

# VIRTUE EV

DRIVING INNOVATIONS IN ENERGY STORAGE

ELECTRIC VEHICLE (EV)  
RAPID / FAST CHARGER  
AND ENERGY STORAGE  
SOLUTION



# THE CURRENT ELECTRIC VEHICLE (EV) MARKET

**The problem:** As of the most recent data, there are currently 959 rapid chargers on the UK network. With demand of faster charging ever-growing; the number of chargers on the network must also increase in order to meet the demand.

**The limitations:** A rapid charger can charge a standard EV vehicle to 80% in approx 30 minutes at 50kW output power. However rapid chargers are limited to areas where the supply is able to tolerate a sudden 50kW load, i.e. non – residential.

Currently even medium sized commercial companies will struggle to charge more than 2 cars at the same time via rapid charging, purely due to the amount of power required. Although the market is increasing at a fast rate, wider adoption of EV's is still limited by the following:

**Range anxiety** – Electric vehicles are still limited by their range, and the vast majority see about 1/3rd of the range of standard fuel consuming cars. This is due to amount of battery capacity that a manufacturer can fit into a vehicle (this is mainly dictated by cost and space).

**Charging time** – In order to fill up a tank of fuel, you will be waiting no more than 2 - 3 minutes. In order to charge an EV vehicle you will be waiting at least 20 minutes, but could be as long as 8-12 hours depending on the charger. Charging time is affected by how fast a particular storage technology can be charged and how much power is available to charge.

**Price** – EV vehicles are considerably more expensive than their combustion engine brethren, which removes EV vehicles out of the low level vehicle market.

Unfortunately convenience is prized above all else in the UK, and these issues are all inconveniences.

To correct these issues manufacturers have to increase the capacity of the vehicles, increase the charging speed of the charging points and reduce the cost of manufacturing, a combination which could take years to perfect.

**The solution:** Introduce local rapid charging and storage to greatly reduce demand spikes and supply the highest possible charging rate by utilising stored energy to deal with the sudden ramp up of power. Not only does this method help the wider grid infrastructure, but it also helps reduce cost on the local network.



## Present day example:

If a commercial company has an electric fleet consisting of **20 vehicles**, and these vehicles are kept to tight **24 hour** shift arrangements, it is vital that the vehicles are charged quickly in order to meet the schedule. If all these vehicles are utilising **50kW** rapid charges to quickly charge the vehicles, you could get a scenario where **10 cars** are charging simultaneously.

That totals a load of **500kW**, which is a very large demand for the majority of storage warehouses and potentially large enough that the supply would need upgrading to tolerate the extra load.

The process of increasing a company's supply can be costly, often totalling in excess of **£50,000+**.

If the local network is saturated (which is often the case) the supply upgrade could have knock on effects upstream, which may even require the local substation to be upgraded, which would cost a considerable fee to upgrade (often exceeding **£100,000's**).

By having local storage, the need to upgrade does not exist, as the storage can charge during non utilised times, as well being charged from local generation, and provide the power requirements to the chargers without pulling anything extra from the grid.

# VIRTUE EV: AN OVERVIEW

## SYSTEM OVERVIEW

Virtue EV is a combined DC rapid / fast charger and energy storage system with integrated 6kW solar (PV) canopies. It provides up to 80kWh of storage with 50kW bi-directional grid-tied inverters.

The system provides both off-grid rapid charging (50kW CHAdeMO) and a fast charging (11kW) AC charger, allowing a site with limited grid capacity to charge vehicles without upgrading infrastructure.

The system can also be charged directly through renewable generators, so that the charging of vehicles can be done independently off the grid.

All units are provided with solar canopy integrated renewable connectivity. Single units include 6kW solar canopies and double units are provided with 12kW canopies. Charging points can be customised based on customer requirements.



### Avoid Costly Upgrades

Virtue EV can provide rapid / fast EV charging without increasing the cabling and load infrastructure and has the ability to support up to 20 EV cars.



### CO2 Reduction

At specific times of the day, the system will be able to discharge the stored energy to the load thus reducing the amount of kWh the load takes from the grid and therefore reducing the CO2 emissions.



### Renewable Connectivity

Renewable sources of energy are connected at the time of installation. In the case of solar (PV) no inverters are needed as the PV generated energy can be stored directly in DC.



### Cost Reduction

The system will draw and store energy throughout the night hours during the cheaper off-peak tariff and use it during the day, avoiding the higher peak tariff cost.



### Smart Grid Integration – Potential Income

The system is a Virtual Power Station and is always grid tied and therefore can participate in helping the grid balance frequency through either Dynamic FFR or Enhanced Frequency Response (EFR).



### UPS Functionality

The Virtue EV system provides full UPS capabilities to the load at all times while at the same time providing charge to the EV chargers when cars are connected.

# APPLICATIONS OF VIRTUE EV

Virtue EV can be provided to match a customer's specification. Whether you want to integrate renewable generation, are restricted on available land to install or require a system that can bring your site additional revenue. Virtue EV solutions are completely bespoke and can be built to meet your needs.



## Virtue EV Rapid Charger 1

The "Bus Stop" design shown is a combined DC rapid/fast EV charger and energy storage system with integrated 6kW solar or 12kW (PV) canopies.

The system provides both off-grid rapid charging (50kW CHAdeMO) and a fast charging (11kW) AC charger. It provides up to 80kWh of storage with 50kWh bi-directional grid-tied inverters.



## Virtue EV Rapid Charger 2

The Virtue EV design utilises 1MWhs of battery storage with 500kW output to provide 10 rapid chargers or 20 fast chargers (22kW) with stored energy, allowing cars to be entirely charged off-grid at a minimum of twice a day. The facility has the ability to draw from onsite renewable energy to charge the batteries throughout the day and utilises this energy to provide power to the car chargers. The unit also performs Demand Side Response (DSR) and supports 500kW of associated load in the event of an outage.



Solar panels are installed onto a canopy on the roof to allow seamless renewable integration



Wi-Fi can be built into the design to offer users a productive pass time whilst their vehicles charge



A customised HMI can be installed to offer an easy and user friendly process



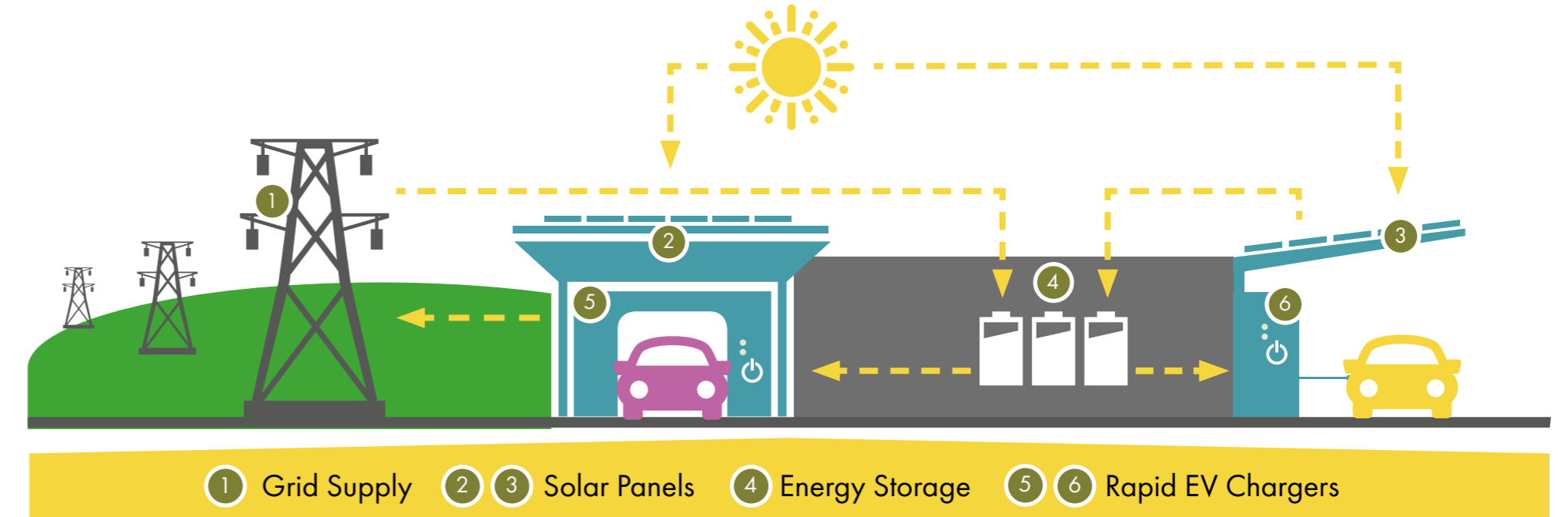
Credit card payment systems can be installed to offer a service to the public and gain extra revenue from your EV charger



An online booking system can be set up to allow users to plan their journey or simply avoid double booking situations – especially where chargers are limited

# PROJECT IMPLEMENTATION

## Typical Installation Illustration



## Current Project Highlights

### Isle of Wight Project

An EU grant has been awarded towards the development of 15 Virtue EV systems for use on the Isle of Wight 'InterGRIDy' project

InterGRIDy brings together the latest cutting-edge technologies, solutions and mechanisms in order to connect the Isle of Wight's energy distribution network.

The project will facilitate the dynamic standalone operation of the islands Distribution Grid (DG).

The Virtue EV charging units will provide an uninterrupted power supply (UPS) to users, alongside issuing a fast EV charge to connected cars.

As Virtue EV systems are always connected the energy network, the solution also offers potential income through Dynamic Firm Frequency Response or Enhanced Frequency Response, both of which help manage grid energy supply.





# COMPANY BACKGROUND

Virtue EV is a combined DC rapid / fast charger and energy storage system with integrated renewable (solar) generation. It enables sites with limited grid capacity to charge vehicles without upgrading infrastructure.

Virtue EV is designed and manufactured to the highest recognised international standards, providing assurance that the solutions represent the most efficient and highest quality systems on the market.

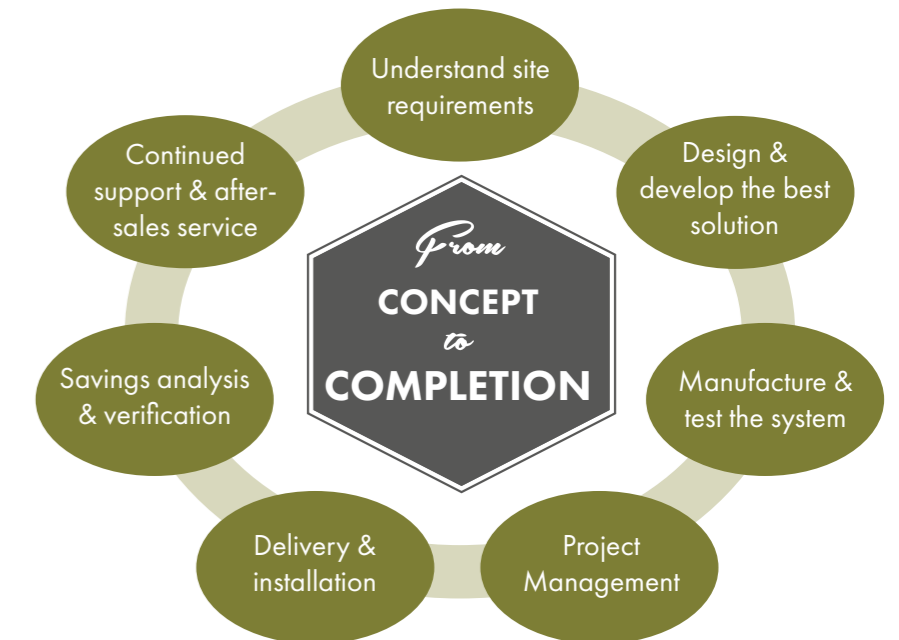
Virtue EV can also be charged directly through renewable generators, so that the charging of vehicles can be done independently off the grid.

In addition, with full R&D, design, engineering, manufacturing and assembly facilities in-house they can offer clients a crucial differential of flexibility as solutions can be adapted to tackle whatever challenges clients face.

Designed and manufactured by renowned energy management innovation specialists Powerstar, Virtue EV is backed by an experienced, engineering focused team who have more than 200 years combined experience in the design and project management of energy systems.

# OUR APPROACH

We deliver a full concept to completion service, utilising the vast experience of the Virtue team to understand the unique requirements of our clients and ensuring all projects are implemented within required parameters, without any negative impact on business operations and delivering tangible results.



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