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The Equity Challenge: Ensuring Grid Upgrades Don't Leave Communities Behind in California

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Issue

California's rapid shift toward vehicle electrification will require substantial upgrades to the state's electricity distribution grid (i.e., the part of the electric power system that delivers electricity from substations to homes, businesses, and other end users). Without proactive planning, these upgrades risk exacerbating existing inequities in access to electric vehicle (EV) charging infrastructure and grid capacity. Specifically, disadvantaged communities that already struggle with higher pollution and economic hardship have lower rates of EV adoption, but are more likely to need costly grid upgrades to support charging.

To better understand these equity implications, we analyzed grid capacity and charging needs across more than 5,000 distribution feeders in California. We combined real-world utility data with projections of EV adoption and charging behavior models for light-, medium-, and heavy-duty vehicles.

Key Research Findings

High-density residential areas are most at risk for grid congestion. Feeders in these areas are already strained, serving more people with less available capacity. As EV adoption grows—especially in areas with limited home charging access—these feeders are projected to experience higher congestion and a greater need for upgrades.

Disadvantaged communities face a disproportionate need for feeder upgrades—despite lower EV adoption. Areas with high CalEnviroScreen scores (i.e., top 20% of disadvantaged communities) will require upgrades on a larger share of feeders, primarily due to a combination of limited capacity and higher shares of land used for commercial, agricultural, and industrial purposes that draw large amounts of electricity (Figure 1). However, because EV adoption itself is lower in these areas, the scale of each upgrade is smaller—the feeders need reinforcement to handle additional load, but not massive expansion.

Grid investment benefits are roughly proportional to costs across communities. When utilities invest in new infrastructure, like upgrading feeders for EV charging, the costs are spread across all customers' electricity bills. Because disadvantaged communities adopt EVs at lower rates, they place less demand on the grid and are responsible for proportionally smaller upgrade costs. In contrast, more affluent communities with higher EV adoption and energy use contribute more to paying back these investments. This raises concerns about proposals to restructure electricity bills into flat, income-based fixed charges, since those charges may not reflect how much different communities actually use the grid.

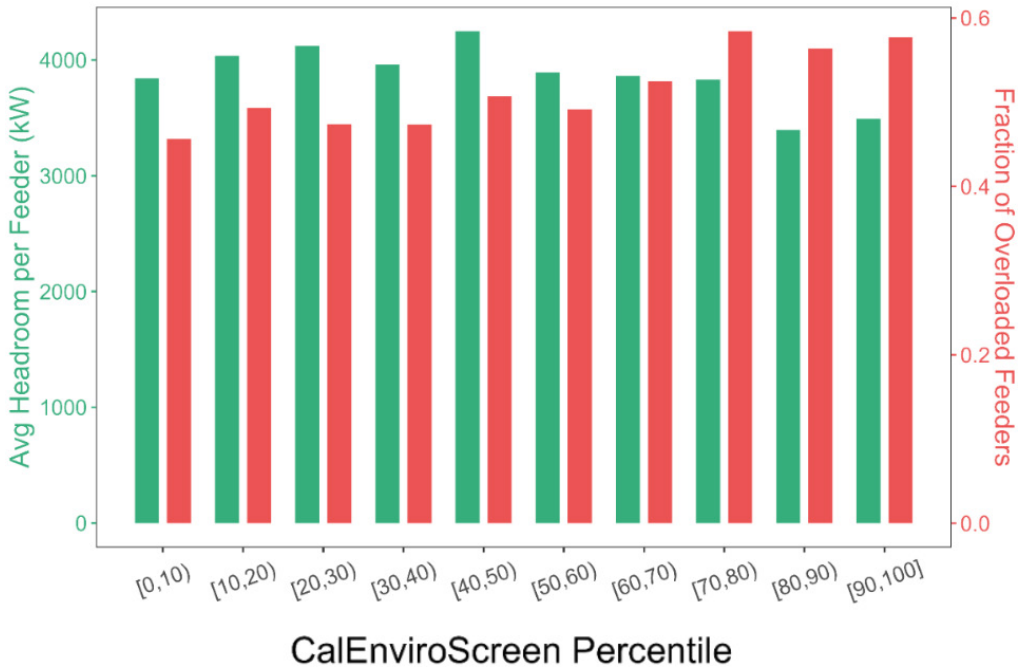

Figure 1. Average capacity headroom left (remaining capacity excluding baseload) per feeder in 2022 (green), and fraction of overloaded feeders due to the growth of EV charging load in 2035 (red) in areas with different CalEnviroScreen scores. In the top 20% disadvantaged communities, less capacity headroom is left when feeders are built, and a higher fraction of feeders would need upgrade.

Utilities often underestimate load growth in disadvantaged communities. Our analysis shows that current forecasting methods underestimate EV adoption and load growth in these communities, leading to insufficient planning and potential underinvestment where upgrades will be most needed. This finding underscores the need for updated forecasting methods that account for changing EV adoption trends and local infrastructure conditions.

Policy Implications

- **Align grid planning efforts with actual EV charging behaviors and land use patterns**, particularly in areas with dense housing or high commercial activity.
- **Consider grid usage—not just household income—in electricity rate design** to equitably distribute fixed infrastructure costs.
- **Update distribution planning assumptions** to prevent future capacity shortfalls, especially where underinvestment has historically occurred.

More Information

This policy brief is drawn from the report, "Evaluating Equity in Distribution Grid Access with California's Electric Vehicle Expansion" prepared by Alan Jenn and Yanning Li with the University of California, Davis. The report can be found at https://www.ucits.org/research-project/2024-20/. For more information, please contact Alan Jenn at ajenn@ucdavis.edu.

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