

Zenobē | Full Turnkey eBus Proposition & Case Studies



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Introducing Zenobē

We make clean power accessible at increasing scale





Zenobē's Full Turnkey EV Offering

Our bespoke, flexible EV fleet solution includes a comprehensive range of connected services



Full Turnkey eBus service offering:

Zenobē offer a full turnkey finance and managed service to Bus and Fleet Operators for the provision of their :

- · charging requirements for their eBus fleet;
- · eBus battery management requirements; and
- eBus vehicle/chassis financing requirements

Zenobe Resolve Grid / Energy Constraint Issues: as an expert in Battery Energy Storage Assets we can use them to ensure the depot has sufficient energy to meet the charging requirements of the Operator's eBus

Maximise use of any Grant Funding: By utilising Zenobē's eBus offering Bus Operators have managed to maximise the use of their grant funding to gain access to more eBuses. Zenobe can support Local Authorities to prepare strong bids for grant funding for eBus and other eFleets

Reduce Total Cost of Ownership of eBus fleet: Zenobē's offering makes the transition to eBuses more cost effective



Next Generation Electric Depot

Zenobe are leading the way to making the transition to Zero emission buses via our innovative partnership approach to bus management and Finance



Zenobē's Live Electrification Projects

Bus Operator	Depot [22 in total]	No. of EVs [541 in total]	Electric Vehicle OEM	Battery Storage System Onsite [7.12 MW in total]
Stagecoach	Guildford (Park Barn)	9		0.39 MW
Stagecoach	Rainham & Barking	47		N/A
Stagecoach	Catford	15		N/A
Stagecoach	Plumstead	10		N/A
abellio	London (Walworth)	34	CaetanoBus	1.26 MW
	Newport	15	YUTONG	0.39 MW
national express	Birmingham	19		0.52 MW
national express	Coventry	10		1.26 MW
First ớ	Leeds (Hunslet Park) 1	9	YUTONG	0.39 MW
First ớ	Leeds (Hunslet Park) 2	5		0.39 MW
First ớ	First York	20	Optare	N/A
Go-Ahead	Riverside North-East	9	YUTONG	N/A
Roberts	Leicester	15	YUTONG	N/A
Leading UK last mile delivery company	ТВС	104	FIAT	N/A
TRANSIT SYSTEMS	Leichhardt	55	BYD	2.52 MW
g	Christchurch	20	YUTONG	N/A
M:Gill's	Johnstone	23		N/A
M:Gill's	Dundee	12		N/A
M:Gill's	Inchinnan	33	YUTONG	N/A
Centrebus	Leicester	4	YUTONG	N/A
Cardiff bus bws Caerdydd	Sloper Road	36	YUTONG	N/A
Local Australian Operator	TBC	15	YUTONG	N/A
	Brixton	22		N/A

Zenobe's Live EV and Battery Storage Sites

Zenobē has a strong track record in the UK and continues to expand domestically and internationally across its EV fleet business and Network Infrastructure proposition



Six of Zenobē's Live Projects



Zenobē's electrification strategy

Working with bus operators throughout the whole process of electrifying their depot

1. Strategy & Design

- A bespoke electrification strategy focusing on:
- Route analyses
- Parking strategy
- Site design
- Electricity supply
- Charging baseload
- Energy procurement
- Fleet replacement

2. Build

A well managed installation:

- Sub-contractors management
- Health & Safety
- Quality control
- Minimising operational impact
- Set up of software & telematics
- Final commissioning

3A. Charging Operations Comprehensive charging set-up:

- Financing
- Guarantees
- Dynamic charging control
- 24/7 monitoring
- Pre-heat or pre-chill as required
- Preventative and reactive maintenance

3B. Electric Vehicle Operation

Comprehensive vehicle set-up:

- Financing
- Battery managed service plan
- Extended warranty
- Operational savings
- Data reporting using software platform

Zenobē's ('ZE') Full Turnkey eBus and Charging Managed Service Offering



Zenobē's ('ZE') Full Turnkey eBus and Charging Managed Service Offering:

ZE purchases all the charging infrastructure and eBus directly from the manufacturers (ZE also offer a sale and leaseback option)

ZE can enter into 3 contracts with the eBus Operator for the provision of our full turkey Managed Service offering:

1. Charging Service Agreement ('CSA')

- ZE covers day 1 cost of all Charging Infrastructure including: eBus chargers, Grid works, Civil works & construction and Battery Energy Storage Asset (if needed)
- ZE guarantees all eBuses will be charged daily to support route. ZE owns market leading IT software to provide smart eBu Charging Strategy
- eBus Operator pays ongoing managed service fee with no upfront capital cost for charging infrastructure

2 & 3: ZE splits the eBus into 2 components the battery and the body/chassis:

2. Battery on the eBus Managed Service Contract ('BOB')

- · ZE owns the eBus battery & provides it to the Operator via a managed service arrangement
- ZE guarantees the eBus battery will always meets the minimum working capacity requirements for the route. ZE covers the cost of the replacement battery
- Accounting and Tax benefits (subject to Operator's advisors approval) as well as mitigating technology risk

3. Master Rental Agreement for the eBus Body / Chassis ('MRA')

· Financing (HP / lease) arrangement so eBus operator has a full vehicle funding arrangement

More Detailed eBus Proposition

Operator EV adoption challenges:

- 1. Up-front cost of the charging infrastructure to address grid constraints restricting access to a sufficient (and cost efficient) energy supply to ensure their EV fleets can be fully charged on a daily basis
- 2. Higher upfront cost of electric Fleet vs diesel / hybrid
- 3. Risk associated with EV battery performance and replacement affecting Residual Value and cash to be recouped over initial contract life

Zenobē addresses these issues by offering Fleet Operators:

Zenobē Proposition	Overview	Bus Operator Benefits
EV Charging Service Solution	 up to 15 year Charging Service Agreement whereby Zenobē: finances, develops, installs and operates the battery charging infrastructure at the Operator's bus depot implements a Battery Storage Asset to ensure energy requirements to charge EV fleet are met to support grid capacity guarantees the Operator that every vehicle leaves the depot each day charged to complete route provision of energy supply 	 reduce grid /energy cost: improving utilisation of existing infrastructure (no expensive DNO upgrade needed) financing: no upfront CAPEX cost for infrastructure as Operator pays through a service payment reduced cost: Zenobē uses battery storage asset for income generating grid services when not charging bus batteries to lower the cost to the Operator optimising charging solution: charging infrastructure can be upscaled to meet the operator's additional EV bus requirements flexible mobility: reduces sunk cost of grid upgrade as charging solution is mobile renewable energy source: all energy delivered from renewable sources ensuring zero emission EVs Reduces/eliminates technology risk: infrastructure can be updated easily
Bus Battery as a Managed Service	5 to 15 year plus ' Battery on the Vehicle ' service agreement whereby Zenobē: guarantees to provide the Operator with a battery on the EV vehicle that meets the minimum working capacity requirements	 lower cost: savings over upfront battery asset purchase. Battery cost paid for by operating savings. Battery cost becomes an OPEX for Operator and not CAPEX technology risk: assumed by Zenobē who are responsible for replacing bus battery when it reaches end of useful life to support the bus route. Battery recycling is Zenobē's responsibility which eliminates any battery disposal costs for the operator accounting & tax benefits: service offering (as battery asset can be substituted and is fully controlled by Zenobē) potential off b/sheet treatment for the operator who doesn't own the bus batteries. Potential tax benefit as a service offering fixed OPEX fee: operator pays a fixed service fee plus additional charge in excess of pre-agreed distance limits. Potential tax benefits
Finance for Vehicle Chassis	5 to 10 year Operating Lease or Hire Purchase Agreement for use of EV vehicle chassis	 OPEX cost: no upfront CAPEX for the bus chassis lower rental: Zenobē can seek to hold RV in chassis



Zenobē eBus/eFleet Operation Manager Overview

Zenobē has developed proprietary software which Bus Operators will find invaluable in managing service levels and optimising the batteries in the depot when transitioning to EVs. This is being adapted for the use of Fleet operators



Operator benefits

- · Bespoke system tailored to meet specific depot requirements
- Sophisticated data that is readily accessible and can be used to help manage EV fleet and improve driver performance
- In-depth study of mileages, energy efficiency for vehicle route combination to determine grid and storage requirements
- Live updates on the state of charge of each vehicle whilst on charge / on the road
- · Full control and sight of the EV fleet in terms of battery status
- Early warning charging / operational issue alerts on every piece of infra
- · 24 hour support if there are any operational issues
- · Zenobē Operation Manager software provides:
 - ✓ Continuous vehicle and battery health monitoring
 - Within depot monitoring of charging status
 - ✓ Grid and energy storage power management (optimise flows and manage peak load within constraints)
 - ✓ Smart charging based on residual charge and expected need for next duty

Key benefits:



Appendices

- BESS Case Study: Newport Bus
- Case Study 1: Arriva Brixton Tram Shed
- Case Study 2: Stagecoach Plumstead
- Case Study 3: First Group Leeds
- Case Study 4: Newport Bus
- Case Study 5: McGill's Glasgow & Dundee
- Environmental, Social and Governance



Video of Battery Storage Asset Installation





Example of Battery Energy Storage Asset ('BESS') in Action over 24 hours



Time of the day



ACTIVE RUNNING POWER

Case Study: Stagecoach Plumstead



Zenobē employed a smart and high-powered charging strategy in response to high mileage and a constrained grid connection

CHALLENGE	ZENOBĒ SOLUTION
Capital Intensive Project Stagecoach needed to deploy 10 eBuses at its Plumstead Garage for TfL route 180, without incurring high CAPEX	 Innovative OPEX Financing With No Upfront CAPEX Needed All 10 eBuses are financed by Zenobē Batteries are financed off-balance sheet via Zenobē's battery managed service
High Mileage + Intraday Charging Requirements The route is high mileage (average 153 miles)	 Bespoke Charging Solution Zenobē is OEM agnostic Intraday and overnight charging windows are maximised, with high-powered chargers
Constrained Grid Capacity	Smart Charging Strategy
shorter charging windows	eBus charging requirements
	 This minimises peak power and ensures eBuses can fully charge
Future Proofing	Flexible Charging Infrastructure
Stagecoach plan to implement more eBuses at the site, so the infrastructure had to be designed with future plans in	Zenobē size onsite infrastructure to accommodate future expansion
mind	This allows for no regret costs when more eBuses are added



CATEGORY	REQUIREMENTS
Route	TfL Route 180
Bus Type	10 x ADL/BYD E400EV Citybus
Battery Capacity	382kWh
Number of Chargers	7 x Phihong DC 180kW
Authorised Supply Capacity (ASC)	1.5MVA (23:00- 06:30) 0.5MVA (06:30- 23:00)

ZENOBĒ SOLUTION	
SUMMARY	

Innovative OPEX financing	✓
Bespoke charging solution	✓
Smart charging strategy	✓
Flexible charging infrastructure	~

Case Study: National Express Yardley Wood



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Zenobē is using a battery energy storage system (BESS) to overcome restricted grid capacity at National Express' Yardley Wood depot

CHALLENGE	ZENOBĒ SOLUTION			
Capital Intensive Project	Innovative OPEX Financing With No Upfront CAPEX Needed			
19 eBuses at its Yardley Wood Garage for Route 6, requiring battery financing and charging	 All 19 eBus batteries are financed off- balance sheet via Zenobē's battery managed service 			
infrastructure services	 Charging infrastructure is financed off- balance sheet via Zenobē's charging infrastructure managed service 		ZENO BĚ	
Limited Grid Capacity	Battery Energy Storage System (BESS) to Support Charging			
number of buses that could be	 A BESS is installed to support the grid when charging oBuses at peak periods 	CATEGORY	REQUIREMENTS	ZENOBĒ SOLUTIO
Depot space constraints also	The BESS takes up an area equivalent to	Route	Route 6	SUMMARY
required any charging solution to be compact	 only 2 car parking spaces The BESS provides services to National Crid during the day, generating avtra 	Bus Type	19 x ADL/BYD E400EV	Innovative OPEX financing
	income, which lowers cost to National Express	Battery Capacity	382kWh	
Future Proofed & Reproducible	Flexible Charging Infrastructure	Number of Chargers	19 x Phihong AC 88kW	Battery Energy Storage System (BESS) to Suppor Charging
National Express needed a flexible charging solution to accommodate further fleet electrification at depot National Express wanted a solution	 Zenobē size onsite infrastructure to accommodate future expansion and eliminate regret costs This project will be used as a template 	Authorised Supply Capacity (ASC)	0.5MVA (24/7) Import 0.35MVA (24/7) Export	Smart charging strategy
that could be reproduced across their depots nationwide	and applied to other depots in the future	Battery Asset	520kW/667kWh	Flexible charging infrastructure

Case Study: Arriva Brixton Tram Shed



Zenobē provided Arriva with a high-powered charging solution which also allows them to maximise their parking space at their Brixton depot

CHALLENGE	ZENOBĒ SOLUTION
Space Constrained Depot	Bespoke, Space-Saving DC Charging
Arriva needed to maintain the ability to park the same amount of eBuses at the depot when they implemented the charging infrastructure for route 319 Arriva's Brixton depot is an old tram shed, built in the 1920s The building is very tight for space and Arriva needed a DC charging solution to meet their operational requirements The lack of space and condition of roof meant that pantograph and traditional DC calutions upper part visible	 Zenobē designed and procured a charging solution that splits the charging units from the vehicles by up to 200m This means that inside the depot, the charging pedestal footprint next to the vehicles was only 440x300mm Maximises parking space so Arriva can maintain number of eBuses operating from the depot
Minimise Ongoing Canacity Charges	Time Limited / Sterilised Connection
Arriva wished to optimise their electric solution, by minimising ongoing distribution use of system (DUoS) charges	 Zenobē's bespoke smart charging software allows Arriva to charge the vehicles with a time limited connection
This could not compromise their ability to charge their vehicles effectively, in any way	 Zenobē worked with Arriva to use an iDNO to sterilise unused capacity and therefore reduce ongoing connection costs
Suboptimal Parking Layout	Parking Strategy Optimisation
Arriva's parking strategy did not maximise the possible charging	 Zenobē worked together, with Arriva, to design an optimal parking strategy
WITLOWS TOF EBUSES	This minimised number of chargers required and peak power

requirement of fleet



CATEGORY	REQUIREMENTS
Route	TfL Route 319
Bus Type	22 x ADL/BYD E400EV
Battery Capacity	382kWh
Number of Chargers	15 x 150kW DC
Authorised Supply Capacity (ASC)	0.8MVA 10:00-22:00 1.6MVA 22:00-10:00

ZENOBĒ SOLUTION SUMMARY

financing	
Space-Saving Solution	✓
Smart charging strategy	✓
Parking Strategy Optimisation	√

Case Study: First Group Leeds

First 🌈

Zenobē has allowed First Group to implement multiple vehicle OEMs at their Leeds depot over 3 phases

CHALLENGE	ZENOBĒ SOLUTION			
Capital Intensive Project First Group initially needed to deploy 9 eBuses at its Hunslet Park depot for its park and ride service, without incurring high CAPEX Following this, another 5 eBuses needed to be put into service for Phase 2. Similarly, without a high CAPEX cost	 Innovative OPEX Financing With No Upfront CAPEX Needed All 14 live eBuses are financed by Zenobē Charging infrastructure is financed off- balance sheet via Zenobē's charging infrastructure managed service 			
Numerous Vehicle and Charger OEMs The first phase of the depot electrification was supporting 9 x Yutong eBuses. One year later a further 5 x ADL/BYD eBuses were introduced	 Advanced Software Integration Capabilities Zenobē integrated all vehicle and charger OEMs with our smart charging software 	CATEGORY	REQUIREMENTS	
Alongside these eBuses, First Group also deployed several electric minibuses	This allows First Group to smart charge and monitor all their vehicles on one	Depot	Hunslet Park, Leeds	SUMMARY
to operate West Yorkshire Combined Authority (WYCA) Services	 platform First Group have full flexibility over their eBus selection going forward 	Vehicle OEM	9 x Yutong E12 5 x ADL/BYD E400EV Citybus	Innovative OPEX financing
Limited Grid Capacity + Future Expansion	Battery Energy Storage System to Support Charging		7 x Mellor Minibuses	
Grid import capacity restricted number of buses that could be charged at the depot	A BESS is installed to support the grid when charging eBuses at peak periods	Charger OEM	8 x Phihong DC	Advanced Software Integration Capabilities
	• Alongside this, Zenobe have managed the power procurement at each stage of the fleet expansion	Battery Asset Size	7 X Rolec AC 390kW/500kWh	Battery Energy Storage System (BESS) to Support Charging

Case Study: McGill's Glasgow & Dundee



Zenobē maximised the use of grant funding while following tight timelines for the electrification of 3 depots

CHALLENGE	ZENOBĒ SOLUTION		
Multiple Simultaneous Builds	Time Efficient Build		
McGill's needed to deploy 68 eBuses across three of their depots	 Zenobē have experienced project managers that are well-versed in keeping to tight deadlines. 		
The three sites need to be electrified and live by October 2021 as the eBuses are to be showcased for COP26 in Glasgow	 Zenobē already have 13 live depots, many of which where built at the same time. This has given us the skill to manage simultaneous builds 		
Maximising Grant Funding	Match Funding with Innovative Financing		
McGill's secured grant funding through SULEB 1 & 2 This pays for 75% of the infrastructure and 75% of the difference between a diesel and eBuses McGill's required additional financing for the eBus and charging infrastructure	 Zenobē financed the remaining CAPEX (c. £17m) to maximise the amount of eBuses McGill's could put into service All 68 bus batteries are financed offbalance sheet via Zenobē's battery managed service The charging infrastructure and chassis were financed with a HP structure 		
Insufficient Onsite Power	Managing Power Procurement		
McGill's did not have sufficient grid capacity on any of the three sites to effectively charge the eBuses	 Zenobē worked with multiple DNOs to ensure that enough power would be available to site at go-live 		
	 Zenobē also work closely with iDNO's to lower the cost of the non- contestable works and speed up the process 		



CATEGORY	REQUIREMENTS			
Depots	Jonhstone, Inchinnan & Dundee	ZENOBE SOLUTION SUMMARY		
55 Bus Type	55 x Yutong E12	Time efficient build		
	12 x ADL/BYD E400EV 1 x ADL/BYD	Match Funding with Innovative Financing		
Number of Chargers	34 x Phihong DC 120kW	Managing power procurement		
Authorised Supply Capacity (ASC) Procured	1.5 MVA across all sites	Smart charging strategy	√	

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