Smart Electric Urban Logistics

Electric Vehicle Deployment

Smart Electric Urban Logistics (SEUL) is a two-year project which commenced in April 2017, designed to support the wider transition to Electric Vehicles (EVs) for larger commercial fleets. Smart charging technology integrating energy storage as well as an innovative tool to assess existing grid capacity will provide scalable learnings from real-world operation and testing.

The SEUL project is led by UPS with project partners Cross River Partnership and UK Power Networks and is part of the Low Emission Freight and Logistics Trial, funded by the Office for Low Emission Vehicles (OLEV) in partnership with Innovate UK. For further information on the project background, please see SEUL Factsheet 1.

1930s UPS electric vehicle being plugged in

UPS experience of Electric Freight Vehicles

UPS has a long history with EVs, having first introduced them into its fleet in the U.S. in the 1930s, and reintroduced modern EVs in 2001. Currently, UPS has more than 300 EVs deployed in Europe and the U.S., and nearly 700 hybrid EVs.

The number of electric vans and lorries operating in the UK and London remains very limited. At the start of their Electric Freight Vehicle (EFV) deployment in Europe, UPS conducted extensive market research and found that there was no fully electric equivalent to the UPS van on the market. Those vans that were available came with a significant loss in payload and volume.

Scope of project

As part of this project, UPS has converted 20 of its existing diesel delivery trucks to fully electric ones.

UPS P80 SEUL project vehicle during conversion

The converted vehicles are mid-life diesel UPS P80 model, 7.5 tonne urban distribution trucks with a Mercedes Vario chassis, drive train and UPS bespoke designed bodies. The Internal Combustion Engine (ICE) removed was typically a Euro 5, 4.2 litre diesel engine. A specialist supplier retrofitted the vehicles with an electric power train and batteries. The converted UPS P80E vehicle has a payload of 3 tonnes, a cargo volume of 23m^3 and a range capability of approximately 100km, comfortably exceeding their average daily urban usage. The vehicles utilise multiple Lithium Ion battery packs that are mounted under the cargo floor between the chassis rails providing 71kWh of energy storage. They are recharged via an on-board charger with a peak input of 22kW. Retrofitting these vehicles enables UPS to avoid compromising on its operationally efficient vehicle design.

All 20 vehicles were successfully converted and deployed by June 2018. Real-world duty cycle data is being collected through the vehicle telematics system for a minimum 12 months as part of the project. Independent testing comparing the electric and diesel vehicles demonstrate tailpipe 100% CO_2e savings of 416g/km compared to pre-conversion Euro V vehicles (carrying the same payload), and estimated well-to-wheel emissions savings of 65%, or 325g/km.[1]

[1]As calculated by LowCVP based on CVRAS cycle testing at Millbrook test facility in November 2018. Well-to-wheel CO2e figures based on Defra GHG reporting figures for 2019(grid/pump average). Diesel tailpipe CO2e figures based on measured CO2, CH4, N2O emissions. BEV charging efficiency not measured, assumed to be 90%.

FACT SHEET 3

Integration with smart charging system

The 20 converted vehicles took the total fleet size above the maximum 63 vehicles that could be charged at the Kentish Town depot. To overcome this local electricity capacity constraints, a smart charging system has been designed and implemented at the Kentish Town depot which allows a growing EV fleet to be charged.

Any unavailability of vehicles due to them not being charged could cause significant disruption and reputational damage, as well as hinder further EV deployment, so this piece is key to ensuring reliability and confidence. The system comprises an Active Network Management System that has the capability of dynamically controlling the local demand. The vehicles typically charge up overnight in the depot, connected to 11kW Type 2 charge posts. The system is able to curtail the charge being delivered to the vehicles and prioritise based on the charge already delivered to each vehicle. Further information on the smart charging system can be found in SEUL Factsheet 2.

Operational considerations and next steps for EFV deployment

> **"UPS's commitment to developing and deploying sustainable, low emission vehicles remains unwavered. EVs in particular have proven to be highly efficient in dense urban operation use cases. We are working cross industry to support and facilitate the advancement of EVs with incumbent and emerging vehicle manufacturers, toward mass commercialisation. The integration between vehicles and buildings will continue to be critical as we scale these transformative initiatives."**
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> **Luke Wake , International Director of Automotive Engineering & Advanced Technology Group**

By assessing the depot and gaining a further understanding of the vehicle charging requirements, a methodology for providing the infrastructure for EV deployment at this and other depots has been developed, using a combination of grid infrastructure upgrades, smart charging and onsite energy storage

Integrating EVs and associated charging infrastructure has required small changes to daily operations. As equipment is initially unfamiliar, processes and responsibilities for plugging in vehicles for charging have been developed to ensure equipment is kept in safe working order.

UPS has a continuous learning programme for maintenance technicians including academic study and manufacturer training to match the latest EV technology.

Conclusion

The vehicles in this project have helped to demonstrate that the characteristics of EVs are not just suitable, but optimal for their intended purpose. This enables UPS to plan for the scaling of EV ambition, including deploying a new generation of purpose-built electric trucks. UK manufacturer Arrival will be supplying the next vehicles to be deployed at the central London depot later in 2019.

Future UPS electric vehicle from UK manufacturer Arrival

For more information, please see
https://crossriverpartnership.org/projects/smart-electric-urban-logistics/

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