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The hidden challenges of EV charge point installation

Many businesses are actively considering the installation of electric vehicle (EV) charge points, which from the environmental point of view is undoubtedly an excellent move. But, says **Julian Grant** of **Chauvin Arnoux**, if the provision of EV charging facilities is to go smoothly, careful planning based on accurate data is essential.

Installing an EV charge point is not quite as easy as, say, installing a new electric heater. For a start, there are likely to be special earthing requirements, but you can expect a competent installer to take care of these. If you are the owner or manager of the premises where the charge point is being installed, however, there are other hidden aspects that you need to be aware of, most of which relate to the effect the charge point will have on your electricity supply system. Before looking at these in more detail, it's important to realise that EV charge points come in many types and sizes, and this has to be taken into account when planning an installation.

The least powerful types, which are often described as "standard" or "slow" chargers have a rating of 3 kW or even less, while one of the latest "superchargers" may well be rated at 130 kW or more. While adding an extra 3 kW load to an existing installation is not likely cause many problems in terms of supply capacity, adding a 130 kW load is almost certain to be more of a headache. So why would you choose a high-power charger? The answer is simple: the higher the charger power, the faster it will charge a car.

A standard charger can be expected to take between 8 and 12 hours to deliver a full charge, which may well be fine if you're charging your car at home overnight, but is probably not ideal for workplace charging, especially if visitors are likely to expect access to charging facilities. On the other hand, a supercharger can deliver a useful amount of charge in as little at 10 to 20 minutes. This is perfect for a motorway service area, but not really necessary in most business environments.

It's likely, therefore that most businesses will choose mid-range chargers rated at up to 7 kW single phase, which will charge a car in 3 to 4 hours, or up to 22 kW three phase, which have a charging time of 1 to 2 hours. The next question is how many charge points you are going to install, as most businesses are likely to need several, especially if they're looking to the future.

When you've chosen your charge point rating and decided how many you need, it's time to consider the capacity of your electricity supply system. If you have a

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three-phase supply, you're probably on a maximum demand tariff, and if you exceed the maximum demand agreed with your energy supplier, you'll incur stiff financial penalties. But how close are you to your limit and will your new EV charge points push you over?

It's possible to estimate your current maximum demand by carrying out calculations based on previous energy bills and using your knowledge of the electrical loads you already have in place. A much more accurate and reliable approach is, however, to monitor your energy usage. This is easily achieved with a modern portable energy logger (**PEL**) such as the **PEL103** from **Chauvin Arnoux**.

This can be installed quickly in a distribution board, in many cases without even having to turn off the supply. It will log data over any time period you choose – hours, days or weeks – so that you can get a detailed picture of your energy usage. This is useful because your peak load may not necessarily occur at the time you would expect. With the results from the **PEL** you will immediately know whether you have the spare supply capacity – often called headroom – that you need for your charge points or whether you are going to have to budget for an upgraded service from your energy supplier.

But that's not all your **PEL** will tell you. Another important concern with EV charge points is harmonics. The supply system is AC, but to charge a vehicle you need a DC supply so at some point in the charging system – either in the charger itself or in the vehicle – there is going to be a rectifier. Rectifiers are inherently non-linear loads that generate harmonics, and if the harmonics in your supply system are outside the limits prescribed by your energy supplier, you may be required to disconnect the load(s) that are causing the problem – which could well be your much needed EV charge point.

Your **PEL** will, however, give you accurate information about the harmonics in your supply system, once again logging this information over a period of time, if you wish. This is useful before you install the charge point to let you know whether you're already approaching the prescribed harmonics limit, and after you've installed it, to ensure that you are still meeting your supply company's requirements.

This is not, by the way, just the supply company being picky. Excess harmonics in your supply system can cause heating and vibration in motors, heating in neutral conductors, poor performance of electronic devices, and many other problems that will end up costing you money. This means that you too will have a vested interested in making sure that harmonic levels are low and stay that way.

Finally, let's consider load balancing. If you have a three-phase supply and you're installing three-phase charge points, this shouldn't be an issue, but what about if you have a three-phase supply and you're installing single-phase charge points? This can be problematic because

even if you're installing them in multiples of three and distributing them across the phases, there's no guarantee that they will all be in use at the same time. The upshot is that with single-phase chargers, there's always a risk that they will unbalance your supply.

This is a particular problem if your business uses three-phase motors, because an unbalanced supply will cause them to run badly, with excess vibration, and to operate inefficiently using more energy than they should, which will cost you money. In tackling this issue, the **PEL** is once again your friend. It will let you see how well your phases are balanced – and don't forget you'll need to check this when the chargers are in use and when they're not. It will also help you to see the effect of redistributing your existing loads to provide the best balancing possible.

As we've seen, a **PEL** is a very useful asset when planning EV charge point installation, and also after the installation is complete to verify that the loading, the harmonics and the supply balance really are within expected limits. Is it worth buying a **PEL** for this? Only you can decide, but it could easily save you much more than its purchase price, especially when you remember its ongoing usefulness. Quite apart from any consideration of the EV charge points, regularly monitoring your supply system to check for balance, level of harmonics, unexpected out-of-hours usage and power factor can save you a small fortune. A **PEL** is not just for now – it's truly a friend for life!

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