Charging Network Options & Load Management

The choice of non-networked or networked EV supply equipment (EVSE) typically balances the needs at each site with equipment costs, software costs, and the cost of employee time. You can use telematics equipment attached to each vehicle or a networked charging system to gather data about the EVs and charging systems. Networked charging, while not the only method for monitoring electricity use for clean fuel credits, can be very effective.

The information provided here addresses:

Non-networked systems

Non-networked charging systems have one functionality—off or on. They don't collect data about charging events or power usage. Non-networked equipment may be appropriate at smaller or remote charging sites, where there is no public access. For clean fuel crediting purposes, power use may be captured on a dedicated submeter.

Advantages: Simple, reliable, no software problems, no per-port network fees

Disadvantages: No data collection, no alerts sent about nonworking equipment

Networked systems

If you do not have an application to capture fleet data, the network software offered on the EV charging equipment may offer adequate reporting and data capture for your fleet.

Advantages: Networked EVSE gather usage data so fleet managers can:

- Understand and scale EV charging by identifying the number, time, and length of charges per day
- Identify vehicles and the power delivered to each
- Control access by determining if a user or vehicle is allowed to charge
- Sophisticated systems can allow use by the public and collect fees
- Allow remote control and troubleshooting of the charger

Disadvantages: Greater initial cost, networking fees, complaints about reliability:

- The network may use Wi-Fi or cell services to communicate data to the cloud about the vehicle plug-in, kWh usage, time-of-use (TOU) charging, and other valuable data
- Per-port cost for the software service and typically a five-year or annual fee, similar to the license fee for computer software

Telematics

Telematics equipment captures data about mileage, topography, and duty-cycles so current usage of the vehicles can be analyzed. If you already track the fossil fuel fleet with telematics, this may be an option with EVs.

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Load management

Load management refers to the tools and techniques for managing all the loads on an electrical panel (buildings, vehicles, appliances) to optimize a facility's total power capacity. The goal of load management is to share power capacity among many demands to minimize the need for upgrades.

For EV charging, load management refers to the tools and techniques for managing when vehicles charge and at what power level. Electrical infrastructure is built to support a defined amount of power (kW). ***Power demand*** is the combination of all EVs charging and other loads on an electrical service or panel at a given moment. Knowing a site's power demand is necessary when planning to install multiple charging ports at a site, and for scheduling how and when to charge different EVs.

Load management equipment and software are useful to control charging costs. Load management may also help:

- Reduce the total number of charging ports
- Minimize the need for utility upgrades
- Optimize infrastructure funding
- Support clean fuel crediting

Demand charges are part of the electricity rate structure for commercial customers. It is tied to the *peak* power an electrical service is supplied in a month. Large spikes in demand are costly for a utility. These fees can dominate electricity bills for fleets that charge relatively few EVs per month.

Customers can manage these costs by maintaining a balanced demand for power over each day and month.

Managed charging

Managed charging refers to load management techniques to balance the facility's overall electrical load. By balancing EV charging, not all vehicles draw maximum power at once.

Software controls can orchestrate the vehicle charging demand over the available dwell time. Software programs can shift power usage within a facility or within a group of EVSE to:

- Provide increased power to fewer charging ports
- Provide decreased power to more ports
- Help operators take advantage of lower electricity rates

For example, if a facility has eight charging ports, and eight vehicles start charging all at once, this will create a significant draw on the facility power system. During a facility assessment, this load estimate may suggest the need for a utility upgrade. However, if the system incorporates managed charging, it can direct power to the eight vehicles at varying speeds and across the anticipated dwell times to reduce the facility load impact.

However, issues with connectivity and maintenance costs have led to a preference for a telematics-based solution over software controls.

Some electric utilities provide funding or incentives for managed charging. Active Managed Charging (V1G) programs offered by utilities will grow rapidly in coming years. V1G programs:

- Offer financial incentives for customers to voluntarily respond to grid events (opt in or opt out of grid events)
- Guarantee the customer a desired state of charge by a defined time of day but allow the utility to reduce power levels or curtail charging if needed during times of peak demand

Read more about this in the BE Toolkit.

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By balancing EV charging needs, managed charging reduces costs across the spectrum by:

- Reducing or eliminating utility make-ready costs (transformer upgrades or bringing more power to a site).
- Mitigating electrical service upgrades. For example, managed charging may reduce the need to increase panel amperage from 200 A to 400 A or 600 A, or for electrical panel upgrades (most commonly with smart breakers).
- Reducing electricity costs by leveraging dynamic rates and reducing demand charges.

More utilities are designing rates to encourage EV charging when there is lower demand on the grid (off peak), such as overnight or when there is an excess of renewable energy. These rates reward customers with cheaper prices and help accommodate more renewable energy on the grid.

Smart breakers

Smart breakers can be cost effective by allowing additional L2 EV chargers on an existing electrical panel because they can share loads across the electrical panel. If an appliance ramps up its power level, the circuits supplying energy to the EV chargers can ramp their power levels down to balance the load. This dynamic balancing improves the efficiency of an existing electrical service and reduces costs. For example, a circuit for EV chargers that could supply 80 A would ramp down to a lower level when there are additional power needs, thus staying under the panel's total power capacity.

Bi-directional, V2G, V2X, or V2B charging

Some EVs with large batteries can help balance the grid while maintaining sufficient charge for the workday through bi-directional, vehicle to grid (V2G), vehicle to everything (V2X), or vehicle to building (V2B) charging.

These vehicles offer resilience for the facility where they are parked, acting as a backup generator if there is a power outage. Ford's F-150 Lightning offers this feature with optional equipment (Ford Intelligent Backup Power). GM and Ram will also offer this option with their upcoming pickups.

This is a rapidly advancing industry. Check with non-biased experts regularly to learn the current state of the industry.

Open Communications Protocol (OCP)

No matter which hardware or network system you choose, OCP can help you keep up with changes in the charging industry. If any EVs in your fleet have proprietary charging, in most cases you can install an industry standard and an adaptor will be available for your specialized vehicle. However, keep in mind that a proprietary standard may not fit with the rest of the growing fleet.