

# The Road to De-Carbonisation

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# The journey

Where have we been  
Where are we now  
Where are we going



# Where have we been?

Since Rudolph Diesel discovered that 90% of the fuel in a steam engine is wasted energy, he invented the diesel powered engine in 1897

The diesel engine has a theoretical efficiency of between 55to 60%

Over the past 120 years we have progressed from the first diesel engine to the latest environmental Euro VI standard



# Euro3 to Euro 6

*Euro 3 emissions January 2000*

CO: 0.66g/Km

HC + NO<sub>x</sub> : 0.56g/Km

Nox : 0.50g/Km

PM: 0.05g/Km

*Euro 6 emissions Sept 2014*

CO: 0.50g/Km (-27%)

HC + NO<sub>x</sub> : 0.17g/Km (-106%)

Nox : 0.08g/Km (-144%)

PM: 0.005g/Km (-163%)



Where are  
we now?

We are at Euro VI

LNG/CNG - still a fossil fuel

HVO - a short term fix!!

Solar panels - it helps!!

Hybrid

# LNG/CNG

Liquefied Natural Gas and Compressed Natural Gas are fossil fuels.

According to European Federation for Transport and Environment :

On-road tests commissioned by the Dutch government were performed by TNO, an independent research organisation, to compare emissions from diesel and liquefied natural gas (LNG) trucks.

Six EURO VI diesel trucks produced in 2013 were tested and compared with three EURO VI LNG trucks produced in 2017/8. In urban driving the LNG trucks emit 2 to 3.5 times more NO<sub>x</sub> compared to the diesel truck with the lowest test result

In combined driving (urban, regional and highway) the LNG trucks emit 2 to 5 times more NO<sub>x</sub> than the diesel truck with the lowest result. If biomethane is used (instead of fossil gas), it does not reduce NO<sub>x</sub> emissions because the fuel characteristics of biomethane and fossil gas are approximately the same.

Volvo states that the new LNG model delivers a 20% CO<sub>2</sub> benefit on a tank-to-wheel basis. According to the TNO tests, the Volvo LNG truck with HPDI technology emits 19% less CO<sub>2</sub> equivalent emissions compared to the average diesel for the combined route (urban, rural and motorway driving); this includes tailpipe methane which is approximately 2% of the CO<sub>2</sub> equivalent emissions. Compared to the diesel truck with the lowest test result, the difference is 14%.

# HVO

## Benefits of HVO fuel

- **Up to 90% reduction in net CO<sub>2</sub> greenhouse emissions:** significantly better for the environment than regular diesel or biodiesel
- **Renewable, sustainable and 100% biodegradable:**
- **Reduces notifiable particulate matter (PM) and nitrogen oxide (NOx) emissions:** improved air quality
- **Drop-in replacement for regular diesel & gas oil:** meets EN15940 standard for paraffinic fuels and Fuel Quality Directive 2009/30/EC Annex II. A wide range of OEM approvals means it can often be used without needing engine and machinery modification
- **Excellent cold-weather performance:** higher cetane number (up to 90) and low cloud point (-32°C) provides better starting performance, clean combustion and less chance of waxing in extreme temperatures
- **High flashpoint:** improved safety, storage and handling compared to regular diesel
- **Reduced need for regular testing:** impurities are removed during the production process, eliminating the key factors for fuel degradation and increasing shelf life to around 10 years
- **Certified by the ISCC:** - International Sustainability and Carbon Certification

# Solar Panels

Solar panels fitted to a vehicle reduce the alternator's requirement to create energy via the burning of fuel, to power all on-board electrical equipment

. Ards and North Down Borough Council are running 13 vehicles with solar panels fitted.





# Hybrid

Hybrid and Plug-In Hybrid trucks takes the strengths of both the electric powertrain and the traditional combustion engine powertrain, to a vehicle that can run emission-free when needed, while still retaining the extended range possible when running on HVO or Biodiesel

# Where are we going?

- Electric !!
- Hydrogen
- Both have their own benefits and problems

# Electric

Zero tailpipe emissions - a plus

Environmentally friendly - is it?

Infrastructure - a negative and a massive problem

Purchase price - a negative

Where does the electricity come from ? Is it green?

Ethical ????

Skills shortage

# Hydrogen

Zero tailpipe emissions - a plus

Environmentally friendly - is it?

Infrastructure - a negative

Purchase price - a negative

Green Hydrogen - is it ??

Skills shortage

# BUT!!

Is the answer to decarbonization and air quality simply to find an alternative fuel?

Should we be looking at solutions that will reduce the amount of vehicles we need to carry out our functions?

Should we be looking at different ways of working?

# Conclusion

There are many challenges that lie ahead

There is no one solution that fits all and fleets will consist of all the future technologies