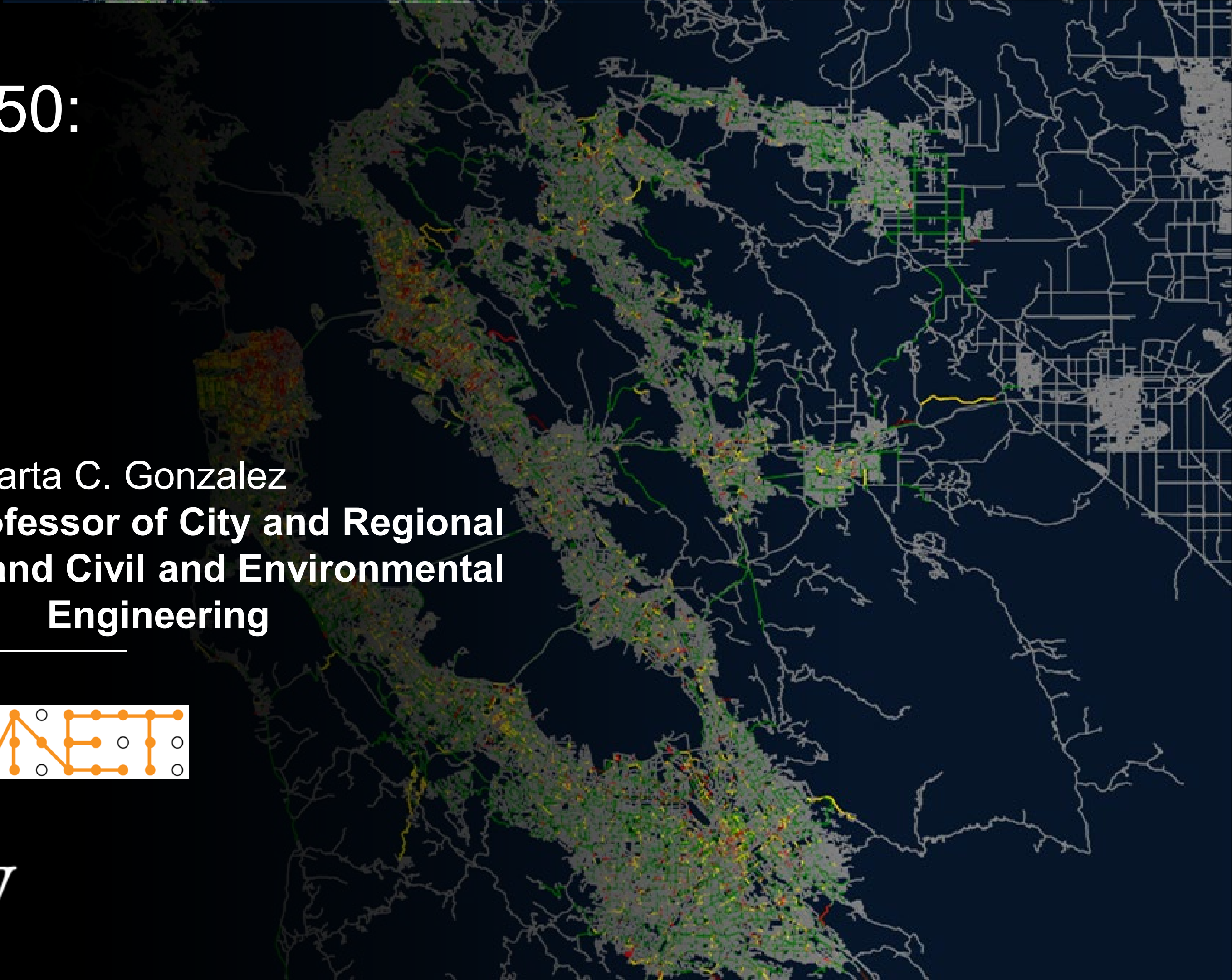
Planning for 2050: Supporting sustainable EV adoption



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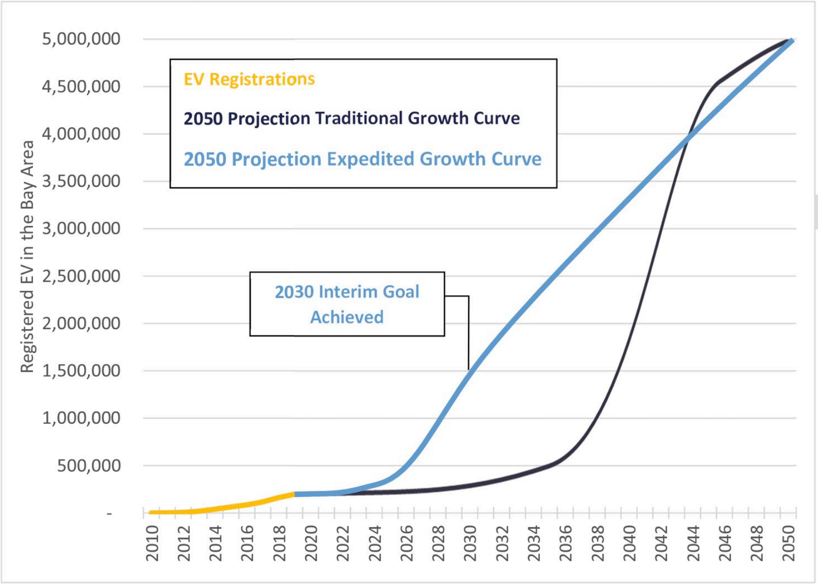
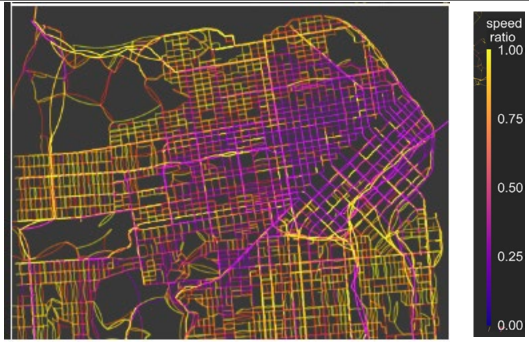
Planning for 2050: Supporting sustainable EV adoption

Figure 5. Bay Area EVs and Projected Increase to Meet 2050 Goal



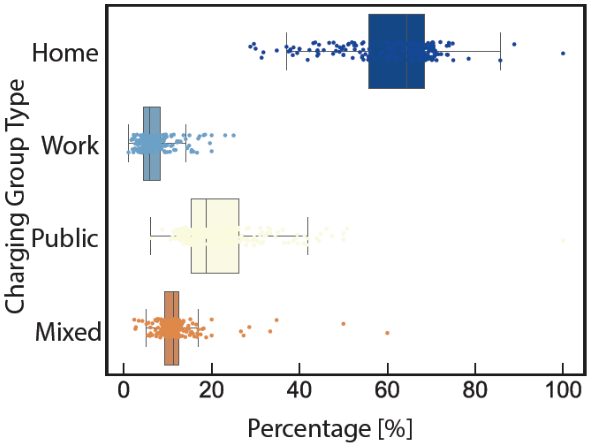
Source: Bay Area Air Quality Management District

13M trips at 10 minute resolution inferred from mobile phone signals with Home and Work locations. **The TimeGeo modeling framework of urban mobility without surveys** *PNAS (August)*, 2016



$$P(\mathrm{EV} \mid I, D) = \frac{P(I \mid \mathrm{EV})P(D \mid \mathrm{EV})P(\mathrm{EV})}{P(I)P(D)}$$

I= income; D=Commuting distance

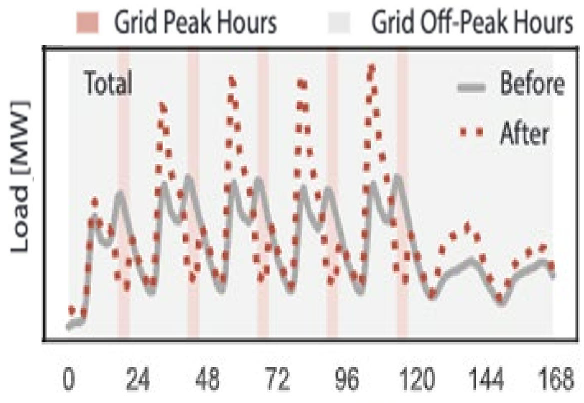


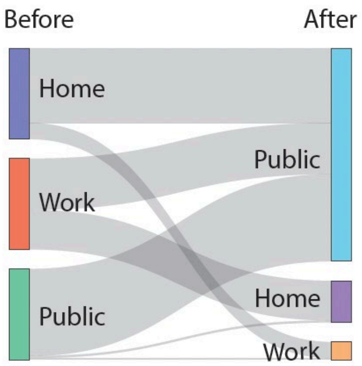
Charging infrastructure access and operation to reduce the grid impacts of deep electric vehicle adoption S Powell, GV Cezar, L Min, IML Azevedo, R Rajagopal. Nature Energy 7 (10), 932-945

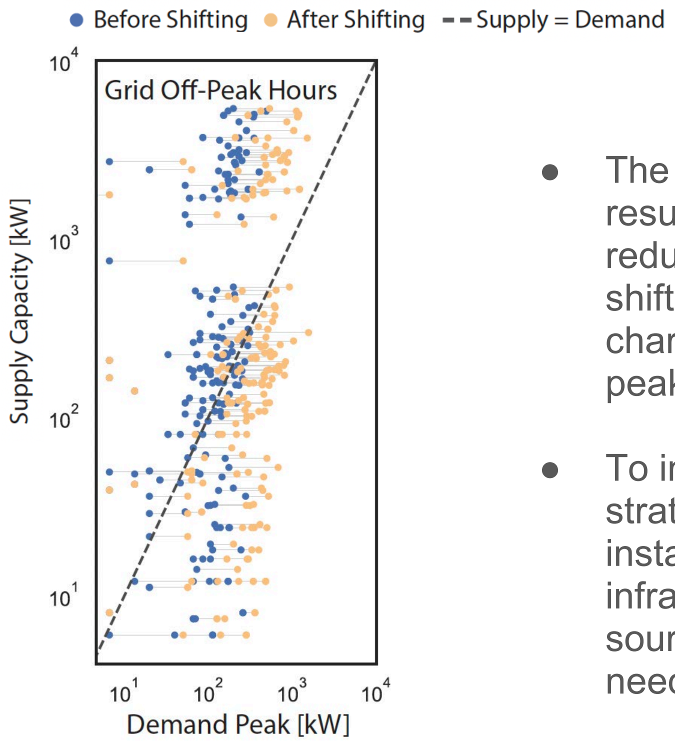
Planning for electric vehicle needs by coupling charging profiles with urban mobility Y Xu, S Çolak, EC Kara, SJ Moura, MC González, Nature Energy 3, 484–493

Planning for 2050: Charging stations to support flexible electric vehicle demand considering individual mobility patterns

Where people need to charge?

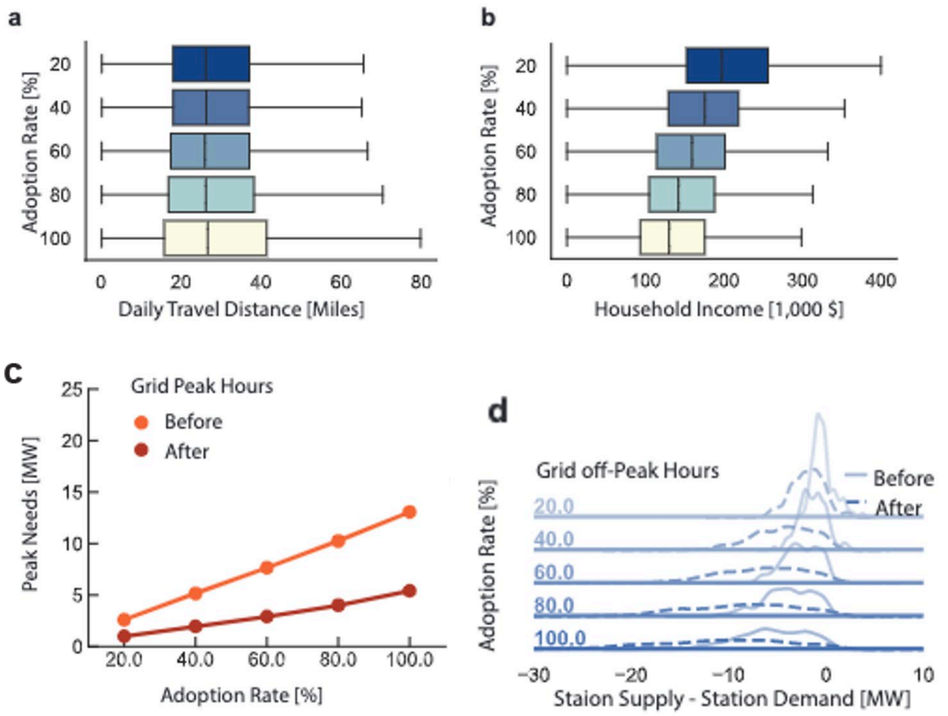




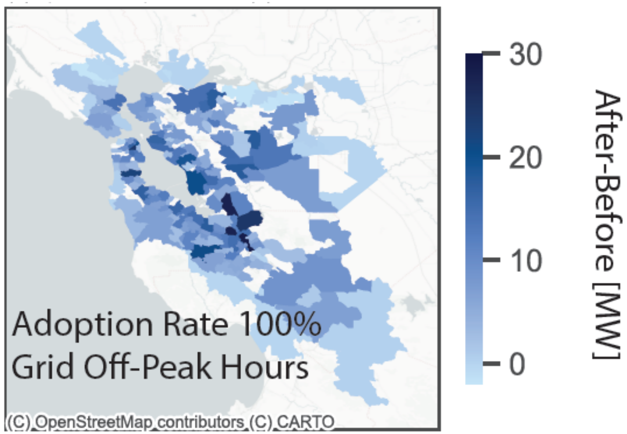


- The shifting strategy can result in a considerable reduction of the peak by shifting home and public charging activities from peak to off-peak hours.
- To implement shifting strategy for future, the installation of new charging infrastructure or renewable sources of energy are needed.

Planning for 2050: Charging stations to support flexible electric vehicle demand considering individual mobility patterns*

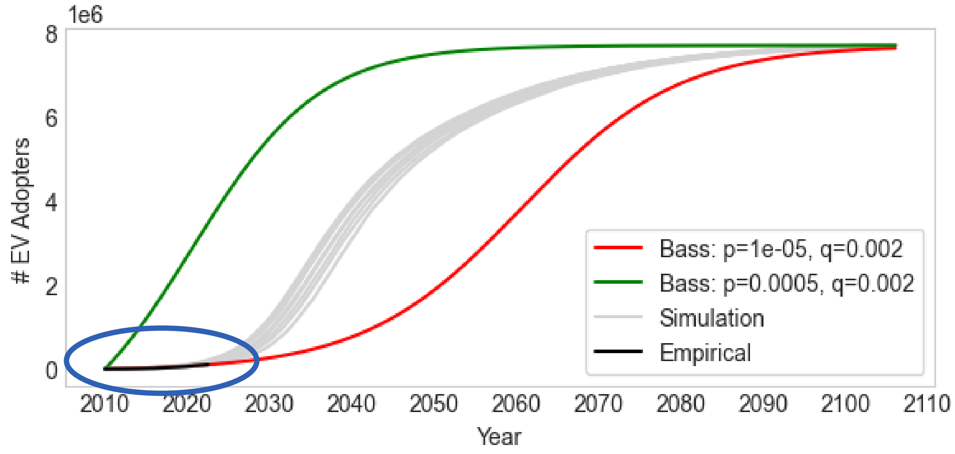


- With the 2050 target of 90% EVs, shifting charging place and time reduces total on-peak charging demand by 61%,
- Implying 37 thousand Level 3 charging stations are needed.
  At peak demand 1.8GW/(200k vehicles)*50KW|L3 station



Jiaman Wu, Siobhan Powell, Yanyan Xu, Ram Rajagopal and Marta C. Gonzalez (under review 2023)

Prediction of PEV Adoption with a Network Diffusion Model



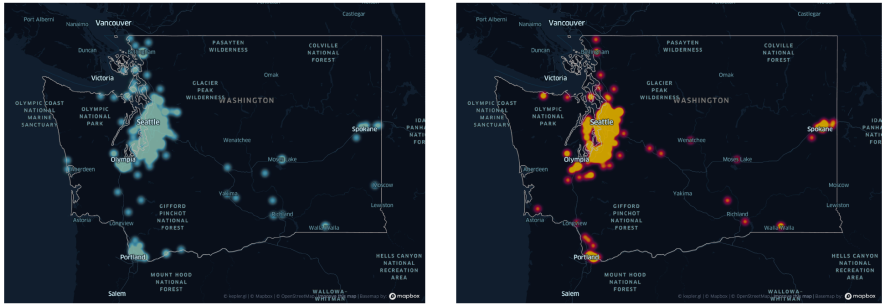


Figure 11. Empirical (left) v.s. Model Simulated (right) Adoption Heatmap at T=612

$$\frac{dI_i}{dt} = (pi + qi\langle k\rangle I_i(t))(1 - Ii(t))$$

$\langle k \rangle$ is the average number of connections in the social network

q_i coefficient of imitation; p_i coefficient of innovation from compartment i