



Example 2

Amanda Lyne, ULEMCo

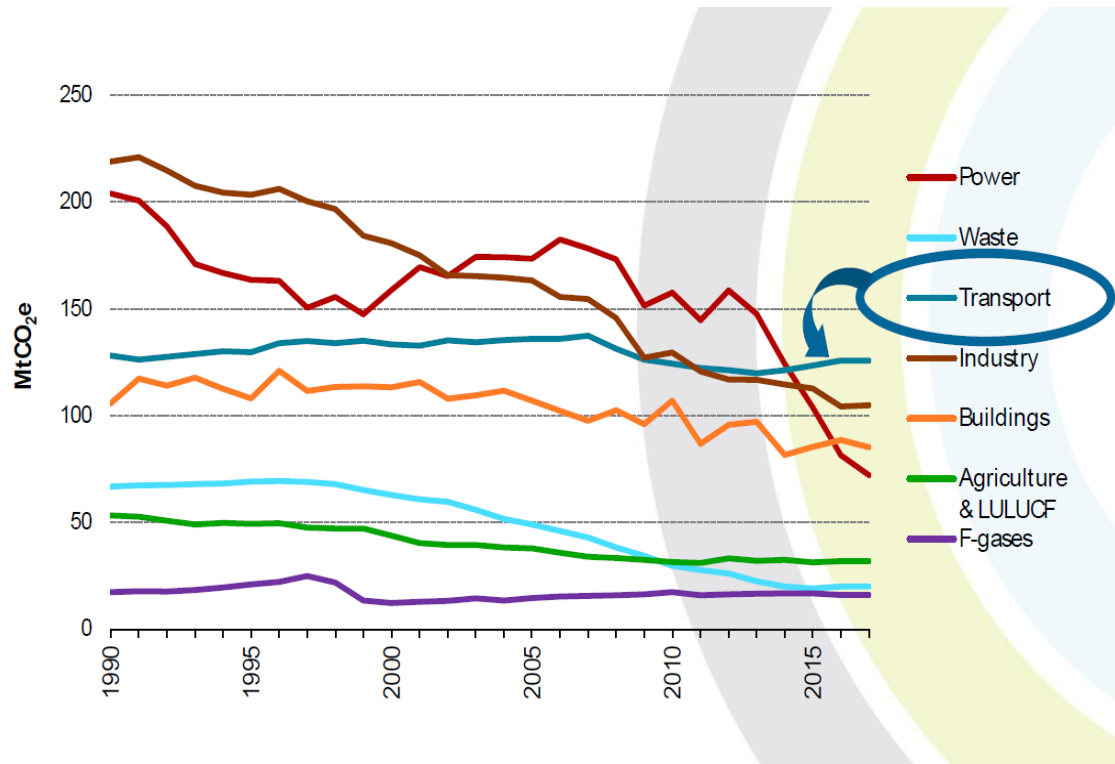




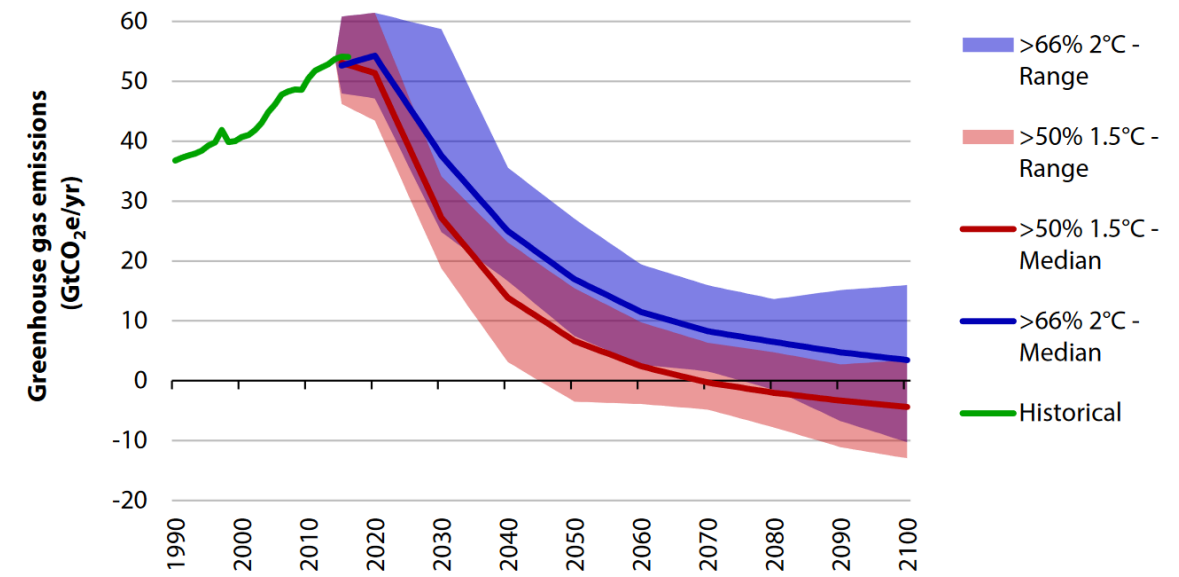
Refuse trucks, road sweepers, large vans and other urban trucks

Amanda Lyne, Managing Director ULEMCo

Transport is now the highest CO2 emissions contributions in the UK



& We've got 10-15 years maximum to transform!



If you care about CO₂ emission reduction, NOW, you will need do something innovative



On 17 May 2018, the European Commission presented a legislative proposal setting the first ever CO₂ emission standards for heavy-duty vehicles in the EU.

The proposed targets for average CO₂ emissions from new lorries:

- In 2025, 15% lower than in 2019
- In 2030, at least 30 % lower than in 2019 (indicative target, subject to review in 2022)

The proposal also includes a mechanism to incentivise the uptake of zero- and low-emission vehicles, in a technology-neutral way.

<https://www.electrive.com/2019/06/15/eu-states-set-binding-co2-limits-for-trucks-and-buses/>

ULEMCo's "Hydrogen Dual Fuel" approach

- Determine options for amount of hydrogen on board storage
 - Assess duty cycle; identify key emission reduction requirement; determine weight and space limitations
 - Estimate on board hydrogen storage capacity
 - Determine budget versus results requirement
- Design specific, safely engineered solution
 - One off design for vehicle type
 - One off engine calibration exercise
- Install "optimised for use" hydrogen system
 - Full ECU controlled system or supervisory approach
- Supply safety assessment and vehicle registration documents for use

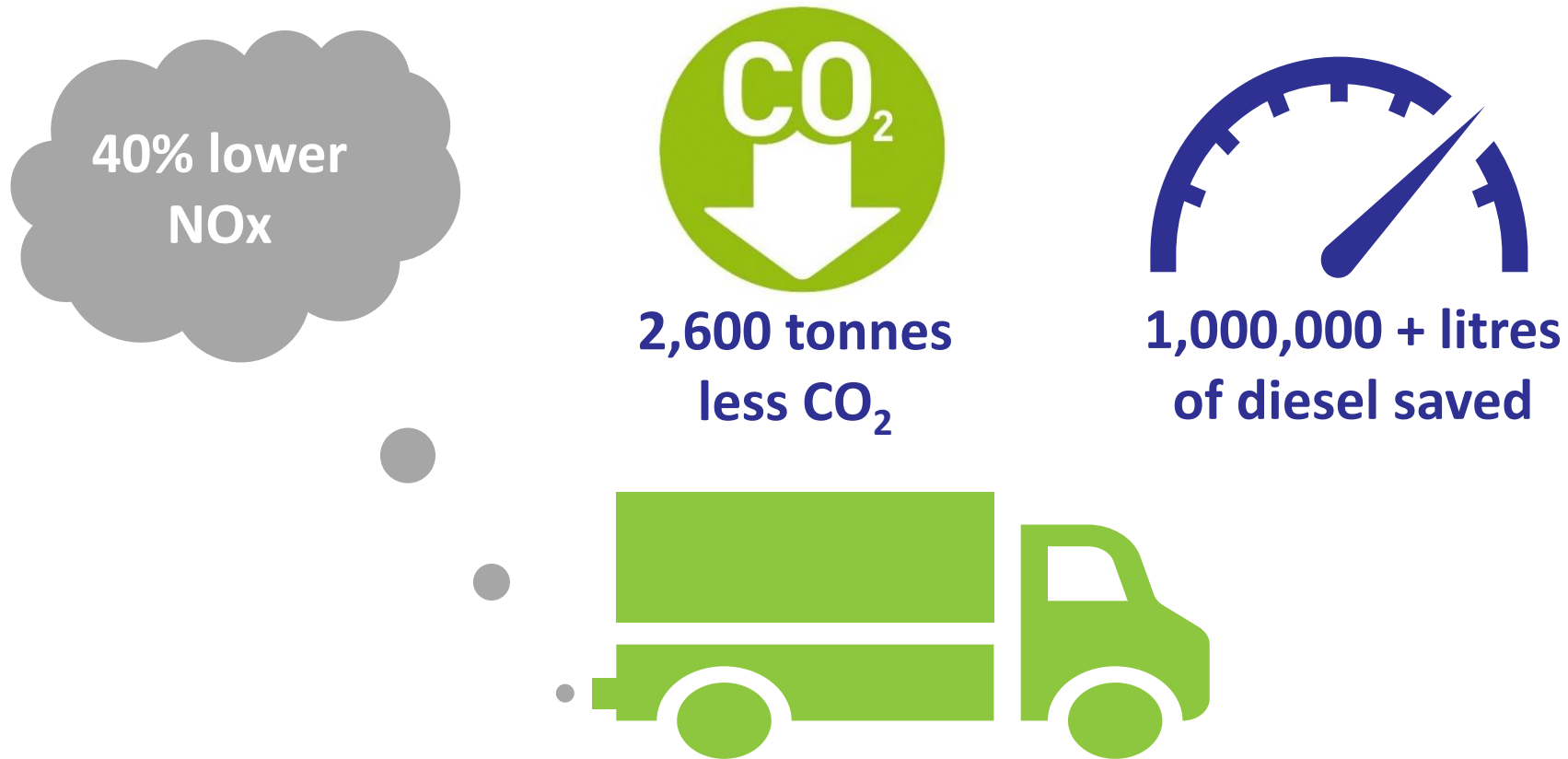


H2iCED™

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A fleet wide deployment of 100 Urban trucks converted to hydrogen* **dual fuel** per year delivers:

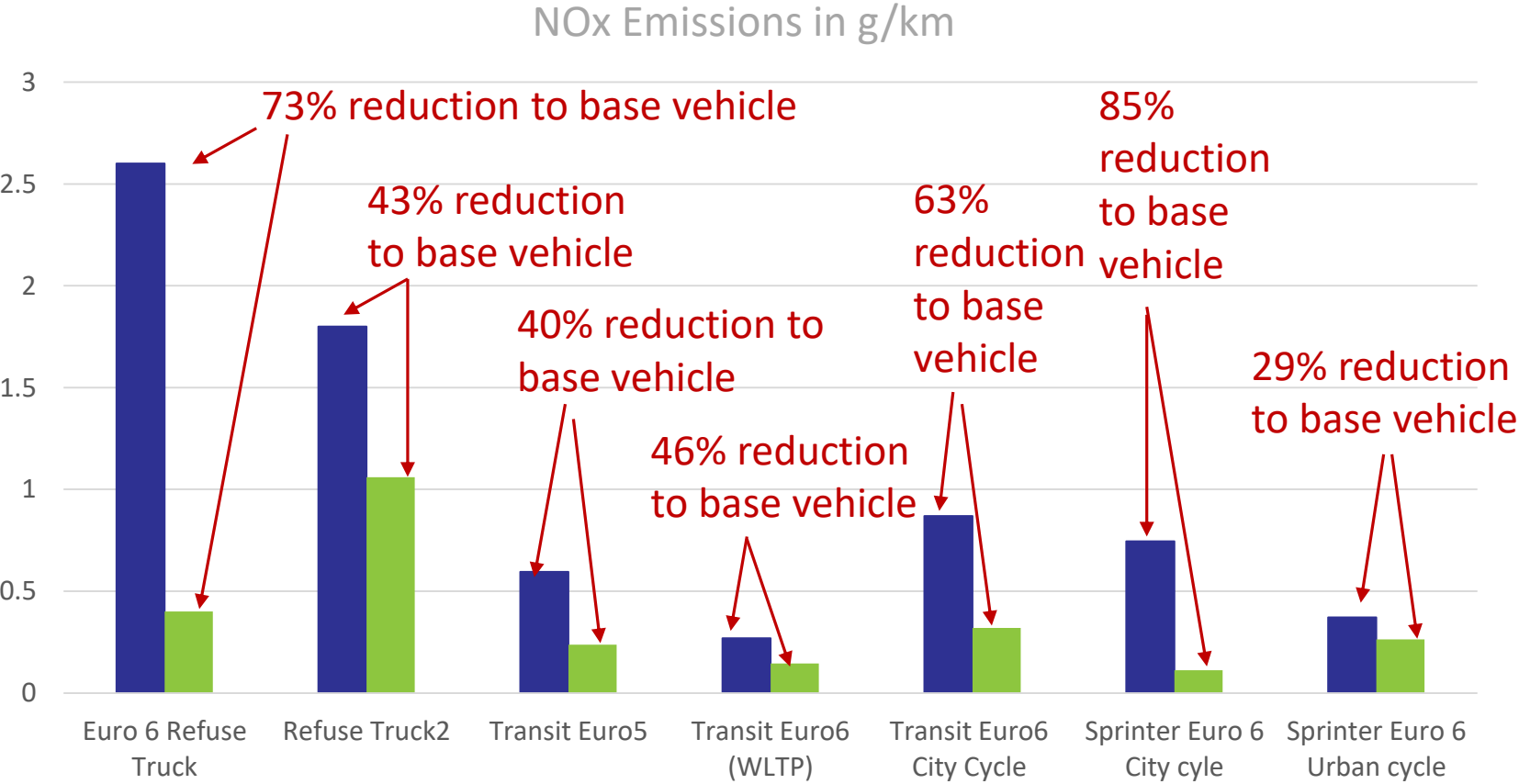


* Using RTFO eligible hydrogen generated from solar or wind

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At the same time as delivering beyond Euro 6 emission air quality standards

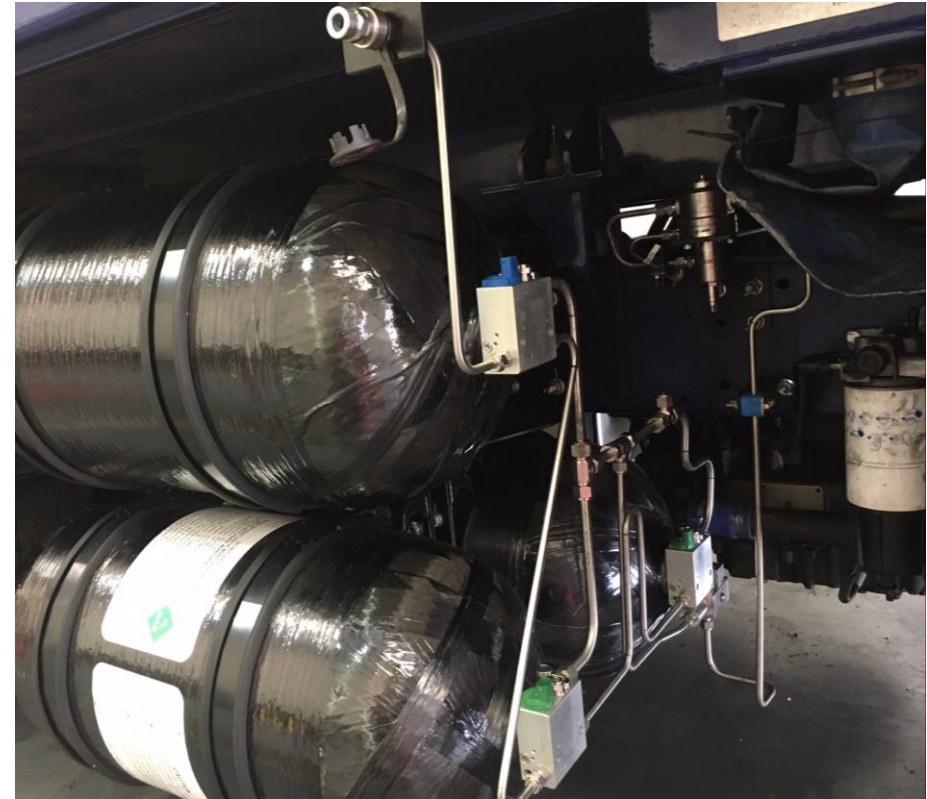


*based on independent tests

■ Diesel ■ Dual Fuel
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Components and technical description

- Addition of on board hydrogen storage
 - 350 Bar EC79 approved
- Air inlet modified to allow for the addition of hydrogen gas injectors
- Hydrogen system engine control (ECU) and safety systems
- Duty cycle optimisation
- Average displacement for of HGV in urban cycle 40-50% giving direct CO2 tailpipe emission savings
- Supplied with individual vehicle approval
- Warrantee and maintenance support



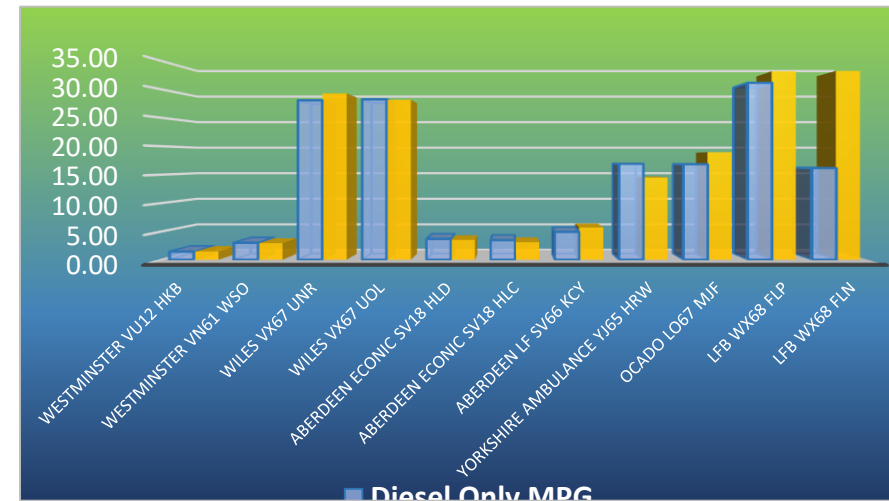
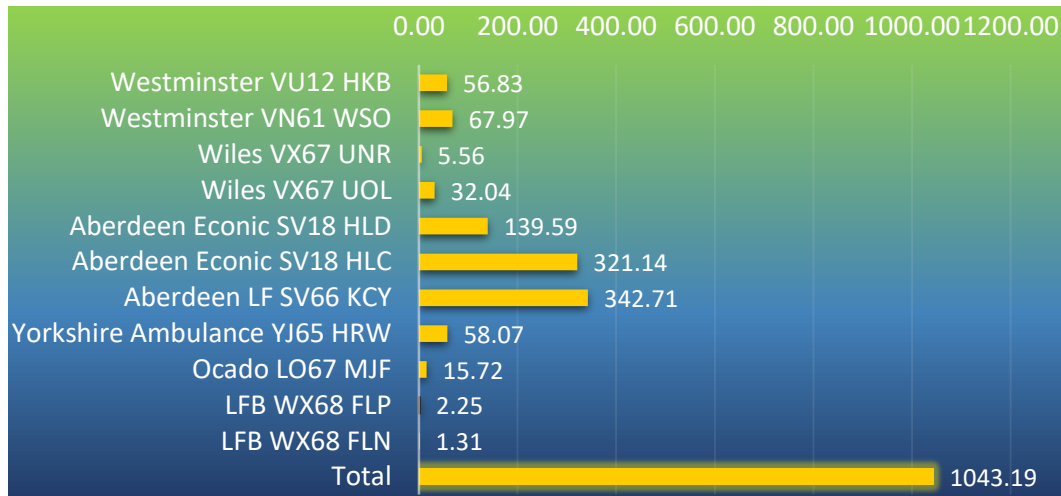
Deployed in over 40 vehicles in the UK alone



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CO₂ saved (over 10 Tonnes) and using less overall energy than diesel only



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Soon to be at scale in Glasgow City Council



<https://www.heraldscotland.com/news/17891455.glasgow-endorses-hydrogen-power-turns-fleet-green/>

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Hydrogen refuelling options –Back to Base

Mobile Refuelling Station Site
Marsh Road, Alperton



Electrical kiosk and transformer

MCP - Hydrogen storage



Deionised water

Firewall and Dispensing unit



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Fleet wide deployment opportunity

- 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
- Maximise hydrogen infrastructure use
- Save 30-40% CO2 across the fleet versus ones and twos in EV, NOW

