

Ubico Fleet Carbon Reduction Strategic Options Appraisal for

Tewkesbury Borough Council

October 2022



1. Aims

The aims of this strategy is to:

- 1.1. Provide strategic options for Tewkesbury Borough Council (TBC) on vehicle fleet contributions to their carbon emissions and ways to reduce it.
- 1.2. Support TBC to meet their carbon neutrality/net zero targets by 2030.
- 1.3. Contribute to reducing TBC operational levels of carbon derived from the vehicle fleet.
- 1.4. Reduce air pollution as a contributor to ill health in TBC geographical territory.

2. Background

- 2.1. Ubico currently operates 39 road registered vehicles for TBC and 74 pieces of plant and equipment to deliver a range front line services.
- 2.2. When operational, the vast majority of these vehicles burn diesel or petrol in internal combustion engines.
TBC used approximately 300,485 litres of white/red diesel and approximately 1,917 litres of petrol whilst operating the vehicle, equipment, and plant fleet in 2021/22. The burning of this fuel releases harmful emissions, including carbon dioxide, into the atmosphere that is believed to contribute towards climate change.
- 2.3. Climate change has been an ongoing concern for many years. The World Health Organisation (WHO) has been vocal to Governments in its concerns for the 'greenhouse effect' and contributions to climate change, global warming and the negative effects on world's ecosystem.
- 2.4. According to the WHO, the greenhouse effect is when heat and energy from the sun get trapped within the earth's atmosphere, acting like a blanket. Some of this is a natural process but additional gases created by human activity traps more heat in the earth's atmosphere. This additional trapped heat raises the atmospheric temperature and leads to global warming and climate change.
- 2.5. The WHO have been calling for worldwide action to severely reduce the 'greenhouse effect' by reducing greenhouse gases (GHG). Carbon dioxide is considered to be the primary GHG and why much research is focused on carbon emissions and reducing them.
- 2.6. The UK Government introduced The Climate Change Act 2008 that committed the UK to an 80% reduction in carbon emissions relative to 1990 levels by 2050. In June 2019, further legislation was passed that extended that target to 'at least 100%' – net zero.
- 2.7. The Government has decided to ban the sale of conventional petrol and diesel cars and vans by 2030 and heavy goods vehicles (HGVs) weighing up to 26 tonnes by 2035.
- 2.8. TBC have declared a climate emergency and a commitment to be a carbon neutral/net zero Council by 2030. This will have an impact on vehicles purchased

over the next few years as under current life expectations, these vehicles would still be operational in 2030.

2.9. Carbon neutrality means that for every amount of carbon the organisation produces, it should take steps to remove the same amount of carbon from the atmosphere – this could be achieved by purely offsetting. Net zero carbon means reducing to a minimum the organisations carbon emissions, and only offsetting the remainder.

2.10. Transportation is now the most polluting sector in the UK, producing the equivalent of 122 million tonnes of carbon dioxide in 2019 (latest Government figures reported in 2021). This is approximately 27% of the UKs total GHG emissions. Controlling, reducing or eliminating emissions from TBC fleet of vehicles can provide significant progress towards the 2030 target.

2.11. Both the terms CO₂ (carbon dioxide) and CO₂e (carbon dioxide equivalents) are terms used to measure emissions. Simply put CO₂ measures only carbon dioxide (cc80% of GHG), whereas CO₂e is a collective measurement that includes all GHG.

3. Route Optimisation

- 3.1 Ubico uses software as necessary and on behalf of TBC to help consider the most efficient routes for its front-line service operation. Collection routes can be quite variable with the introduction of new roads, new properties being built, and new road restrictions being implemented.
- 3.2 Determining the most effective route and which property or street sits on the most efficient operational 'round' is critical to reducing mileage, efficient use of auxiliary equipment and saving fuel, thus reducing the carbon impact of a particular 'round'.
- 3.3 Ubico will continue to work with TBC to plan and re-optimize operational rounds where they have become unbalanced or have become less efficient over time.

4. Vehicle Specification, Selection and Procurement

- 4.1. Vehicle specification is one of the most critical elements of vehicle procurement – to acquire the most suitable vehicle for the job it is required to do, at the most advantageous cost, best value and taking the opportunity to emit less carbon throughout the vehicles life.
- 4.2. Ubico procures vehicles on behalf of TBC and will consider the environmental credentials of potential vehicle manufacturers and suppliers of vehicles to understand their commitment to reducing carbon, both in manufacturing and supply arrangements. Available vehicle options are also considered that reduce the drag effect, such as aerodynamic cab fairings and integral roof beacons.
- 4.3. At the offset of specification discussions Ubico, in liaison with TBC and operational users, will always consider alternatives to a fossil fuelled vehicle to determine if an appropriate vehicle option is commercially available to carry out the job efficiently and effectively that it is required to do.

- 4.4. Where there are no opportunities to move away from fossil fuelled vehicles within operational or financial scope, Ubico will support TBC to ensure the most efficient and lowest polluting vehicle engine available is specified for the acquisition.
- 4.5. Ubico will mandate on vehicle specifications that there is a requirement (on suitable vehicles) to have connected telematics systems on board that allow Ubico and TBC to capture, analyse and improve driver and vehicle performance in relation to reducing carbon.
- 4.6. Ubico will support TBC in identifying opportunities within their annual vehicle replacement programme to procure vehicles that will reduce current carbon emission levels. Ubico will advise of the budgetary requirements to procure such vehicles during the Councils annual budget setting cycle.
- 4.7. It is not considered that TBC (similarly for most mixed fleets in the UK) will have a single alternative fuel solution for the vehicle fleet. It is envisaged a mix of Battery Electric Vehicles (BEV), Internal Combustion Engine Vehicles (ICE) and Fuel Cell Electric Vehicles (FCEV) will be the practical solution over the next few years.

5. Eco Driver Coaching and Development

- 5.1. A substantial number of TBC vehicles within the fleet are high in fuel use, due to their operational activity. For example, heavy goods vehicles, vehicles with an auxiliary power requirement (refuse vehicles, road sweepers, etc) and operational stop start requirements (for example caged tipper vehicles/multi stop 'rounds').
- 5.2. The more fuel used by a vehicle, the more carbon and harmful emissions are disbursed into the atmosphere.
- 5.3. A significant number of TBC high fuel usage vehicles will provide telematics and CANbus data to allow Ubico to examine vehicle and driver performance. This data identifies many areas of activity including excessive idling, over revving, excessive speeding, harsh acceleration, harsh breaking, and other vehicle and driver performance data; all potentially having a negative impact on carbon emissions.
- 5.4. The data collated would provide the foundations for individual driver improvement programmes to be delivered and the drivers eco-driving techniques developed.
- 5.5. Successful implementation will reduce fuel usage and save carbon.
- 5.6. Eco-driving is also safe driving. Co-benefits include less accidents and less stress on drivers.

6. Tyres

- 6.1. Tyres produce carbon emissions and use a significant amount of oil when manufactured. Therefore, by reducing the number of new tyres fitted to vehicles during their lifetime, carbon is reduced.

- 6.2. Tyres are available in a range of options that improve their performance and or life depending on the application that is required. The rolling resistance of tyres can improve or hinder fuel consumption and contribute to excessive carbon being emitted into the atmosphere, especially smaller faster moving vehicles. A greater rolling resistance produces a less robust tyre, so considerations around tyre application is critical.
- 6.3. The selection of the correct tyre tread patterns and compounds within tyre manufacture will have a positive impact of reducing carbon. Ubico's robust tyre policies ensure the correct tyre selection; twinned tyres on positioned on same hubs; side wall protection banding; the re-grooving of existing tyre tread and turning the tyre on rim at optimum times to ensure maximum life and associated carbon reduction.
- 6.4. A significant number of TBC vehicles are large in physical size and operating in a restricted space e.g. refuse collection vehicles. 'Kerbing' of tyres or the load tipping environment can damage a tyre. On some vehicles these damaged tyres (and tyres worn to minimum) can be repaired and/or re-treaded, significantly reducing carbon.
- 6.5. Ubico work with specialist tyre contractors to ensure Ubico policy tyre fitments accurately reflect the operation and carbon reduction to TBC requirements.
- 6.6. All procurement specifications for tyre contracts will meet the needs of TBC aspirations for carbon reduction, value and operational effectiveness.
- 6.7. Tyre carbon reduction savings on tyres will be recorded on a regular basis.

7. Maintenance Regimes

- 7.1. Standard petrol and diesel vehicle reliability has increased with technology advances. Therefore, vehicle manufacturer's maintenance schedules that incorporate regular oil and other component changes have subsequently decreased over recent years.
- 7.2. Scheduled vehicle replacement incorporating the latest engine and auxiliary technology ensures maximum opportunities for carbon reduction.
- 7.3. Vehicles with zero emissions (ZE) have a reduced maintenance regime than traditional fuelled vehicles due to minimal moving parts in power storage, electric motor drive chains and regenerative braking technology.

8. HVO Biofuel

- 8.1. Considering TBC current fleet vehicles, HVO biofuel (Hydrotreated Vegetable Oil) has the potential to significantly reduce 'well to wheel' carbon emissions by up to 90% (UK Government Renewable Transport Fuel Obligation statistics: Period 10 [2017/2018], report 6 [DfT 2019]). Results are dependant on HVO manufacture, and a conservative 80% reduction has been used in this report.

- 8.2. 'Well to wheel' carbon emissions is capturing both the tailpipe emissions and the emissions associated with generating the fuel or energy to ensure a fair comparison of all technologies and fuels.
- 8.3. HVO is a second generation paraffinic biofuel. It is a drop in fuel – a fuel that doesn't require any adaption to the operational fuel infrastructure, the vehicle (where the use is approved by the manufacturer) or the vehicle maintenance regime.
- 8.4. Not all vehicle manufacturers initially approve the use of HVO, but a significant number of manufacturers of the TBC fleet do approve its use. For those that do not, a hybrid refuelling approach or individual manufacture approval is possible.
- 8.5. HVO supply chains are not UK wide but do service the whole of Gloucestershire including the current TBC depot location.
- 8.6. HVO is currently 15% to 20% more expensive the traditional fossil fuel B7 diesel, although this percentage is expected to drop as the manufacture and use become more available.
- 8.7. Cheltenham Borough Council use HVO as a vehicle fuel and share the same depot and refuelling infrastructure as TBC.
- 8.8. In any use of HVO, Ubico will only source feed stock and hydrogen from renewable sources that comply with EU Legislation RED II and the UK Renewable Transport Fuel Obligation (RTFO). Ubico will not use HVO formats that include palm oil in its manufacture.
Manufacturers can identify the origin of the raw material to verify the credentials of the HVO product and provide declarations from the Renewable Fuels Assurance Scheme to TBC.

9. Zero Emission Fuels

- 9.1. Fuels that emit zero harmful emissions are realistically limited to two: battery electric vehicles (BEV) and hydrogen fuel cell electric vehicles (FCEV).
- 9.2. Hydrogen does not occur naturally on earth in any significant quantities and therefore must be manufactured, usually using a carbon intensive process. However, these processes can be made a renewable process using wastes and residues (unfit for human or animal consumption) as classified by the EU RED II Legislation.

Although currently limited, there are other sustainable alternatives to fossil fuels to create the electrical energy used to produce hydrogen, such as renewable wind and solar energy which allows the hydrogen production to have a carbon neutral/net zero footprint – known as Green Hydrogen.

Ubico would only seek hydrogen that is produced from renewable resources.

- 9.3. Similarly for BEV recharging, TBC can ensure their depots electrical suppliers are supplying electric from renewable resources.

- 9.4. BEVs also have their ethical supply issues and concerns have been raised on the source of raw materials used in the manufacture of batteries, such as cobalt. There is also carbon emissions from transportation that is necessary to deliver the raw material to the battery manufacturing sites.
- 9.5. There are pro's and con's with both BEVs and FCEVs, but both present practical solutions now (BEVs) and in the future (BEVs & FCEVs) for TBC vehicle fleet.
- 9.6. For hydrogen fuel cells to provide a viable zero emission alternative fuel, producing hydrogen from renewable energy sources is essential.
- 9.7. Hydrogen used in a fuel cell is free from any harmful emissions. The only by-product is water from the chemical reaction within the fuel cell. This reaction also produces electricity that is stored onboard and used to power the vehicle. Currently, available commercial FCEVs are substantially limited, but major manufacturers are starting to invest heavily in this technology.
- 9.8. Commercial BEVs of 3.5 tonne and less are more readily available for TBC to make an impact on their fleet's carbon reduction targets over the short term, with commercial FCEVs being more accessible through a range of vehicle applications, probably at the middle to back end of this decade.
- 9.9. Range and battery weight is an issue for some operations when using BEV, although this is becoming less of an issue as technology advances. Additional gross vehicle weights are also being introduced on same vehicles to compensate for the additional weight of the BEV.
The range of a FCEV is not dependant on the outside temperature, so does not deteriorate in cold weather. BEVs will.
- 9.10. FCEVs are more practical than BEVs for heavy goods vehicles due to higher payloads and range. Although becoming more available, a BEV approach for HGV's may not currently suit TBC due to additional vehicle cost, current lack of depot recharge infrastructure, and a current low risk tolerance to new technologies that expose front line services to potential service failures.
Subject to topography, testing the majority of 'rounds' serviced by a 26T diesel refuse vehicle, TBC do have the range to deliver residual waste and dry mixed recycling collection services with HGV BEV's.
- 9.11. The main infrastructure for BEVs is already in place – the national grid. However, limitations on supply and capacity at Swindon Road depots would severely reduce the full transition to BEVs, especially the opportunity for battery electric heavy goods vehicles. However, there is an expectation that limited numbers of < 3.5T vehicles could recharge through the current depot infrastructure overnight with the addition of a limited electric vehicle charge points (EVCP).
An electrical survey of the depot and subsequent Grid applications would identify for TBC the current and potential electrical supply capacity.
- 9.12. The infrastructure for FCEVs is currently poor and does not support the local forecourt refuelling of vehicles, with only 13 sites currently open to public/business in the UK. However, there are alternative refuelling methods for FCEVs if TBC wanted to explore FCEVs further in the future. These include having own refuelling stations at depots and mobile 'top up' contracts.

- 9.13. The refuelling/charging times for BEVs are currently long, with FCEVs much better, around the same time to refuel as a diesel vehicle. Although it is difficult to ignore the restrictions on efficiency this creates, TBC's current operations have a downtime built in that is ideal for recharging BEVs.
- 9.14. Capital expenditure required to purchase zero emission commercial vehicles that TBC use to undertake front line operations are significantly more expensive than a petrol or diesel vehicle alternative.
- 9.15. Ubico, on behalf of TBC, will continually keep abreast of vehicle technologies that promote zero emission as they progress and develop.
- 9.16. Ubico will continue to support TBC by sharing their expertise and knowledge of zero emission vehicles to ensure that if TBC are procuring, then the correct zero emission fuel type is selected for the operational requirements of the vehicle and its duty cycle.

10. Electric Wheelie Bin Lifting

- 10.1. Refuse collection vehicles (RCV's) use fuel driven hydraulics to lift and empty wheelie bins.
- 10.2. Fuel and carbon savings can be achieved by changing the power source to electric from the equivalent hydraulic variant.
- 10.3. Electric bin-lifts can be fitted to diesel vehicles or biofuel vehicles to improve carbon emissions and operational noise.

11. Air Quality and Euro 6 Engines

- 11.1. Although TBC have committed to carbon neutrality/net zero by 2030, Ubico also promotes the importance of cleaner air from vehicle emissions. Ubico is a member of the Westminster Commission for Road Air Quality which strives to promote the reduction of air pollution from vehicles.
- 11.2. Some of the measures being suggested to reduce carbon from vehicles will also have a co-benefit of reducing air quality pollutants from vehicle tailpipes.
- 11.3. Where alternative fuelled vehicles cannot be secured, TBC target is for all vehicles, to be at least 'Euro 6' compliant. Euro 6 is the name given to a set of limits for harmful exhaust emissions produced by virtually all vehicles powered by petrol or diesel fuel. Both particulate matter (PM) and nitrogen oxide (NOx) emissions from tail pipes have been significantly reduced when operating Euro 6 vehicles.
- 11.4. Although the end of diesel-powered heavy goods vehicles will happen, the replacement has not yet been fully defined. If TBC want to wait for HGV technologies to be defined before deciding on which alternative fuel to choose, TBC should not feel uncomfortable about a movement to full HGV Euro 6 fleets, incorporating HVO and utilising driver/vehicle behaviour and performance telematics on their journey for net zero carbon.

12. Budgets

- 12.1. The journey to achieving net zero carbon emissions for TBC by 2030 will entail investment from the Council in vehicle acquisition, infrastructure and/or biofuel.
- 12.2. Capital expenditure to purchase battery electric or hydrogen fuel cell vehicles would need to significantly increase, doubling (or even quadrupling for FCEV) current vehicle prices.
- 12.3. Although prices are expected to reduce through competition, economies of scale and technological advances, these price reductions are not expected to be significant in the short term.
- 12.4. The infrastructure required to facilitate BEV's and PHEV's needs investment by TBC. This could be significant in the areas of zero emission HGV vehicles, but less so for recharging limited numbers of < 3.5 tonne vehicles.
- 12.5. Specialist tooling and training for vehicle technicians on the maintenance and repair of zero emission vehicles must also be recognised in budget setting.
- 12.6. Revenue budgets would show a saving through fuel and maintenance costs when purchasing light commercial < 3.5 tonne BEVs, reducing the whole life cost of this range of vehicles.
- 12.7. The current price of electric heavy goods vehicles would not be expected to provide a whole life vehicle cost saving. There is currently no satisfactory financial return on investment.
- 12.8. Revenue budgets would need to be increased in a move to more sustainable and lower carbon fuels. For example, HVO biofuel currently attract a 15% to 20% premium.
Depending on TBC arrangements with CBC concerning Swindon Road depot, a HVO refuelling infrastructure may be in place as CBC already have a separate fuel tank housing HVO.

13. TBC Strategic Options

Option 1 – Do Nothing

There is always the option for TBC to do nothing different with the current vehicle fleet, and procure like for vehicles when due for replacement.

By leaving things as they currently are and making no fleet changes resulting in a carbon reduction, TBC could only realistically meet their 2030 net zero carbon pledge by finding huge carbon savings or off-setting projects elsewhere within the Council or by participating in an off-setting scheme that could compensate for TBC's carbon emissions.

Either of these would need to off-set the carbon emissions generated by TBC's vehicle fleet.

Vehicle Group	Alternative Fuel
Light/small Commercial Vehicles	ICE Traditional B7 Diesel
Medium Commercial Vehicles	ICE Traditional B7 Diesel
HGVs (>3.5T)	ICE Traditional B7 Diesel

Estimated Additional Fleet Budget Cost - £0

Option 2 – Low Risk, Low Cost

Introduce electric bin lifting equipment on domestic refuse collection vehicles. When compared to an equivalent hydraulic bin lift variant that is fitted to standard refuse collection vehicles, manufacturer testing has seen a saving on fuel. The 50 litres of fuel saved on test would equate to a carbon saving, but the testing has not been independently verified.

Electric bin lifters could be installed on any 26 tonne domestic refuse collection vehicle within any of these strategic options, providing a combination of carbon savings.

In all TBC procurement tenders for 26 tonne domestic refuse collection vehicle tenders, the electric bin lift will be priced as an alternative option to standard hydraulic. This will provide TBC with an alternative priced option, for a post tender decision.

Estimated Additional Fleet Budget Cost (October 2022):

To be advised as an option on supplier tender submissions.

Option 3 – Low Risk, Low Cost

Introduce eco-driving coaching and driver performance solution to utilise vehicle telematics and real time alerts to the driver on eco-driving style. Pilot schemes with other shareholder councils have produced savings in excess of 5% on fuel and associated carbon reductions.

A significant number of TBC HGV's have mobilised telematics functionality already installed, but no hardware. The hardware can be retrofitted and a managed fee or recruitment funded to launch this solution. The solution can be applied across all strategic options.

Vehicle Group	Alternative Fuel
Light/small Commercial Vehicles	ICE Traditional B7 Diesel
Medium Commercial Vehicles	ICE Traditional B7 Diesel
HGVs (>3.5T)	ICE Traditional B7 Diesel with telematic eco-driver coaching and driver performance solution

Estimated Additional Fleet Budget Cost/Saving pa (October 2022):

Telematics/Eco Driving:

Hardware install to applicable vehicles – £4,375

Manged Service - £3,600 per annum

Or Employee Driver Liaison Manager - £39,494 per annum (potential to share with CBC)

Minimum 5% Fuel saving on Applicable Vehicles - £12,496

Option 4 – Low Risk, Medium Cost

When considering this document in its entirety, there is an option that provides a significant incremental movement towards TBC's 2030 net zero carbon objective, at relatively low risk and medium cost:

Light/Small Commercial Vehicles - 2.5 tonnes and less

Zero emission vehicles in this weight category are now well established in the commercial vehicle market, with excellent range, high reliability and reasonable cost. These vehicle would provide a zero emission solution for TBC.

The infrastructure requires an electrical survey of the Swindon Road depot by a qualified electrical engineer, but logic indicates there is capacity to charge several vehicles overnight.

Medium Commercial Vehicles – 2.6 to 3.5 tonnes.

Zero emission vehicles in this weight category have received minimal investment by manufacturers, mainly due to UK driving licence restrictions. Recent changes in gross vehicle weights for electric vehicles and enhanced power train technology has now provided a larger market where manufacturers are investing in this category of BEV solutions and this range of vehicles are a reliable alternative to diesel.

However, this range of vehicles are still expensive, and any successful acquisition will depend on the topography of the TBC operational locations. Decisions to purchase or not would be decided by TBC on an operational/cost case by case basis. Currently, there is unlikely to be any financial return on investment.

The infrastructure requires an electrical survey of the Swindon Road depot by a qualified electrical engineer, but logic indicates there is capacity to charge several vehicles overnight.

Those vehicles not suitable as BEV, could use HVO as they are renewed and meet the engine standards required. This provides a significant well to wheel saving in carbon as HGV's below:

Large Commercial Vehicles/Heavy Goods Vehicles (HGV) - > 3.5 tonnes

Currently, Ubico advise against TBC progressing with zero emission vehicles in the HGV options due to available budget identified, current vehicle reliability and refuel/recharge infrastructure. There will be scope in the future, with appropriate funding and when reliability is more on a par with diesel.

However, a significant number of TBC vehicles can run on HVO Biofuel; a much cleaner fuel than traditional B7 diesel, saving >80% well to wheel carbon emissions. HVO currently demands a market premium of 15 to 20%.

HVO, coupled with the telematics eco-driver performance solution to save fuel (> 5%) and mitigate against a proportion of the additional HVO cost. HVO/Telematics provides a significant option in reducing carbon emissions on TBC's HGV's and or medium commercial vehicles not suitable as a BEV.

Vehicle Group	Alternative Fuel
Light/small Commercial Vehicles	BEV
Medium Commercial Vehicles	BEV (or Euro 6, HVO where topography etc. dictates)
HGVs (>3.5T)	ICE Euro 6, HVO with telematic eco-driver coaching and driver performance solution

Estimated Additional Fleet Budget Cost/saving pa (October 2022):

Electric vehicles:

Small and Medium Commercial vehicles (<) 3.5T Electric: £525,000 (Optional)

Telematics/Eco Driving:

Hardware install to applicable vehicles – £4,375

Manged service - £3,600 per annum

Employee Driver Liaison Manager - £39,494 per annum (potential to share with CBC)

Relative Fuel Saving - £12,496

HVO – Move Permitted Vehicles (expected approvals Dec 2022) to HVO - £54,480 (saving approx. 249,910 litres of fuel)

Option 5 – Early Adopter; Higher Risk, Higher Cost

Opportunities do currently exist for TBC to replace all its vehicles with zero emission alternatives at this and at future replacement schedules. However, this would entail huge investment in Capital expenditure on vehicles and infrastructure. There are currently service reliability issues with zero emission HGV vehicles that would require additional substitute vehicles to prevent service failure.

Small Commercial Vehicles - 2.5 tonnes and less

As option 4, but if all vehicles were to be BEV there is little doubt that the Swindon Road infrastructure to recharge all the TBC vehicles overnight would require significant investment (subject to electrical survey).

Medium Commercial Vehicles – 2.6 to 3.5 tonnes.

As option 4, these vehicles are currently available, but are expensive – up to twice the price of a diesel equivalent. Any rounds that do not conquer the topography operationally required and fail the case by case testing would need to be supported by an additional zero emission vehicle.

There is little doubt with a full BEV fleet, the Swindon Road infrastructure to recharge all the vehicles overnight would require significant investment (subject to electrical survey).

Large Commercial Vehicles/Heavy Goods Vehicles (HGV) - > 3.5 tonnes

HGV's and refuse collection vehicles (RCV's) are getting more reliable with each firmware update, but manufacturers are probably still three(?) years away from an electric RCV being as reliable as a diesel equivalent whilst still being able to handle all TBC topography with combined adequate road speeds that a diesel can.

Reliability can lead to service failures in front line services bringing both cost and reputational issues.

These vehicles are expensive, with original manufacturers RCV's currently in excess of £420,000 each. Zero emission support vehicles would be required, adding to the overall acquisition cost.

There is little doubt with a full BEV fleet, the Swindon Road infrastructure to recharge all the vehicles overnight would require significant investment. Subject to electrical survey.

With huge increases in budget, with supporting infrastructure projects and an acceptance of the high risk elements of TBC being relatively early adopters of these vehicle types, it is would be possible to provide a net zero road registered (non-mower/plant) vehicle fleet.

Note: Hydrogen fuel cells electric vehicles (FCEV) have not been included in the options above as the current availability and practical delivery of this solution has not yet been well-defined.

Vehicle Group	Alternative Fuel
Light/small Commercial Vehicles	BEV
Medium Commercial Vehicles	BEV
HGVs (>3.5T)	BEV

Estimated Additional Fleet Budget Cost (October 2022):

Electric vehicles:

Approx. price to change all fleet (except mowers/plant) to BEV on renewal - £4,424,760 (saving approx. 282,399 litres of fuel).

14. Additional Notes

- 14.1. Hydrogen fuel cell electric vehicles (FCEV) have not been included in the Strategic Options in section 13, as the current pricing, availability and practical delivery of this solution has not yet been defined.
- 14.2. Mowers, plant and professional handheld equipment solutions are currently sporadic with limited competition or proven resilience and have been excluded from this Strategic Options report. However, at each relevant procurement stage the market will be reviewed and guidance on any industry progression for alternative fuels for this equipment will be considered and provided to TBC and operational teams where relevant.
- 14.3. Any residual fleet generated carbon excess remaining would be treated by off-setting projects elsewhere within TBC or by participating in an off-setting scheme to achieve carbon neutrality/net zero for 2030.
- 14.4. As technology in alternative fuels, vehicle maintenance and vehicle components advance over future years, TBC will be advised by Ubico on new and updated options and recommendations in reducing carbon from TBC vehicle fleet.

Ian Bourton; Head of Fleet Operations, Ubico Limited.
13.10.2022