

## RETHINKING EV CHARGING

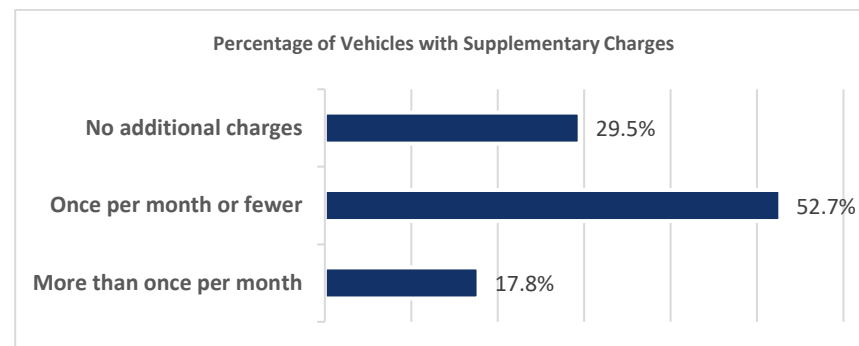
A commonly held belief by new or prospective electric vehicle (EV) owners is that purchasing an EV requires the installation of a “level 2”, or 240 volt, home charger. This norm is reflected in [media stories](#) about EV charging, where level 2 chargers are described as the default or preferred option.

Level 2 chargers are relatively fast, typically drawing power at a rate of 5 to 12 kilowatts (kW), significantly greater than most other large household appliances, such as air conditioners, dryers, and ovens, that operate closer to 1 to 4 kW. Consequently, as EV adoption grows, unmanaged EV charging risks straining distribution infrastructure when too many EVs in a local neighbourhood try to charge at the same time. Moreover, level 2 access can be unequal, especially in multi-unit residential buildings.

While one solution is to manage or coordinate charging in a local area to avoid the issue of too many cars charging at once, a simpler and complementary route is to encourage greater use of level 1 (120 volt) chargers. Level 1 chargers have less impact on the distribution grid since the power draw is much smaller, at roughly 1 kW, well-within the realm of traditional electric devices. Moreover, level 1 outlets are already widely available and, where not, can be easily retrofitted into existing parking spaces available in most multi-residential buildings, avoiding the need for potentially costly upgrades.

However, a concern with this solution is whether level 1 charging is sufficient to meet the energy needs of EV drivers. Using real-world driving data over a 13-month period from December 2021 to December 2022, we assessed the effectiveness of routine level 1 charging access in meeting energy needs for 129 EVs operating in Calgary, Alberta.

[Our findings](#) challenge the belief that all EV owners require access to level 2 charging. Instead, our research shows that level 1 charging is likely sufficient for many households. We find that 29 per cent of the vehicles in our study can fully meet their energy needs strictly with level 1 charging, while an additional 53 per cent of vehicles required only occasional—on average once per month or fewer—supplementary charges using a rapid charging station. Only 18 per cent of vehicles require frequent, i.e. more than once per month, supplementary charges to meet their energy needs.



Frequency of supplementary level 3 charging required for each vehicle to meet observed driving needs over the 13-month modeling period. Results from Fried, Shaffer and Hastings-Simon (2024).

To meet the extra energy needs of EV owners who cannot solely rely on a level 1 charger, we propose a suite of solutions, including:

- expanding access to charging infrastructure outside the home, such as workplaces or public parking spaces;
- making 'neighbourhood' level 3 (fast) chargers easily accessible; and
- promoting the use of lower power (i.e. 2-4 kW) level 2 chargers.

As EV adoption grows, expanding access to chargers and minimizing their impact on the electric grid will be increasingly important. While many will still need, or simply desire, the greater power and flexibility of a level 2 charger, a greater reliance on level 1 charging, often an afterthought, appears feasible.

### REFERENCES

Fried, A., Shaffer, B., & Hastings-Simon, S. (2024). Sufficiency of level 1 charging to meet electric vehicle charging requirements. *Environmental Research: Infrastructure and Sustainability*, 4(2).