Planning for 2050: Supporting sustainable EV adoption

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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

\[
P(EV | I, D) = \frac{P(I | EV)P(D | EV)P(EV)}{P(I)P(D)}
\]

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.
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

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

*Jiaman Wu, Siobhan Powell, Yanyan Xu, Ram Rajagopal and Marta C. Gonzalez (under review 2023)
Prediction of PEV Adoption with a Network Diffusion Model

\[
\frac{dI_i}{dt} = (p_i + q_i \langle k \rangle I_i(t))(1 - I_i(t))
\]

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

\( q_i \) coefficient of imitation; \( p_i \) coefficient of innovation from compartment \( i \)