CS Energy and EV Charging Infrastructure

DEPW Forum

Stephen Hoult – shoult@csenergy.com.au – 0433 118 092

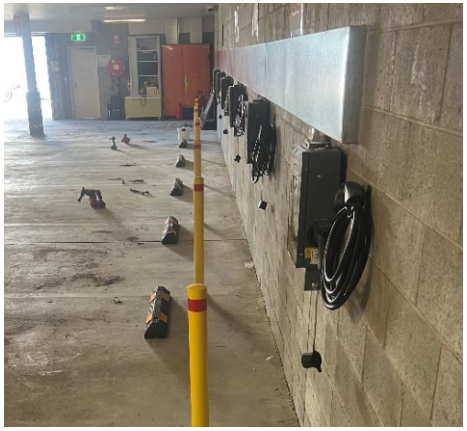
CS Energy and EV Charging Infrastructure

- CS Energy is on QFleet's QFL0003-20 EV Charging Infrastructure supplier panel.
- We have partnered with Australia's two largest EV charging equipment suppliers: EVSE Australia and JetCharge.

- Queensland Government entities deal directly with Queensland based and owned CS Energy.
- CS Energy will scope the most cost effective solution to meet the customer's needs, from overnight AC fleet charging through to public facing charging with fast DC chargers.
- All equipment is 'smart' with options like active/dynamic and fixed load management where required.
- Solution options range from just supply of equipment right through to complex turn-key installations where we do everything to deliver working EV charging infrastructure.

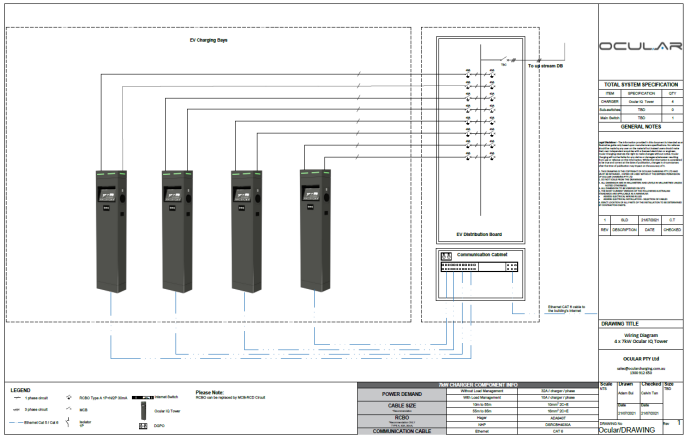
EV Charging Installations

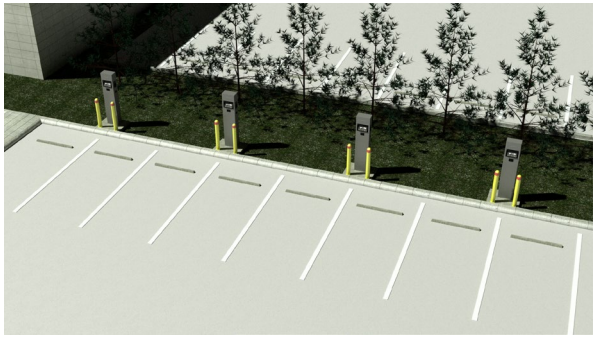
- Many successful installations done to date under the SOA which commenced late 2020. Several hundred chargers over 100+ govt sites.
- Government sites completed include multiple TAFE Queensland sites, hospitals, Government House, Parliament House and many government departments including multiple sites like Queensland Health, Roadtek, DCYJMA, DoR, DEPW, QAS/Emergency Services, DES, DESBT and DSD etc.
- We are experienced and offer all EV charging types and sizes, fleet or public/commercial facing. Team includes licenced electricians and electrical engineers.
- We do the scoping, proposal package which you will need for internal and building owner approvals, and other information as required.



Sample Site and Process – North Brisbane

- Attended site to understand client's needs and scoped EV charging solution which is suitable and cost effective using CS Energy's expertise.
- Prepared a proposal for client consideration which includes information on technology, electrical diagrams, 3D rendered images, equipment/configuration, electrical specification and pricing. This is a complete proposal and is usually also sufficient for building owner approvals. There is no cost for this.
- Proposal was for multiple stages – Stage 1 included works in main switch room, electrical supply to new EV distribution board in carpark, cabling in carpark to chargers, installation of 8 chargers (4 x dual head 7kW chargers) and conduits/prep works for the second future stage (future proofing with additional chargers).
- Delivered solution 3 weeks from start to end.





EV Charger Complexity

- EV charging equipment is not like a common electrical appliance. The load is larger (min of 32Amp single phase for a 7.2kW charger), quickly uses building electrical capacity and needs load management equipment and software in installations of multiple chargers where building or switchboard capacity is limited.
- Car boot chargers supplied with the car should not be used on ongoing basis. Safety issues arise.
- All chargers we supply are ‘smart’ chargers, capable of fixed and active load management, user access through RFID and QR Code, and able to provide charging data in many formats.
- Communications to outside world should not be on the customer’s network, rather over supplied 4G.
- Chargers can be open access, controlled/unlocked by RFID card, or QR code though a phone App.

Load Management

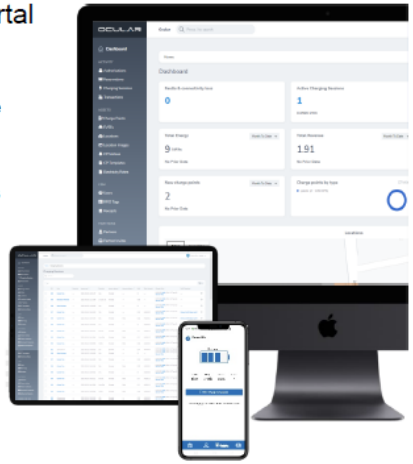
- Smart chargers with fixed (and potential for active) load management essential. Will avoid chewing up electrical capacity, allow many more chargers to be installed, reduce electrical supply/upgrade costs, get the most of out of existing building electrical capacity and still enable all vehicles to be charged for when they need to be. Need smart chargers to do this.
- **Fixed load management** is where the group of chargers are programmed to manage as an aggregate within a fixed limit, for example within a total current draw on the distribution board of 200 amps. Where everyone plugs in at once, it will pull charge rates back to ensure the chargers remain within the total limit. If only some cars plug in, it will allow them to charge at maximum rate. As headroom becomes available, it will ramp up the charging rates.
- **Dynamic or active load management** is where CT clamps are put on the feeder to the main supply distribution board or building switch board, dynamically adjusting the available charging limit for the chargers as other loads like building aircon come on and off. This gets even more chargers and charging capacity out of the building electrical capacity.

Smart Equipment

Software| Management Portal

Key features

- Data collection and billing software
- Monthly firmware update and maintenance
- Energy usage report
- Set pricing and generate revenue
- Monitor & control all live charging activities
- Load Management setup/maintenance*
- OCPP 1.6 & RESTful API enabled.
- 24/7 after sale support



Monitoring & Reporting

Live monitoring and Recording all of your charging station sessions

Payment & Billing

Intelligent billing applications allow operator to bill users for energy usage or time occupying the charge point

Smart Energy Management

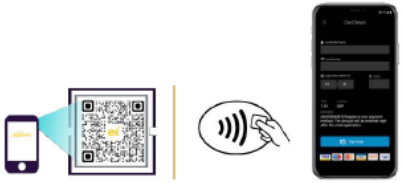
Custom load management applications specifically for your location and energy supply

Branding

Add your logo to display and leverage your branding on the Exploren App.

User Friendly

Accept Payments Directly



- Scan QR code instead of finding your charger on an App.
- Payments can be accepted with credit/debit card or PayPal.
- Pre-paid model with optional auto top-up of balance.
- Corporate billing - users bill their charging fees to the partner and the company pays in bulk at the end of the month.
- Virtually any model is supported and can be configured to match your business requirements.

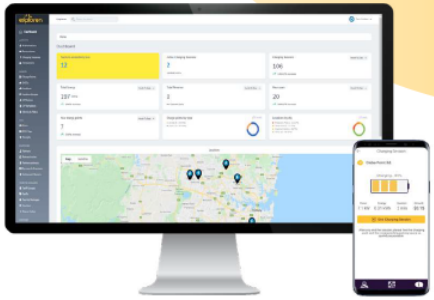
Operational Backend

Charging Stations

Any OCPP Charging Station can be connected to the Exploren Network, and managed and controlled remotely.

Exploren can manage the following:

- OCPP connection
- Dynamic load management
- Monitoring & Auto-Recovery
- Remote functions:
  Reset / Start / stop session.
  Firmware update.
  Run diagnostic report, trigger OCPP message, unlock a stuck connector and many more.



EV Charging Installation Tips

Charger Location

- You need an EV charging location as close as possible to your electrical source like a Distribution Board with spare breaker slots (poles) and capacity.
- You want to try and group carparks/chargers to avoid supply cables being run to multiple areas.
- Try to mount chargers on walls or existing structures where possible. This avoids purchase of stands.
- Try to avoid areas where extensive trenching is required or where existing concrete or bitumen has to be cut through.
- Look for locations where existing structures facilitate electrical supply cables being run easily, like existing beams, cable trays, trenches and conduits.
- Try to pick a location which minimises the distance between the charger and electrical supply source.
- Try to pick a location with strong 4G signal to mimimise comms complexity. Not on your network.
- Try to source power from a board supplied by your electricity meter rather than common power.
- Look for locations where chargers can be mounted on rear walls or the backs of bay pillars.
- If no walls or pillars, charger pedestal will need concrete slab or mounting to concrete. Tar or asphalt wont work.
- Try and get electrical supply from a board that takes from your tenant meter rather than common power, otherwise metering is more complex.
- Good to have DC chargers out of weather. AC okay.
- Power ideally needs to be supplied from a DB on your tenant meter. If from ‘common power’, meters or sub meters (to National Metrology Institute pattern standard) are required, with arrangements for building owner or property manager to read them.

Future Proofing

- It is critical you need to install ‘smart’ chargers now, even if the smarts aren’t activated at this stage. This will allow future features like active or fixed load management, access control and data interrogation. If the functionality in existing chargers is not there down the track, it cant be activated.
- If a new EV charging distribution board is required, oversize the number of poles and capacity now. For example 24 or 26 poles rather than a small 12 pole DB, with a larger electrical supply cable to it.
- Consider cable trays rather than conduits for above ground electrical where possible (ie carpark with concrete ceiling), and consider bigger conduits if underground to allow more electrical to be pulled through down the track.
- Look for locations where a charging installation has room to expand.
- Work on getting carpark bays reallocated to allow your department to be able to get a grouping or groupings of chargers.

Did you know?

There are AC (Alternative Current) and DC (Direct Current) chargers.

- Fixed installation AC chargers typically range from 7kW to 22kW. To put this into comparison, a home electric heater or kettle will use around 1.8kW to 2.4kW. A standard 10 amp power point is rated up to 2.4kW.
    - An AC charger takes an power AC supply and transmits AC power to the car's rectifier. The car's rectifier converts it to DC for charging of the vehicle DC battery. Charging rates, despite the size of the charger, are often limited by the vehicle's rectifier and control system (usually 3kW to around 12kW depending on the vehicle).
- Fixed installation DC chargers typically range from around 20kW to over 300kW.
    - A DC charger takes an AC power supply, with its inbuilt rectifier converting the power to DC. The charger then transmits DC power to the vehicle, bypassing the vehicles rectifier, talking to the vehicle Battery Management System and charging vehicle DC battery. Accordingly, with the vehicle's rectifier not being utilised, significantly higher charge rates are possible. The DC chargers are larger in size/footprint.
    - DC charging technology comes at a significant price premium for the equipment, electrical works and installation.
- A vehicle battery can range from around 5-15kW hours (kWh) for a hybrid, to around 50kWh to 65kWh for a full EV.
- For a vehicle housed overnight at the charging site (i.e. a fleet site), an AC 7KW charger is usually sufficient. For a fleet vehicle in and out during the day and not housed at site or a charging location overnight, DC charging may be better.
- Cabling for anything above a 7kW charger is a three phase rather than a single phase electricity circuit, adding to costs.
- The larger the chargers, the quicker you exhaust any available capacity on your building electricity system, electricity feed and distribution boards. 7kW chargers are usually sufficient for fleet if housed overnight at the same location, and you can have many more chargers, especially with the load control functionality.
- The Hyundai Kona full EV has a 65kWh battery, so from flat will charge fully overnight comfortably. The Mitsubishi Miev has a 16kWh battery, so a 7kW charger will comfortably do it in 2-3 hours max.
- The plug in portable charger in the car's boot will do around 2kW to 2.4kW charge rate. It is strongly recommended that this not be used on a permanent basis as it can be dangerous. A significant continuous large load on a house power point for several hours minimum (but usually significantly longer) risks fault in the leads, plug, house power point or house wiring, which can cause electrical fire. They are really meant for emergency use only.

Connectivity?

Connectivity with the internet and Exploren or similar software allows the following functions:

- remote software updating and data reporting, with data on who is charging, when, which stations, over selectable time periods, greenhouse reporting etc.
- ability to shape charge times during the most appropriate periods, for example outside of evening peak periods to avoid a more costly retail electricity tariff shape. Ultimately, a retail customer pays more per kw of electricity where the load shape is less desirable. The user may wish to dial back charge rates in less appropriate times, whilst still achieving 100% vehicle charging for example overnight.
- Fixed and dynamic load management where chargers can be managed as an aggregate within set distribution board capacity limits. This allows more chargers to be installed for a given capacity which is important for future expansion or where electrical capacity might be limited. If everyone plugs in at once, the chargers will be scaled back automatically as a group to keep within limits. If less chargers are plugged in at once, they can charge at full capacity. This allows installation of further chargers down the track rather than using remaining building capacity in a non-smart solution now.
- State greenhouse and EV charging reporting will become increasingly important.
- Ease of programming of RFID cards.
- QR code functionality where the user can also scan a QR code to unlock the charger. The QR code also allows public facing charging with the ability for users to be invoiced separately (credit card payment through mobile app).