Colchester
City Council

Colchester City Council: Fleet Transition Strategy 2023/24

Contents

Abbreviations

Battery electric vehicles	BEV
Carbon dioxide equivalent	CO_2e
Climate Emergency Action Plan	CEAP
Colchester City Council	CCC
Electric vehicle	EV
Electric refuse collection vehicle	eRCV
Hydrotreated vegetable oil	HVO
Internal combustion engine	ICE
North Essex Parking Partnership	NEPP
Refuse Collection Vehicle	RCV
Street Care & Safety	SC&S
State of charge	SoC
Tank To Wheel	TTW
Ultra-low emission vehicles	ULEV
Well To Tank	WTT
Whole life costs	WLC

1. Introduction

This document is to set out the strategy for the Colchester City Council's (CCC) fleet to move to a carbon neutral fleet by 2030 if operationally and commercially viable. This is in line with the Council's commitment to tackle the climate emergency, which was declared in July 2019 and set out in the Climate Emergency Action Plan (CEAP).

By 2030 the Council's ambition is to transition to a fully tail pipe carbon neutral fleet. During this programme, diesel and petrol vehicles will be replaced, where practicable, with electric vehicles (EV), but other options may be considered such as hydrogen and low emission alternative fuels including hybrid vehicles.

The CEAP identifies the Council's fleet as accounting for approximately 25% of its total emissions. As the grid continues to decarbonise and purchased electricity becomes 'greener', emissions from the Council's fleet will become an increasingly larger portion of the overall footprint. An action from the CEAP is to take a phased approach to renewal of the fleet as new technologies and associated infrastructure become available.

1.1. Vision and Objectives

Effective management of fleet related assets is critical to the delivery and performance of Council services. This Fleet Transition Strategy sets out and controls the management of Council fleet related assets.

The objectives of the Fleet Transition Strategy are:

- Ensure assets fit for purpose - All vehicles/plant and equipment will be 'fit for purpose' in terms of condition and suitability for the intended use.
- Ensure assets are used effectively – Assets will be treated as a corporate resource, and the need to own/maintain the vehicles/equipment will be regularly challenged and the performance of assets will be monitored and reported with the aim of eliminating unnecessary expenditure.
- Support sustainability - Assets, which run efficiently, maximise value for money, are environmentally and energy efficient contributing directly to delivering reductions in carbon emissions inclusive of the environmental life cycle of the vehicle and component parts (including fuel).
- Safety - The vehicle/plant or equipment must secure the minimum health and safety risk to our staff and members of the public.

Note: This strategy is not intended to cover the Council's grey fleet (vehicles that are owned and driven by an employee for business purposes)

This strategy is well aligned with elements of the Strategic Plan in that it helps the Council's response to the climate emergency, delivers modern services to the city and supports the improvement of health and wellbeing of staff and residents.

2. Fleet Profile

The total number of vehicles as of July 2023 is 124, however the fleet profile will fluctuate due to housing growth, changes in legislation or the result of other county wide projects including the emerging Colchester and Essex Waste Strategies.

The fleet portfolio is made up of a diverse range of vehicles from small cars, vans, light goods caged and tipper vans, tail-lift box vehicles, sweepers, JCB's and a range of heavy goods vehicles.

A current breakdown of the fleet is provided below in table 1.0, and the lifespan and replacement programme are detailed in table 1.1.

Vehicle Type	No. of vehicles	Service	Electric	Hybrid	Diesel
RCV	36	R&W	0	0	36
Resilience RCV	5	R&W	0	0	5
Road Sweepers	6	SC&S	0	0	6
JCB	2	Depot	0	0	2
Cage Tippers	21	SC&S	0	0	21
Car/Van/4x4	54	SC&S, NEPP, Helpline, Greening	19	4	31

- R&W – Recycling & Waste
- SC&S – Street Care & Safety
- NEPP – North Essex Parking Partnership

Table 1.1 – Lifespan and replacement programme for the fleet.

Vehicle Type	Vehicle Count	Purchase year - CCC owned	End of lease agreement	Estimated life span from new	Replacement due
Refuse Collection Vehicles	28	2018(14) 2019(12) 2020(1) 2021 (1)		7 Years	2025(14) 2026(12) 2027(1) 2028 (1)
Refuse Collection Vehicles (Contract spare/spot hire)*	5		2025 (3) Spot hire (2)		
Food Waste Vehicles	7	2020		7 Years	2027
Food Waste vehicle resilience	1	2021			2023

Vehicle Type	Vehicle Count	Purchase year - CCC owned	End of lease agreement	Estimated life span from new	Replacement due
Sweepers	6	2019		7 Years at time of purchase. 3/5 years now modelled depending on specification.	2026
JCB	2		2026	3-year contract hire	2026
Cage Tippers	19 +2 hired	2022(19)	Spot Hire (2)	7 Years	2028
Large size vans	3 (2 + Luton)	2018 2021	Spot Hire (1)	7/10 years should electric be an option	ASAP
Medium size vans	4 (2 GREEN, 1 BD, 1 PEST)		Spot Hire (4)	7/10 years should electric be an option	ASAP
Small size vans	12 (6 EV,1 BD, 1 GREEN,4 SC&S)	6 EV 2022	Spot Hire (6)	7/10 years should electric be an option	6 owned - 2030 7/10-year estimated life. 6 hire - ASAP
NEPP vans	4		2023	7/10 years should electric be an option	2024
NEPP cars	25	2021 (5) Used vehicle (12)	2023 (8)	7/10 years should electric be an option	2029 7/10-year estimated life.
Cars - Hybrid	4 (Helpline)	2021		7/10 years should electric be an option	2028
4x4	2	2022		7 Years	2029

Total 124

*Contract spare/hired vehicles that are not CCC owned therefore not part of the councils Fleet Strategy.

2.1. Corporate Fleet Assets Roles and Responsibilities

Leadership and Cabinet

Under the Scheme of Delegation by the Leader of the Council to Cabinet Members, the Portfolio Holder for Neighbourhoods and Waste has delegated executive powers of implementation within the confines of the Council's budget and policy framework.

Head of Neighbourhood Services and Fleet & Depot Manager

Under the Scheme of Delegation by the Leader of the Council to Officers, the Head of Neighbourhood Services has delegated powers to act within the approved budget and policy objectives of the Council in relation to fleet.

Overarching responsibility for the compliance of all requirements associated with the Council's Vehicle Operators Licence and for the delivery of strategic fleet procurement, maintenance, and management rests with the Head of Neighbourhood Services and the Fleet & Depot Manager.

The Fleet & Depot Manager will provide advice and guidance for all departments within the Council on all aspects related to vehicle, plant, and equipment assets operation related matters, including provision of driver training if required.

Directorates/Service Departments

Timely identification and clear communication of requirements to deliver services including the pursuit of alternative environmentally suitable modes of travel. Production of evidence-based business cases including financial commitment to seek amendments to fleet portfolio. Managing staff to ensure they comply with CCC policies and procedures, Transport and Road Traffic laws. Suitably manage drivers to ensure adherence to regulations and that there is no damage to the assets in their control and that the safety of themselves and others is not compromised in any way.

Drivers/Operators

Compliance with all elements of CCC driver policies, transport, and road traffic laws. Use the assets in accordance with operating instructions and return them in good condition. Provide feedback via their service department on the suitability of vehicles currently in service and any demonstration vehicles they are asked to trial.

Strategic Procurement

Provide specialist advice and support to Fleet & Depot Manager and lead the procurement process and compliance with CCC and public procurement regulations.

Financial Services

Work with the Head of Neighbourhood Services, the Fleet & Depot Manager and service departments to produce, maintain and monitor a sustainable financial plan to support the strategy to ensure approved budgets are not exceeded. Provide appropriate financial analysis on business cases, work with the Head of Neighbourhood Services, the Fleet & Depot Manager and service departments to identify appropriate funding for additional assets outside of the approved plan and challenge to ensure maximum efficiency and sustainability.

2.2. Storage and Supply of Fuel

Fuel is supplied from the Shrub End depot. The procurement and distribution of this fuel is managed by the Head of Neighbourhood Services and the Fleet & Depot Manager

Fuel use for the current CCC vehicle fleet excluding vehicles/plant that fuel away from Shrub End is estimated at 514,124 litres (financial year 22/23 figures from TimePlan Fuel Management system).

The Council's Greenhouse Gas Report identifies that the Councils fleet emits an estimated 1,354.9tCO_2e *per annum.*

2.3. Fleet Asset Replacement and Management Process

The Council has identified the current core fleet asset needs via the formation of a live asset register. Services have and will continue to be required to confirm a continuing need for the assets. Investment in such assets is needed to enable the delivery of core functions and responsibilities. For additional new vehicles or vehicle modifications/enhancements services must provide an approved business case clearly demonstrating the necessary ongoing funding is in place or which other parts of the fleet profile is to be reduced to accommodate any increased funding costs.

The financial investment required to support such a large and diverse asset replacement programme must not be underestimated and poses a very real challenge, with only minimal capital allocations secured significant additional funding is necessary to keep services operational. With demands exceeding available financial resources the need for a robust replacement plan is essential to prioritise replacements based on necessity.

The asset register will identify assets coming to end of operating life and/or when an asset is coming to the end of its funding arrangement or when cost of replacement has risen. The Fleet & Depot Manager will engage with services to determine if there is an ongoing future need and if so, explore marketplace advances to inform replacement options including Ultra Low Emission Vehicles (ULEV).

Replacement factor considerations:

- condition of vehicle
- mileage of vehicle
- age of vehicle
- service unit's requirement needs.
- whole life costs incurred to date.
- projected future maintenance costs if retention is considered.
- existing fuel type and carbon impact
- alternative marketplace fuelling options available and viable.

2.4. Decarbonising the Vehicle Fleet

Since declaring a climate emergency on 17 July 2019, the Council has taken action to calculate the emissions from its activities and operations and set an emissions baseline from which to measure progress against towards the net zero emissions target by 2030.

The way in which Council vehicles are operated and renewed is seen as a vital part of the response to the climate emergency and the expectation that the Council becomes a leader in the fight to reduce the conurbations carbon emissions.

The Government's Road to Zero Strategy [The Road to Zero (publishing.service.gov.uk)] presents a challenge to drastically reduce carbon emissions by 2030. For fleet management, that means taking a 4-step approach to sustainability:

1. Collecting accurate data around vehicle use
2. Managing and reducing demand
3. Switching to Hydrotreated Vegetable Oil (HVO) a paraffinic, premium quality second-generation renewable fuel that provides a cleaner-burning alternative for use in diesel engines. Whilst not the full solution it offers a significant important interim intervention in reducing greenhouse gas emissions by up to 90%. while other technologies are developed, (Section 5 of this paper provides further information on HVO).
4. Investing in ultra-low-emission vehicles (ULEVs) and infrastructure where accessible and proven in the marketplace

Green vehicle technology is developing rapidly all the time, and the purpose of this strategy is not to second guess what future technology will emerge within the marketplace or predict the corporate transformation programme outcomes, including understanding how and where services will be delivered across the city. At the heart of this strategy is a bold aim to significantly reduce the current carbon emissions and transition as many of the vehicles to be a ULEV fleet over the forthcoming years where these are marketplace available and proven effective, as well as promoting healthier forms of travel such as walking and cycling.

2.5. Marketplace Overview

Industry acknowledges that the ULEV marketplace is yet to mature particularly in terms of the large goods vehicle fleet, with some types of vehicles not widely available. Whilst over the past year development of the larger type of vehicle has expanded onto the market, these new market entrants' longevity and fitness for purpose remains in part unproven, however rapid progress is now being made.

As part of the Government's Green Industrial Revolution, and following extensive consultation with car manufacturers and sellers, the Government has confirmed that the UK will end the sale of new petrol and diesel cars and vans by 2030; this date was put back to 2035 in a recent Government announcement. The Government also announced plans to phase out new diesel heavy goods vehicles (HGVs) by 2040 as part of a move to decarbonise all forms of transport.

2.6. Pathway to Achieve a Zero Tail Pipe Emissions Fleet

This Strategy's pathway details a series of steps to be fully considered before procurement is pursued:

- Where possible, in the first instance the fleet will continue to be rationalised as transformation programmes develop, ensuring that vehicle utilisation is maximised whilst balancing a growing city and the operational needs of service departments.

- To compliment the fleet profile and encourage alternatives to services the introduction of a pool of electric bikes will be evaluated to encourage active travel where it is safe and appropriate to service delivery to do so.
- When a vehicle is due to be replaced, it will be replaced with an ultra-low emission vehicle (ULEV) as the vehicle of preference e.g., small van fleet. Essentially, and with consideration to existing Council infrastructure and current availability, these are likely to be full electric vehicles or a petrol hybrid configuration at the present time.
- When a ULEV is not available, economically viable or cannot secure the necessary supporting infrastructure needs, the replacement vehicle will as a minimum be Clean Air Zone compliant and options of using Hydrotreated Vegetable Oil (HVO) fuel which provides a straightforward alternative to diesel to significantly lower carbon emissions by as much as 90% maybe considered. There exists some controversy regarding the use of HVO, with the Environment Agency stopping its use by contractors in 2022. However, a recent study carried out by Balfour Beaty Vinci and Imperial College has determined that the emissions factors are credible if the provenance of the ingredients is assured i.e., made from waste material sources in the UK), and compliant with the Renewable Transport Fuel Obligation (RTFO).

Whilst ambitious, this strategy takes a measured approach in investing limited funds in the rapidly evolving area of electric or other ultra-low emissions vehicle (ULEV) technology and recognises that the Council is not best placed to stay on the cutting edge of technology development.

Electric vehicle infrastructure requirements are scalable, and Colchester's relatively small geography mitigates some of the concerns about electric vehicle range for being a suitable ULEV technology pathway for the Council to pursue currently.

The Council, like any organisation looking to invest in a large number of electric vehicles faces a challenge: charging infrastructure and capacity. Surveys of our sites suggest the capacity is limited to only charge a small number of vehicles.

To realise this strategy and achieve 94 new ULEV replacements including Large Goods Vehicles (LGV's) significantly bolstering the 23 vehicles already forming part of our ULEV fleet, investment in enabling infrastructure is key and will necessitate funding to upgrade the substation at the existing depot to address the current incoming main capacity limitations of 100kw to achieve 500kw, a large capacity network, a standard EV charger is rated at 7.2 kw and a larger chargers at 40kw / 50kw.

Investigations have shown that axillary sites can generally accommodate between 2 – 3 chargers without the need for infrastructure upgrades although each proposed location will need to be surveyed for confirmation.

2.7. How Electric Vehicles Stack Up

Electric vehicles are only one of several ULEV technologies within the transport marketplace but are one of the most advanced and readily available. Replacing existing petrol or diesel vehicles with electric vehicles (EVs) brings the environmental benefits of lowering carbon emissions and reducing local air pollution.

Development continues throughout the motor industry with new market entrants emerging in increasing numbers now including the Large Goods Vehicle market.

2.8. Renewals Cycles for EV

Currently ICE vehicles have a life cycle between 5 and 7 years. However, with less wear that EV's have the life of the vehicles can be extended. There may be some instances where battery degradation happens sooner depending on usage. Individual cells may be replaced which can be costly, however not as costly as replacing complete battery packs. Renewals schedules may differ with types and makes of vehicles depending on battery warranties terms and possible hydrogen fuel cell warranties.

Table 2.0 – Fleet transition timeline

Year	RCV	Food Waste	Sweepers	JCB	Tippers	Large van	Medium van	Small van	Cars/4x4	Totals
23/24		1				1	4	10		16
24/25									12	12
25/26	14									14
26/27	12		6	2		2				22
27/28	1	7							8	16
28/29	1				19				4	24
29/30									2	2
30/31								6	5	11

*The above does not include contract spares or spot hired fleet.

Table 2.0 indicates what can be transitioned and in which year it is scheduled to happen should budget allow and the relevant charging infrastructure be available.

- Green - vehicles are readily available.
- Amber - only certain types of vehicles available.
- Red - vehicles not readily available or in very early stages of development.

Should Hydrogen be a source of fuel all vehicle types would be within the red category as these fuel alternatives are in very early stages of production.

2.9. Potential Costings

Table 3.0 – Costs for RCV dependent on fuel types

Fuel type	Cost new	Additions	Fuel running costs
Electric - Purchase	£425,000	Off board charger £20,000	£0.32 Per kWh (day)* £0.23 per kWh (night)*
Electric - Hire & Maintenance	£693,000 over a seven-year term		£0.32 Per kWh (day)* £0.23 per kWh (night)*
Diesel	£210,000	£0	*£1.25 per litre (*11.10.23)
Hydrogen	£750,000	Hydrogen fuel tank required to store hydrogen at a depot £250,000	£6.50 per kg
*Running cost shown at current market price October 2023			

Table 4.0 – Costs for Vans dependent on fuel types

Fuel type	Size	Cost new	Fuel running costs
Electric	medium	£28,000	£0.32 Per kWh (day)* £0.23 per kWh (night)*
Diesel	medium	£19,000	£1.25 per litre
Electric	Large	£54,000	£0.32 Per kWh (day)* £0.23 per kWh (night)*
Diesel	Large	£27,000	£1.25 per litre

*kWh per hour is our current tariff, in addition to these costs are the following, standing charge £11.19 per day, Site Fee £0.07 per day, Agreed availability charge £1.04 per kVa and a settlement charge of £0.02 per day.

3. Considerations

The Council has an ambition to transition all its current fleet to EV by no later than 2030. To achieve this aim, this strategy sets the following objectives:

- Make effective and robust informed decisions.
- Ensure efficient and effective fleet management.
- Improve and future proof service delivery.
- Enhance fleet performance.

It is proposed that, as the Council formulates its transition from diesel to greener fleet options, the following principles are agreed and considered at each stage and during the procurement process:

- Review the data systems in place to track, monitor and evaluate the fleet.
- Undertake robust evaluation of operational need and financial viability.
- Challenge the number and size of vehicles.

- Explore both lease hire and purchasing options, considering existing budgets.
- Base decisions on expert recommendations and guidance

3.1 Establish a transition team.

The successful transition of the CCC fleet to a zero-emission fleet will require CCC to establish a small team encompassing fleet management and the main vehicle operating departments, estates, energy management, human resources (for grey fleet), procurement and finance. The robust appraisal of need and utilisation, changing vehicle procurement to a model based on WLC, funding the new fleet, putting in place the charging infrastructure to support new BEVs and addressing issues like home-based charging, will require input and resources from all the groups identified above, as well as a governance and reporting structure with full senior management team engagement.

The move to zero tailpipe emissions is a once in a generation transformation and is not just a project for the Fleet & Depot Manager.

4. Infrastructure

4.1 Current

In 2022 the Council invested in ten wall mounted EV chargers at its St. Johns car park. These chargers have been utilised to charge fully EV's from Street Care & Safety, Environmental and NEPP services. In addition, two EV chargers were added to the Priory Street car park; one has a double socket that is publicly accessible and an additional single unit for the use of CCC's car club.

In the summer of 2023 six double EV charging points were erected at the Council's head office, Rowan House. Of these six double units, five of these are a single-phase units, while the sixth is a three-phase charging unit. These are now currently being utilised.

4.2 Additional Requirement

To implement infrastructure to transition the entire RCV fleet (currently thirty-six CCC owned vehicles) we would require an electrical substation.

In 2020 the Energy Savings Trust (EST) compiled a report on how CCC could decarbonise the RCV fleet by transitioning them to fully electric vehicles. Section eight of that report looked at Electric Vehicle Charging Infrastructure (EVCI). Below is an extract from the report:

It tells us that ideally, vehicles should be charged overnight from 20:00 to 08:00 hrs, to avoid a negative impact on the local and national grid by charging during periods of peak use. It is therefore important that CCC negotiates low overnight and weekend off-peak tariffs for electricity at all sites, where electric vehicles may be based. It is also important to avoid charging weekdays during the 16:00 to 19:00 hrs peak period, when grid demand is at its maximum, grid GHG (greenhouse gas) emission intensity is high, due to the use of gas generation, and the unit cost per kWh is also at its peak. However, if there is on-site generation for photovoltaic (solar), that should be used if available.

With several battery electric vehicles on the fleet, the infrastructure cost can be spread, and it is very likely that large parts of the charging infrastructure will outlive the vehicles, especially the expensive cabling and groundworks.

Cars and vans up to 60 kWh battery size can be charged overnight in less than 12 hours with 7.4 kW AC chargers but eRCVs will require more expensive 40 kW DC chargers, or 3-Phase AC supplies for on-board AC chargers.

4.3 Meeting the demand for EV charging – tracking data

Using the tracking data from the CCC fleet, the EST were able to estimate the charging capacity needed to meet peak demand. That peak occurs when several vehicles return with a low State of Charge (SoC) which will happen on the longer trips, or trips with high energy use due to a large load (tonnes collected) or many hydraulic movements (bin lifts and compactions).

There are several options for charging EVs. The simplest is to build sufficient site capacity (kW or kVA) to meet the simultaneous maximum demand for charging all the EVs from the grid connection at the full rate, supported by the charger regardless of the local "domestic" site load. This can be expensive, especially if it requires significant upgrades to the local grid infrastructure.

The alternative is to use some method of moderating the supply available to the chargers. This could be achieved by simply restricting the time when banks of chargers are operational or, with more sophisticated controls, limiting the power available to each charger and reallocating that capacity as vehicles are fully charged.

The issue with timed charging, which must be based on predicted need, is it that there is a higher risk of some vehicles not having an adequate charge to complete the *following* day's workload if they return with a much lower than anticipated SoC.

It is also possible to link the management of the energy available for charging EVs to the site's "domestic" load so that the charging control system can maximise the current it draws as the load from the rest of the site falls. Each step-up in charger management requires more investment in the charging system but should avoid even more expensive capacity upgrades in the local grid and gives the fleet team greater visibility around demand and driver behaviour.

The EST determined the capacity required from four possible charging strategies.

- The first is the capacity required for all the chargers to operate simultaneously at full power – this is the simplest option, and many vehicles will be fully charged in less than eight hours leaving unused capacity throughout the rest of evening.
- The second strategy considered assumes that all the vehicles return with 10% battery capacity and there is a charge management system in place to spread charging over the whole overnight period by restricting the capacity available to the chargers.

- The third strategy uses the tracking data, considers the mileage driven by the vehicles during the day and determines the electricity (kWh) required to return the vehicles to a fully charged state.
- The fourth and final strategy is much riskier. It allows the vehicle to run down throughout the week by ensuring that each vehicle has enough power to complete the next day's workload and is only fully recharged over the weekend. This final strategy only works with a very predictable daily workload and does not accommodate changes made at short notice. It is a high-risk strategy and should only be considered if the site capacity is severely constrained, upgrade is very expensive, and the vehicles have a very predictable work pattern.

Table 5.0: Site capacity required by different charging strategies.

Strategy	Description	kW	Notes
1	Simple maximum capacity – all 100% charged	1,040	Very Expensive
2	Smart - worst case – all 100% charged	533	Expensive as over 400kVA
3	All departures 100% charged	498	Optimal
4	No unnecessary off-site charging, not all 100%.	351	High risk

It may be difficult to create the 500 kW of headroom predicted to be needed to fully charge the eRCVs overnight. The EST believe this may be a worse case estimate but only a long-term detailed on-site evaluation of an eRCV across all the CCC routes will determine that. Dennis Eagle has a policy of limiting the initial number of eRCV to two and these will provide all the data needed to confirm the impact of an eRCV fleet.

4.4 Electric Vehicle Charging Infrastructure Recommendation

CCC will need at least 526 kVA capacity to charge a large fleet of electric RCVs (assuming a power factor of 0.95).

If the entire fleet (including the smaller vehicles) is moved to electric power, then even that capacity may not be sufficient and consideration should be given to other options like installing onsite battery storage or charging some of the fleet at other Council sites, or, (for the smaller vehicles at least,) whether charging at employee homes is practicable and finally - probably as an option of last resort - a further upgrade of the site capacity which will be expensive.

Careful monitoring of new electric vehicles as they join the fleet will allow the estimate of future demand to be refined and a strategy developed long before the whole fleet has switched to electric power. All CCC EVs should all be equipped with on-board telemetry that is "EV-aware" and can report battery state of charge as well as total kWh received from charge points and distance travelled. This data needs to be linked to good fleet data management system.

5. Alternative Fuels

An alternative replacement fuel is currently available called Hydrotreated Vegetable Oil (HVO), which is a paraffinic diesel fuel that can be used as a direct replacement for diesel. It offers superior operational and environmental performance over fossil diesel with significant environmental benefits in terms of tailpipe emissions, while supporting existing logistical infrastructure. The claimed advantages of using HVO include:

- HVO is a renewable diesel alternative NOT a biodiesel.
- It is manufactured from 100% renewable and sustainable raw materials, certified by the International Sustainability & Carbon Certification (ISCC) (ISCC is the gold standard for environmental, economic, and social sustainability, globally)
- Net greenhouse gas CO_2e reduction of up to 90% versus fossil diesel fuel
- It claims significant reductions in Noxious tail pipe emissions.
- It also claims a significant reduction in NOx (nitrogen oxide) and PM (particulate matter)
- It has approval from many manufacturers including Volvo who provide engines for Dennis Elite vehicles.
- No engine modifications or new infrastructure required to change over.

CCC's Climate Emergency Officer commented on the use of HVO which is shown below,

"This fuel is better than the current diesel option that is used in our vehicles (if this is just standard diesel), especially as 'steppingstone' fuel to the fleet becoming greener. This is just as important as skipping straight to EV (Electric Vehicle), making emissions reductions now is better than waiting four years for EV/Hydrogen fuel options to arise. You always want to reduce emissions as quickly as possible, if you do not lock yourself out of better alternatives (i.e., in this case use of EVs/Hydrogen Fuel where it is viable)."

All the figures shown below are based on these vehicles using regular road diesel. At this time, attention is drawn to the CO_2 tonnes emitted.

Taking the three vehicles highlighted below, running on road diesel they would have emitted 7.283t of CO_2. The Council ran these vehicles on HVO and it is claimed they will have produced 90% less CO_2 equalling to 0.7283t of CO_2 making a CO_2 reduction of 6.5447 tonnes of CO_2 emitted over a one-month period for three RCV's.

Vehicle	Drivers	EEDI	Target MPG	Actual MPG	Diff %	Analysis	Distance (Miles)	Fuel (litres)	CO_2 Tonnes Emitted
VE68YNZ - Dennis Elite 6	0	58	4.00	5.12	27.92%		1373.96	1,220.70	3.077
VN68RYM - Dennis Elite 6	0	57	4.00	5.35	33.84%		977.62	830.18	2.093
VN68RYO - Dennis Elite 6	0	63	4.00	5.10	27.49%		1379.13	1,229.41	3.099
VN68RYP - Dennis Elite 6	0	66	4.00	5.20	30.02%		1123.05	981.70	2.474

Vehicle	Drivers	EEDI	Target MPG	Actual MPG	Diff %	Analysis	Distance (Miles)	Fuel (litres)	CO_2 Tonnes Emitted
VN68RYR - Dennis Elite 6	0	88	4.00	4.49	12.16%		1053.38	1,067.38	2.690
VN68RYT - Dennis Elite 6	0	61	4.00	4.73	18.30%		1032.25	991.69	2.500
VN68RYU - Dennis Elite 6	0	67	4.00	5.28	31.92%		1310.47	1,128.97	2.846
VN68RYV - Dennis Elite 6	0	68	4.00	4.78	19.44%		871.15	828.96	2.089

5.1 HVO and other drop-in fuels

In September 2023 the Energy Savings Trust provided some information on HVO and other 'drop-in' fuels, they said:

"*There has been growing interest in use of this 'drop-in' diesel replacement fuel. Much of the demand is based around its very low BEIS TTW CO_2e conversion factor, 0.0356 $kgCO_2e$/litre1 , versus 2.478 $kgCO_2e$/litre for (average biofuel blend) diesel. While we recognise the theoretical benefits of HVO, there are remaining concerns about the source of its principal feedstock, Used Cooking Oil (UCO) and the use of this fuel under the current sustainability assurance regime. We expect and hope that one significant positive outcome of the DfT's low carbon fuels strategy consultation is to improve the robustness of the assurance process for this fuel and its feedstock.*

In the UK and Europe, where UCO is classified as a waste product and has few approved secondary uses, it is much easier to trace its origin back to its producer than non-European UCO. Fundamentally, we must be certain that the UCO, used as a feedstock for HVO is in fact a waste product. In south-east Asia and the Americas, where almost all of the UCO imported into Europe originate, UCO has sometimes been used as animal feed (mixed with grain) and so in some cases it is not a true waste product, as it has a permitted use.

The high price that UCO suppliers are achieving because of its 'waste' classification in Europe, is resulting in a distortion of the world market: UCO is diverted from the less financially rewarding markets and is replaced with other farmed crops which may include palm oil. In instances where palm oil cannot be harvested, soy is grown instead but this crop has a lower energy yield than palm oil and so even more land must be used for crop planting. The greater demand for palm oil and other types of crop-derived oil contributes to further global deforestation, and other indirect land use change (ILUC) leading to reduction in biodiversity, a loss of ecosystem services and further increases in GHG (greenhouse gas) emissions.

According to the DfT's (2020) complete RTFO data2 , 100% of UCO feedstock for UK HVO came from outside Europe and none of the HVO sold in the UK was produced using UK UCO. 104 million litres of UCO were produced in the UK in 2020 but none of this was used to make HVO for domestic use. In 2021, the provisional figures show only 9% of UCO was European in origin (Spain, Italy, and Czech Republic). This contrasts with 100% of biomethane feedstock coming from Europe in both years.

As quoted on the BEIS conversion factors, "All fuels with biogenic content, such as (average biofuel blend) diesel and petrol and all electricity consumption should have the biogenic CO_2 emissions reported, to ensure a complete picture of an organisation's emissions is created". Instead of the 80-95% carbon reduction sometimes quoted from adopting HVO, the combined TTW, WTT and out-of-scope emissions figure, shows a much more modest reduction in carbon intensity (around 18%)".

5.2 Hydrogen fuel cell electric vehicles (H2FCEVs)

The Energy Savings Trust also spoke about Hydrogen fuel cell electric vehicles writing the following:

"A *common question is around whether H2FCEVs will be suitable for future vehicle replacements on fleets like those operated by a refuse and recycling local authority. H2FCEVs offer potentially convenient rapid refuelling, and zero harmful air quality emissions where vehicles are operating.*

Whilst there is a potential role for 'green' hydrogen in decarbonising heavy transport (distinct from the carbon intensive 'grey' hydrogen and methane-derived 'blue' hydrogen), it is not yet clear whether this will be the best pathway for refuse and recycling local authority vehicles for the following reasons:

- *A hydrogen fuel cell uses more than three times the electrical energy of charging a battery for the same amount of energy to arrive at the wheels of as a BEV. This means more than three times the energy needs to be generated and this comes at both a financial and environmental cost.*
- *When well to wheel factors such as distribution and transport of the hydrogen are taken into account, the energy use of the fuel cell is likely to be between four to six times that of a battery electric equivalent (Zemo Partnership, 2021).*
- *The lower efficiency of producing hydrogen for fuel cells not only means extra cost but is likely to divert renewable power away from the grid (as growing off peak demands of a national battery electric fleet are emerging), thus slowing broader decarbonisation.*
- *Using H2FCEVs simply adds inefficient processes to energy generation and costly additional components and maintenance requirements compared to a BEV. It is highly likely that there will viable high-capacity battery / rapid charging alternative emerging within this decade that will cover all refuse and recycling local authority operations.*
- *H2FCEVs cost significantly more to purchase than BEVs and unlike them, do not offer any savings from reduced energy consumption to offset the higher costs when compared to diesel vehicles.*
- *Fuel cell vehicles are more technically complex than BEVs and thus will require more maintenance expenditure.*
- *Refuse and recycling local authority would ideally need reliable local third-party hydrogen refuelling infrastructure if investing in a fleet of that nature, along with a back-up plan if the refuelling supply becomes unavailable.*

For some hard to electrify vehicles, hybrid solutions that work primarily using a battery and use fuel cells as a range extender may well be helpful options that emerge later in the *decade, but these are not yet commercially available from any OEMs, and local refuelling infrastructure remains critical".*

The below link was shared with CCC by Nottingham City Council who are one of the UK's local authority leaders in transitioning their fleet services to fully electric vehicles. It is an article for Einride who carried out extensive research to compare alternative ways to fuel a heavy good vehicle: https://www.einride.tech/insights/battery-electric-vs-hvo-vs-hydrogen-fuel-cell

6. Wellbeing Staff & Residents

The wellbeing of staff and residents is a key factor when transitioning the Council's fleet. The introduction of electric, hydrogen or other low carbon alternative fuelled vehicles will lead to better air quality, which in turn leads to better health outcomes for people working and living where these vehicles will operate due to their zero or low tailpipe emissions. Electric / hydrogen vehicles will help to further drive down air pollution in the city and improve the environment.

For local authorities such as CCC, switching to zero emissions vehicles can generate substantial emission savings, as well as help to deliver carbon neutral targets. For CCC staff they provide a smooth and quiet driving experience while an increase in vehicle torque is a welcomed addition to the drivers carrying heavy loads. The introduction of further zero emission tailpipe vehicles will continue to demonstrate the Council's leadership on the path to net zero and cleaner air.

7. Options

There are many options that the Council can consider when transitioning the fleet in the future. The three main options are shown below:

1. **Transition the fleet when due for renewal over to fully electric powered vehicles**: This option is in line with the Councils current CEAP. To implement this, significant capital investment would be required to build a suitable charging infrastructure within a suitable location to have the ability to fully charge the Councils vehicles. To procure the highly expensive electric vehicles an analysis of costings would be required to determine if the vehicles are to be purchased or contract hired.

2. **To use Hydrotreated Vegetable Oil (HVO) as a drop in fuel.** This could be used as a stop gap until a fully zero tail pipe emission fleet is procured. This could be implemented immediately into much of the Council's fleet including the RCV's to reduce the tail pipe emissions that the vehicle emits. More and more Local Authorities are taking this option as they wait for the electric and hydrogen fleet market to develop further.

3. **To continue with replacing fleet with the latest Euro engine diesel vehicles:** The Council could continue to run with its current fleet and when the current vehicles are due to be renewed, replace them with the latest Euro engine diesel version. In the short term this is the most cost-effective way however this option does not meet with the Councils current CEAP. The electric and hydrogen fleet market continues to develop and with future localised waste strategies and legislation changes local authorities need to ensure the way in which services are to be delivered before making the switch to more sustainable vehicles as vehicle range may factor into procurement decisions.