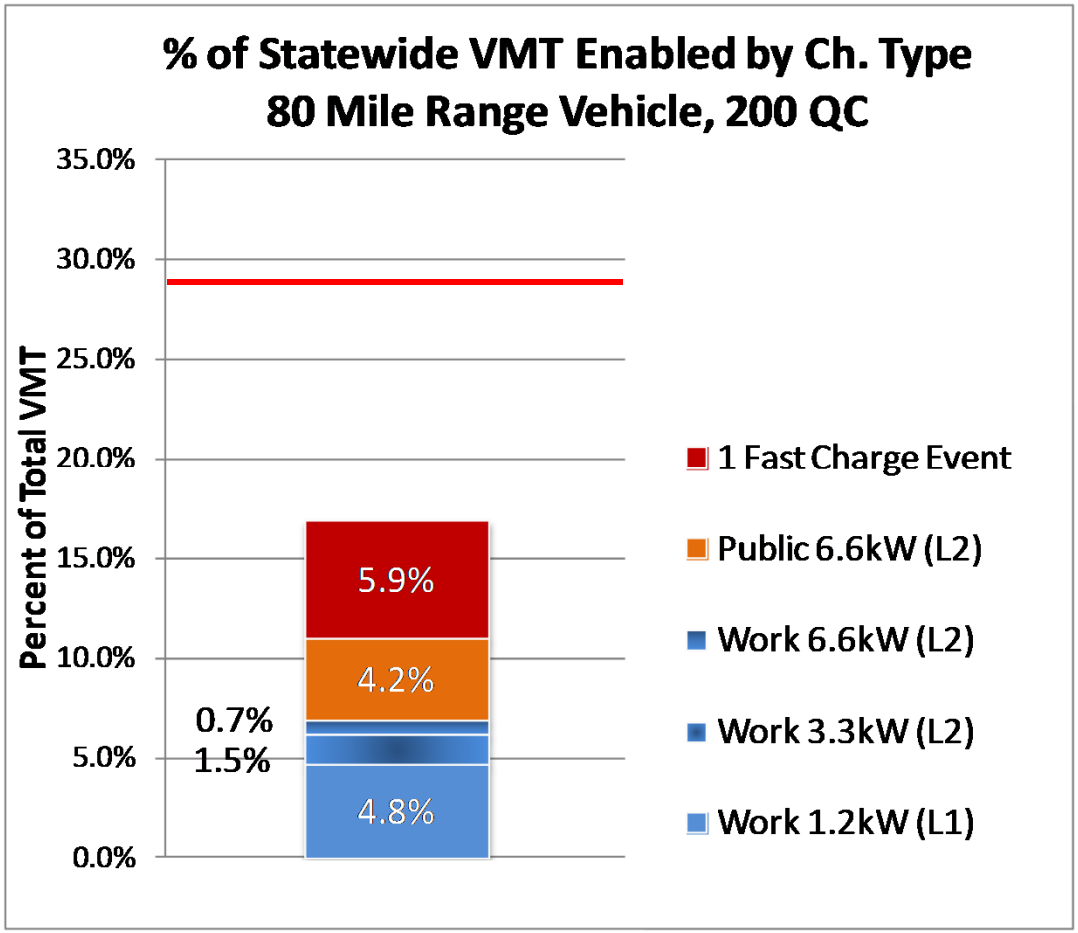

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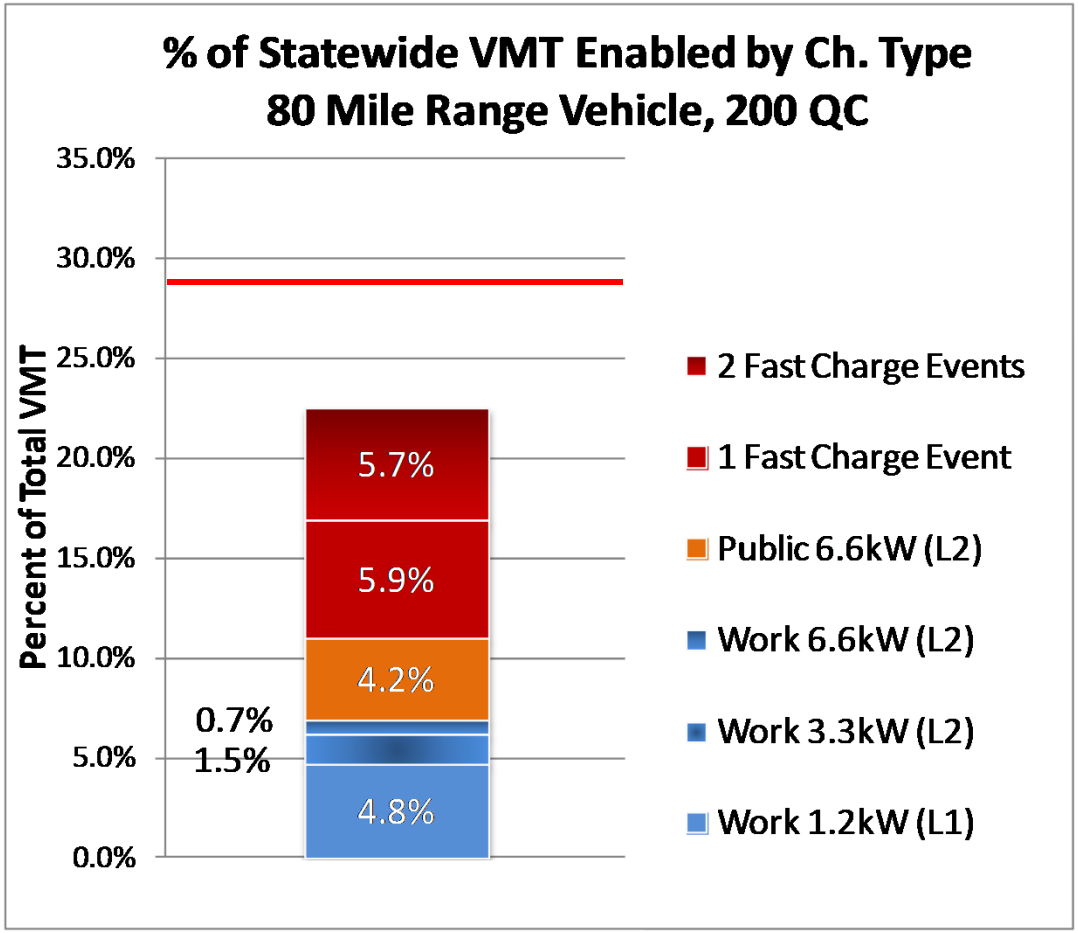

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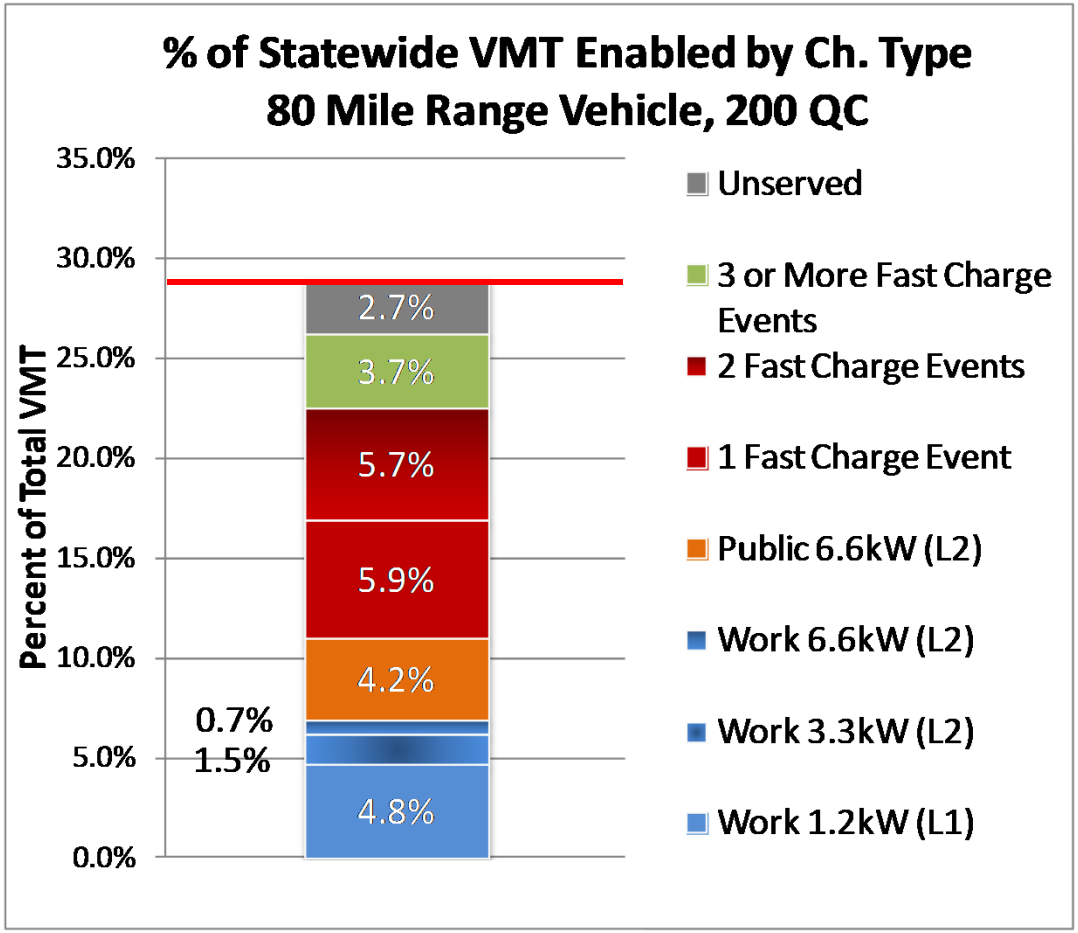
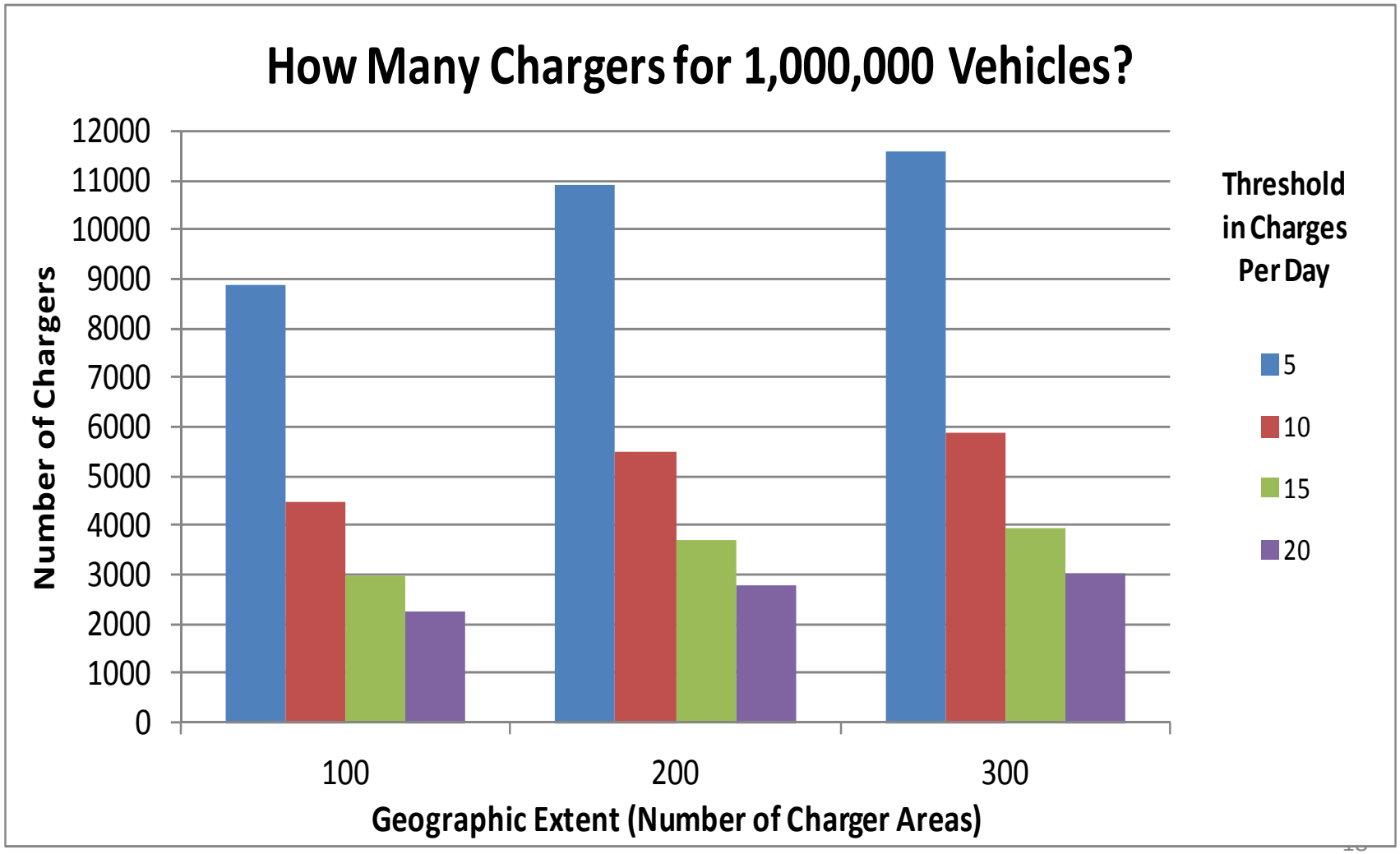
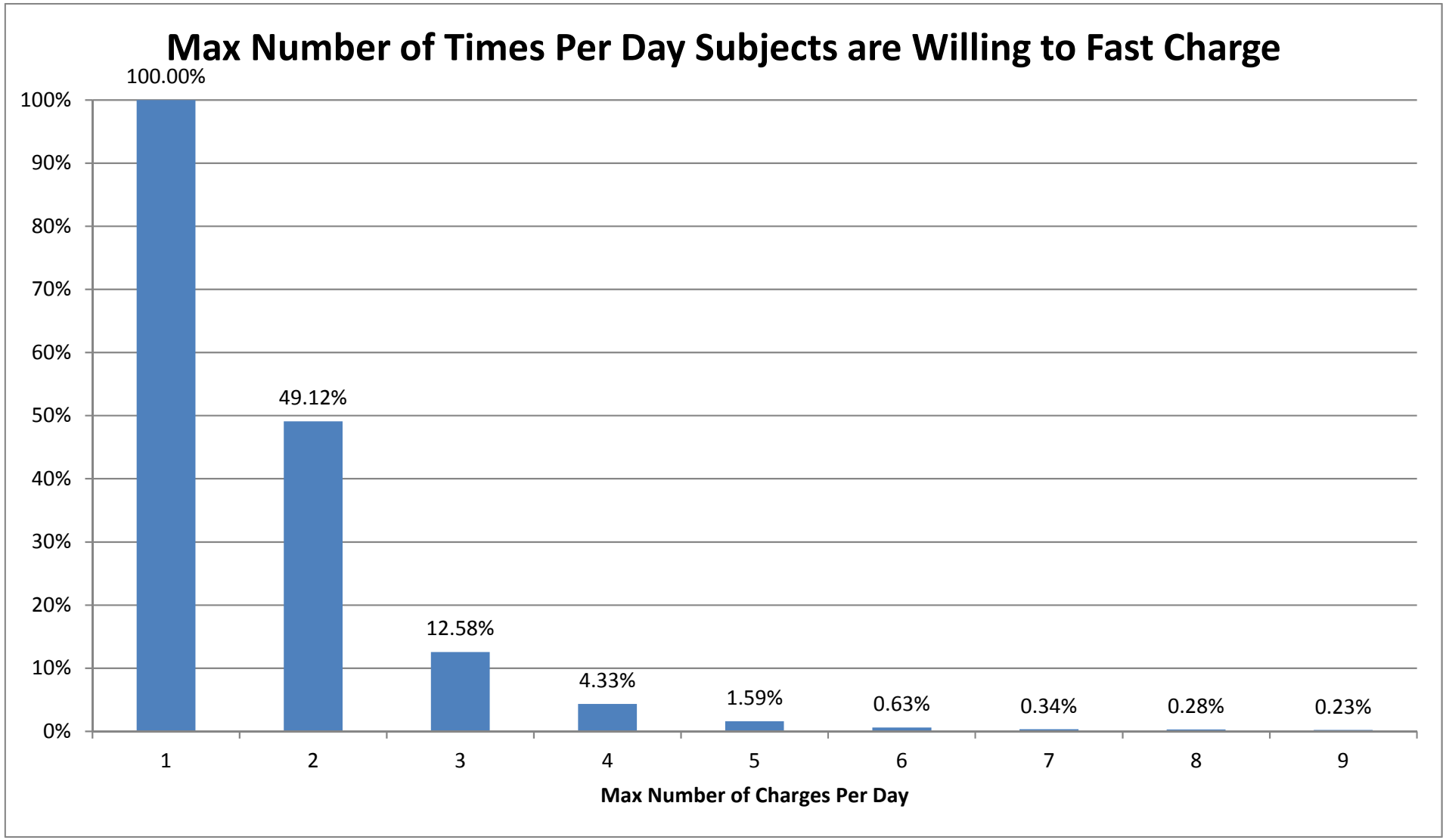


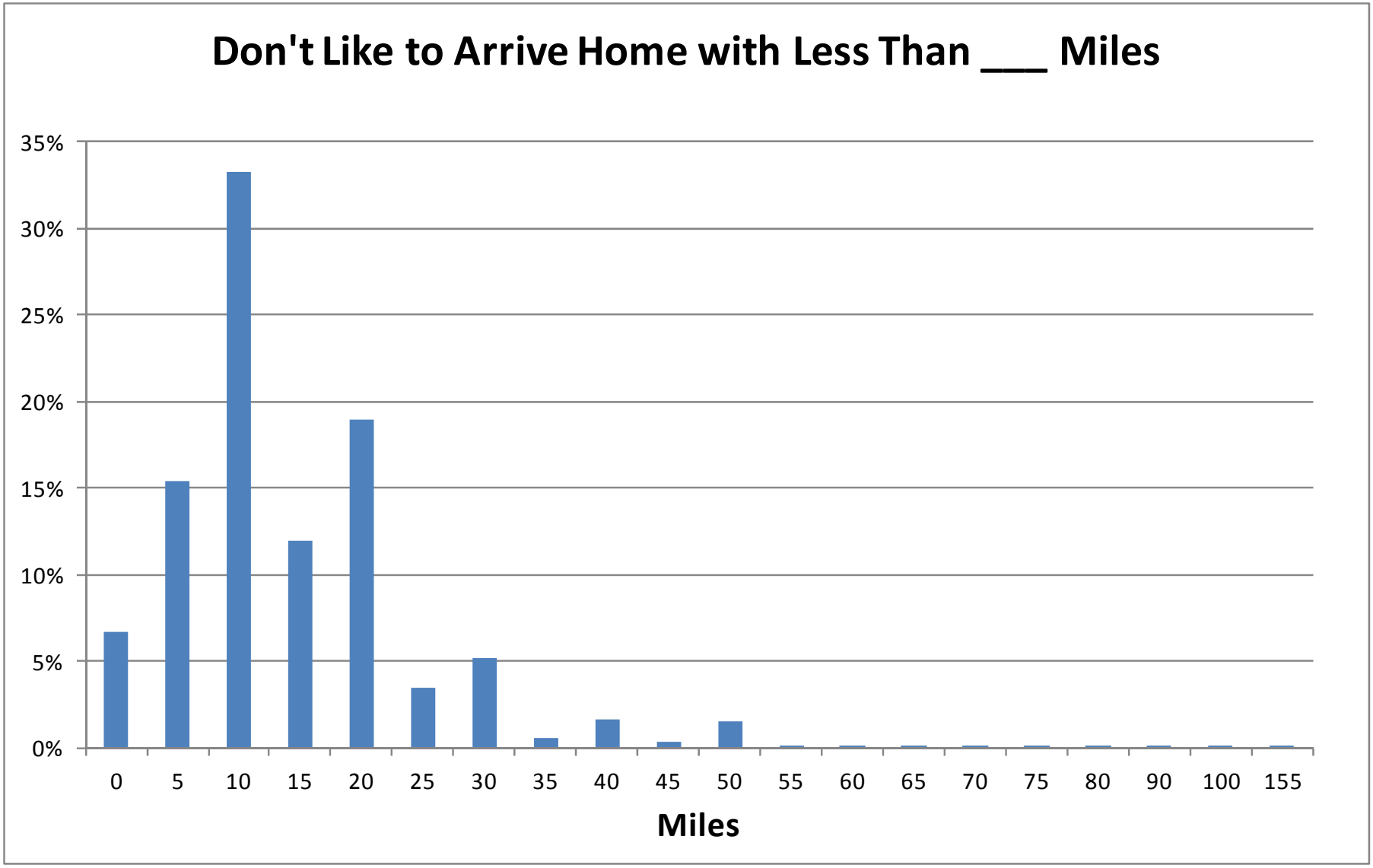
# Scaling Locations to Number of Chargers in California. For an 80 Mile BEV, Approx. 1 Fast Charger/500 veh.



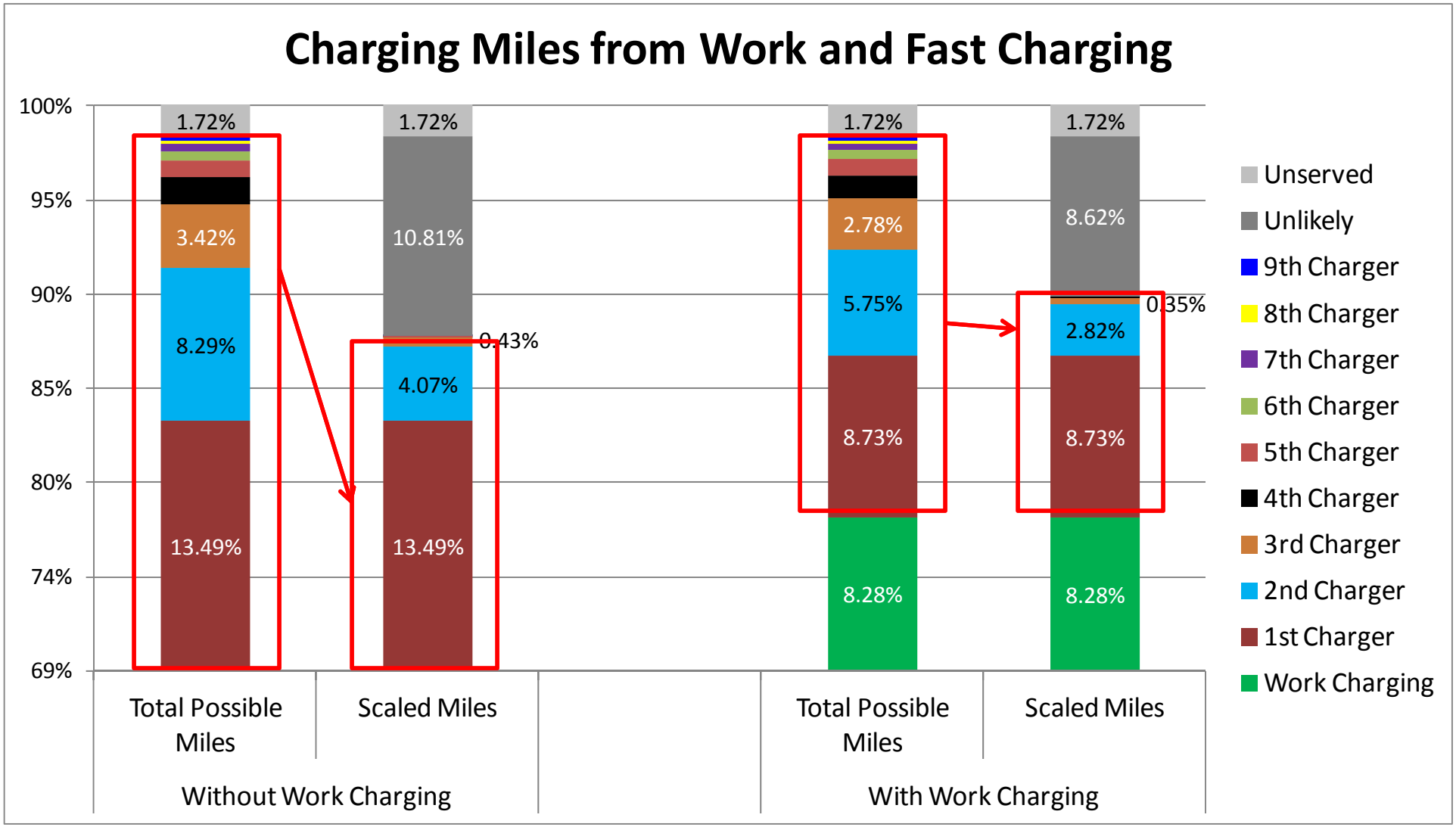
# New Survey Data:
# Charges Per Day on Occasional Long Tours



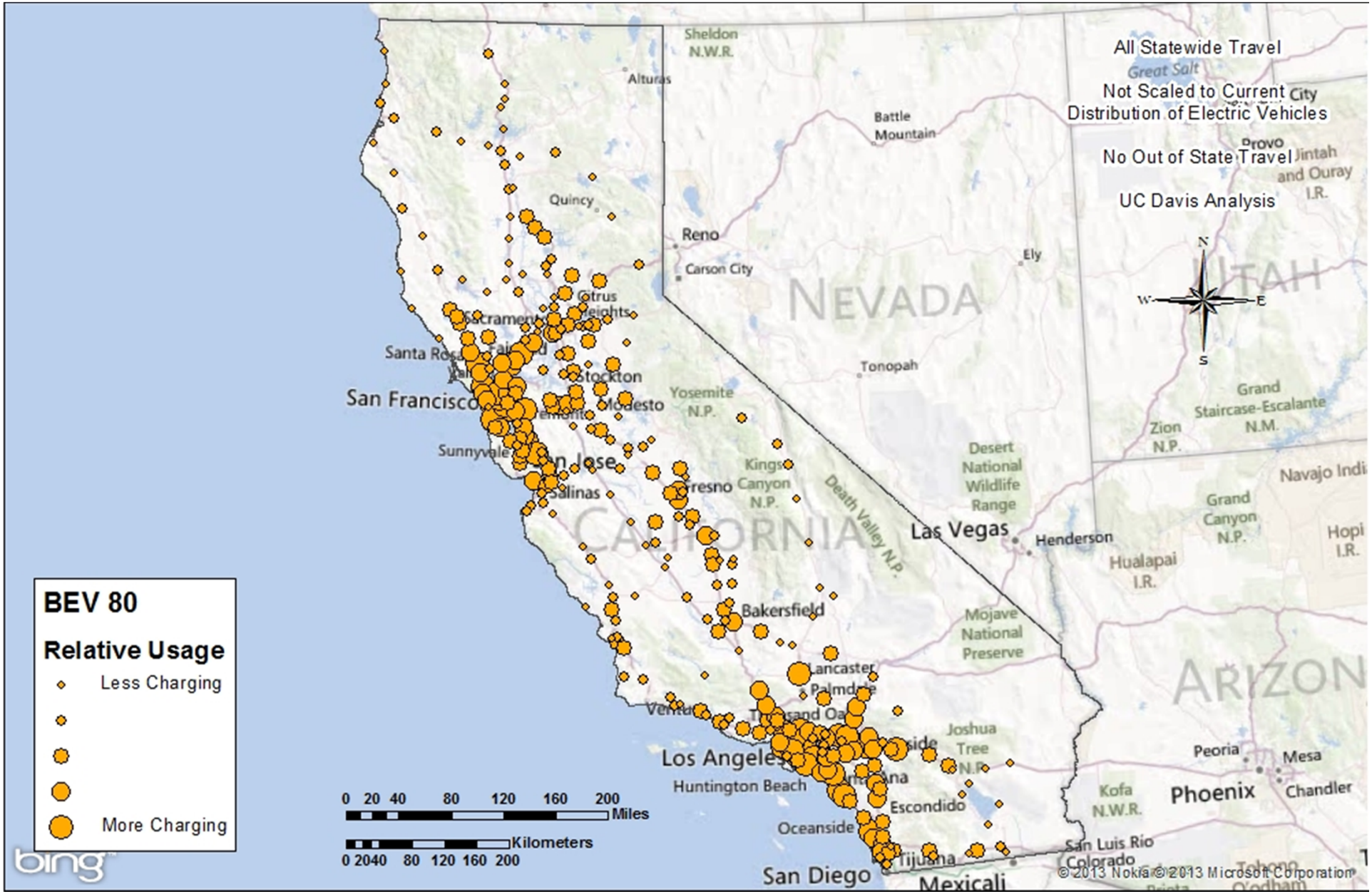
# People Don’t Feel Comfortable Arriving Home With Less Than 10 Miles Left (Adjust From 5)



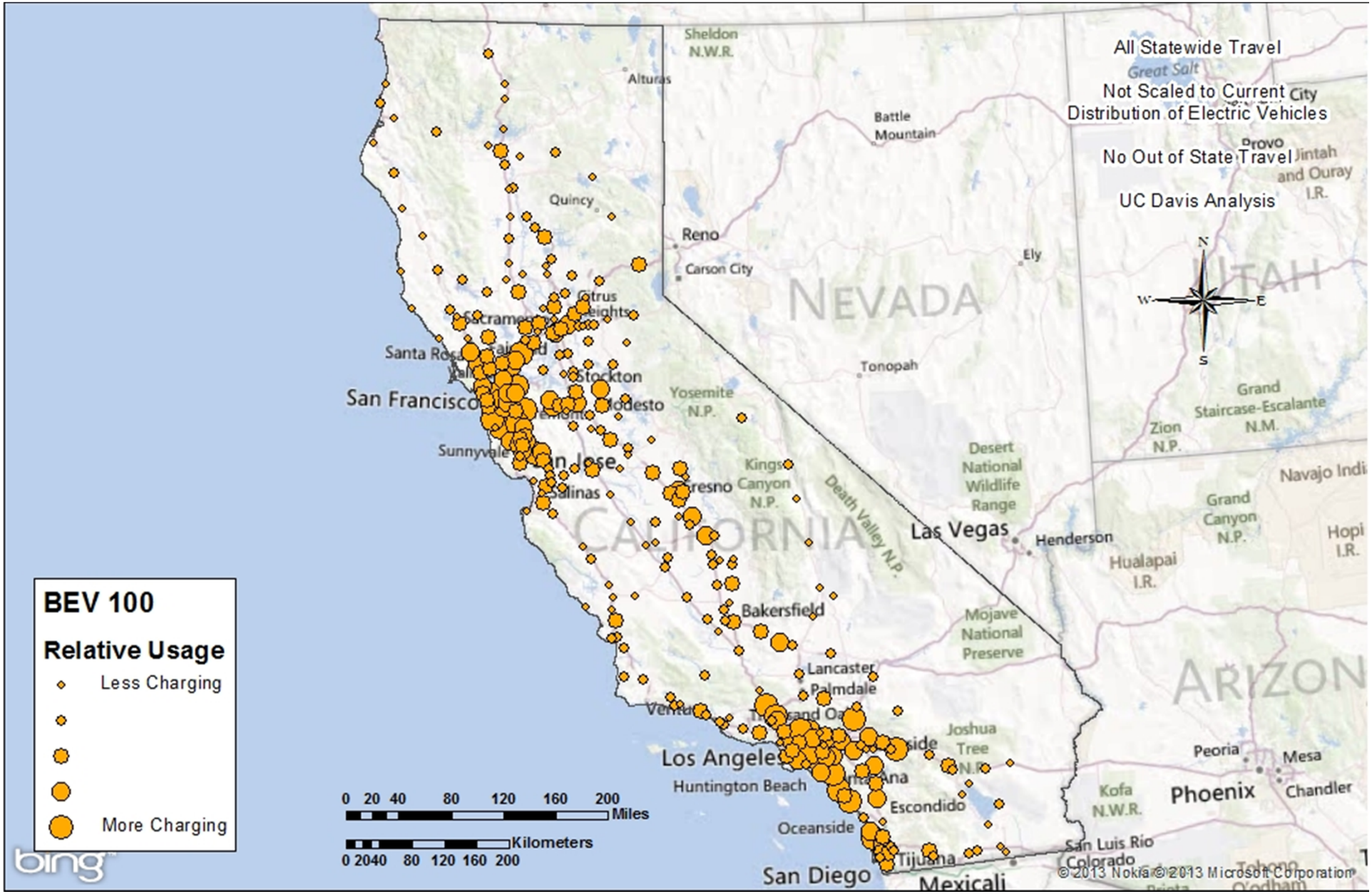
# How Does Aversion to Stopping Decrease Likely VMT Benefits?



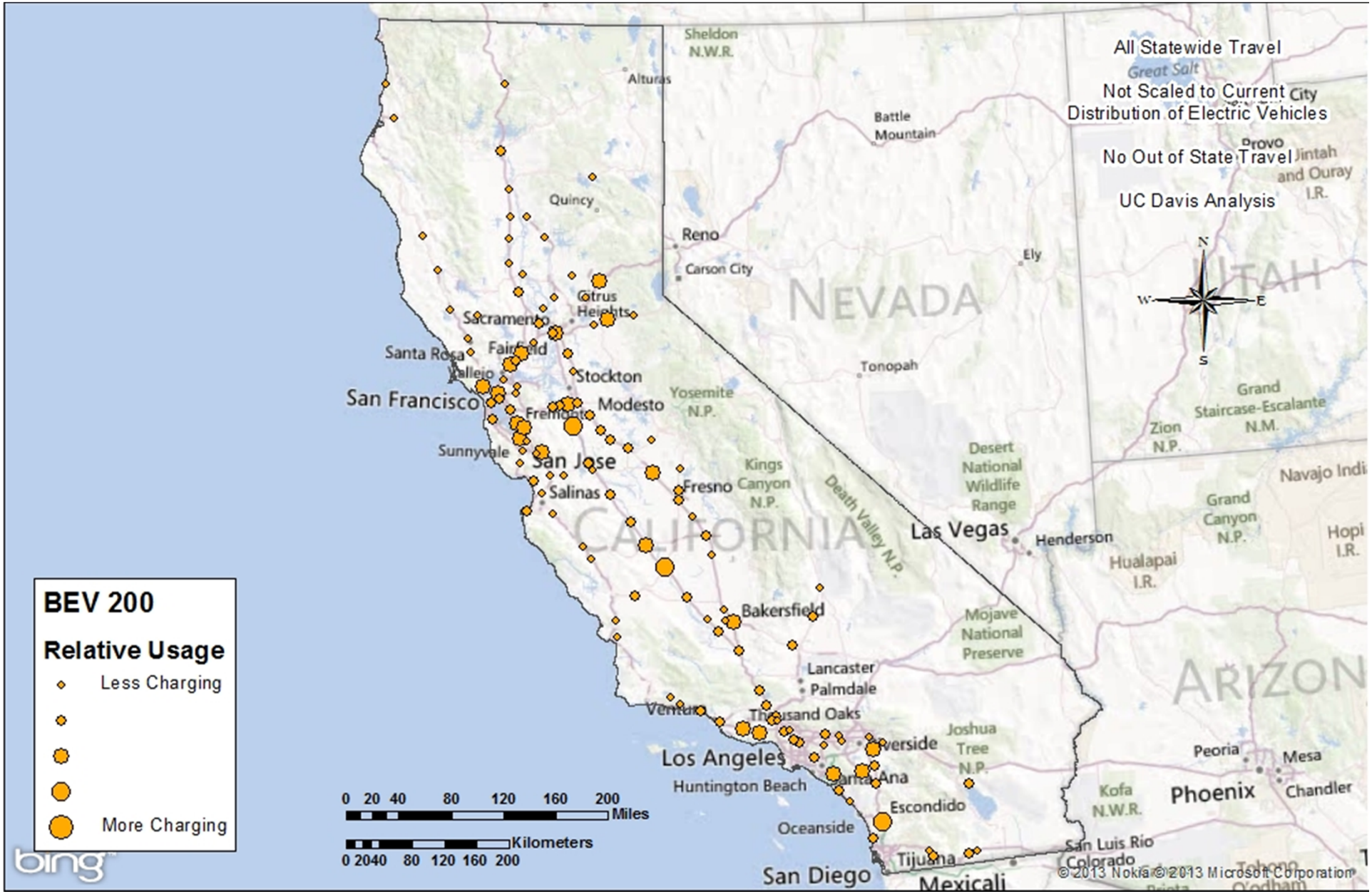
# Statewide Demand Distribution:
# BEV 80. 334 Locations



# Statewide Demand Distribution:
# BEV 100. 334 Locations



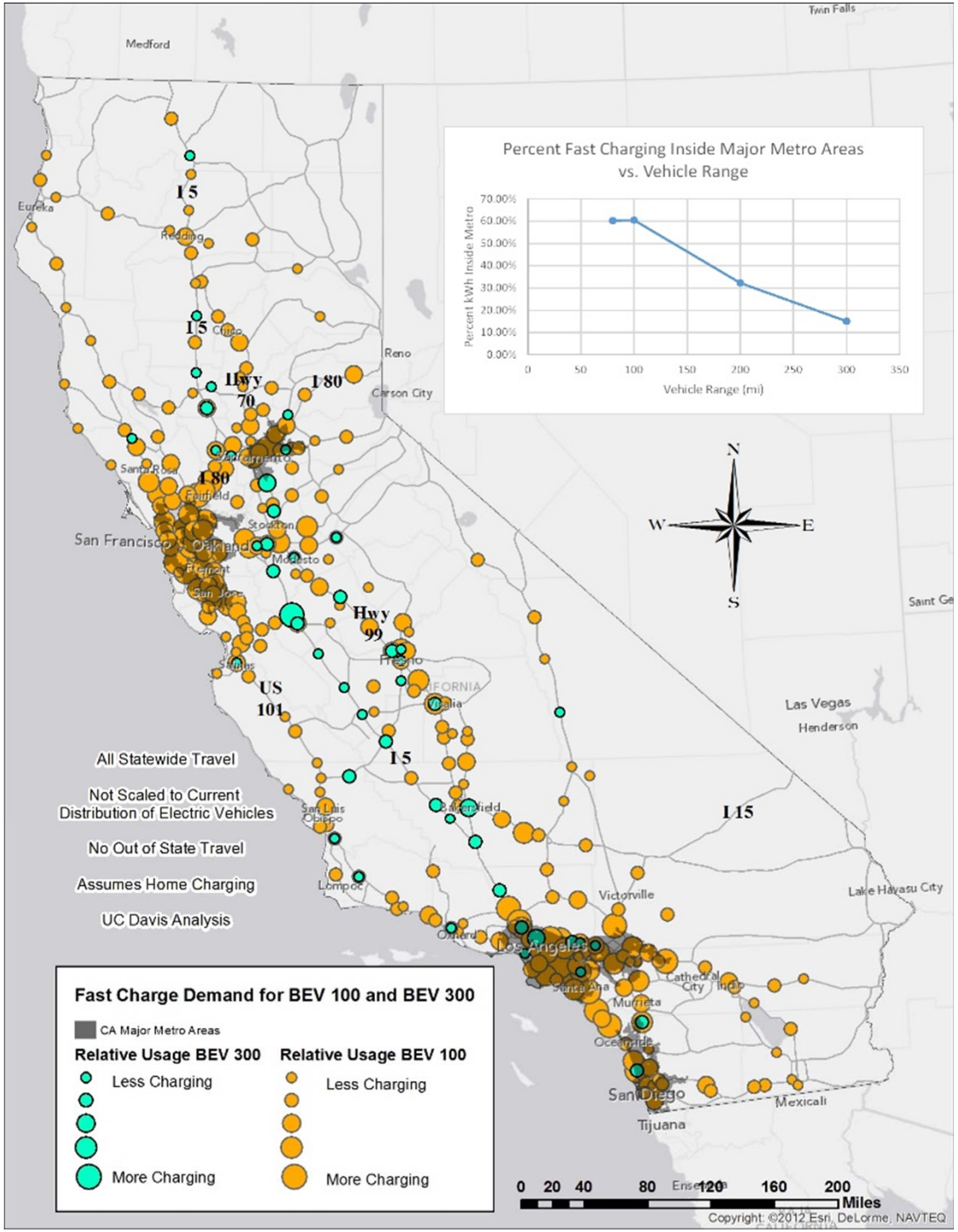
# Statewide Demand Distribution: BEV 200. 334 Locations



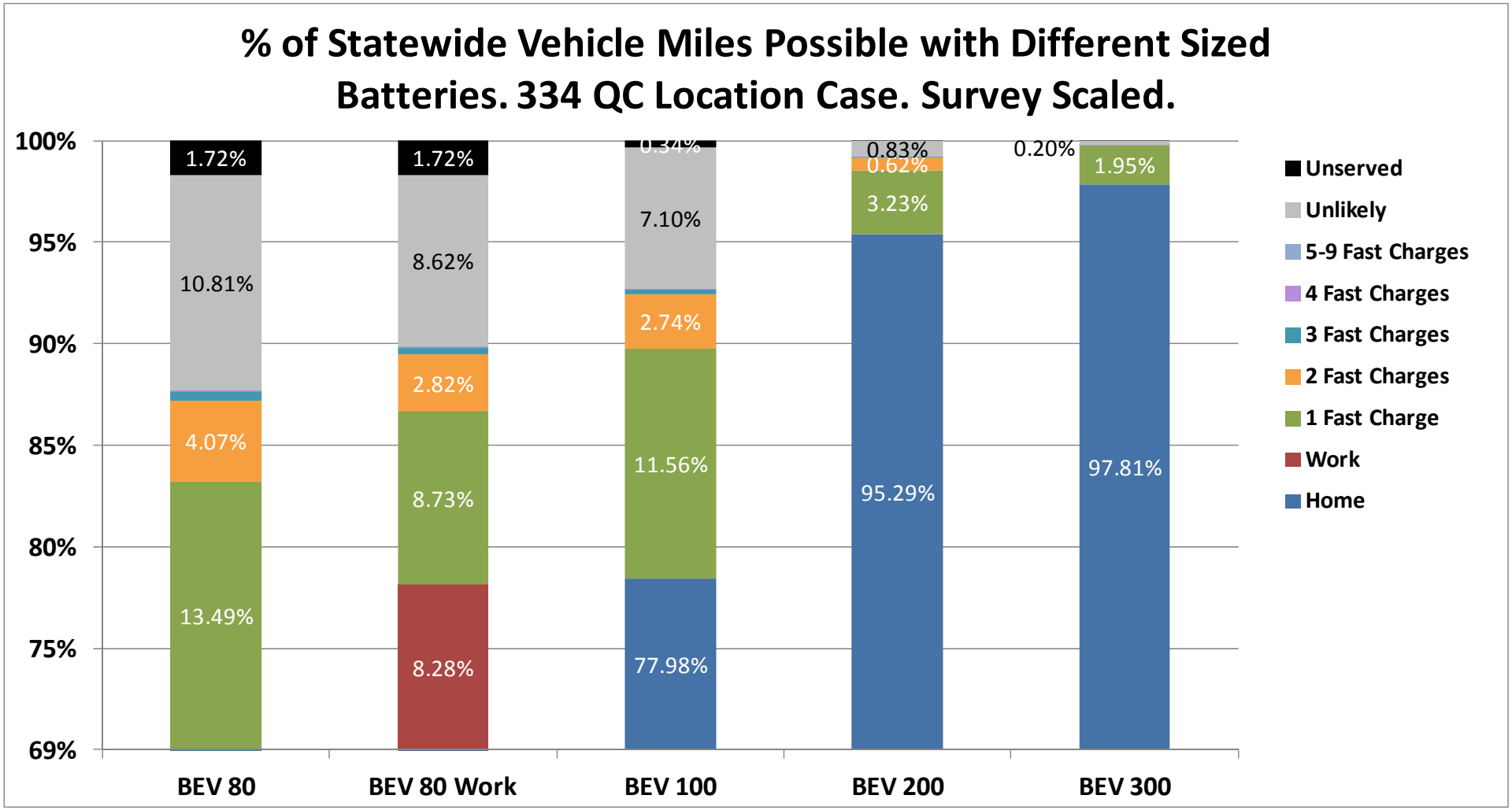
# Statewide Demand Distribution:
# BEV 300. 334 Locations

## Comparison of DC Fast Charging Potential Inside Major Metro Areas for Small and Large Battery BEV

- Smaller battery BEVs show much larger need inside major metropolitan region
- 4 Metro regions included in analysis: Sacramento, Bay Area, Los Angeles and San Diego
- 4 Metro regions are based on census urbanized area and are in some cases combined areas. For example San Jose and San Francisco are both classified as “Bay area”
- 4 Metro regions as defined represent 67 percent of the California population
- For a BEV 100, 60 percent of DC fast charging is within the defined metro regions
- For a BEV 300, 15% of charging is within these regions



# Declining Number of Fast Chargers Needed as Batteries Get Larger



# Final Thoughts

- DC fast charging is necessary to address statewide travel needs even when level 2 is “ubiquitous”.
- For 200 mile range BEVs, 95% of Statewide miles are possible with only level 2 charging
- For 200+ mile range BEVs, almost all trips can be done with 2 or fewer fast charges
- For 200+ mile BEVs, most demand occurs on Interstate 5 and CA-99. Some demand on other long distance corridors
- BEV80 networks are on adjacent-region corridors (ArCs) and BEV200+ networks are on trans-regional corridor (TReCs)