



# **Distribution grid impacts of electric vehicles: A California case study**

Sloan Webinar

Alan Jenn, PhD

Assistant Director & Assistant Professional  
Researcher

University of California, Davis

# What most people think about when you say “Smart charging” or “V2G”



+

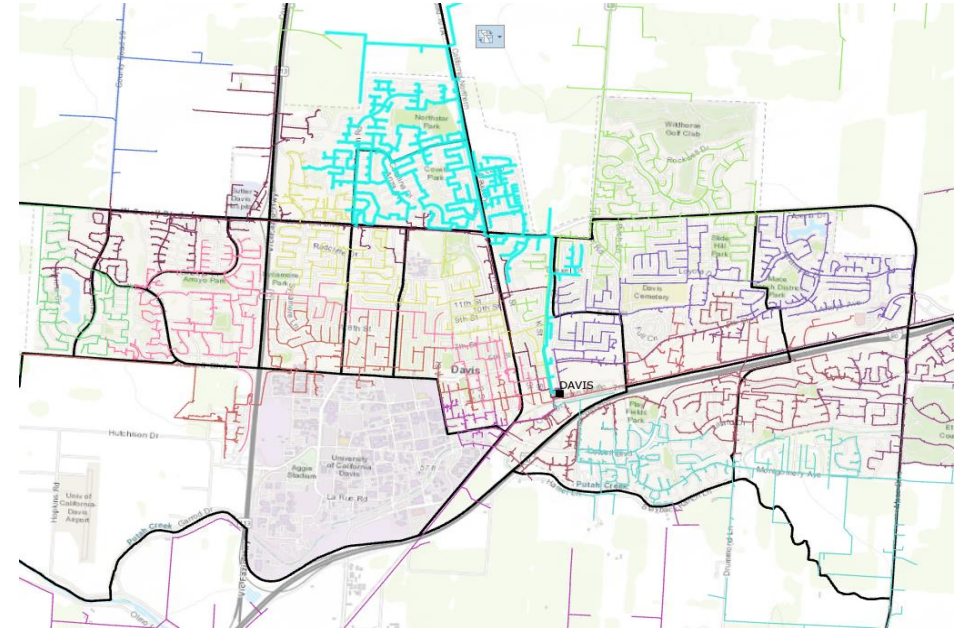
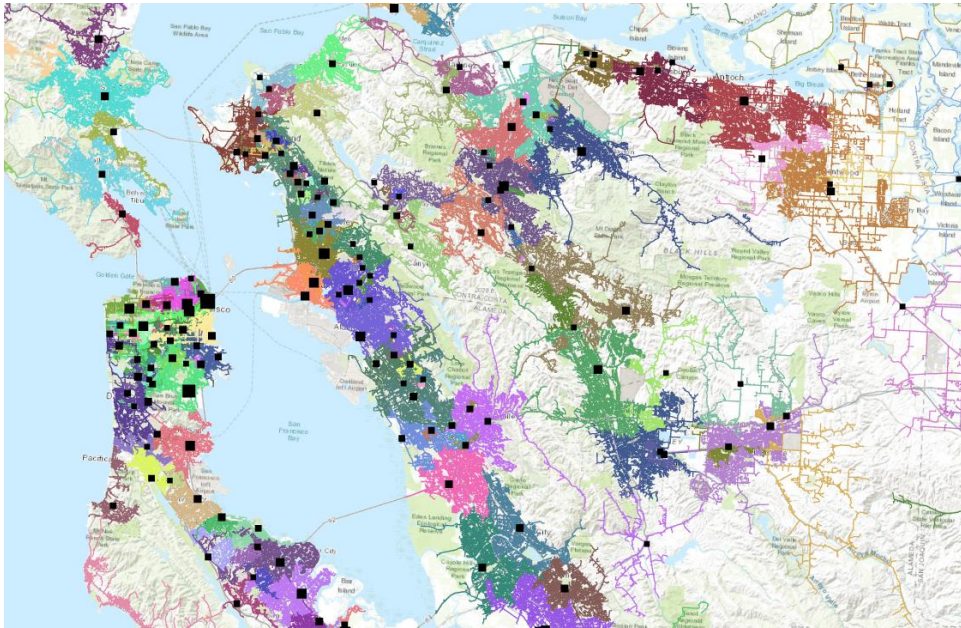


# In reality, avoiding this:



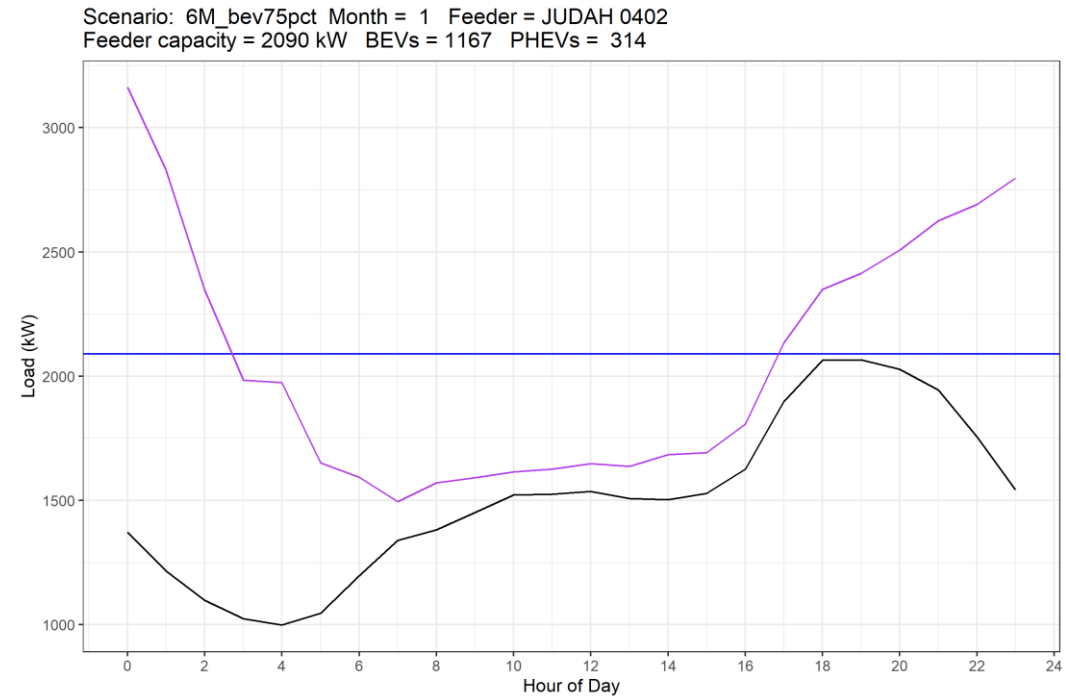
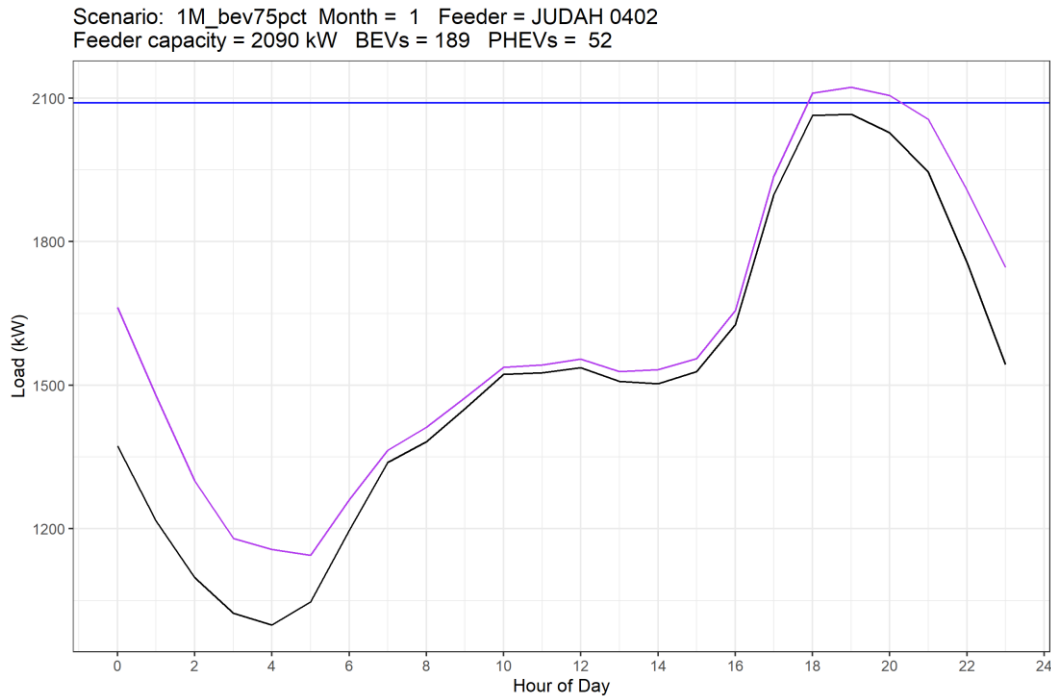
**...is  
where  
you save  
the real  
money**

# High resolution examination of PG&E territory



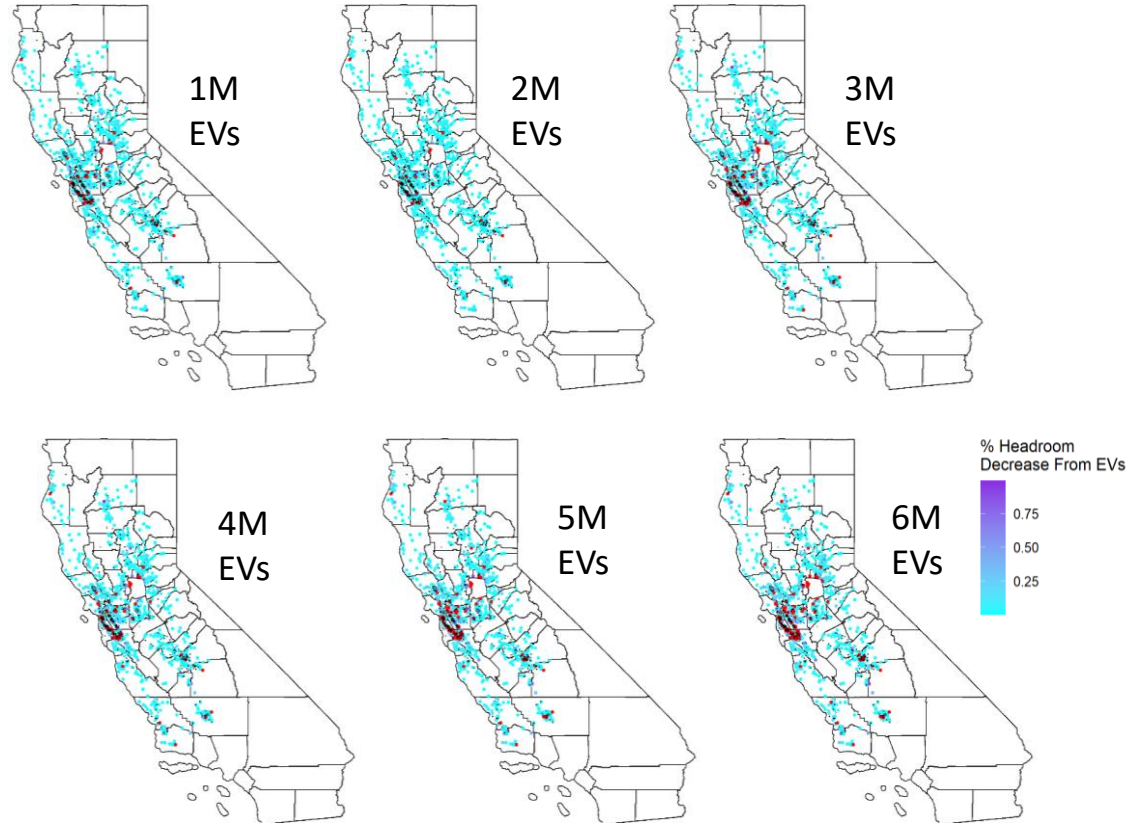
- We employ Integration Capacity Analysis maps to access distribution network data at the feeder circuit level

# Diversity of load shapes = diversity of impacts



- The ways in which capacity thresholds (blue line) for feeders are exceeded differ dramatically in different areas

# Infrastructure upgrades are critical as EV volumes increase



- Our work finds that over 20% of distribution feeder networks will exceed their rated capacities with 6 million EVs on the road
- Large mismatch between GNA upgrades and our findings

# Policy Implications

- Lots of mechanisms to monetize benefits of charging to accommodate the grid at the wholesale level:
  - E.g. Differences in TOU rates, participation in markets, batteries as grid storage, etc.
- But there are *no* incentive mechanisms to “rebate” avoided costs of distribution infrastructure. These costs will be the most substantial cost to the grid, finding a pricing signal for charging behavior is critical!
- As money pours into funding expansion of public charging infrastructure, will there be funds dedicated to upstream upgrades?