

# **Cutting Carbon from the London Bus Fleet**

**Finn Coyle**

**Environmental Manager (Transport Emissions)**

**TfL**



# Presentation Overview

- Environmental Priorities
- Environmental Impact of the TfL Bus Fleet
- Initiatives to date
- Short / Medium term Environmental Strategy
- Long Term Environmental Strategy



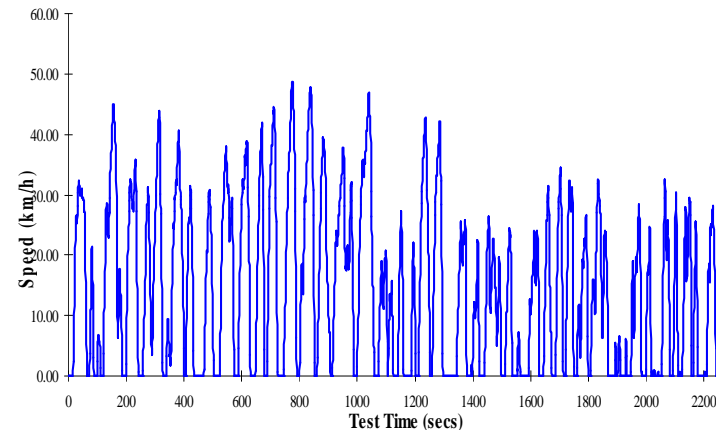
# Environmental priorities

- **Climate Change**
  - Mayor's Climate Change Action Plan sets target of 60% CO<sub>2</sub> reduction across London by 2025
- **Air Quality**
  - EU Limit Values for
    - Fine particles (PM<sub>10</sub>)
    - Nitrogen dioxide (NO<sub>2</sub>)



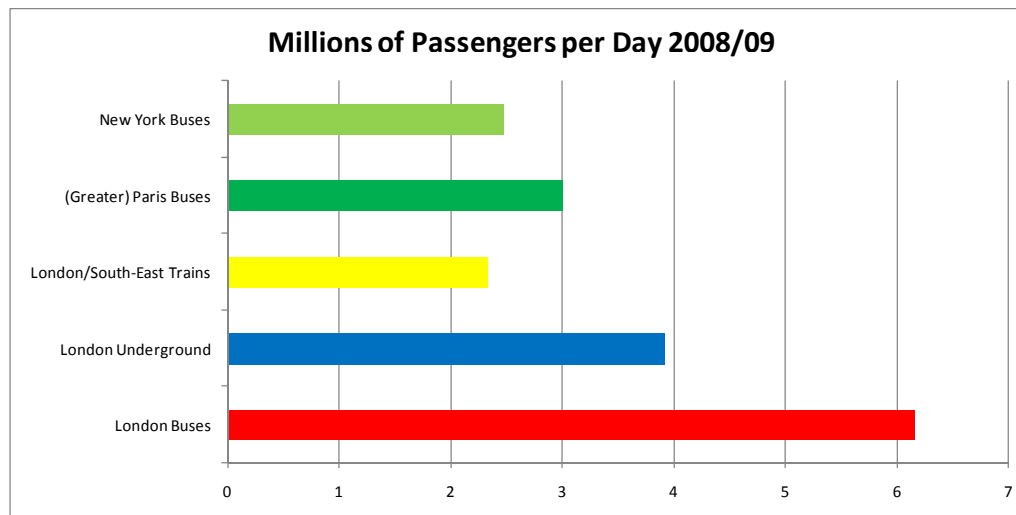
# Calculating the Environmental Impact of the Bus Fleet

- TfL developed with Millbrook a 'real world' drive cycle based on Route 159 from Brixton to Oxford Street
- Every new type of bus is tested to ensure CO<sub>2</sub>, PM and NO<sub>x</sub> emissions meet TfL's requirements
- Enables TfL to model the impact of the Bus Fleet on London emissions and predict the impact of interventions



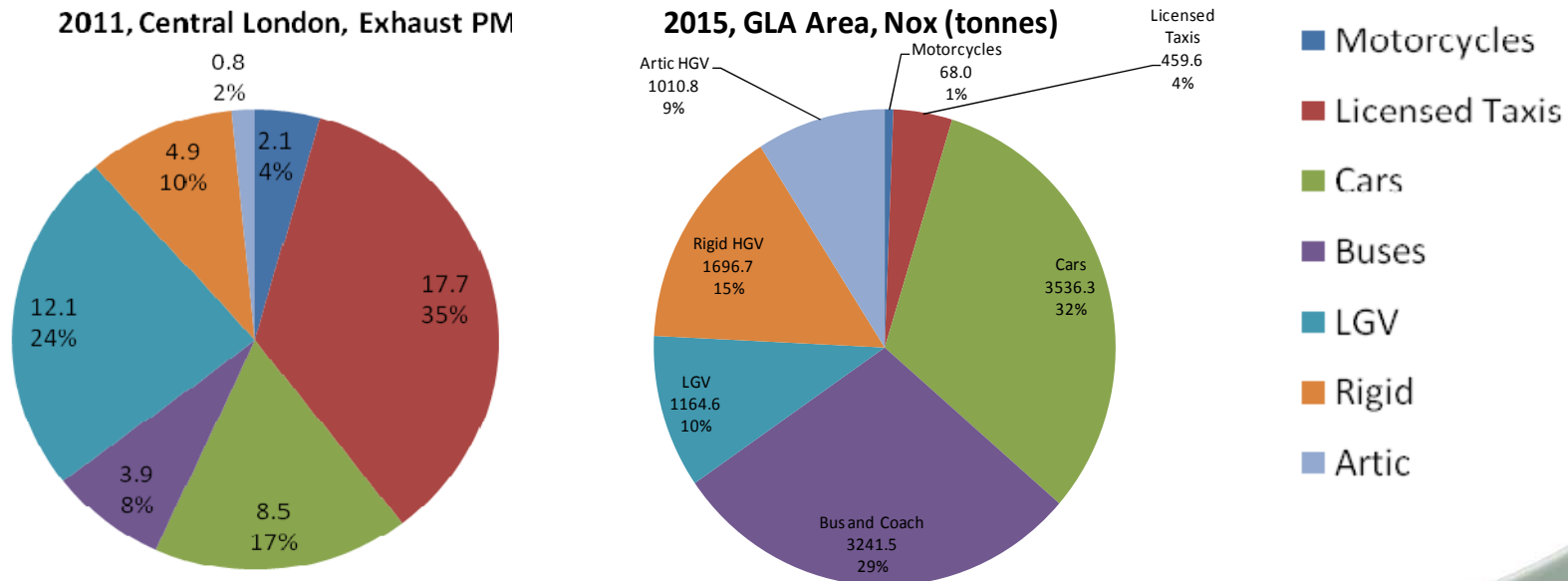
# CO<sub>2</sub> impact of the bus fleet

- 6% of London's transport CO<sub>2</sub> emissions come from buses
- Buses are largest contributor to TfL's CO<sub>2</sub> footprint accounting for 31% of emissions
- Network consumes 250 million litres of diesel per year
- 650,000 tonnes of CO<sub>2</sub> emissions produced per annum



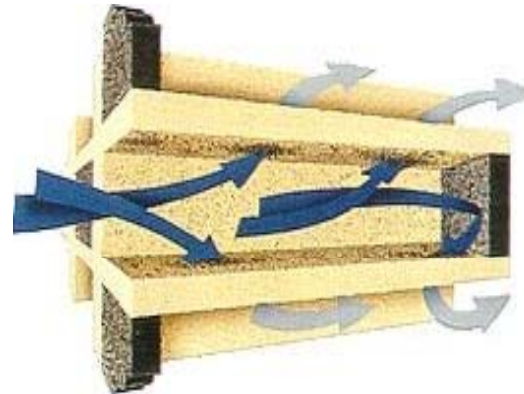
# Air Quality impact of the bus fleet

- Link between air quality and cardio-respiratory health is clear
- Air Quality also has a climate change impact
  - NOx is a precursor to Ozone
  - Black carbon (PM) absorbs heat

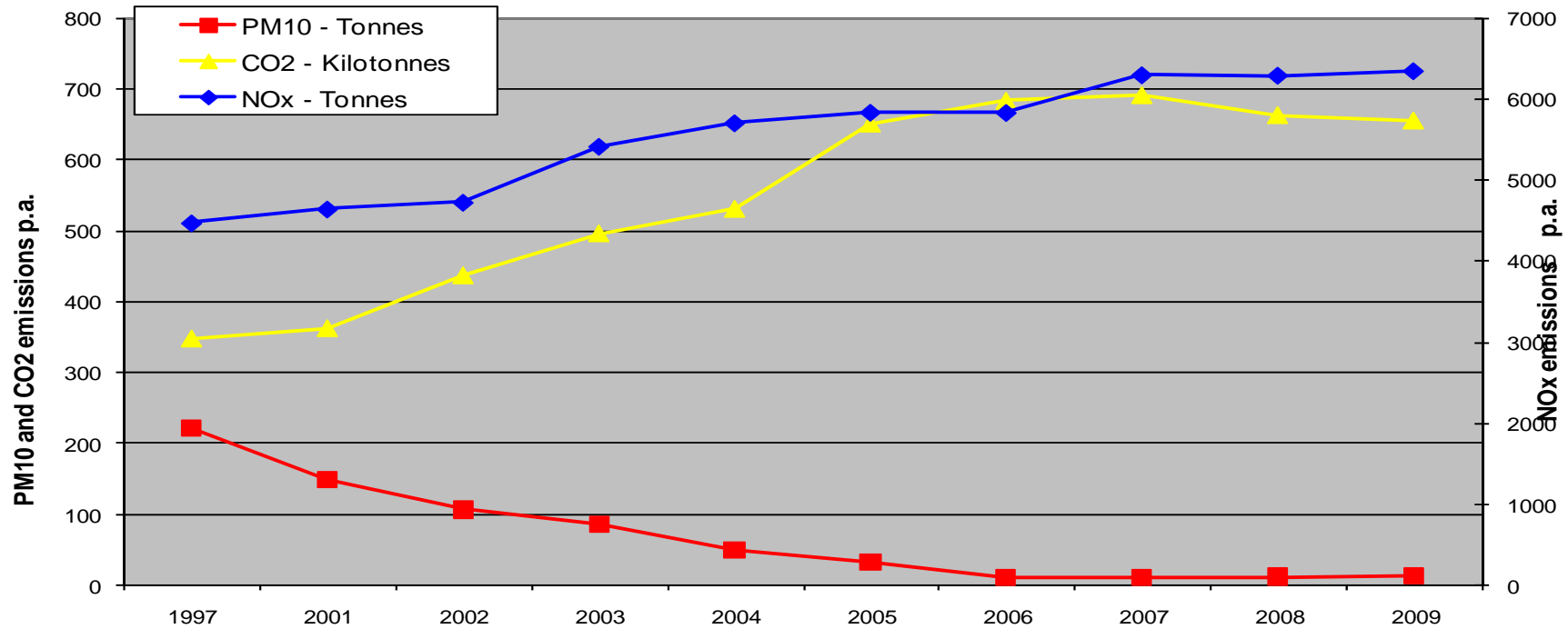


# Initiatives to date - DPF Retrofit Programme

- TfL Retrofitted Diesel Particulate Filters on all its Euro 2 and 3 buses
- All TfL buses meet the Euro 4 standard for PM
- DPFs reduce PM by approx 90 %
- PM emissions from the fleet have dropped from over 200 tonnes in 1997 to 10 tonnes in 2008



# Fleet emission trends 1997-2009





## Short to Medium Term Strategy - Hybrid Buses



Four New Hybrid Bus Types  
Wright Bus, ADL, Optare, Volvo



# Hybrid Trials

- The hybrid programme has spurred bus manufacturers to develop hybrid buses
- Phase 1: trial and evaluation, complete
  - 56 hybrid buses now in service from 4 manufacturers.
- Phase 2: roll-out of hybrid vehicles with
  - 300 hybrid buses in service by 2012
- Emissions testing at Millbrook showed significant reduction in fleet average hybrid emissions compared to fleet average Euro IV:
  - 30% reduction in CO<sub>2</sub>
  - 21% reduction in NO<sub>x</sub>



# New Bus for London

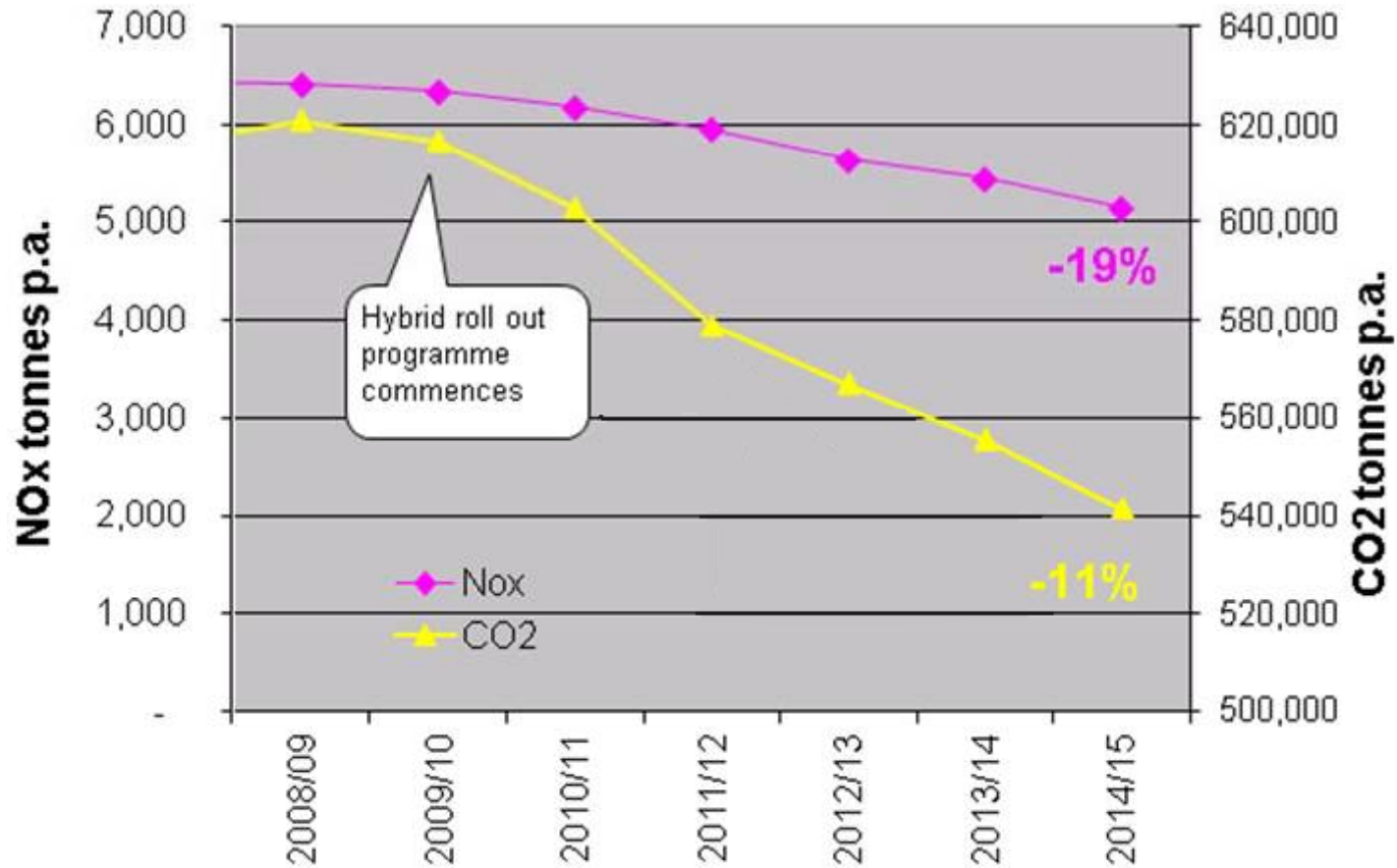


# New Bus for London

- Opportunity to design a bus for London from ‘the ground up’
- Hybrid Drive-train
- Light weight composites used in key areas
- Bidders were assessed on sustainability on all aspects of vehicles life cycle – manufacturing, operation and disposal
- Requirement that vehicle achieves a re-use, recycling and recovery rate of 95 % of vehicle mass
- Emits 40 % less CO<sub>2</sub> than a conventional diesel bus and 15% less CO<sub>2</sub> than current hybrids
- Euro 6 Compliant
- In service from 2012



# Impact of environmental initiatives



# Long Term Strategy - Hydrogen Buses

- Participated in Clean Urban Transport for Europe trials (CUTE)
- Three hydrogen-powered buses in London on route RV1
- Reliable and safe but had limited range
- A viable alternative to diesel buses in London
- Designated refuelling site in Hornchurch



# Hydrogen Hybrid Fuel Cell bus for 2010

- TfL is now taking steps towards a hydrogen bus programme to build on the success of the previous CUTE project
- A fleet of 8 hydrogen buses will be operated on route RV1 starting in December 2010.
- Aim to achieve operation as close as possible to diesel buses
- Construction of new maintenance and refuelling facility within a standard bus depot



# Future environmental programmes

- Mayor's Climate Change Action Plan sets target of 60% CO2 reduction across London by 2025
- Strategy will focus on reducing carbon dioxide, with priority given to those initiatives that also reduce air pollution and noise
- Short term to medium term
  - Introduce diesel electric-hybrid technology
- Long term:
  - Move towards zero emission (at source) technology such as hydrogen fuel cells





**Questions?**

