The Challenge of Decarbonising HGVs

Philip Fjeld, CEO – CNG Fuels
03 December 2019

CNG Fuels – Who are We?

- CNG Fuels is building a large nationwide UK network of public-access Bio-CNG stations

- UK Bio-CNG station developer and operator
- CNG Fuels is the UK's largest and fastest growing operator of biomethane refuelling (Bio-CNG) infrastructure
- 100% of fuel volume dispensed at CNG Fuels' Bio-CNG stations is RTFO-approved biomethane sourced from a sustainable and renewable waste feedstock
- CNG Fuels is a market-driven company. In the future our stations can, and probably will, accommodate hydrogen and electric charging infrastructure – when there is sufficient market demand for such solutions

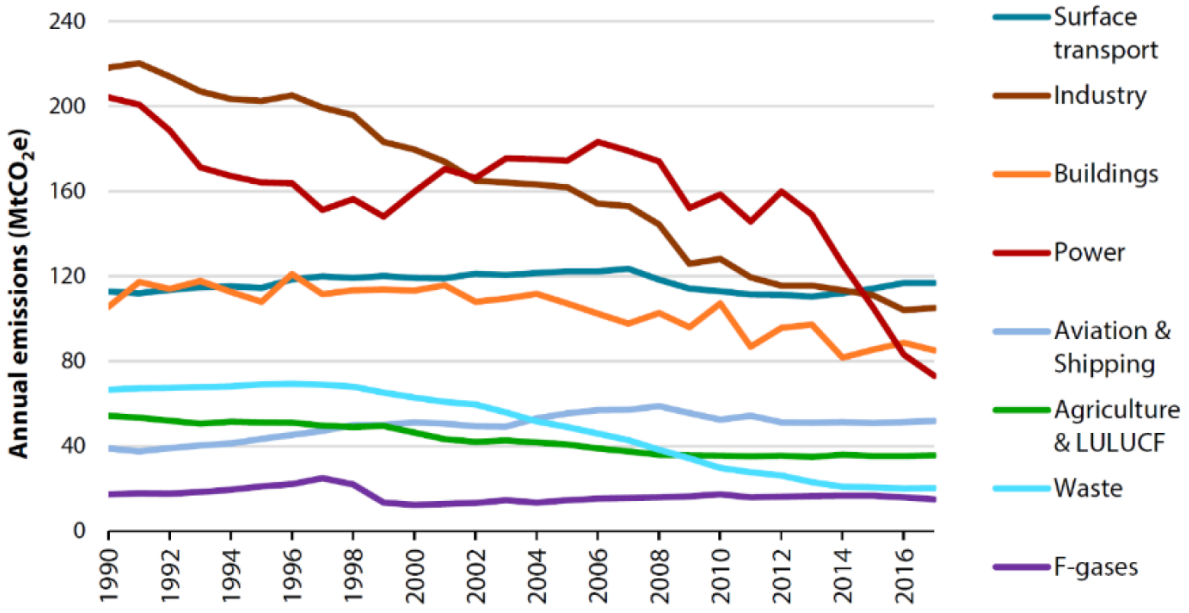
20+ **UK Bio-CNG stations in various stages of development**

300% **growth in biomethane dispensed in 2018**

The Challenge Facing Us

Department for Transport

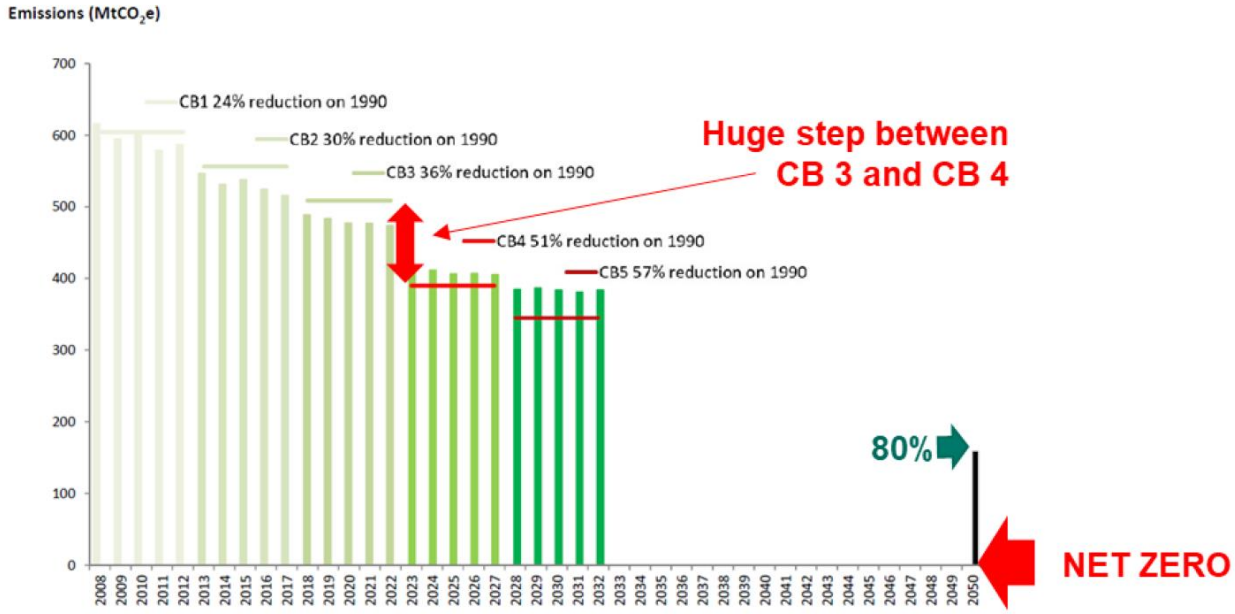
Transport emissions not falling



BEIS (2019) Final UK GHG emissions national statistics

Department for Transport

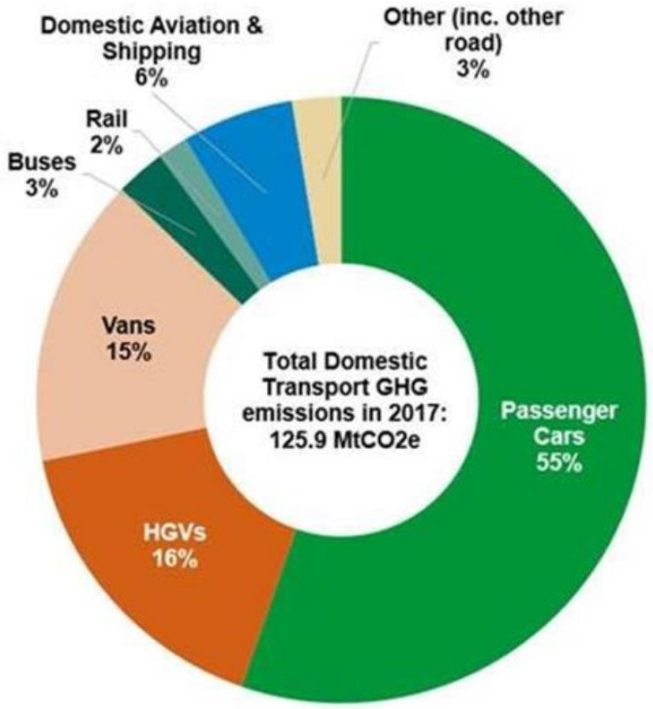
Legally binding carbon targets



The Challenge Facing Us – cont'd

Department for Transport

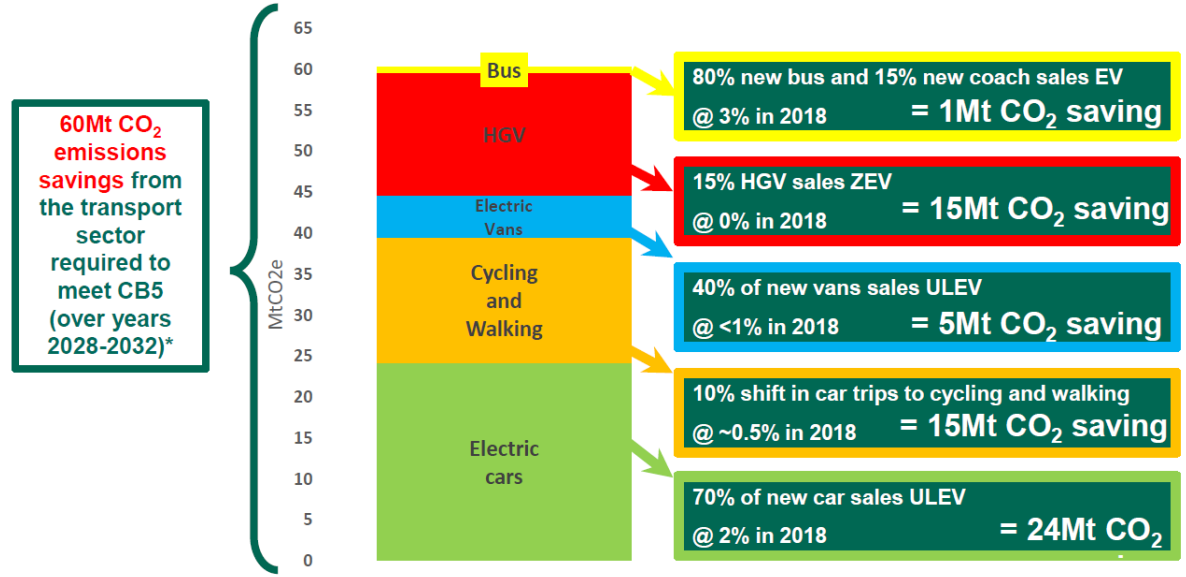
86% of transport emissions from roads



Department for Transport

Meeting Carbon Budget 5 (CB5) is challenging…

60Mt CO_2 emissions savings from the transport sector required to meet CB5 (over years 2028-2032)*



Let's Talk About Timelines..

- CNG Fuels was founded 5+ years ago.
- The company has grown tremendously in 5 years and the biomethane volume being dispensed into HGVs has done the same
- However, we are still only supplying a very, very small part of fuel used by UK HGVs
- 2019 has become a "tipping point" year, where widespread biomethane adoption is taking hold across the HGV sector
- Based on our experience, *mass adoption of a new technology across the UK HGV sector will only occur 10+ years after vehicles and refuelling technology are widely regarded as proven, economical and fit for purpose*

I am Going to Focus on The Heavy end of HGVs

A Typical Long-haul 26+ tonne HGV

- Can travel more than 200,000 miles per year and as much as 400+ miles per shift, or up to 800+ miles per day during peak periods
- Is in many cases “double-shifted” – meaning the vehicle hardly stands still. *“If the wheels are not turning – it is not paying for itself”*
- Is refuelled quickly – typically in 5-10 minutes and from depot-based diesel tanks
- Operates in all kinds of weather from +30 to -15C and can be utilised across all duty cycles

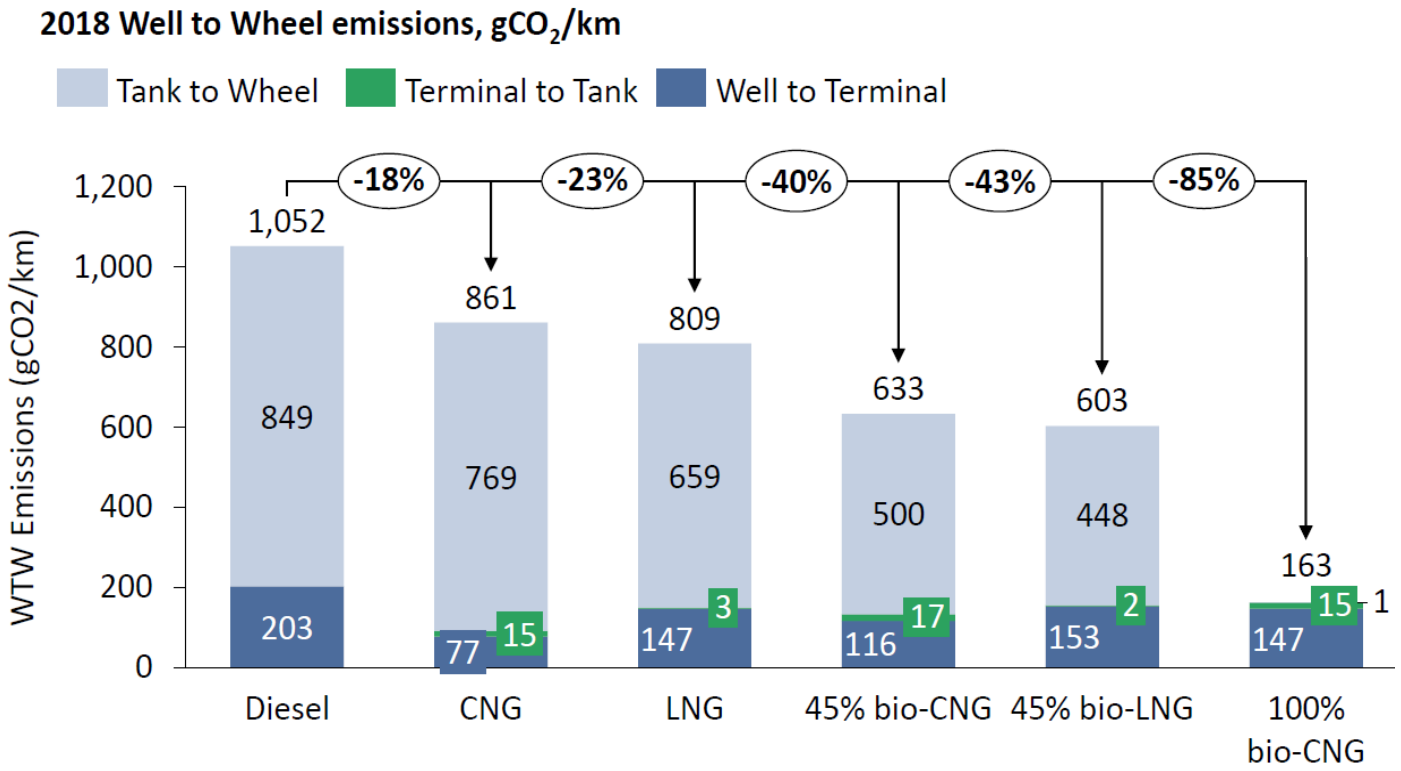
Strategy to Decarbonise Long-haul HGVs has to

- Permit duty cycles that are as close as possible to diesel
- Provide vehicles that are as reliable and driver-friendly as current diesel vehicles
- Convince fleets to move away from depot-base refuelling to using large multi-user public-access refuelling stations

- Biomethane is a solution that is being deployed at scale today and that is a bridge to a future where hydrogen and/or electricity is the main fuel

Biomethane as a Fuel Offers Very Deep GHG Cuts

- The environmental attributes of Bio-CNG (biomethane from a waste feedstock) are very appealing
  - Offers typically more than 80% GHG reduction compared to a standard forecourt (bio) diesel blend



Source: Element Energy, "Development of a Well to Tank Emission Tool for Heavy Good Vehicles

Biomethane From Manure is a Negative GHG Fuel

Proposed Values in Renewable Energy Directive (RED) II

	*Typical GHG Saving**	*Default GHG Saving**
Sugar beet ethanol	79%	76%
Animal fats biodiesel	84%	78%
Waste cooking oil biodiesel	88%	84%
Biomethane (wet manure)	206%	202%

*GHG saving compared to fossil fuel comparator

- The UK agricultural sector is struggling to reduce GHG emissions. The 2017-CCC-Report-to-Parliament states:
- *"The UK agriculture sector is not on track to deliver the agreed level of ambition for a reduction of 3 MtCO2e in England by 2022"*
- Renewable Energy Directive (RED) II has updated figures for biomethane for transport from wet manure feedstock. This is now recognised as a "negative GHG" fuel.

RTFO Biomethane – How it Works in Practice

1. CNG Fuels contracts biomethane from a biomethane supplier
2. Biomethane producer typically has to be ISCC/REDcert certified
3. Biomethane supply is mass-balanced through the pipeline grid and dispensed at CNG Fuels' stations over a quarterly period
4. An application is made to the RTFO scheme at the end of each quarter. Verification audits carried out by DfT approved verifier
5. Renewable Transport Fuel Certificates (RTFCs) are issued approx. one month after application has been made. RTFCs are sold to obligated parties with a blending obligation. This then releases funding to pay the biomethane producer
6. Process starts all over….

RTFO Driving Increased Biofuel Feedstock Imports

Estimating share of RTFO supply coming from UK sources:

4.7 We then estimate what share of additional biofuel feedstocks come from UK sources. Combined with our processing assumptions, this gives us the total additional biofuels supply processed in the UK. To calculate this, we looked at the total of each biofuel supplied in year 7 of the RTFO, calculated the share that came from UK sources, and developed three scenarios for sources of additional future supply:

- Optimistic: Same proportions UK/abroad as present
- Pessimistic: All additional biofuel comes from abroad
- Central: Halfway between optimistic and pessimistic

- The amended RTFO will effectively more than double the UK biofuel blending obligation under the RTFO for the period 2018 – 2032
- In the Government's 2017 response to the consultation on RTFO amendments, three scenarios were listed as sources of additional future UK biofuel supply
- Central scenario above assumes that only 15% of additional biofuel feedstocks required are sourced from UK feedstocks

UK Motorists Expected to Spend More Than £8 Billion on non-UK Biofuel Feedstocks

- When analysing existing DfT RTFO statistics and the cost benefit analysis in the Government's response to the consultation on RTFO amendments we have estimated that **UK motorists are likely to fund more than £8 billion in biofuel feedstock imports in the 2018 – 2033 timeframe**

- £8 billion is a lot of money to be sending abroad when the UK still has ample domestic feedstocks to continue to develop production capacity for renewable gases to be used as transport fuels

CNG HGV Demos

- Since January 2017 more than 80 fleets have used our Bio-CNG stations to trial biomethane powered HGVs
- Average WTW CO2eq. emission savings between 80% - 85%
- All vehicles performed well compared to diesel equivalent vehicles
- Majority of fleets looking to order CNG-powered HGVs over the coming 6 - 24 months as refuelling infrastructure is developed

Bio-CNG Stations Pipeline

- CNG Fuels is rapidly growing its Bio-CNG station pipeline to cover the UK's main logistics hotspots
- Development timeline for a Bio-CNG refuelling station can be as much as 3 years
- Lack of refuelling infrastructure is now holding back mass deployment of biomethane powered HGVs for many fleets
- *"We will stop ordering diesel HGVs as soon as you get more stations opened"*

Multi-User Bio-CNG Station – Typical Example

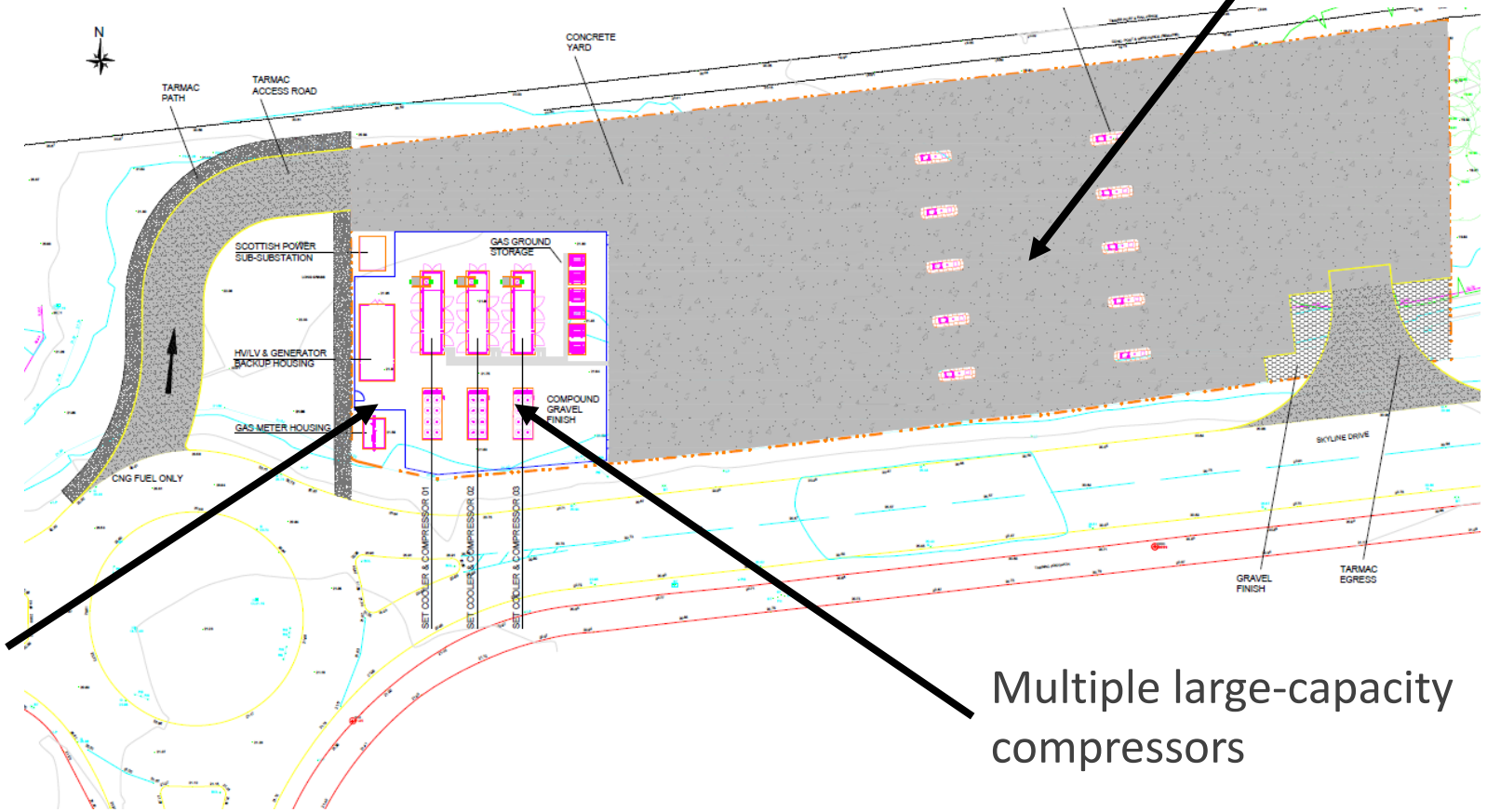
- Biomethane for transport in the UK is heavily focused on long-haul HGVs
- The long-haul market consists of approx. 135,000 vehicles
- Back-to-base logistics dominates, making it possible to refuel many vehicles at relatively few refuelling stations
- By the end of 2020 CNG Fuels will have built refuelling infrastructure that can refuel more than 9,000 HGVs

Warrington - A Typical Large Multi-User Bio-CNG Station

All Bio-CNG stations are “truck friendly” single fuel sites that are intended for heavy usage by multiple large commercial fleets

10-12 trucks can refuel simultaneously. Expected max capacity of 600 – 800 trucks/day

Is ready to accommodate hydrogen or charging infrastructure when the market demands such solutions



Total compression capacity of 400 – 600 GWh/year

Multiple large-capacity compressors

Warrington - A Typical Large Multi-User Bio-CNG Station

Summary

- The HGV sector is very challenging to decarbonise and it will take decades to achieve
- Future UK HGVs will likely be made up of a diverse mix of green technologies and not just one “magic bullet” - that is still yet to be developed
- Hauliers today are faced with limited options when wanting to fully decarbonise HGVs. Biomethane is pretty much the only solution available today at scale
- In 2022 CNG Fuels’ station network is likely to reduce emissions from the HGV sector by 300 – 400,000 tons of GHG emissions per year. We could easily be reducing HGV emissions by 1 – 1.5 million tons GHG emissions per year by 2025
- Biomethane is decarbonising HGVs today and can be replaced as an HGV fuel in the future if/when other equally proven, economical and fit for purpose technologies have matured

Thank You

philip.fjeld@cngfuels.com