Supplemental appendix

Our report[1] analyzes the public DC fast charging (DCFC) infrastructure needs for a hypothetical ride-hailing fleet of 10,000 full-time drivers who transition to electric vehicles by 2027, none of which have home charging. We analyze DCFC infrastructure needs under a 4-hour, 6-hour, and 8-hour charging utilization scenario. As summarized in Table 5 of the report, we find that the number of DC fast charge points needed to support a fleet of 10,000 ride-hailing vehicles in 2027 ranges from 827 in the 4-hour scenario to 413 in the 8-hour scenario. A key input to the analysis in our report is that none of the ride-hailing drivers have access to charging infrastructure at home.

Below we analyze two additional cases to provide supplemental information: a case where ride-hailing drivers have partial[2] overnight home charging access, and a case where drivers have everyday access to overnight home charging.

Table A1 shows the public DCFC infrastructure needs based on the case where drivers have partial overnight home charging access. For this analytical case, we assume that half of all miles traveled are powered by home charging and the remaining miles are powered by DC fast charging. In practice, the share of home versus public fast charging would likely vary across the ride-hailing fleet based on variation in charging price, individual driver behavior, and daily mileage. As shown, the number of DC fast charge points needed to support a fleet of 10,000 ride-hailing vehicles in 2027 ranges from 413 for 4-hour average utilization to 207 for 8-hour average utilization. Compared to the 0% home charging case shown in Table 5 of our report, the number of charge points needed when drivers have semi-regular access to overnight home charging is about 50% lower. Our assumption that half of all electric vehicle miles traveled (eVMT) is split evenly by home and DC fast charging is highly sensitive to future electricity prices and DC fast charging subscription models which are not known at this time.

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[1] Peter Slowik, Sandra Wappelhorst, & Nic Lutsey (2019), *How can taxes and fees on ride-hailing fleets steer them to electrify?* (ICCT: Washington, DC, 2019), https://theicct.org/publications/taxes-and-fees-electrify-ridehailing

[2] Assumes that half of all vehicle eVMT is powered by electricity supplied at home overnight infrastructure

Table A1. Public DC fast charging infrastructure needs for a 250-mile range BEV fleet with partial overnight home charging under 4-hour, 6-hour, and 8-hour utilization scenarios

Year	Number of BEVs	BEV share	Cumulative # DC fast charge points			BEV to DCFC ratio		
			4 hours	6 hours	8 hours	4 hours	6 hours	8 hours
2020	500	5%	27	18	14	18	28	37
2021	900	9%	46	31	23	20	29	39
2022	1,620	16%	78	52	39	21	31	41
2023	2,916	29%	133	89	67	22	33	44
2024	5,000	50%	217	145	109	23	35	46
2025	7,500	75%	310	207	155	24	36	48
2026	9,200	92%	380	253	190	24	36	48
2027	10,000	100%	413	276	207	24	36	48

Note: Assumes that half of all vehicle eVMT is powered by electricity supplied at home overnight infrastructure.

Table A2 shows the public DCFC infrastructure needs based on a scenario where drivers have everyday home charging access and thus begin each working day with a full charge. To evaluate public DC fast charging infrastructure needs, we simulate the behavior of ride-hailing driver daily mileage using a random distribution model (see Figure A1 below). Based on the core assumptions of drivers working 280 days and driving 40,000 miles per year, we find that the number of working days where the daily mileage exceeds 200 miles is about 3%. We assume that drivers seek charging when there are 50 miles of range remaining in the battery. Because drivers only exceed 200 daily miles on about 3% of working days, very few public DC fast charging sessions are needed. As shown in Table A2, the number of DC fast charge points needed to support a fleet of 10,000 ride-hailing vehicles in 2027 ranges from 25 with 4-hour average utilization to 12 with 8-hour average utilization. In this scenario where drivers have everyday home charging access, drivers would, on average, use public fast charging about 8 times per year.

Table A2. Public DC fast charging infrastructure needs for a 250-mile range BEV fleet with everyday access to overnight home charging under 4-hour, 6-hour, and 8-hour utilization scenarios

Year	Number of BEVs	BEV share	Cumulative # DC fast charge points			BEV to DCFC ratio		
			4 hours	6 hours	8 hours	4 hours	6 hours	8 hours
2020	500	5%	2	1	1	306	459	612
2021	900	9%	3	2	1	325	488	651
2022	1,620	16%	5	3	2	345	517	690
2023	2,916	29%	8	5	4	364	546	728
2024	5,000	50%	13	9	7	384	576	767
2025	7,500	75%	19	12	9	403	605	807
2026	9,200	92%	23	15	11	403	605	807
2027	10,000	100%	25	17	12	403	605	807

A key input to our analysis of public DCFC infrastructure needs for electric ride-hail drivers is driver daily and annual miles traveled. Table A3 shows the assumptions used in our simulation of ride-hailing driver behavior. As shown, we assume an average of 280 working days per year and 143 daily miles driven for an annual total of 40,000 miles. We use a standard deviation of 10 for driver working days per year and a standard deviation of 30 for daily mileage.

Table A3. Summary of key assumptions in random distribution model of driver number of working days per year, miles per day, and annual miles

Year	Number working days per year	Miles per day driving	Annual miles
Average	280	143	40,000
Standard deviation	10	30	

Figure A1 illustrates our simulation of ride-hailing driver behavior. The blue bars show the frequency of days with a given amount of daily driving (left axis), whereas the line shows the cumulative number of days with a given daily mileage (right axis). As shown on the left, drivers do no driving on about 23% of days per year (i.e., 280 working days). Drivers exceed 200 daily driving miles on about 3% of working days. These estimates are in lieu of rigorous real-world data on ride-hail driver daily and annual miles traveled that help us analyze the boundary conditions above.

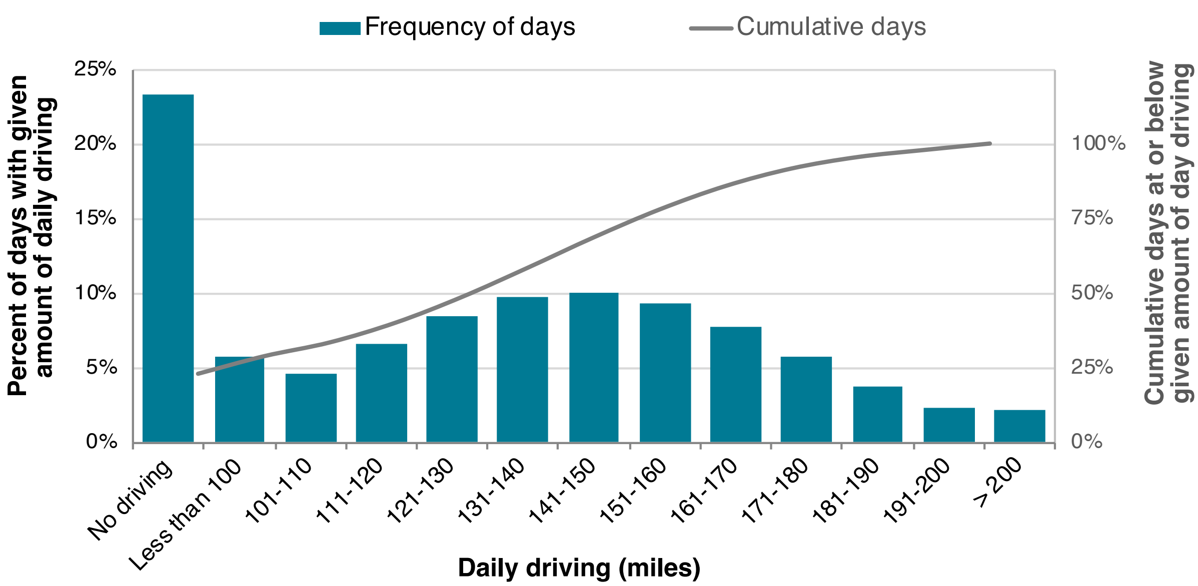

Figure A1. Distribution of driver number of working days per year and daily driving miles

Additional key assumptions used in this work include electric vehicle range of 250 miles, electric vehicle efficiency of 0.28 kilowatt-hours per mile (kWh/mile) in 2018 increasing to 0.26 kWh/mile in 2025, and a DC fast charging power transfer rate of 50 kilowatts (kW) in 2018 increasing to 86 kW in 2025.