Distribution grid impacts of electric vehicles: A California case study

Sloan Webinar

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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?