ULTRA LOW EMISSION COMMERCIAL VEHICLES

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MANAGING DIRECTOR, ULEMCO
Ultra Low Emission Commercial Vehicles

Delivering the Hydrogen Economy, Halton 2019

Amanda Lyne, Managing Director ULEMCo
Transport is under pressure to radically improve air quality at the same time as reducing CO2 emissions.
Specifically for road transport, hydrogen is part of the mix to deliver full decarbonisation.
And according to McKinsey 2018

By 2050, Hydrogen could power:

- >400m Cars
- 15-20m Trucks
- 5m Buses
Why should a fleet manager consider change?

I’m losing customers that want lower carbon solutions!

My truck has to last 10 years & I’m unsure about the future!

Diesel might be banned!

££££’s
And what are the options other than hydrogen?

- "Clean" diesel
- Biogas
- 100% CNG
- Electric

100%

ULEMCo
Ultra Low Emission Mileage Company Limited
ULEMCo’s “Hydrogen Dual Fuel” approach

✓ Arguably, the best value for money way to reduce carbon emissions

✓ Delivers results for urban driving without compromise for other circumstances

✓ Available now, using known technology

✓ No range anxiety
Deployed in over 40 vehicles in the UK alone
Hydrogen dual fuel case studies

CO$_2$ saved to date (over 10 Tonnes) and using less overall energy than diesel only

<table>
<thead>
<tr>
<th>Company</th>
<th>Diesel Only MPG</th>
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<tbody>
<tr>
<td>Westminster VU12 HKB</td>
<td>56.83</td>
</tr>
<tr>
<td>Westminster VN61 WSO</td>
<td>67.97</td>
</tr>
<tr>
<td>Wiles VX67 UNR</td>
<td>5.56</td>
</tr>
<tr>
<td>Wiles VX67 UOL</td>
<td>32.04</td>
</tr>
<tr>
<td>Aberdeen Econic SV18 HLD</td>
<td>139.59</td>
</tr>
<tr>
<td>Aberdeen Econic SV18 HLC</td>
<td>321.14</td>
</tr>
<tr>
<td>Aberdeen LF SV66 KCY</td>
<td>342.71</td>
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<tr>
<td>Yorkshire Ambulance YJ65 HRW</td>
<td>58.07</td>
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<tr>
<td>Ocado LO67 MJF</td>
<td>15.72</td>
</tr>
<tr>
<td>LFB WX68 FLP</td>
<td>2.25</td>
</tr>
<tr>
<td>LFB WX68 FLN</td>
<td>1.31</td>
</tr>
<tr>
<td>Total</td>
<td>1043.19</td>
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At the same time as dramatically reducing the base vehicle NOx in real world emission tests*

*based on independent tests
Refuse Collection Vehicle – TCO and well-to-wheel emissions results

2018 costs and specifications

2030 costs and specifications

- For domestic refuse collection vehicles, if low carbon H₂ can be used, dual-fuel vehicles offer significant CO₂ savings over diesel, hybrid or CNG versions. Total cost of ownership is slightly less than diesel hybrid. Lower cost H₂ (>> £7/kg) is needed to be competitive with CNG.

- The reduction of CO₂ emissions relative to diesel are achieved at low cost (£0.15) per kg CO₂ saved over the vehicle’s operational life, when compared to hybrid (£0.32), and similar to BEV (£0.14).

- BEV and fuel cell versions, when available, will be able to offer greater CO₂ savings, but at higher cost.

*Note: At the time of this study, BEV and fuel cell versions of this vehicle type are not yet widely available.

Main assumptions

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<tr>
<td>Operational period</td>
<td>8 years</td>
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<tr>
<td>Annual mileage (miles)</td>
<td>25,000</td>
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<tr>
<td>Interest rate</td>
<td>8%</td>
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<tr>
<td>H₂ price and emissions</td>
<td>£7 per kg of low carbon H₂</td>
</tr>
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Hydrogen refuelling options – Back to Base
Project Rooftop - eNV200 FC Rx™ Conversion
Proof of concept fuel cell power module to extend the range of electric vans
Summary of opportunity for public sector fleets

- The only route to save carbon and deliver air quality, across a fleet, without massive change to your normal operational duties

- Range of vehicle either available, or soon to be available

- External funding sources possible for vehicles and infrastructure