FAREHAM
BOROUGH COUNCIL

Report to the Executive for Decision
07 December 2021

Portfolio:	Streetscene
Subject:	**Hydrotreated Vegetable Oil (HVO) Fuel Pilot**
Report of:	Head of Streetscene
Corporate Priorities:	Protect and Enhance the Environment. Strong, Safe, Inclusive and Healthy Communities. Dynamic, Prudent and Progressive Council.

Purpose:
Outline the results of a feasibility study into potential fuels for the Council's Refuse Collection Vehicles and propose a 12-month trial of hydrotreated vegetable oil HVO.

Executive summary:
The Climate Change Action Plan was approved at the 7 June 2021 Executive meeting. Understanding the Council's vehicle replacement options and trialling vehicles to move towards other fuel sources for the fleet were identified as priorities within the plan.

The feasibility of hydrogen, electricity and hydrotreated vegetable oil (HVO) as alternative fuels for the refuse collection vehicle (RCV) fleet are presented.

The report proposes a 12-month trial of HVO in the three RCVs to be used for garden waste collections, starting in time for the launch of the new wheeled bin collection service in February 2022.

Recommendation/Recommended Option:
It is recommended that the Executive approves:

(a) a 12-month pilot using Hydrotreated Vegetable Oil to fuel the three Refuse Collection Vehicles collecting garden waste; and

(b) that the Head of Streetscene, following consultation with the Executive Member for Streetscene, be authorised to broaden the use of Hydrotreated Vegetable Oil to the wider refuse collection vehicle fleet during the trial considering a reasonable balance of emissions savings against potential additional costs.

Reason:
To help significantly reduce the Council's carbon emissions from fuel and contribute to the Council's commitment to becoming carbon neutral in service provision by 2030.

Cost of proposals:
The additional HVO fuel premium would be approximately £1,650 pa based on current prices, with some small additional infrastructure costs e.g., hire of additional tank and electrical connection to it, costing around £500. The additional fuel costs could potentially be offset by potential improvements in mpg that HVO could bring.

Appendices **A:** Summary of Alternative Fuel Options

Background papers: None.

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Executive Briefing Paper

Date:	07 December 2021
Subject:	Hydrotreated Vegetable Oil (HVO) Fuel Pilot
Briefing by:	Head of Streetscene
Portfolio:	Streetscene

INTRODUCTION

1. This paper provides the results of a recent feasibility assessment of low emission fuels for the Refuse Collection Vehicle (RCV) fleet. It then proposes a trial of Hydrotreated Vegetable Oil (HVO) to fuel the Garden Waste RCVs for 12 months.

Background

2. The Climate Change Action Plan was approved at the 7 June 2021 Executive meeting. Understanding the vehicle replacement options and trialling vehicles to move towards other fuel sources for the fleet were identified as priorities within the plan.

3. Streetscene operate a fleet of 24 RCVs which collect domestic, clinical, business waste, recycling, and glass in the Borough. Additionally, they operate a single 7.5t tipper vehicle for bulky waste collections and two large street sweepers. All these vehicles are fuelled by diesel.

4. Diesel is a significant contributor to the Council's carbon emissions. The Council's Carbon Footprint Report for 2019/20, showed that fleet fuel (diesel and petrol) accounts for over 48% of the Council's Scope 1 and 2 emissions, contributing 928 tCO2e annually.

5. RCVs account for two thirds of the fuel used by the Council's fleet, contributing 610 tCO2e annually and costing approximately £226k.

6. The Government's recent Transport Decarbonisation Plan outlines a timetable to end the sale of all new vehicles with tailpipe emissions. All the Council's RCVs, tipper vehicle and large streetsweepers are classed as lighter HGVs (up to 26t) with a deadline to end sales by 2035.

7. The timescales are therefore relatively long for transitioning to zero emission RCVs. However, given the Council's commitment to becoming carbon neutral in the provision of its services by 2030 and, the significant contribution that RCVs make to the Council's emissions, a decision was made to conduct a Low Emissions Fuel Feasibility Study. This was conducted between September and October 2021, with the main findings outlined in

the remainder of the report.

Low Emission Fuel Feasibility Study

8. Three zero or low emission fuel options, Hydrogen, Electric and Hydrotreated Vegetable Oil (HVO) were identified as potentially being suitable for the Council's RCV fleet. Each fuel option is explored below with the main findings highlighted for each.

Hydrogen RCVs

9. Hydrogen fuel cell vehicles use electric motors for propulsion powered by a fuel cell, which works like a battery.

10. *Only one type of hydrogen is created in a low emission way:* There are several ways to produce hydrogen, all them are energy intensive and most result in carbon emissions. The only zero carbon approach is 'Green Hydrogen' created by extracting hydrogen atoms from water by a chemical reaction called electrolysis, using renewable power sources e.g., solar.

11. *The infrastructure to produce Green Hydrogen locally does not exist:* Green hydrogen can only be transported short distances i.e., under 30 miles. Beyond this distance, emissions related to transportation will adversely impact on the benefit of using Hydrogen. There are currently no known Green Hydrogen production facilities within the local area to allow efficient transportation of the fuel to the depot.

12. The Government's Hydrogen Strategy released in August 2021, suggests that 20-35% of the UK's energy use by 2050 could be Hydrogen based. The feasibility of the Port of Southampton to act as a hub for hydrogen production and distribution is also currently being explored. However, if deemed feasible and funding found, any potential infrastructure would take several years to be established.

13. *The infrastructure, vehicle and fuel costs are not yet clear*: Hydrogen RCVs are being trialled in a small number of sites across Europe and Glasgow City Council is working towards having a limited number of vehicles on the road in late 2022. The lack of financial data available means that it is too early to get an accurate understanding of the costs involved.

14. *Tailpipe emissions from RCVs would be zero:* The only emissions from the RCVs would be water vapour.

15. *Hydrogen RCVs are not a viable option:* Considering the findings outlined above it is not considered worthwhile exploring hydrogen fuel cell RCVs further at this time.

Electric RCVs

16. An electric vehicle (EV) uses electric motors for propulsion powered by a battery. The batteries are plugged in to chargers as they become depleted.

17. *The main benefit of EVs is the eradication of tail pipe emissions:* There are zero carbon emissions from the vehicle itself.

18. *The carbon footprint related to production of electric RCVs is higher than diesel RCVs:* It is estimated that almost 80 tCO_2e are emitted in producing an electric RCV, compared to 56 tCO_2e for diesel.

19. Most of these additional emissions come from the mining and extraction of the metals needed for the manufacture of the lithium-ion batteries. These processes are water intensive and use toxic chemicals which can lead to water, soil, and air pollution.

20. *The use of more EVs would increase the Council's consumption of electricity:* To achieve the lowest Carbon Footprint, the Council would need to be on a renewable energy tariff. Options for this are currently being explored.

21. *Electric RCVs are cheaper to fuel than diesel:* It costs around £15,700 a year to fuel an RCV with diesel. To power an electric RCV would cost around £5,500 a year which is £10,200 a year cheaper based on current prices.

22. *The electric vehicle market is a rapidly evolving sector:* For smaller vehicles e.g., vans there have been significant developments on the distances they can travel and speed of charging. Electric RCVs have emerged on the market more recently and are only manufactured by a handful of suppliers, meaning the market is much less mature.

23. *Electric vehicles are expensive to purchase:* The cost of a new electric RCV is around £445,000 with a two-year-old version costing around £236,000. It is anticipated that as the electric RCV market matures costs should reduce. The Council currently purchases used diesel RCVs costing around £125,000, however, this may increase between now and 2040 as the vehicles are slowly phased out.

24. *There is a long lead time for new electric RCVs:* As an electric RCV has not been procured by the Council before the process would likely be prolonged. Demand for electric RCVs has increased and supply has been impacted by the semiconductor shortage, with some suppliers not accepting new orders, and others estimating 10-12 months lead time.

25. *Infrastructure requirements are likely to be significant:* Electric RCVs require powerful rapid chargers, which depending on the size of the fleet and number of chargers needed, may potentially require the creation on an additional substation and additional cabling in the depot vicinity.

26. Based on early analysis this would cost from £30,000 for a single rapid charger to £450,000 depending on the number of vehicles to be charged and the network upgrades needed. Further work will shortly take place to understand the infrastructure requirements of transitioning the Council's fleet to electric.

HVO Fuelled RCVs

27. Alternative fuels to diesel are available and the current best alternative is Hydrotreated Vegetable Oil (HVO). HVO takes feedstock such as vegetable oils and waste fats and processes them into a very clean burning fuel.

28. *Diesel vehicles can run on HVO:* HVO can run well on normal diesel engines without the need for modification and it can even be mixed with diesel in the event of significant supply or cost issues.

29. *Emissions are significantly lower than diesel:* HVO would reduce CO_2e emissions by approximately 88% (Eastleigh Borough Council used 90% in their calculations, Hampshire County Council used 88%). The actual figure will be based on the type of engine and operating temperature when compared to diesel. This includes a reduction in Nitrous Oxide emissions which would be up to 27% lower and 84% lower production of particulate matter (data from Wessex Petroleum), helping to improve air quality.

30. *Fuel costs are slightly higher than diesel:* HVO fuel currently costs around £550 a year more than diesel per Garden Waste RCV and the market is more volatile due to supply and demand issues. However, if diesel fuel prices continue to rise, as they have over recent times, HVO could ultimately become a cheaper option.

31. Other Councils have reported improved miles per gallon when using HVO which could help offset some of the cost.

32. The diesel RCVs tend to achieve between 3 to 4 mpg, which is typical. Small changes at very low mpg are significant. A vehicle achieving 4mpg will use 25% less fuel than one only achieving 3mpg.

33. *Infrastructure requirements are much lower than electric vehicle infrastructure:* The only infrastructure required would be a double lined storage tank to ensure no leakages on site, and a power supply to this tank.

34. *Other Councils are switching to HVO:* Following a pilot, Hampshire County Council are planning to replace all diesel with HVO across their fleet for a 12-month trial. Portsmouth City Council have switched all their RCVs over to HVO and Eastleigh Council are currently trialling HVO with the aim of expanding its use to all its diesel-fuelled fleet.

Proposed approach

35. Whilst electricity or hydrogen will be the most likely options for the Council's RCV fleet in the long term, the availability, infrastructure costs, vehicle costs and lead times are currently prohibitive to be a realistic option at this time. As the market develops it is anticipated that the costs and production timescales for the vehicles should reduce.

36. HVO provides a viable transitionary alternative until the other RCV markets mature. It significantly reduces emissions, requires limited additional infrastructure, is similar in cost to diesel and is being adopted by other Councils.

37. It is therefore proposed that a 12-month HVO RCV trial take place to further assess its feasibility. The three vehicles used for garden waste collections would be used in the trial and would be HVO fuelled for the start of the new paid collection service in early February. This would reduce the Council's annual carbon footprint by approximately 99 tCO2e. This saving is calculated based on the actual fuel used historically by the Garden Waste vehicles.

38. If the trial proves to be successful, there is potential to expand the use of HVO in the wider Council RCV fleet and diesel-powered vehicles.

39. The Head of Streetscene, following consultation with the Executive Member for Streetscene, would be able to broaden the use of HVO to the wider RCV fleet during the trial considering a reasonable balance of emissions savings against potential additional costs.

40. If HVO was used in the entire fleet of diesel fuelled vehicles, it would lead to an annual reduction in emissions of over 700 tCO2e, based on historic diesel fuel usage.

Financial considerations

41. The additional fuel premium for the three-vehicle trial would be approximately £1,650 pa based on current prices, with some small additional infrastructure costs e.g., electrical connection to the tank, costing around £500. The additional fuel costs could potentially

be offset by potential improvements in mpg that HVO could bring.

Next Steps

42. If approved, the trial would be organised in conjunction with the Council's fuel suppliers, with installation of the additional tank to store the HVO to be installed in the new year. The three Garden Waste RCVs would be fuelled by HVO for the start of the chargeable collection service launching in early February.

Conclusion

43. Green Hydrogen, Electricity and Hydrotreated Vegetable Oil (HVO) were assessed as fuel options for the Council's RCV fleet, with HVO seen as the most viable in the short term. Therefore, a 12-month trial of the fuel is proposed which can be expanded to the use of HVO in the wider Council RCV fleet and diesel-powered vehicles if the initial trial proves successful.

Enquiries:

For further information on this report please contact Mark Bowler (Ext 4420).

Appendix A: Summary of Alternative Fuel Options

	Diesel		HVO		Electric	
	New	Used	New	Used	New	Used
Capital costs	£190,000	£125,000	£190,000	£125,000	£445,000	£236,000
Annual fuel/electricity costs	£15,732		£16,284		£5,536	
Costs per annum*	£36,843	£33,589	£37,395	£34,141	£54,980	£39,250
Infrastructure costs	£0		£500		£40,000 - £230,000	
Emissions per annum** (tCO_2e)	43.54	37.34	10.68	4.48	16.50	7.62

*Whole of Life modelling was used. New vehicles were modelled over 9 years. Used vehicles data are based on those that are 2-years old and modelled over 7 years.

**The (tCO2e) emissions for new vehicles include embedded carbon that relates to the raw materials, manufacturing processes, logistics, etc. for production of a new vehicle. This report uses 'cradle to gate' measurements which represents the footprint up to the point when the vehicle is delivered to the first user. This means that the embedded carbon footprint for a new vehicle is allocated to the first user and is not passed on when a used vehicle is sold. This is reflected in the whole of life modelling above. Cradle to gate modelling is used by many organisations, including the Energy Saving Trust, as the decommissioning footprint cannot be known ahead of time for example if batteries are re-purposed for use in buildings or disposed of.