West Berks Client Presentation

Andrew Hope
Fleet Development Manager

Alternative Fuels and Low Emission Technology

Agenda:

- Latest Veolia UK Alternative Fuel Achievements
- Vehicle Decarbonisation Landscape
- BEV Vehicle Development
- Hydrogen Vehicle Development
- Proposed West Berkshire Fleet & Decarbonisation Options

Latest Veolia Alternative Fuel Achievements

OEM Supplied BEV RCVs:

- 40 Operating in Westminster
- 27 to be Delivered to Kingston
- 1 to be Delivered to Brent
- Potentially 4 additional BEV RCVs to order for 2024

Latest Veolia Alternative Fuel Achievements

A new depot and charging infrastructure has been opened at Landmann Way in South London to locate many of the Westminster BEVs. The site which cost approximately £3m can charge up to 54 vehicles at the same time, using electricity from the adjacent ERF, SELCHP.

The Kingston depot has been upgraded to allow for charging their 27 RCVs at the same time. This project is due to complete this month.

Latest Veolia Alternative Fuel Achievements

OEM Supplied BEV Sweepers on Order:

- 6 x Bucher V65e 16T Truckmount Sweepers
- 8 x Schmidt e Swingo Sweepers
- 20 x Boschung 2.0 Urban Sweepers/Washers
- 1 x Greenmachine 500ze Plus Sweeper

Latest Veolia Alternative Fuel Achievements

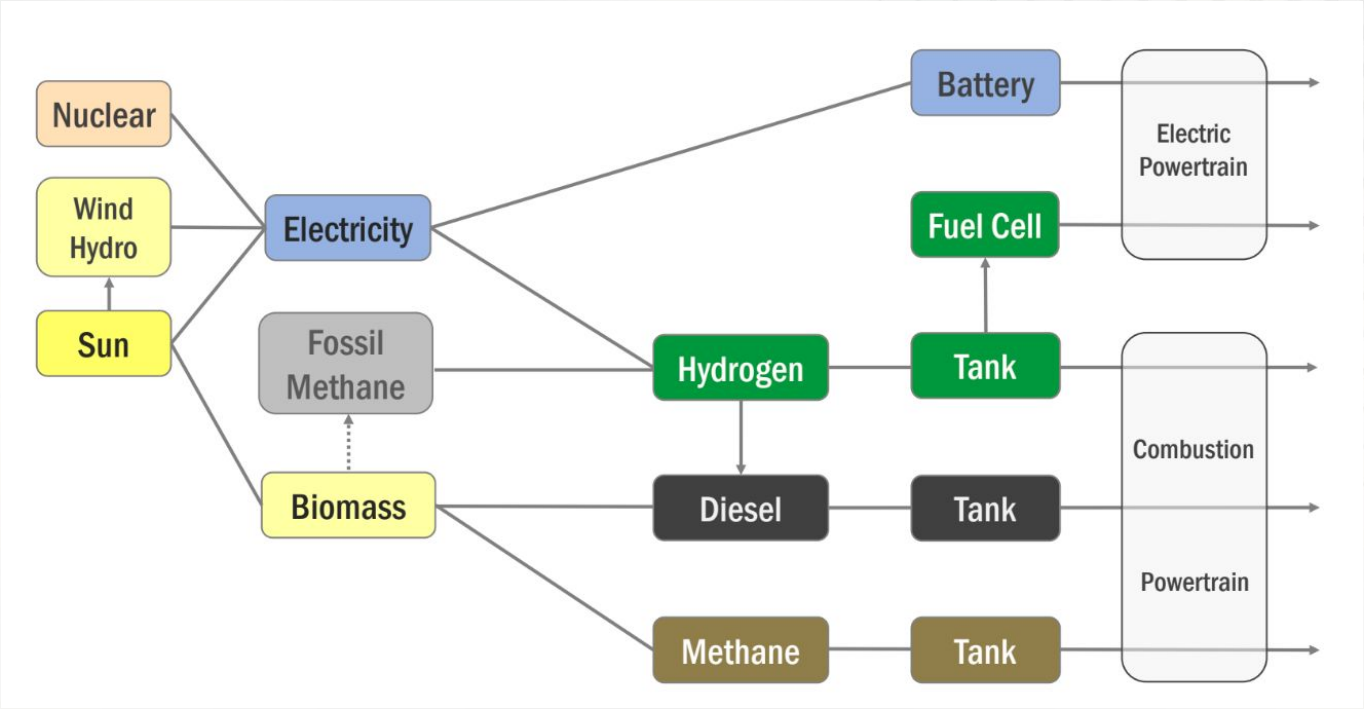
Other OEM Supplied BEVs in Operation:

Vans, Cage Tippers, Quad Cycles, Hybrid Dozer

Vehicle Decarbonisation Landscape

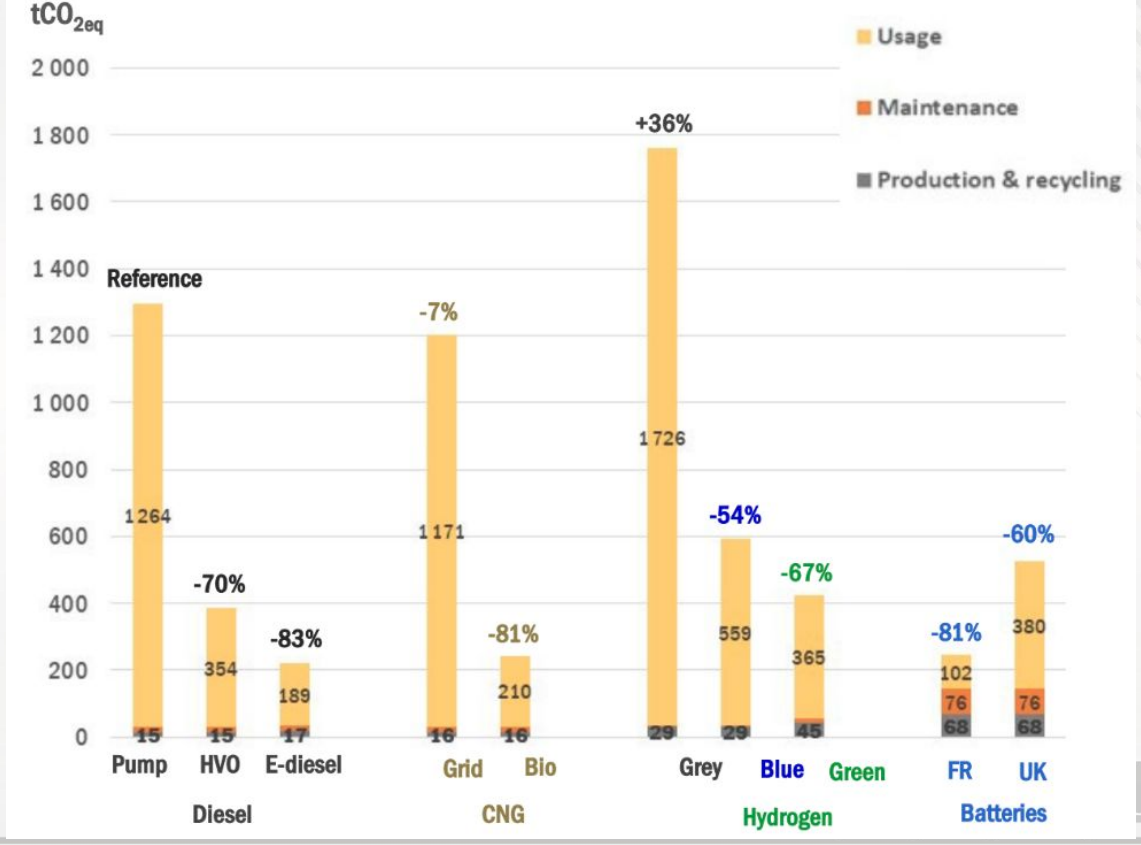
VEOLIA

Decarbonisation Options for Trucks:



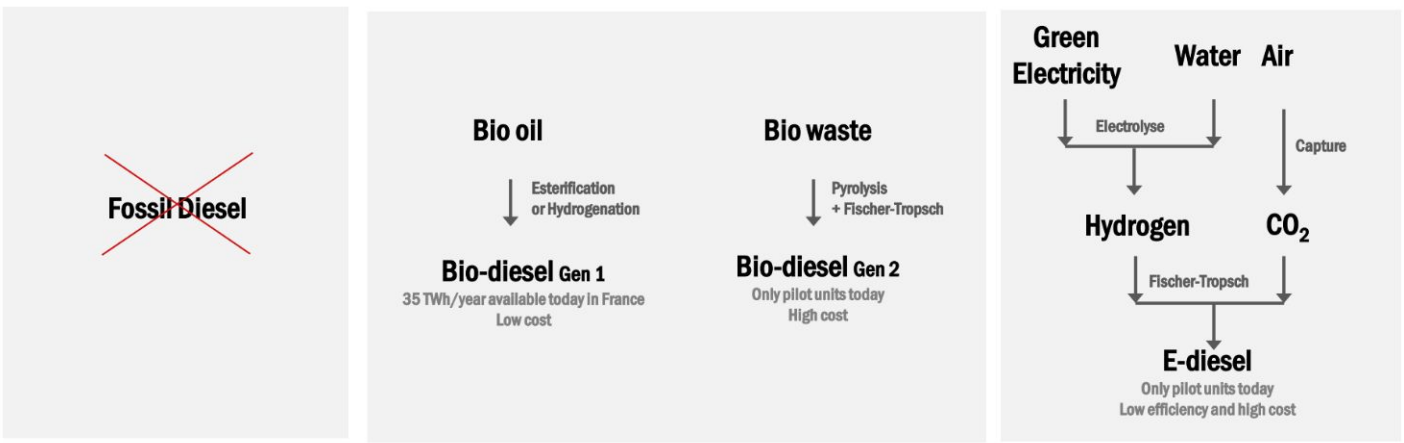
Vehicle Decarbonisation Landscape

Global Warming Potential for Fuel Types



Vehicle Decarbonisation Landscape

The Case for ICE & Diesels:



Drop-in fuels in existing fleets

NOx emissions of combustion engines

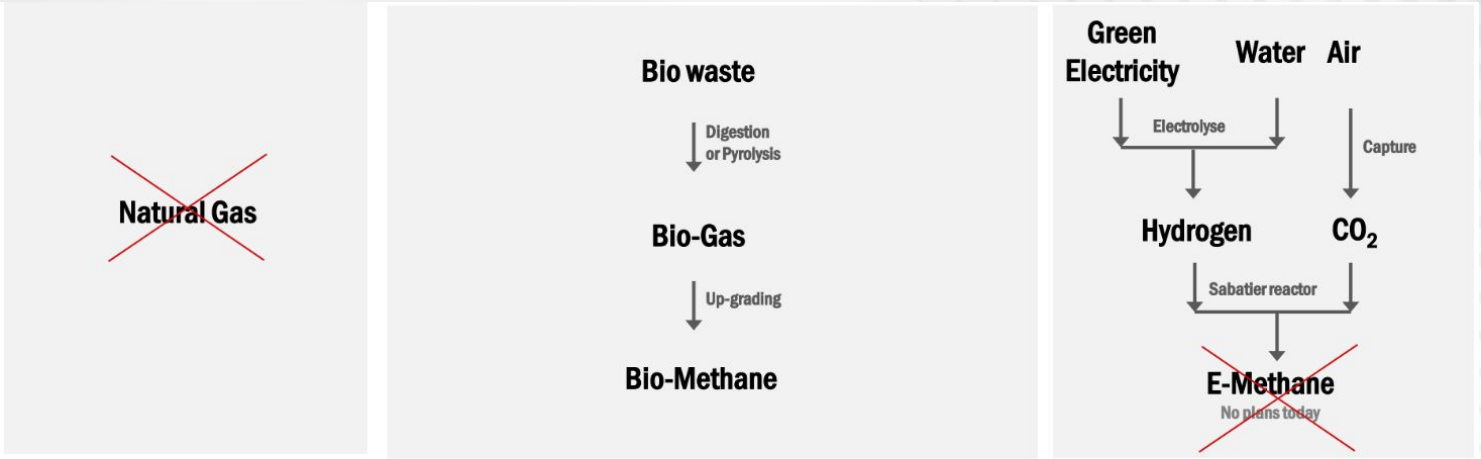
Will likely ban those trucks from cities by 2030.
Therefore only appropriate for long-haul trucks.

Limited quantity available

Due to biomass limitation and competition with other sectors (aviation...) ➔ Max 10% of trucks fleet in 2050

Vehicle Decarbonisation Landscape

The Case for ICE Gas Vehicles:



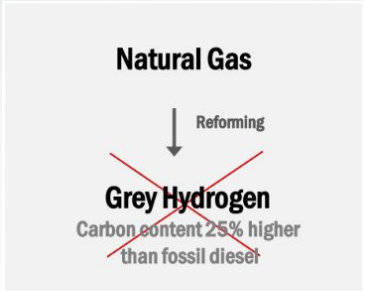
NOx emissions of combustion engines
Will likely ban those trucks from cities by 2030.
Therefore only appropriate for long-haul trucks.

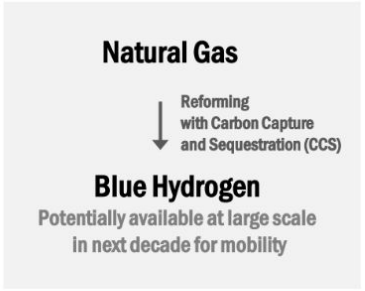
High Global Warming Potential of leaks
GWP per mass unit 86 times higher than CO_2 over 20 years

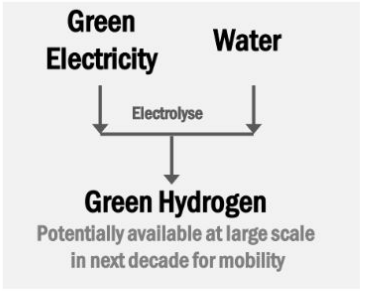
Limited quantity available
Due to biomass limitation, for instance for France, max 50 to 100 TWh can be produced in 2050.
Due to competition with other sectors (industry, ships, power generation...), max 5 to 10 TWh might be used in trucks in 2050 in France (➔ ≈ 10% of trucks fleet)

Vehicle Decarbonisation Landscape

The Case for ICE & Fuel Cell Hydrogen Vehicles:







Truck Technology not fully defined yet:

- Fuel cell or combustion engine
- Liquid or compressed hydrogen storage

- Makes sense in case some of the **hurdles of battery electric trucks** cannot be overcome for some application or regions (minerals, grid, range, refill time)
- **Synergies with other industries** for usage and infrastructure (chemicals, steel, power generation...)

- Low **energy efficiency** with green hydrogen
  A green hydrogen fuel cell truck consumes 3 times more electricity per km than a battery electric truck
- Higher CO_2 **footprint** vs battery electric
  Due to efficiency with green hydrogen, due to process with blue
- Higher **transport cost** vs battery electric

Vehicle Decarbonisation Landscape

The Case for Battery Electric Vehicles:

Highest **energy efficiency** among all options
Well-to-wheel energy efficiency 3 to 6 times higher than any other option

Lowest CO_2 footprint among all options
Cradle-to-grave CO_2 emission reduced by 80% in France and 50% in Germany for a truck bought in 2022, and 80% by 2040 in all European countries

Lowest **Transport Cost** among all options
Forecast of lower transport cost than diesel after 2025 for city trucks and 2028 for long-haul trucks in France

Zero **NOx** in cities
Cradle-to-grave NOx versus diesel reduced by 80% in Europe today

Lowest **Noise** among all options
For today's D 16 tons electric versus diesel:
Reduced external noise (- 8 dBA = -85% acoustic power) and internal noise (- 99% @ 0 km/h, - 70% @ 30 km/h, - 40% @ 50 km/h, similar @ 90 km/h)

Battery minerals
E-mob market rapid take-off generates supply bottlenecks. Minimizing environmental footprint requires thorough supplier chain control.

Thorough **grid load management** required
With enough power plant flexibility or storage capacity for daily variations. Smart charging management will mitigate this.

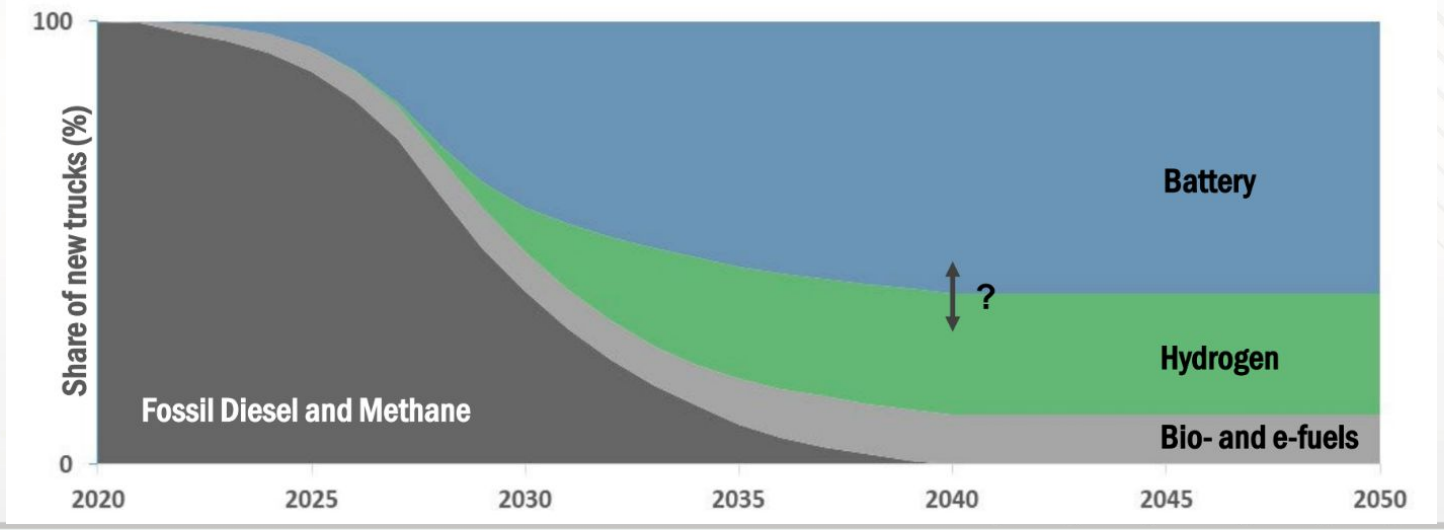
Higher **operational constraint** vs diesel
Due to range, charging time (will ease as battery energy density and charging power continue to increase) and lower payload per truck (payload slightly reduced today, but not mid term, thanks to the +2 t GCW European allowance and possibly more axles)

Higher **up-front investment** vs diesel
Truck purchase, charging infrastructure, grid strengthening

Vehicle Decarbonisation Landscape

Share of New Truck Sales:

- It is expected that battery and fuel cell vehicles will become the dominant powertrain before 2040 (when diesel will be completely phased out)
- For long range trucks hydrogen fuel cell or combustion engine vehicles are likely to be dominant
- Fewer internal combustion engine options will be produced and only for bio and e-fuels



Battery Electric Vehicle Development Timeline:

VEOLIA

7.5T, 18T & 26T Battery Electric

Series Production Now Available

Expanded Battery Electric Offering

Series Production 2023/2024

DAF SCANIA VOLVO

Fuel Cell Electric Technologies Development Timeline:

VEOLIA

26T Full Cell

Retrofit Supplier Development/R&D Available Now

Long Haul Hydrogen Fuel Cell

Series Production 2028

Expanded Hydrogen Fuel Cell Offering

Series Production 2029/2030

DAF SCANIA VOLVO

Proposed West Berks Fleet

Additional Cost of Replacing Large Refuse and Garden Waste Vehicle Fleet with BEV RCVs

- **'One-Pass' Recycling Vehicles are only available with diesel drives**
- Total Additional Cost for purchasing 14 refuse/garden waste collection vehicles would be £3.1M
- Additional cost for charging stations could be +£500K, plus circa +£250K if upgrades to the grid connection are required*

* an extensive site survey would be required to establish exact costs

	Cost per Vehicle	Total Cost (14 Vehicles)
Diesel	£199,825	£2,797,550
Electric	£428,120	£5,993,680
Cost Increase	£228,295	£3,196,130

Proposed West Berks Fleet

Electric Bin lifts included on all large collections Vehicles:

- Bin lifting Equipment is driven by electricity, not vehicles engine
- 8-10% reduction in fuel consumption
- Potentially 40,000 litres of diesel saved per year *
- Potentially 107 tons of Co2 saved per year *
- Collections vehicles will be significantly quieter for residents

* Based on estimated 2022 RCV fuel consumption

Proposed West Berks Fleet

HVO: Drop-in Transition Fuel in Municipal Contacts

- 100% HVO in use in Broadland
- 50-50 HVO/GTL blend in use in Solihull
- Currently 25% more expensive than diesel: £177K pa*
- No other vehicle or infrastructure investment required
- Greenhouse Gases significantly reduced (up to 90%)
- Can be used to decarbonise **all** West Berkshire diesel vehicles, not just the collections trucks.
- No arrangements currently made between WBC and Veolia for HVO use.

Diesel HVO

* Based on 2022 diesel consumption and current diesel and HVO prices