Appendix E - Climate Change – Decarbonising Stevenage Borough Council Fuel

Hydrotreated Vegetable Oil (HVO) Business Case

Stevenage Borough Council.

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Date	19.12.2023

1. Summary

1.1 HVO is an effective way to lower the Council's GHG emissions until the Council transitions to a definite zero emissions energy source for the fleet, reducing the fleet-related net emissions by up to 90% or 751 tCO_{2e} per year.

1.2 There would be an increased cost of circa £156,115.99 to the fleet fuel bill at the current price but significant environmental benefits at the local and global level.

1.3 Switching to HVO would help to demonstrate progress in addressing the climate crisis and directing efforts towards the council's climate targets.

1.4 There are no additional infrastructure changes required and no modifications to the vehicles' engines are needed.

2. Background

2.1 As part of Stevenage's target to be net zero by 2030, the Council has set a target to decarbonise the fleet before 2030.

2.2 The fleet accounted for circa 23% of Scope 1 and 2 emissions of the Council when we developed the baseline, based on 2018 data.

2.3 Currently the Council operates a mixed fleet of vehicles consisting of large goods vehicles, vans, tractors, mowers, road sweepers, plant, and small utility vehicles.

2.4 Almost all the fleet currently runs on white diesel fuel. The Council now has two electric vans. The first electric van was delivered on the 23/8/23 and the second on 5/12/23.

2.5 White diesel is a petroleum fuel created by distilling crude oil. It is commonly referred to as simply diesel and is used for transport in the UK.

2.6 As part of the Councils Climate Change Strategy, we have developed a pathway to decarbonise the fleet. This pathway includes the switch from diesel to an ultra-low carbon biofuel, as soon as possible, and using BEVs as the preferred replacement option for cars and small vans (from 2025 onwards) and light-duty (from 2027), and ZEVs (BEVs or hydrogen FCEVs) for HGVs (from 2027).

2.7 Diesel (B7) is a type of diesel that contains up to 7% biodiesel, which is a renewable fuel derived from oilseed rape, sugar beet, and wheat.

2.8 In the year 01.12.22 – 30.11.23 the Council used 332,161.70 litres of diesel (B7) in the fleet. Each litre of diesel combusted produces 2.512 kgCO_{2e}, therefore the fleet produced 834.39 tCO_{2e} in that year.

2.9 Changing to HVO can reduce the net GHG emissions from the fleet by up to 90%, a potential saving of 750.95 tCO_{2e} per year.

3. Hydrotreated Vegetable Oil (HVO)

3.1 HVO, also known as HVO Biodiesel, is a synthetic, second-generation paraffinic fuel, a biofuel produced from vegetable oil waste through hydrocracking or hydrogenation.

3.2 Hydrotreating is the process of reacting the feedstock with hydrogen in order to remove atoms other than carbon and hydrogen, particularly oxygen atoms.

3.3 As a result, HVO has a longer shelf life than regular biodiesel, which is produced through an esterification process using methanol, which fails to remove oxygen increasing the risk of oxidation. Eventually this can cause contamination and thus regular biodiesel must be closely monitored to check if still usable.

3.4 HVO is produced to conforms to EN15940 & ASTM D975 standards for paraffinic & diesel fuels, and the EU Fuel Quality Directive (FQD) 2009/30/EC Annex 2.

3.5 HVO can be used as a direct, drop-in replacement for white diesel. It can be stored in the same fuel tank and be used in the same way as diesel, without modifications.

3.6 All of SBC's fleet vehicles except for two older vehicles (which are due to be replaced) have the OEM approvals for HVO use.

3.7 HVO fuel offers improved combustion, further reducing emissions such as NO_x, MP, unburnt HC, and CO.

3.8 If HVO supply ever became an issue the Council fleet can just switch back to diesel.

3.9 Vegetable oils used in HVO production may include rapeseed oil, sunflower oil, canola oil, soybean oil, corn oil, palm oil, waste cooking oil, and tall oil.

3.10 Therefore, HVO needs to be sourced from suppliers that can demonstrate their supply chains are sustainable, particularly, not using palm oil as this can contribute to deforestation and climate change.

3.11 The fuel origin can be verified to check that the source is low carbon when considering the whole supply chain (e.g., ISCC standard). This can be a requirement during our procurement process.

4. Costs Comparison: HVO and White Diesel

4.1 The Council used 332,161.70 litres of white diesel between 01.12.2022 and 30.11.23.

4.2 The base price of diesel and HVO on the framework that the Council use are the same; however, the supplier margin for white diesel is 3p per litre while for HVO is 50p per litre – more expensive due to increased supply chain costs.

4.3 This is 47p per litre more than diesel which equates to £156,115.70 above the amount SBC currently pays per year. The price of white diesel as of 22.11.23 was £1.11638 per litre.

4.4 Averaged over a year (the price fluctuates) the cost was approximately £386,569.78 on white diesel. A move to HVO would increase the councils fuel bill to £542,685.77.

4.5 This extra amount will decrease over the years, based on the above-mentioned pathway for decarbonising the fleet.

4.6 This extra bill expenditure could allow the council to save 750.95 tCO_{2e} per year. This means that the abatement cost of carbon through this alternative is 207.89 £/tCO_{2e}.

5. HVO Switch

5.1 The Cavendish Road depot has two diesel fuel tanks: one is 25,000 litres the other is 5,000 litres.

5.2 All the vehicles and machinery have a fuel tag to use the pumps and they are allocated to a pump to use.

5.3 We have worked out the practicalities of a partial switch (50%) to HVO. This will mean one tank having HVO and the other diesel.

5.4 Currently we have diesel delivery every 2-3 weeks that fills up both tanks. It usually takes 2-3 days from ordering fuel to getting the delivery.

5.5 Due to the size of the tanks and our fleet operation patterns, a partial switch would require an important increase in filling up and fuel deliveries, increasing the risk of running out of diesel and having to conduct manual changing of tags.

5.6 Trialling HVO in 50% of the fleet will be hard to manage and risks our fuel resilience. We are therefore recommending a 100% switch to HVO.

6. HVO Switch Costs Allocation

6.1 The costs have been broken down to the combined fleet, then SDS fleet and non-SDS fleet as SDS are funded from the general fund (GF) and non SDS from the HRA fund.

6.2 The diesel price is based on the invoiced price from November 2023 (£1.1638 per litre excluding VAT). HVO is 47p per litre higher due to the supplier margin. The base price is broadly similar.

6.3 If the Council switched to HVO at 100% on the 1st December 2024, the extra cost for December, January, February and March would be: £52,038.64, split £46,584.36 general fund and £5,454.28 HRA fund (excluding VAT).

6.4 As part of the 2024/25 Budget setting process for the General Fund and HRA, Members approved a total of £75k growth (66k General Fund and 9k HRA) to allow for a switch to HVO from the 1st of October 2024. This document sets out the benefit of switching fuel as the Council is committed to Net Zero by 2030.

7. Reasons for using HVO and benefits

7.1 HVO is a FAME-free, fossil-free, sulphur-free, renewable, biodegradable, and non-toxic fuel that is produced from sustainable sources.

7.2 It is an effective way to lower up to 90% of the fleet net GHG emissions, achieving a potential saving of 751 tCO_{2e} per year, demonstrating a step towards 'net zero', and leading others by example.

7.3 It is a flexible drop-in replacement for diesel and can be used without engine modifications or new infrastructure requirements (no other costs involved).

7.4 Mature technology, tested out by large companies (low technological risk), and approved by numerous OEMs.

7.5 This interim approach will create time to allow for the development of alternative energy sources and technologies, to help the council plan the finances and ensure the council makes the best investment decisions to get the fleet to zero carbon in due course.

7.6 It will also help the council's resilience if there were fuel supply chain issues, with the ability to switch products.

7.7 The new fuel contract procurement has got the option to switch to HVO written into the specification. This is due to be in place in March 2024.

7.8 HVO can reduce maintenance costs due to the cleaner burning with better engine performance. It reduces particulate build-up, engine wear, and ageing of engine oils.

7.9 The unsaturation and contaminants removed during HVO production result in better storage stability and a longer shelf-life of up to 10 years compared to 1 year for diesel (relevant for back-up generators).

7.10 HVO leads to exhaust emissions benefits, with substantial reductions in NO_x, PM, CO, and HC, improving air quality.

7.11 Year-round performance, including exceptional cold-weather performance. It can be used down to -42°C. Its low cloud point reduces likelihood of waxing in low temperatures. Additionally, it has a high flash point.

8. Drawbacks of using HVO

8.1 HVO has a greater supplier margin than diesel, resulting in an increased fuel bill for SBC.

8.2 The reduction of NO_x and MP emissions varies with the type and size of engine; however, it is certain that Euro 6 engines reduce PMs by as much as 99% and NO_x by 45%. By 2026 we should only have 5 vehicles in our fleet that are not Euro 6 standard.

8.3 As the demand increases the price could also, introducing some risks due to price fluctuations. However, this is not so different from what currently takes place with diesel.

8.4 To guarantee that net GHG emissions are reduced by up to 90%, there is a need to monitor the life-cycle emissions across the HVO supply chain, information that must be certified. The Council should also aim to avoid unintended consequences across the HVO supply chain, particularly when using palm oil or feedstock linked to deforestation.

8.5 There might be shortages in the supply chain if the demand greatly increases.

Glossary

B7	Diesel type blended with 7% of renewable biodiesel.
BEV	Battery Electric Vehicle.
CO	Carbon Monoxide.
CO_2	Carbon Dioxide.
CO_{2e}	Carbon Dioxide Equivalent.
EN15940	A paraffinic diesel fuel specification that governs a new generation of cleaner transport fuel for use in road vehicles.
EU	European Union.
Euro 6	An engine emission standard introduced by the EU in September 2015.
EV	Electric Vehicle.
FAME	Fatty Acid Methyl Ester.
FCEV	Fuel Cell Electric Vehicles.
FQD	Fuel Quality Directive.
GF	General Fund.
GHG	Greenhouse Gases.
HC	Hydrocarbon, an organic compound consisting of hydrogen and carbon.
HRA	Housing Revenue Account.
Hydrocracking	The process that breaks big molecules into smaller ones using hydrogen.
Hydrogenation	The process of adding hydrogen to molecules.
HGV	Heavy Good Vehicle.
HVO	Hydrotreated Vegetable Oil.
ISCC	International Sustainability & Carbon Certification.
Net Zero	The net total of your GHG emissions is zero.
NO_2	Nitrogen Dioxide, a type of NO_x.
NO_x	Nitrogen Oxides.
OEM	Original Equipment Manufacturer.
Palm Oil	Vegetable oil that is widely used but linked to deforestation.
Particulates	Soot and particles as a result of combustion.
PM	Particulate Matter.
Scope 1	Direct emissions caused by operating the assets the Council owns or control, e.g., burning gas and fuels.
Scope 2	Indirect emissions caused by the production of energy that the Council buy, e.g., electricity generation.
Shelf Life	The length of time that the product can be stored before degrading.
White Diesel	Taxed diesel for road going vehicles.
ZEV	Zero Emissions Vehicle.