Operations | Transportation and logistics | Network optimization | Uni / Multi-Objective

Optimizing EV Fleet Charging Infrastructure Deployment for Maximum Emissions and Savings Impact

BUSINESS PROBLEM

Verizon is planning on electrifying its fleet of 10,000+ light-duty vehicles spread across 1,000+ sites as part of a broader effort to meet its corporate sustainability goals. However, deploying EV charging infrastructure at such a dispersed fleet presents challenges: site-specific constraints, diverse vehicle usage patterns, location-based grid emissions, labor costs, utility rates and incentives. A scalable, data-driven approach is therefore required to support decision making about what order to electrify sites in and how many vehicles to convert on each site to minimize capital and operational costs and maximize emissions reduction.

APPROACH

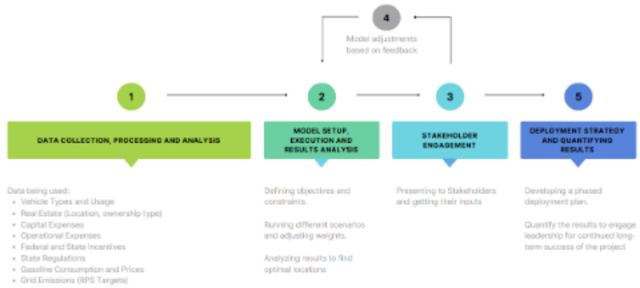
An integrated optimization model was developed to identify the optimal sequence and scale of charger deployment across sites. The model incorporates site-level vehicle usage, capital and operational expenses, incentive structures, and emissions profiles. Scenarios optimize for emissions reduction, OpEx savings, or a hybrid of both using an internal carbon cost (weighted objective function).

DATA SOURCES

Verizon Telematics Data (fleet usage, mileage, fuel purchase data), Verizon Real Estate Data (coordinates, type & ownership status), utility rate schedules, Bureau of Labor Statistics (zip based labor rates), government sources (State & Federal incentives, and state RPS targets), National Centers for Environmental Information (weather data), previous EV projects by Verizon (capital expense data).

Data Types and Format

Mainly time-series (telematics, weather) and location-based (labor rates, RPS targets) tabular data. Incentives data were unstructured text - converted to structured tables for ease of analysis.



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IMPACT

The optimization model delivers a data-driven roadmap for EV charger deployment aligned with Verizon's sustainability goals. By incorporating a hybrid objective that balances emissions reductions with operational savings, it outperforms a baseline ranking by fleet size, achieving 72% higher CO_2 reductions and 87% greater cost savings under an ICC of \$200 per metric ton CO_2 for a single-year planning horizon. The effective ICC, calculated post optimization, is \$113, much lower than the input of \$200/m.ton CO2 suggesting that the model chooses sites which have a better balance of operational savings and emissions reductions. Although the multi-year analysis results are only 2-3% better than baseline, it front loads high-impact sites, delivering early benefit as compared to baseline. The model incorporates conservative factors of safety for battery degradation (both long-term and weather based), ensuring only vehicles whose daily rides are within the effective range are electrified, avoiding the need for on-the-go charging. The optimization can re-evaluate site conditions if incentive programs or corporate goals change (change ICC), or if new EV technologies become available. Overall, the model ensures that each dollar spent on electrification is directed where it yields the highest net benefit, creating a replicable, robust blueprint for other large-scale fleet operators aiming to accelerate emissions reduction without compromising on financial viability.

DRIVERS	Stringent corporate sustainability targets at Verizon, including a 53% reduction in Scope 1 and 2 emissions by 2030 and net-zero operational emissions by 2035, demanded a scalable fleet-electrification plan. Evolving regulations like California's ACF rule, and consumer expectations around green operations spurred the need for a data-driven EV-charging infrastructure strategy.
BARRIERS	High initial capital expenditure, along with potential to disrupt operations while upgrading sites is the biggest barrier to rollout. EVs are also prone to disruptions due to power outages. This, along with other factors such as range anxiety, uncertainty of weather impacts on range make it difficult to get some site operators on-board.
ENABLERS	Strong executive sponsorship, robust internal data analytics capabilities, extensive fleet data, and cross-functional collaboration (Real-Estate, Fleet Operations) helped accelerate solution development.
ACTIONS	Collected and analyzed telematics data to identify usage trends. Engaged stakeholders to define scope. Gathered labor, incentive, grid-emissions, and utility-rate data. Built single- and multi-year models of capital/operational costs, emissions, and incentives. Incorporated load management to reduce demand charges. Applied a hybrid objective (emissions + OpEx) to prioritize high-impact sites.
INNOVATION	A hybrid optimization model simultaneously targeted emissions reduction and cost savings, using an internal cost of carbon. The model accounted for demand charges, weather-driven range loss, and location-based incentives. It also accounted to operational limitations while developing a easy to use ranking system for site deployment.
IMPROVEMENT	Compared to a baseline approach which electrifies sites in descending order of size, the single-year hybrid solution yields up to 72% additional emissions reduction and 87% more operational savings based on an ICC of \$200/m.ton CO2. Over a long-term planning horizon, the model yields 2-3% improvement, but does so by front-loading high-impact sites and lowering capital expenditure by making effective use of incentives.
BEST PRACTICES	1. Tailor EV deployment to real site and vehicle usage profiles - avoid one-size-fits-all. 2. Incorporate weather impact and battery degradation assumptions. 3. Don't ignore smaller sites as they might be high impact due to high annual mileage. 4. Use load management to reduce demand charges. 5. Leverage an internal cost of carbon to balance profitability and sustainability goals.
OTHER APPLICATIONS	This integrated optimization framework can extend to commercial fleets in logistics, utilities, and public transit. Future expansions could include medium- and heavy-duty vehicles, backup-power integration, or vehicle-to-grid options.