Executive Summary

Electrifying Urban Ridesourcing Fleets at No Added Cost through Efficient Use of Charging Infrastructure

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Ridesourcing fleets present an opportunity for rapid uptake of battery electric vehicles (BEVs) but adoption has largely been limited to small pilot projects. Lack of charging infrastructure presents a major barrier to scaling up, but little public information exists on the infrastructure needed to support ridesourcing electrification.

In this study, we show that (1) modest additions of public fast-charging infrastructure make urban ridesourcing electrification practical under a range of vehicle operating strategies, and (2) the current economics of urban ridesourcing can support vehicle electrification and the required charging infrastructure at total costs lower than the costs of the ICEV-based ridesourcing system. In addition, the increased utilization of charging infrastructure due to ridesourcing BEVs could reduce public charging costs for all BEV users and further support large-scale transportation electrification. Therefore, electrifying the urban ridesourcing sector could be a cost-effective approach to reducing transportation-related greenhouse gas emissions and urban air pollution, and properly designed policies could realize these benefits with no cost burdens to governments, transportation network companies, or ridesourcing drivers.

Contrary to common perception, we illustrate using simple economic reasoning that ridesourcing drivers have adequate time to charge during their shifts, and that—with sufficient utilization—fast-charging infrastructure will pay for itself. Based on driver wages and fares in NYC, we estimate that drivers have about 14 minutes of idle time per shift-hour, whereas DC fast chargers rated at 50kW could resupply the energy consumed in less than 3 minutes (Figure 1). Meanwhile, we find that as long as chargers are utilized at least four hours per day, the cost of refueling BEVs is lower than that of conventional vehicles (Figure 2).

To verify these findings, we used data on ridesourcing trips from New York City and San Francisco to conduct agent-based simulations of BEV fleets. Our results suggest that given a sparse network of three to four 50kW chargers per square mile, BEVs can provide the same level of service as internal combustion engine vehicles (ICEVs) at lower cost and higher net revenue (Figure 3), while enabling charger utilization of over 12 hours per day.

In short, our results suggest that switching to BEVs with today’s technology will not impose a significant cost burden on the ridesourcing industry. A combination of mandates on ridesourcing companies coupled with public investments in charging infrastructure can help ensure that ridesourcing companies invest in driver adoption of BEVs while freeing them of concerns related to availability and utilization of charging infrastructure. Mandates that require industry to obtain a certain percentage of miles from zero-emission vehicles would naturally spur the development

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of innovative financing and leasing strategies for ridesourcing BEVs and accelerate the development of efficient charging-routing algorithms.

**Figure 1.** Distribution of time spent by an average NYC ridesourcing driver, with time cost of charging for both DC fast charging (50 kW) and Level 2 charging (22 kW or 7 kW). We assume a vehicle energy consumption of 0.28 kWh/mile, equivalent to the performance of the 2018 Chevrolet Bolt. For relocating to charge, we assume one charging session per 8-hour shift and an average relocation distance of 2.5 miles at a speed of 10 miles/hour.

**Figure 2.** Relationship between the total cost of charging infrastructure (capital cost, electricity, and demand charges) and percent utilization by time. Cost assumptions are shown in Error! Reference source not found. in the methods section.
Figure 3. Average expenses and net revenue of operating a ridesourcing BEV per shift-hour, broken down by component for each city. Dashed lines show comparison to total ICEV cost and net revenue, while red numbers show total expenses and black numbers show net revenue after expenses. Error bars show difference between BEV scenarios.