

Level 2 Smart Charging Features and Benefits

In many cases Electric Vehicle (EV) charging can be done with a simple non-connected Electric Vehicle Supply Equipment (EVSEs), but smart charging technology is becoming more affordable. Many utility companies are interested in using EVSEs for more advanced functions like metering and demand response (DR.) Smart charging also enables better integration with renewable energy, so it is good to look into different features and think about where they could provide the best value.

Smart charging systems provide a variety of functions and features. Even though basic “dumb” charging stations are in most cases the cheapest option, there are many use cases where smarter solutions provide advantages that will make the advanced systems more cost effective in the long run. This document tries to clarify the features and benefits so that system owners can make well-informed investment decisions.



In addition to initial capital investment and installation costs, system owners should also figure out ongoing connectivity and service costs and take those into account when calculating the longer term costs. On one end you will have simple, not-connected stations where you don't really have ongoing costs. The other end is “all the bells and whistles” systems, where connectivity and service costs can easily be more than the value of the electricity delivered through these stations. There are use cases for both ends and everything in between, but system owners need to do their homework to make sure they get the best value for their money.

Feature descriptions

Here are short descriptions for different features listed on the “Level 2 smart charging features and benefits for different users and stakeholders” table.

Programmable power limits

This feature allows setting static power limits to individual EVSEs. This is especially useful for workplace charging when payment structure is set based on available power levels. This prevents people from “gaming the system.”

Power sharing

Smart charging systems can adjust power to individual charging stations based on the power needs of other charging stations. This can keep the overall charging power load below a set threshold, and can enable a higher number of charging stations if power supply is limited.

Dynamic peak power limits

Smart charging systems can monitor the overall power consumption of the building and adjust the charging power consumption to avoid demand charges.

Metering and reporting

A smart EVSE with an incorporated energy meter will eliminate the need for a separate submeter on the line thus saving on system, installation and connectivity costs. Metering and reporting functions can provide information for utility billing purposes or for any system owner to monitor electricity consumption.

Access control

Smart EVSEs can provide electronic access control, e.g., with RFID or smart phone app technology. Low-tech access control can also be achieved with manual locks, either with a built-in EVSE lock, a lockable unit box or a smaller lock in the J1772 connector.

Demand Response and other utility controls:

The utility could lower or turn off charging power if the grid is facing a high power load. Smart EVSEs could also be programmed to turn on and off or adjust the power levels based on utility rate schedules. These schedules could be static or dynamic.

Renewable Energy synchronization

The system could follow solar production and/or wind production signals to charge when renewable energy is available.

Payment and billing

Smart charging stations can provide payment features where, for example, a user can set up a prepaid account or the user's credit card is deducted based on their charging station usage. The system provider could also provide billing as a service, or EVSEs can report usage figures to the utility company, which will incorporate charging consumption as part of a user's home energy bill.

Features matching table

The following "Level 2 smart charging features and benefits for different users and stakeholders" table will show how these features can provide value for different stakeholders. The dark green color indicates best match, lighter green next best and pink is used to indicate a use case for which this feature is not recommended.

Level 2 smart charging features and benefits for different users and stakeholders

	Home Charging	Multi Housing Charging	Workplace Charging	Public Charging	Fleet Charging	Utility company
Programmable power limits		Setting power limits will control how much energy is drawn to match the agreed payment level.	Setting power limits will control how much energy is drawn to match the agreed payment level.			
Power sharing	Enables higher number of charging station installations even if power supply is limited.	Enables higher number of charging station installations even if power supply is limited.	Enables higher number of charging station installations even if power supply is limited.	Enables higher number of charging station installations even if power supply is limited.	Enables higher number of charging station installations even if power supply is limited.	Less power capacity upgrades. Less power peaking
Dynamic peak power limits	Mitigates or eliminates increased demand charges.	Mitigates or eliminates increased demand charges.	Mitigates or eliminates increased demand charges.	Mitigates or eliminates increased demand charges. (Not recommended)	Mitigates or eliminates increased demand charges.	Smaller impact on grid.
Metering and reporting	Valuable if utility company provides separate rate that utilizes EVSE metering.	Very valuable in condominiums. Useful in apartment buildings.	Useful information if users pay flat fees. Required for kWh-based payments.	Required for kWh-based payments.	Valuable information for fleet consumption analysis.	Enables EV rates without separate meter.
Access control	Valuable if unit is installed outside.	Valuable if EVSEs are shared, installed outside or residents want it.	Valuable if EVSEs are shared or installed outside.	Enables both flat fee and usage-based payments.	Enables cost allocations and valuable if EVSEs are installed outside.	
Demand response functions or other utility controls.	Utility company incentives	Utility company incentives	Utility company incentives	Not recommended	Utility company incentives	Rapid response control load
Renewable Energy synchronization	Valuable with residential solar if no net metering and car is at home during the day.	Valuable for meeting sustainability goals.	Valuable for meeting sustainability goals.	Not recommended	Valuable for meeting sustainability goals.	Local power quality. Better utilization of excess renewable power.
Payment and billing	Utility can provide special EV rate and bill customers directly.	Utility or 3 rd party can provide special EV rate and bill customers directly.	Useful if the system owner doesn't have an existing financial relationship with users. (Building owner/management company.)	Enables 3 rd party taking care of the payment and billing.	In most cases not needed.	Enables EV rates without separate meter.