An Institute of Transportation Studies Program

## Research Question

- Effects of EV charging at highway rest areas in California on:
- -The grid
- -The curtailment of renewables
- -Mitigating GHG and other harmful emissions -Cost of implementing needed charging infrastructure
- Recent California legislation with goal of carbon neutrality in 2045
- -Transportation will need to convert to zero emission vehicles (ZEV)
- -Robust charging infrastructure for longdistance ZEV is needed
- -Renewable energy needs to be utilized

 Considering increasing EV use, our model will estimate the following:

Results

- -Electricity demand
- -Grid impacts
- -Renewable energy use
  - Increased integration
  - Decreased curtailment

 Additionally, we hope to inform policy makers by estimating GHG mitigation as well as conformity to CTP EO B-30-15 2040 and

### **Effects and Implications of Utilizing Highway Rest Areas for EV Charging** Alex Sheldon, Behdad Kiani, Joan Ogden Institute of Transportation Studies, University of California, Davis - December 2018



- optimization.
- California divided into 5 regions for modeling generation and demand.
- Travel demand data from -California Household Transportation Survey
  - -CALTRANS traffic census program
- Scope (spatial and temporal)
  - -Highway rest areas, electricity generation, and grid operation in California

  - -Current and future hourly load analysis

• What are the implications? -If results are promising, this project could be implemented to attain state emission reduction and renewable energy use goals -Long distance travel with ZEVs would be possible and practical

 If I had more time I would..... -Observe travel demand and rest area behavior extensively to improve model accuracy





# Methods and Data

• MESSAGE (Model for Energy Supply Strategy Alternatives and their General Environmental Impacts) will be used to build our model using mixed-integer multi-objective

### Model Assumptions

- -Charging technology will advance to provide fast & economically viable charging options
- -ZEV range will continue to increase such that charging is needed at intervals comparable to gasoline vehicles
- Energy data gathered from
  - -CAISO & Utility companies in California

### About this study

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