Economic Analysis of Fleet Vehicle-to-Grid (V2G) Applications

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Overview

What is it? V2G tech enables reverse flow of energy from the Electric Vehicle (EV) back to the grid, in addition to traditional flow from grid to EV.

Challenge: How can we use fleets of electric vehicles (EV) as a grid resource? Is there a grid application or way in which we can use medium- and heavy-duty fleets of EVs that decrements the battery life making it economically unviable for fleet owners.

Opportunities:
- Business models are yet to be developed: owner compensation, discounts on energy.
- Fleet participation: range anxiety, guaranteed minimum state of charge levels for primary usage.
- Battery degradation: who would cover the cost of battery degradation/replacement.
- Standards: V2G standards need electric power system & vehicle battery degradation models.

V2G Pilots in the U.S.
- Beverly Public Schools, MA: Thomas Built school bus used for peak shaving for 50+ hours in summer 2021 by National Grid.
- Cajon Valley Union School District, CA: Five Blue Bird buses with Nissan bi-directional chargers will be used to evaluate additional revenue streams by the school district.

General Market Overview

Wholesale Energy Market (BPA)

1. Highest market revenues come from energy arbitrage, however -
2. Biggest hit to battery life comes from energy arbitrage and demand charge reduction.
3. Lower cycling requirements associated with frequency regulation and spinning reserve result in lowest impact on battery life, and consequently result in the most viable grid application.