Reducing Peak Demand from Electric Fleets Through Rates and Incentives

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Electric loads from charging medium- and heavy-duty (MDHD) electric vehicle (EV) fleets can be substantial, with the timing of their peak energy demand varying based on operational patterns. However, thoughtful rate design and targeted incentives can help reduce peak demand by shifting it to other times of the day, reducing grid strain without inconveniencing these emerging electric fleets. This document provides information on reducing peak demand from electric fleets and highlights best practices for rate design, off-peak incentives, and vehicle-to-grid programs that can be used to shift EV fleet charging peaks.

Rate definitions[1]

- Volumetric rates: Electric rates based on the total amount of energy used (in kilowatt-hours). These rates can be a fixed price per-kilowatt hour or vary, for example, by time of day.
- Time-of-use rates (TOU): TOU rates are a type of volumetric rate where utilities set different electricity rates for different times of the day. These include times of day when costs are higher such as evenings between 5:00-8:00 p.m. (i.e., peak hours), and times when costs are lower (i.e., off-peak hours) such as late at night.
- Demand charges: These are commonly used for commercial and industrial customers given their high energy usage. The demand charge is calculated based on the maximum amount of energy used by a customer in a month over a specific time interval (e.g., in 15-, 30-, or 60-minute intervals set by utilities; intervals can vary). For example, if a customer's peak demand in a month is 70kW (measured in a 15-minute interval), and the utility's demand rate is $10 per kW, then their monthly demand charge will be $700 (Whited 2023). Demand charges can be coincident or non-coincident. Coincident demand charges occur when the customer's peak demand occurs at the same time as the overall system's peak demand. Non-coincident demand charges refer to when the customer's peak demand does not coincide with the system's peak demand.
- Critical peak pricing: This rate charges a high energy price during certain limited events in a year when the grid is expected to be extremely strained. These might occur a few times a year, for a period of a few hours. Customers are usually notified in advance.

Best practices for rate design to reduce fleet charging during peak periods

Although demand charges are common for commercial customers, they can pose a barrier to the adoption of electric fleets. Inappropriately designed demand charges can also burden commercial fleet customers without reducing grid strain. For example, non-coincident demand charges, that apply to

[1] For a detailed descriptions of the rates, see Synapse Energy's Best Practices for Commercial and Industrial EV Rates (Whited, Frost and Havumaki 2020).

maximum demand in a given time period, even during off-peak hours when electric fleets tend to charge, can be cost-prohibitive for potential customers.

1. **Switch demand charges to simplified TOU rates:** TOU rates can be effective in sending the correct price signal since they encourage fleet operators to charge vehicles when electricity demand is lower (usually at night), reducing strain on the grid and lowering costs (Whited, Frost, and Havumaki 2020). Simple TOU rates that are easy to understand—as opposed to frequently varying hourly rates—can be effective for fleets that can control their charging time (Whited, Frost, and Havumaki 2020). For these rates to be effective, systems must be in place to inform fleet owners and operators about TOU rates so that fleets can plan their operations and charging behavior accordingly.
2. **Offer critical peak pricing along with TOU rates as an option for EV fleets:** Critical peak pricing (i.e., when high energy prices are in effect, limited to a few events a year) is another rate option for electric fleets (Whited, Frost, and Havumaki 2020). If utilities choose to provide critical peak pricing, it should ideally be offered alongside and stacked with other rate options such as EV-TOU rates. Fleet customers are usually warned of high critical peak pricing events in advance so that they can plan to shift their charging behavior, if possible, to avoid the high costs.
3. **Demand charge alternatives to reduce charging rates in early commercial EV phases:** Additional options to relieve the cost burden of demand charges for EVs according to a report by the National Association of Regulatory Utility Commissioners include 1) temporarily pausing demand charges (i.e., a demand charge holiday) in the initial stages of EV adoption (i.e., until EV charging reaches sufficient charging levels to justify demand charges again), and/or 2) instituting fixed monthly subscription charges for different levels of expected charging loads (McAdams 2022). Adoption of these principles may be challenging based on the state commission's normal rate design principles and other legal precedents that may be set by past rate cases/rate design efforts.

> Pacific Gas and Electric (PG&E) is one example of a utility that has replaced demand charges with a TOU rate and a monthly subscription charge. PG&E's business EV plans charge customers a monthly fee based on the charging subscription level that is chosen for their EVs (Pacific Gas and Electric). Additionally, customers are billed for their EV charging based on TOU rates with lower off-peak hour rates outside of 4:00-9:00 p.m. PG&E's BEV2 business rate plan is applicable to fleets. A case study by Synapse Energy Economics about how PG&E switched demand charges to TOU rates can be found in the report, Best Practices for Commercial and Industrial EV Rates (Whited, Frost, and Havumaki 2020).

Best practices for incentives to increase off-peak charging for fleets

Utilities can also incentivize off-peak charging without using TOU rates through different mechanisms.

1. **Provide discounts, rebates, and incentives through managed charging programs:** Utilities can offer managed charging programs which include discounts or rebates to fleet customers for charging during off-peak hours (Alliance for Transportation Electrification 2023). Charging for these programs can be done with or without a smart charger (explained below), depending on if the utility program relies on active or passive managed charging. Through passive managed

charging, one can schedule their EV (without needing additional technology) to charge during pre-set off-peak hours. On the other hand, active managed charging can entail smart chargers, which can be used by utilities and third-party entities to actively control charging (over the internet) to best fit the needs of the grid.

> Con Edison's SmartCharge program for light-duty fleets offers a discount of 10 cents per kWh as their off-peak incentive which can be earned by charging during off-peak hours year-round with bonus incentives of $35 per month to avoid charging during the summer peak hours of 2:00-6:00 p.m. (Con Edison). Customers enrolled in the program have to connect their vehicle's telematic data to online software which records charging behavior for the purpose of calculating the incentive that is paid back to the customer. Customers can schedule charging on their vehicles to off-peak hours as usual and there is no third-party control of the vehicle charging. Signing up for SmartCharge does not override any preset charging preferences.

2. **Create incentives for participating in demand response events:** Participation-based incentives are additional ways to design discounts for commercial customers and manage fleet load (Fitzgerald and Dougherty 2021). These incentives can be provided to customers on a monthly or an annual basis for participation in demand response events (as they occur), with varying rates for small to large commercial customers. For example, as part of a demand response participation program, utilities can require customers to limit charging "x" number of times each month (when notified to do so by the utility), with some leniency to opt-out for one of those requests every month. Customers are given monetary compensation for each demand response event they "participate" in (i.e., for the number of times they limit their energy use when asked to by the utility).

Vehicle-to-grid load management for electric fleets

Vehicle-to-grid (V2G) EV technology allows for bidirectional charging, with the vehicle having the ability to send power back to the grid. As a result, V2G-capable EVs can support grid resiliency when utilities expect the grid to be strained (i.e., during peak hours in summer) through a controlled and/or timed discharge of electricity from electric fleets using load management software and hardware. V2G can also help electric fleets earn revenue based on the amount of electricity they send to utilities and help power communities during power outages. This section provides an overview of how utilities can implement successful V2G operations.

1. **Use existing processes and guidelines to improve bidirectional charging programs:** Smart Electric Power Alliance's (SEPA) State of Bidirectional Charging report recommends that utilities and regulators use guidelines from interconnection processes already in place for existing distributed energy resource systems (such as solar PV or batteries) to set up and connect new bidirectional systems (Blair, Moran, and Fitzgerald 2023b). Setting up interconnection processes that are streamlined can make implementation easier for customers. SEPA notes that utilities with "stationary storage interconnection tariffs" (i.e., fees) can use pre-established standards/processes for V2G systems as well covering such issues as smart inverter requirements and customer portals. Utilities without interconnection processes for battery

storage may need to set up their own interconnection processes or rely on other pre-existing solar PV interconnection processes as guidance.

Revel's V2G project is an example of V2G chargers being interconnected through a modified version of ConEd's existing interconnection process for stationary storage, where the chargers only had to go through some additional certifications (Blair, Moran, and Fitzgerald 2023a).

2. **V2G-specific rates and tariffs can provide financial benefits to electric fleets:** V2G program tariffs can be structured to require electricity discharge back to the grid during certain peak hours and can vary depending on the utility's needs. These can be peak hours in summer only, a few peak hour events in summer and winter, and no more than a few times each month. For example, in summer 2023, Revel was required to discharge energy back to the grid between 2:00-6:00 p.m. every day (which was how ConEd's program was set up) (Blair, Moran, and Fitzgerald 2023a). The V2G tariff pilot for their light-duty fleet was expected to earn $10,000 in summer 2023. Lessons learned as part of Revel's project suggested that instead of requiring participation every day of summer, participation could be limited to a few days when the utility anticipates high peak demand.

   One V2G school bus pilot in Massachusetts with National Grid, Highland Electric, and Synop, discharged almost 11 MWh over 158 hours and generated $23,000 in revenue for the school district (Kregel 2023). As another example, San Diego Gas & Electric's school bus V2G project was scheduled to send back electricity between 4:00-9:00 p.m. for the months of May-October as part of its load emergency response (which was determined day-of or day-ahead) and paid $2 per kWh of electricity sent back during the required times (Steimer 2023). However, the rate was not specific to V2G operations, but rather the load emergency response program itself.

   A report on San Diego Gas & Electric's V2G school bus pilot also recommended that the V2G pilot operation's financial benefits (beyond current revenue generation) could be improved by developing and offering V2G-specific rates (Cadmus Group and Energetics Incorporated 2024a). Combining V2G-specific rates with on-site generation and battery storage can reduce load demand at a site by reducing operating costs.

3. **Ensure the interoperability of V2G components:** The lack of interoperability of V2G components can be a hindrance to implementing V2G projects if not coordinated in advance. Therefore, prioritizing the interoperability of V2G components (such as the bus, charger, battery, and software) during the planning phase so that the individual components can communicate with and respond to each other can ensure that the project can be implemented smoothly from the start (Cadmus Group and Energetics Incorporated 2024a).

> Starting in late 2020 and running through 2021, Con Edison started piloting V2G operations on three electric school buses (ESBs) in White Plains, New York through the state's first V2G ESB pilot. The pilot looked into whether ESBs can serve their intended transportation use, while also undergoing V2G responsibilities, and the impact of V2G on battery health. Although the final report for Con Edison's ESB pilot does not specify the total energy discharged back to the grid, their total cost of

ownership estimation for managed V2G charging showed that electric buses could save on "fuel" costs (i.e., electricity costs) (Con Edison 2022). Their analysis found that V2G discharge by the electric bus can generate enough utility bill credits and can surpass the cost to charge the vehicle by $4,000. Although the reliability of scheduled V2G discharge events (from the bus to the grid) averaged only 55% during the course of the pilot (due to needing hardware replacement, software, and human errors, and the fact that some of the technology was still pre-market), reliability is expected to improve as the industry matures and operators gain additional experience managing V2G e-buses.[2]

Impacts of rate design, incentives, and load management on fleets

EV load management solutions such as switching demand charges with EV-TOU rates, providing monetary incentives to charge during off-peak hours, and V2G programs are a two-fold solution that can help make EV charging more affordable for fleets while also supporting the grid. As utilities implement a suite of different load management strategies, reviewing their impact on fleet charging behavior is necessary to understand whether the programs are working as expected. For example, a report for Consumers Energy's (Michigan) PowerMIFleet pilot program found that in 2022-2023, the program was able encourage off-peak charging through TOU rates, with over 85% of charging for fleets occurring during off-peak hours (Consumers Energy 2023). The Commission approved the PowerMIFleet to be a permanent program, and the latest program report filed in June 2025 reported that ~91% of fleet and workplace charging occurred during off-peak hours in 2024 (Consumers Energy 2025).[3]

Another evaluation report for year three for several EV programs in California, including MDHD programs, found that the overall energy consumption for school buses was much lower during the peak hours (4:00-9:00 p.m.) during load-managed days compared non-load managed days for programs by Pacific Gas and Electric, San Diego Gas and Electric, and Southern California Edison utilities (Cadmus Group and Energetics Incorporated 2024b). While the overall average energy consumption between 4:00-9:00 p.m. for non-managed load days hovered between 26–31% of the total daily energy consumed, it dropped to around 10–16% on load-managed days—about half, or in some cases even one-third of the non-managed usage. This suggests that load management can reduce energy demand during peak hours. However, the data was varied, implying that one must be mindful of factors such as operational patterns, and the potential for charging flexibility of the fleet itself.

The above examples show instances where load management strategies were successful in shifting peak demand. Given the variety in vehicle operations for MDHD fleets, early program data, in general, can provide insights into what is working and what is not for electric fleets, and ultimately be used to inform the development of appropriate utility rates and program incentives. For example, off-peak charging might not suit the schedules of all fleets and so it would be critical for utilities to work with commercial fleets to explore what might work and what might not. Assessing this early on (and throughout the

[2] The project defined reliability as the electric school bus's availability to send electricity back to the grid when scheduled to do so and reported the metric as a percentage of days the school bus was available for V2G operations.

[3] For the latest 2024 report, filed in June 2025, Consumers Energy combined off-peak charging data for fleet and workplace charging (see Figure 10 in report).

program's implementation) can give utilities the opportunity to investigate the need for modifications (if any). While data on TOU rates and load management programs appear to be more common, data on the impact of demand charge holidays or demand charge alternatives were more limited. One reason for this could be that these types of utility rate designs are still new and are still under implementation meaning data might not be available yet. As the trial periods for demand charge holidays come to an end, it will be just as important to review their influence.

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