



Energy Visualization of Electric Vehicle (EV) Charging

Summary

This whitepaper presents the considerations understanding the EV operations profile and charging needs as a necessary step in the planning process to optimize costs, streamline deployments, and enable future growth while maintaining deployment schedules.



About EVCharge.Energy

EVCharge.Energy enables energy visualization and analysis of EV charging impact on facility electricity consumption, enabling fleet owners and operators to evaluate and design cost optimized EV charging deployments. EVCharge.energy draws on the experience of Enerlogics Networks, Inc. in its development of behind-the-meter projects utilizing solar, energy storage systems, EV charging infrastructure, and related technologies for commercial, industrial, government, and educational customers across the US.

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Fleet deployments of Electric Vehicles (EVs) include passenger vehicles, light duty trucks, delivery vehicles, school buses, and even semi-trucks and refrigerated trailers. These fleets are increasingly deployed for facilities including municipal / government, utilities, schools, and private sector clients. With increasingly pervasive deployments of EVs into the marketplace, consideration of the EV charging needs today and in the future is required *before* fully deploying EVs. This whitepaper is a companion to our previous whitepaper on Fleet Electric Vehicles and Charging Considerations available at http://evcharge.energy/wp-content/uploads/2024/04/Enerlogics_EVChargingConsiderationsWhitepaper_2024.01.11-1.pdf

Mission

Enabling engineers, facility planners, and EV charging companies to evaluate, analyze and visualize the impact of EV charging on facility power usage. By focusing on regular fleet applications, including commercial fleets, school buses, and similar applications, EVCharge.Energy enables rapid evaluation of EVs and recharging on facility power and energy.



Problem Statement

Today, engineers, facility planners, and EV charging companies do not have a way to fully evaluate the impact of electric vehicles and recharging on facility power usage. Furthermore, when planning, few facilities fully understand or consider electric vehicle range and battery capacity, as well as limitations on power infrastructure to support EV charging.

From the electric vehicle standpoints, key considerations include: Vehicle type, battery capacity, and anticipated power usage. For example, passenger vs. commercial scale vehicles (class 6+ trucks) have wide variability on battery capacity and range.

Rather than utilize EV charger-specific data, EVCharge.Energy utilizes more simplified vehicle level information to analyze the power *needs* of the vehicles to enable a downstream selection of the specific chargers. The vehicle charging information includes a simplified consideration of the recharge window hours with an average power draw across those hours.



EVCharge.Energy utilizes key information about the facility, fleet, and available times to charge to visualize energy consumption of the charging. This process follows several distinct steps to enable holistic analysis:

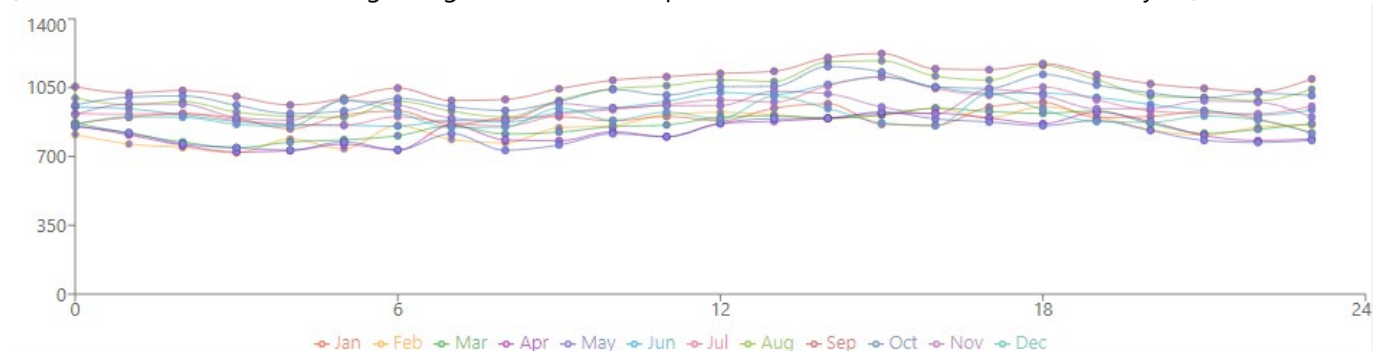
- **Baseline Facility Consumption:** Optional step to utilize facility level interval data to provide a baseline of facility consumption.
- **Vehicle Capacity and Available times for recharge:** Identification of the type(s) and counts of vehicles, battery size, anticipated battery depletion at the end of a typical day, and available times to recharge.
 - Note that multiple scenarios of available recharge times allows visualization of the impact of charging vis-à-vis utility tariff schedules and peak rates.
- **Solar Energy Production:** Optional step to include the impact of solar energy production from a system at the site.
- **Combined Energy Visualization:** Visual presentation of the baseline, EV charging, and net consumption after solar.
- **Download of all key information:** Available download of hourly interval data to enable integration with financial analysis platforms such as Energy Toolbase.

The balance of this whitepaper provides a step-by-step guide on utilizing the EVCharge.Energy platform ("EVCE").

Step 1: Baseline and Reference Data

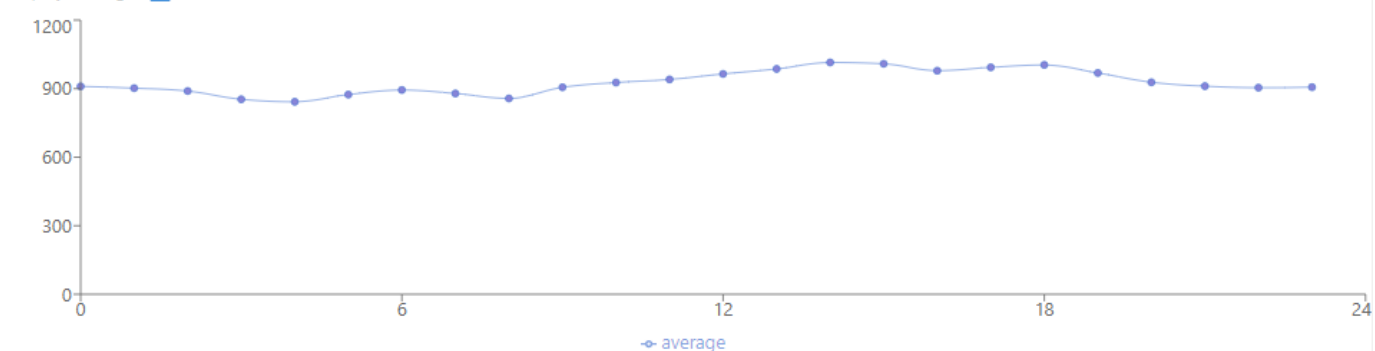
EVCE first enables you to upload facility reference data as part of the baseline facility consumption visualization. This reference data enables you to select a CSV file that contains the interval data for the site, in a 2 column (date/time, kWh) format.

Once the file is uploaded and processed, the reference data chart will display the average usage by hour by month (i.e., a 12x24 chart of the average usage for the 24 hour period, for each of the 12 months of the year).



EVCE also allows you select the "Average" to toggle the average across the entire year.

Display Average ☒



Both the 12x24 and the average are valuable in understanding the facility's baseline energy consumption *before* the addition of the EV charging.

Note that the baseline interval data upload is not required to utilize EVCE; however if the interval data is available we recommend utilizing the data to assist in understanding the impact of EV charging.



Step 2: Entry of Vehicle Types and Charging Hours

EVCE enables the analysis of estimated power needs by considering for main factors:

- Vehicle count (e.g., 16)
- Vehicle type and battery capacity in kWh (e.g., Freightliner eCascadia with 428 kWh)
- Vehicle anticipated depletion at end of a normal business day (e.g., 65% or 0.65 depletion)
- Available hours for recharging in hour starting (0 through 23)

From this data, the EVCE calculates the average power need over those available hours.

EVCE allows multiple vehicle types to be entered to evaluate the impact of e.g., passenger vehicles, class 6, and class 8 trucks simultaneously.

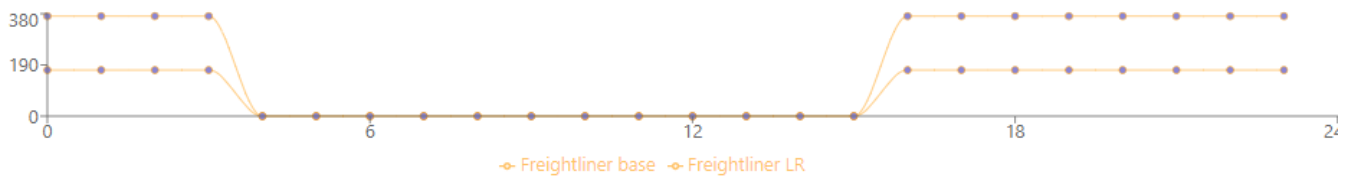
Actions	Count	Make	Battery Capacity (kWh)	Percent Depleted	Charging Hours
 	16	Freightliner Long range	428	.65	0,1,2,3,16,17,18,19,20,21,22,23

 	12	Freightliner base	228	.75	0,1,2,3,16,17,18,19,20,21,22,23
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EVCE then provides visualization of the EV charging demand over those hours; this data is shown for each vehicle type. The "Download CSV" enables a download of the data as a CSV file.

[Download CSV](#)

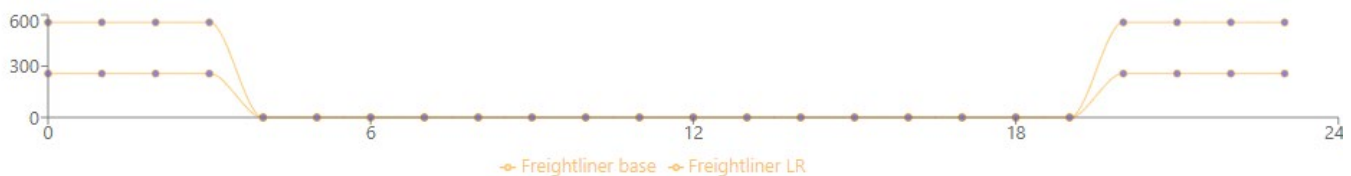
Display Average ☐



Note that by changing the available charging hours, the demand per hour is affected. The image above reflects a 12 hour recharge window (hour starting 4 pm through hour starting 3 am the following morning). If we shrink that window to an 8 hour available window (hour starting 8 pm through hour starting 3 am), the demand increases.

Actions	Count	Make	Battery Capacity (kWh)	Percent Depleted	Charging Hours
 	12	Freightliner base	228	.75	0,1,2,3,20,21,22,23

 	16	Freightliner LR	428	.65	0,1,2,3,20,21,22,23
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This enables you to evaluate and visualize the demand impact based on the available dwell times for recharging.

Note that utility tariff structures may dictate certain recharging hours as more cost effective. For example with utilities that have demand charges in the noon to 5 pm period, we generally recommend that recharging starts at 5 pm or later. Correspondingly for utilities that have demand chargers or time of use rates that extend into the



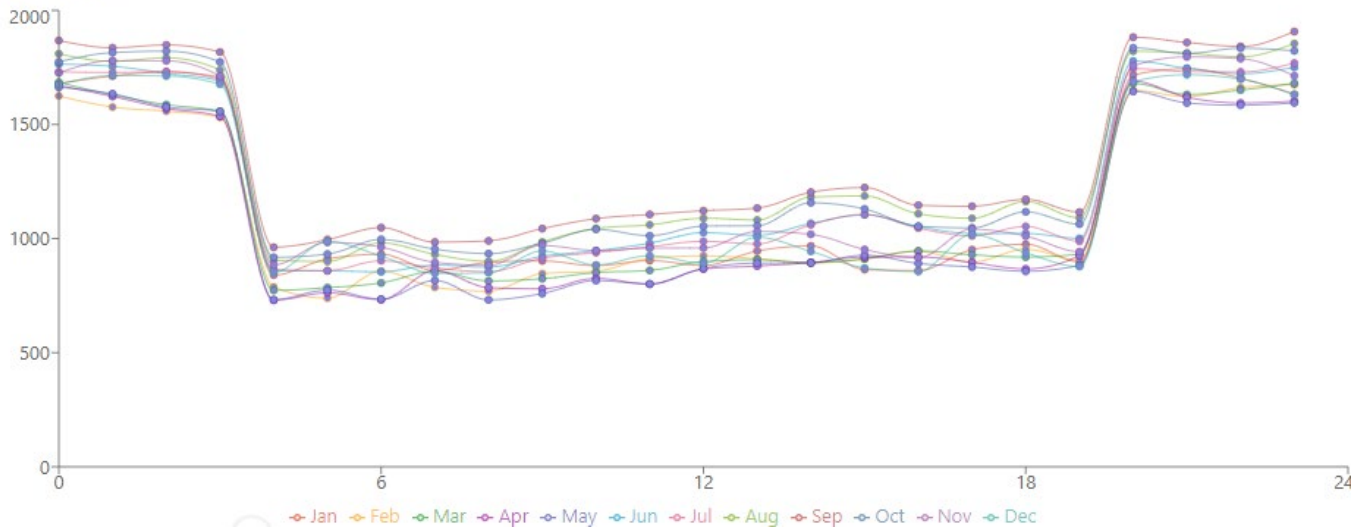
evening hours, we recommend that recharging starts after those high demand charge/TOU periods (e.g., 9 pm or later for CA utilities)

Step 3: Aggregate Consumption Data

EVCE then displays the aggregate consumption data of the combined facility usage plus the EV charging load. As with other charts, the 12x24 is the default display, with the option to display the average.

[Download CSV](#)

Display Average ☐



Step 4: Solar Generation Estimates (Optional)

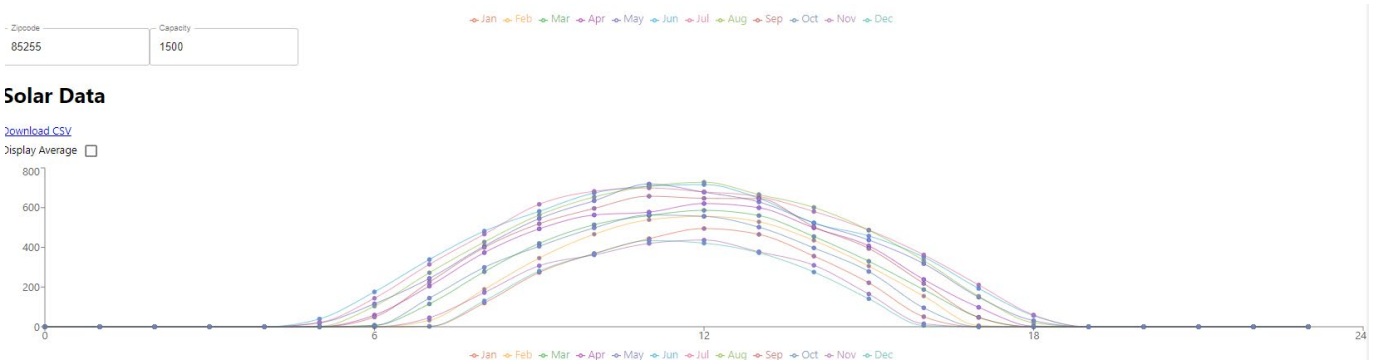
EVCE enables an estimated solar data using the site zip code paired with capacity in kWdc. EVCE utilizes NREL's PVWatts API to create the solar production profile.

Zipcode	Capacity
85255	1500

Solar Data

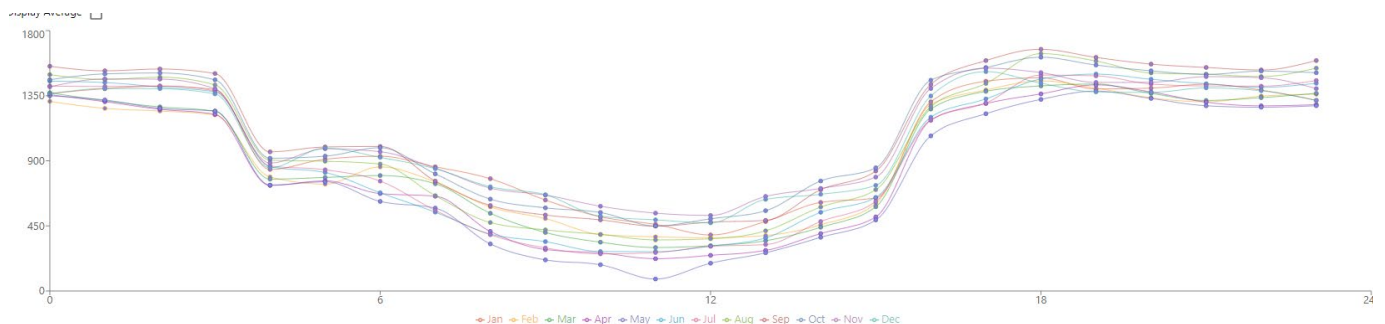
[Download CSV](#)

Display Average ☐



Step 5: Combined Usage Net of Solar

EVCE then displays the combined net usage.





Step 6: Using the EVCE Information

EVCE enables visualization of the charging impact on overall facility consumption, with considerations of seasonality and time of impact. This is invaluable in understanding the power needs of the facility and support of EV charging. In our experience, we have utilized the EV charging data to evaluate multiple charger option including the number and power capacity of the proposed chargers. As we have discussed, key considerations on charger counts and type include:

- Number of vehicles
- Available space for chargers
- Charger to vehicle strategy (E.g., 1 charger per vehicle, 1 charger with dual dispensers, etc.) as well as operational impacts (connect vehicle and disconnect in AM vs. cycling multiple vehicles per charger)
- Available power from building

EVCE does not attempt to pick chargers but instead is designed to enable analysis of the power needs in support of the selected vehicles. EVCE further enables analysis of the power impact of considerations around the charging needs and charging windows. For example, with longer dwell times, EV chargers with lower power draw (e.g., 50 kW level 3 chargers) can support some applications, whereas shorter dwell times could result in needs for higher power level 3 chargers.

EVCE enables you to download CSV files associated with each of the graphical charts of data. This generates a full interval data file with hourly data (8,760 intervals of data). We have utilized the step 4 aggregate consumption data to then perform a full financial analysis under the utility tariff structures in platforms such as Energy Toolbase. By having variable charging windows and control strategies, these platforms enable evaluation of charger impact on overall facility consumption and costs; as well as enable evaluation of the impact of solar and energy storage to reduce operational impacts from EV charging.

Conclusions

EVCE is a platform designed to enable visualization and analysis of the impact of fleet electric vehicle charging on facility level consumption. EVCE is designed to integrate with other proven platforms (like Energy Toolbase) to enable holistic analysis of the cost impact of various charging scenarios.

About Enerlogics Networks, Inc.

Enerlogics Networks, Inc. ("Enerlogics") is a developer of intelligent energy solutions for commercial, industrial, governmental, and educational customers across the US. Contact us at www.enerlogics.com | 216.362.3000 x303

