UPS Response to Ofgem Consultation

August 2021

Background

UPS is one of the world's largest logistics companies, playing a vital role in the collection, warehouse and delivery of goods. Our UK operation includes 77 operating facilities, approximately 8,900 employees and a fleet of more than 2,900 vehicles.

In the UK

UPS is committed to improving air quality and supporting the transition of our fleet to advanced technology and alternative fuel vehicles. As a commercial fleet operation there are many challenges we currently face regarding vehicle availability, grid capacity and final mile delivery (amongst others) at a time when our delivery volumes are increasing due to e-commerce growth, and over the past 18 months, Covid. UPS currently has 121 alternative fuel or advanced technology vehicles in the UK (more than 10,300 globally) including:

- 72 Electric Vehicles in London
- 15 Range Extended Electric Vehicles, operating outside of London, that can handle longer journeys
- 34 liquefied natural gas (LNG) tractor units running on renewable LNG through a government-approved mass balancing system

However, one of the largest barriers to expanding our EV fleet has been our grid capacity for charging as our vehicles need to charge overnight, back at the depot.

Electrifying the Fleet – Grid Capacity

At UPS, our goal has been to move towards electric vehicles in urban locations. We first introduced electric vehicles in London in 2008, but over the past 13 years have faced the twin challenges of vehicle availability and charging capacity. A major barrier to expanding our electric fleet is in not having enough grid capacity for charging these vehicles simultaneously at peak times in the evening. It is not feasible to charge the vehicles during the day as they are on the streets carrying out multiple deliveries with only minimum time spent at each location. As a result, we worked closely with UK Power Networks (UKPN) and a three tier system of landlords to update the site's grid capacity at our Kentish Town depot, at considerable expense. While this investment was successful, a report from FREVUE (a European project funded by the EU's Seventh Framework Programme for research, technological development and demonstration) highlighted the fact that UPS was required to make an investment in a UKPN asset without control over its operation.

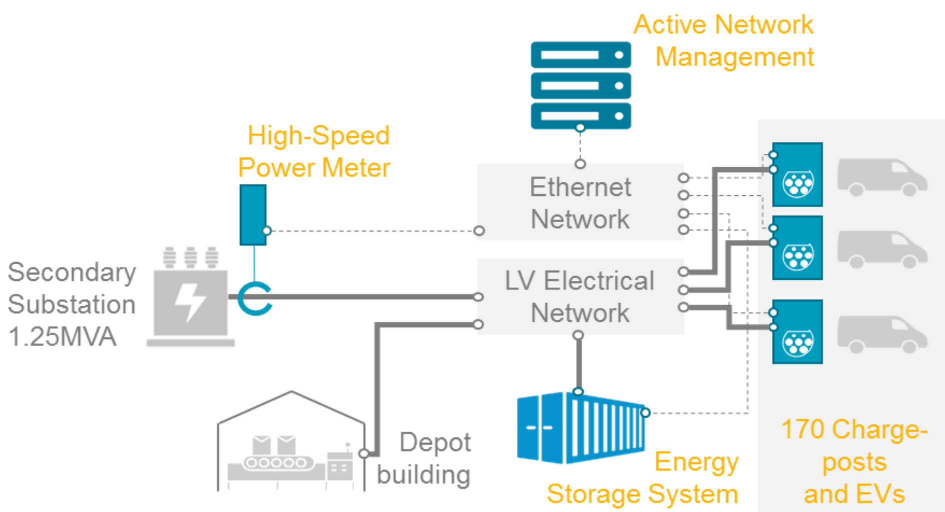
SMART Grid Technology

In addition to the conventional grid upgrade that we undertook, UPS worked with a consortium to deploy a radical new technology solution with the potential to dramatically reduce the cost of recharging a fleet of electric vehicles. Recharging a fleet of electric vehicles can be rendered cost-prohibitive by the need for expensive external power grid reinforcement work, as outlined above. To overcome this, the consortium, which comprised UPS, UK Power Networks and Cross River Partnership, commissioned a combined smart-grid and energy storage system at the UPS operation in central London. The initiative was supported financially by the UK's Office for Low Emission Vehicles. It has had the immediate effect of raising the number of 6-7.5 tonne vehicles that can be recharged simultaneously overnight from the electricity power supply available at the site from 65 to the whole 170 fleet without any further external grid reinforcement work.

<u>Smart Charging Technology Deployed</u>

Following the initial grid reinforcement exercise in 2013/14, our central London depot of global had a 1,250kVA connection agreement with the local Distribution Network Operator (DNO). However, full fleet electrification with uncoordinated EV charging in addition to existing on-site demand would require a connection of 2,200kVA. The deployment of smart charging technology bridged this connection gap without the need for further physical grid reinforcement. Our operational profile provides a 12-hour time window to charge the EVs overnight, which means that vehicle demand could in fact be spread throughout this time-window to lower peak demand. Upon evaluating different technologies and assessing several smart charging options, it was decided that the optimal set of technologies for the site would be a combination of an Active Network Management (ANM) and Energy Storage Systems (ESS).

Believed to be a world first to be operating live at this scale and combining both smart-grid and energy storage technologies, the intention of the consortium is to produce a strategy for how the solution could be used in other UPS facilities and beyond to electrify fleets cost-effectively. We believesthe day is rapidly drawing closer when the cost of an urban distribution electric vehicle, including the necessary power supply investments, will be lower than that of its diesel counterpart. This breakthrough will be instrumental in enabling electric vehicles to be deployed in scale in the world's cities, itself an essential component of tackling the air quality challenges that those cities face.



The **Smart Grid system** that has been developed, installed and commissioned at our site by UK Power Networks Services comprises four core sub-systems: a high-speed power meter, an Active Network Management system (ANM), an Energy Storage System (ESS) and smart charge posts. The following diagram highlights the four elements of the smart grid system.

The **Active Network Management system** is a sophisticated software solution which is connected to all systems' interfaces and is responsible to dispatch the ESS and/or curtail the EVs when the site demand gets close to the capacity limit. The system collects information related to the site demand, the energy that has been supplied to each of the vehicles and the State of Charge of the ESS in order to prioritise the curtailment of the EVs.

The **Energy Storage System** is a flexible and fast asset that acts as a buffer and is dispatched to smooth the demand profile minimising the curtailment of the EVs. In addition to peak-shaving functionality, the asset can deliver several services including frequency and voltage regulation to further improve its business case.

The 11kW Type 2 **charge posts** that had previously been installed on site were retrofitted with a device to allow communication between the charge-points and the Active Network Management. They communicate with the vehicles as-per the IEC6181 standard.

The **high-speed power meter** is connected at the busbars of the transformer which powers the site and records, in a second-to-second granularity, data related to the total demand of the site, voltage levels and frequency.

Key Learnings

Smart charging firstly reduces the capital expenditure (CAPEX) required to transition a fleet to EV by minimising the grid connection capacity required, and making best use of existing assets. The technology can bring further commercial benefits by reducing operational expenditure (OPEX), such as cost of energy, and could potentially earn revenues in the future. When considered with the reducing cost and improving performance of vehicles, smart charging will play a key role in enabling fleets to transition to EVs over the coming years.

The installation at our site in central London demonstrates that smart-charging can support the optimisation of the use of existing assets. Here the system allows for a full depot of EVs with an uncontrolled peak demand of 2,200kVA to be charged on a 1,250kVA grid connection. It therefore avoids installing additional electrical equipment and reinforcement works on the local grid.

In the near-term, smart-charging can be used to reduce OPEX by capitalising on time-of-use tariffs, offsetting the vehicle charging to periods of low electricity cost. Additional revenues can be earned by providing ancillary services to the grid – controlling the rate of charge of vehicles to help the grid System Operator to manage supply and demand across the UK’s network.

Both vehicle and smart-charging technology is developing rapidly. Developments will enable further optimisation of existing assets, such as integrating state of charge information of the vehicles into the system, allowing increased optimisation of charging. Additional revenues may be possible by using bi-directional charging and “Vehicle-to-grid” (V2G) technologies. These developments will ultimately lead to reduced CAPEX and OPEX for charging EVs in fleets.

Finally, business continuity must be considered throughout the project. For fleet operators deploying EVs, any unavailability of EV charging can have a substantial financial and reputational impact and thereby hinder future EV deployment. Thus, careful design, implementation and testing of fail-safe mechanisms is critical for the implementation of a successful system that can be adopted as Business as Usual by end-users.

Summary

UPS believes that reform of the market structure surrounding the upgrade of local electric grids is required so that the end user does not need to bear the entire upstream cost of the upgrade regardless of the owner of the upgraded asset. UPS urban distribution vehicles do not stop for long enough during their daily operations for on road charging infrastructure to be usable, so we need back at base overnight recharge solutions which pose a heavy demand on the electricity supply to the building. The market structure reform could potentially be contingent on the use of the best 'smart' technology solutions in conjunction with upgrades in order to minimise upgrade costs.

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