

**Cummins**



**CHALLENGE THE IMPOSSIBLE**



*Clessie Cummins, 1934*



# Putting Euro VI at the heart of air quality

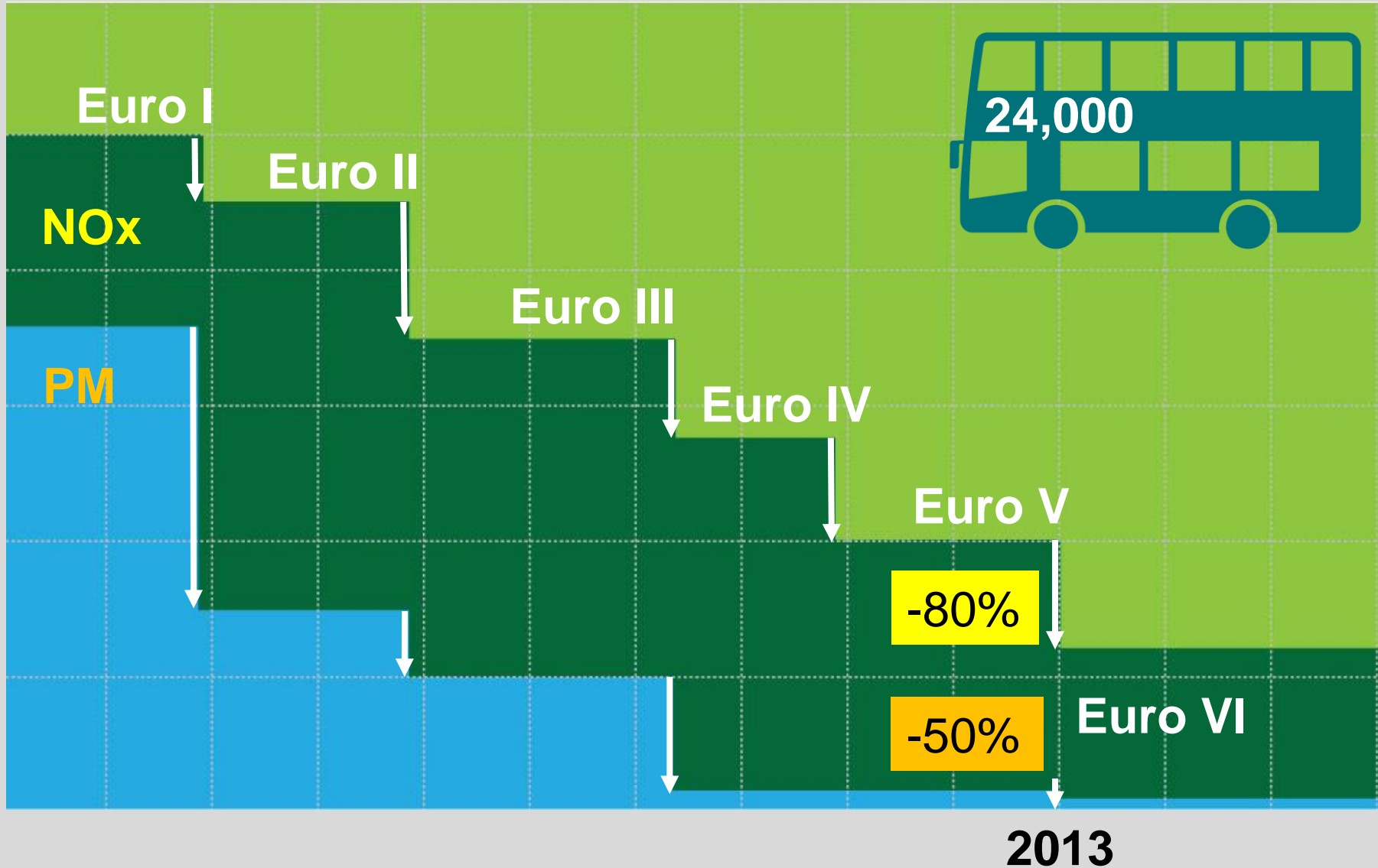
Peter Williams

Director of Certification & Compliance

Cummins Europe



# Euro VI – improving air quality

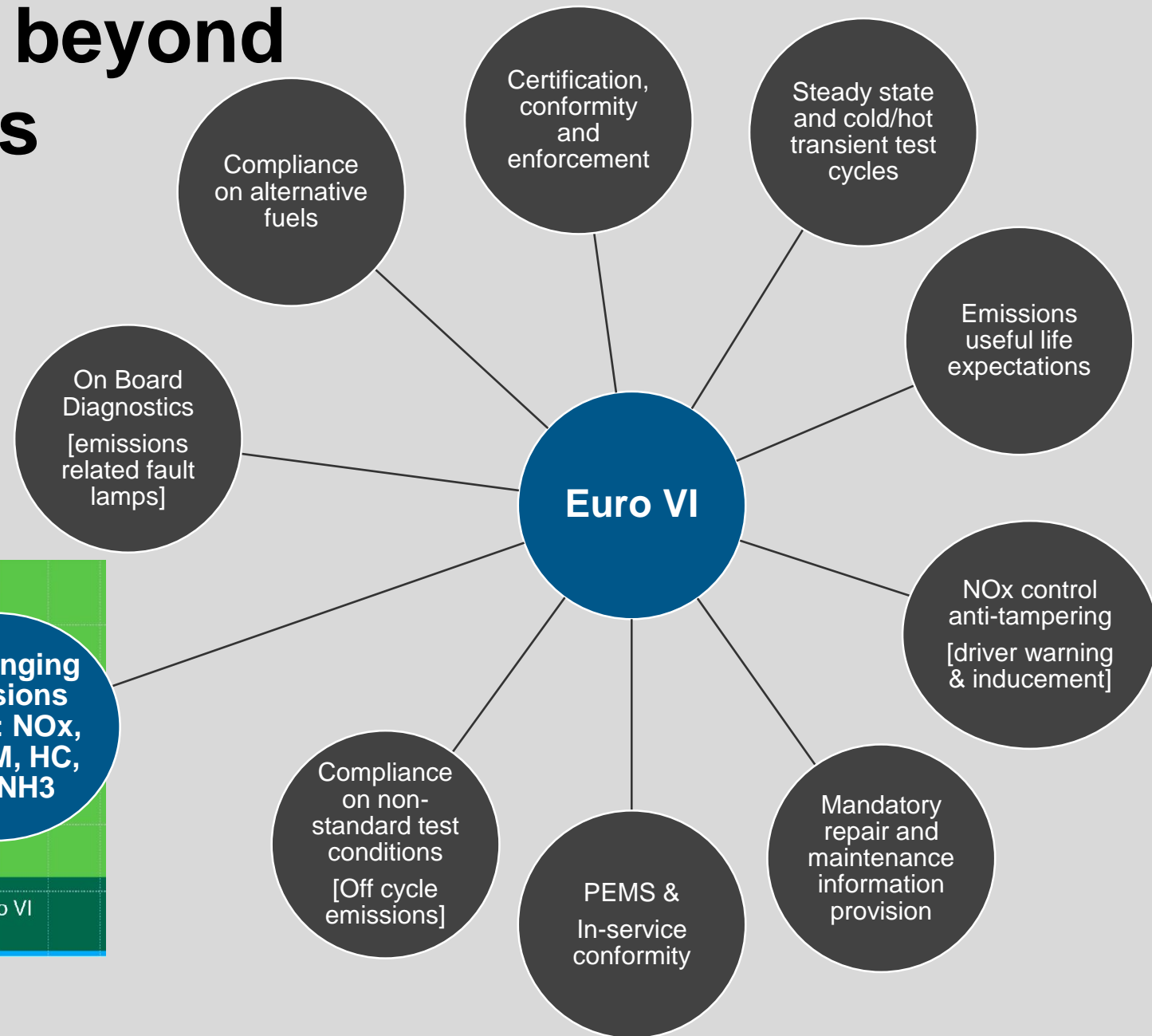
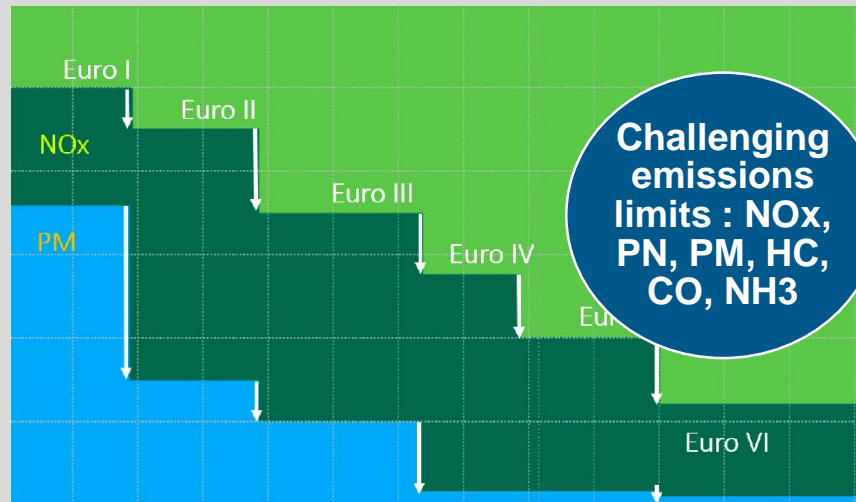


mass emissions  
limit per unit of  
work in kilowatt-hours

NOx  
0.46 g/kWh

PM  
0.01 g/kWh

# Euro VI – going beyond emissions levels

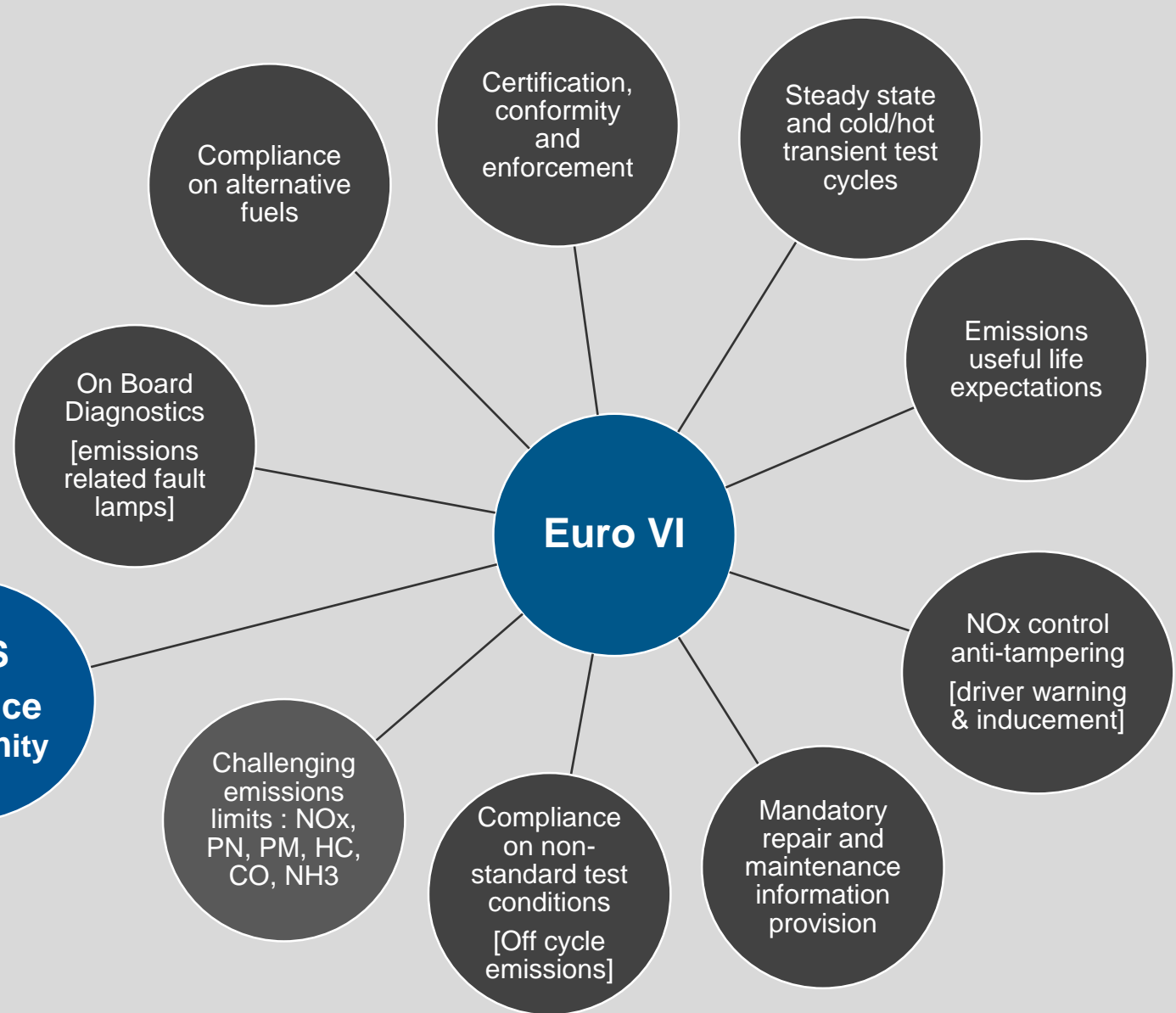


# Euro VI – PEMS Useful Life



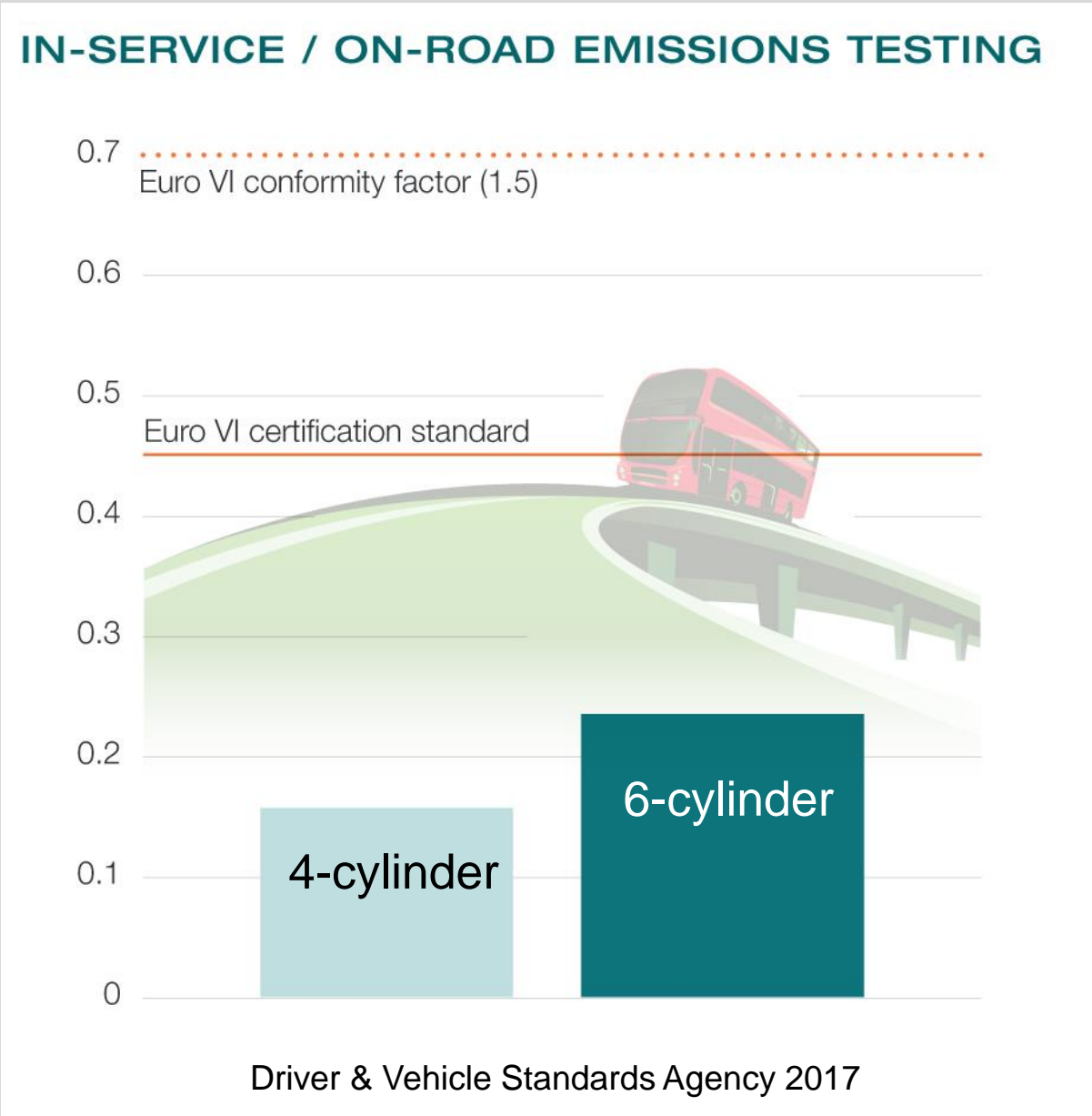
- Portable emissions measurement system
- 300,000 km or 6 years

**PEMS  
In-service  
conformity**



# Euro VI validation

**NOx**  
grams per kilowatt-hour



around **50%**  
below the Euro VI limit

# NOx on-road comparison



0.5 grams per kilometre



+

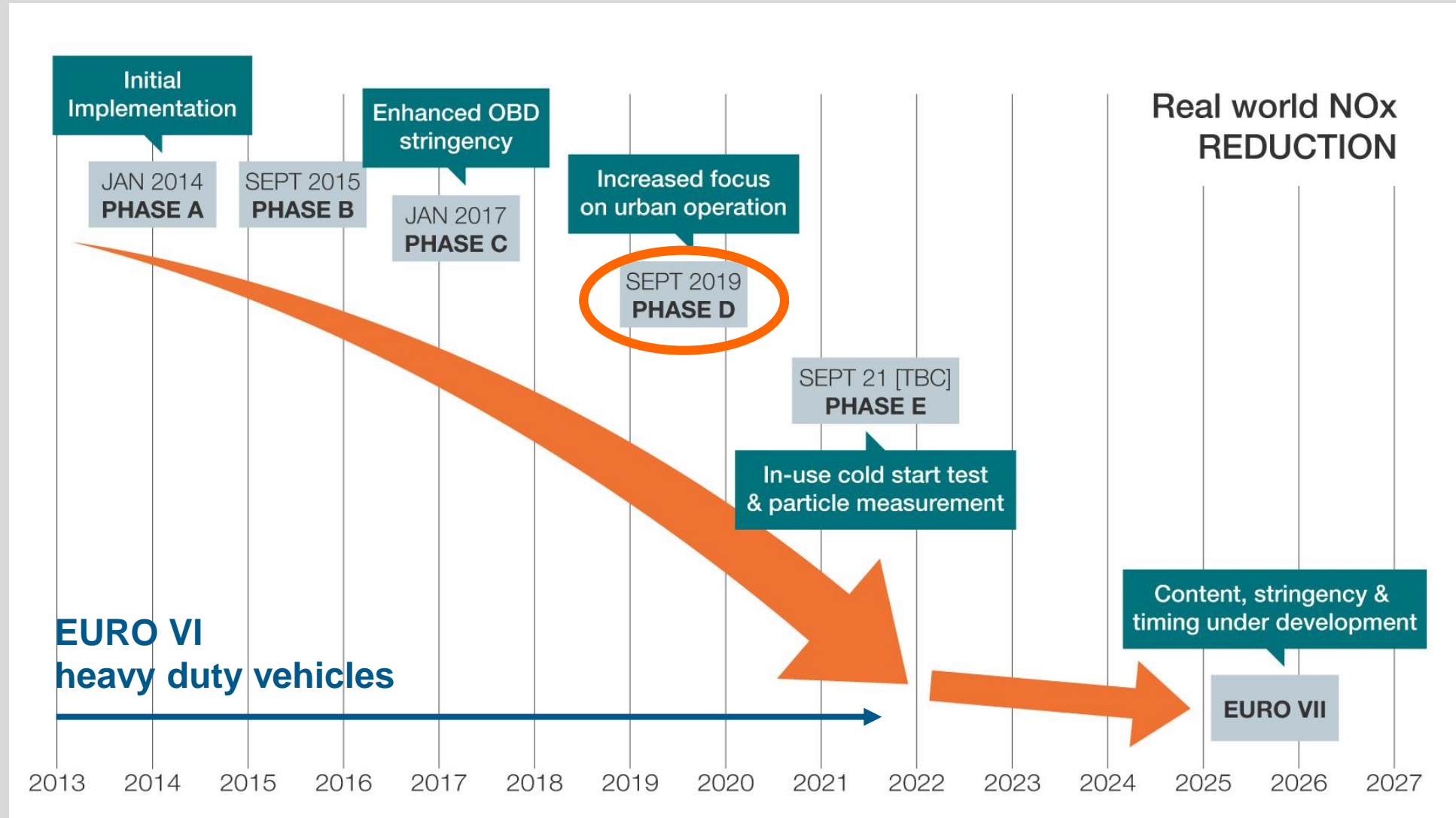


1.25 grams per kilometre



0.8 grams per kilometre

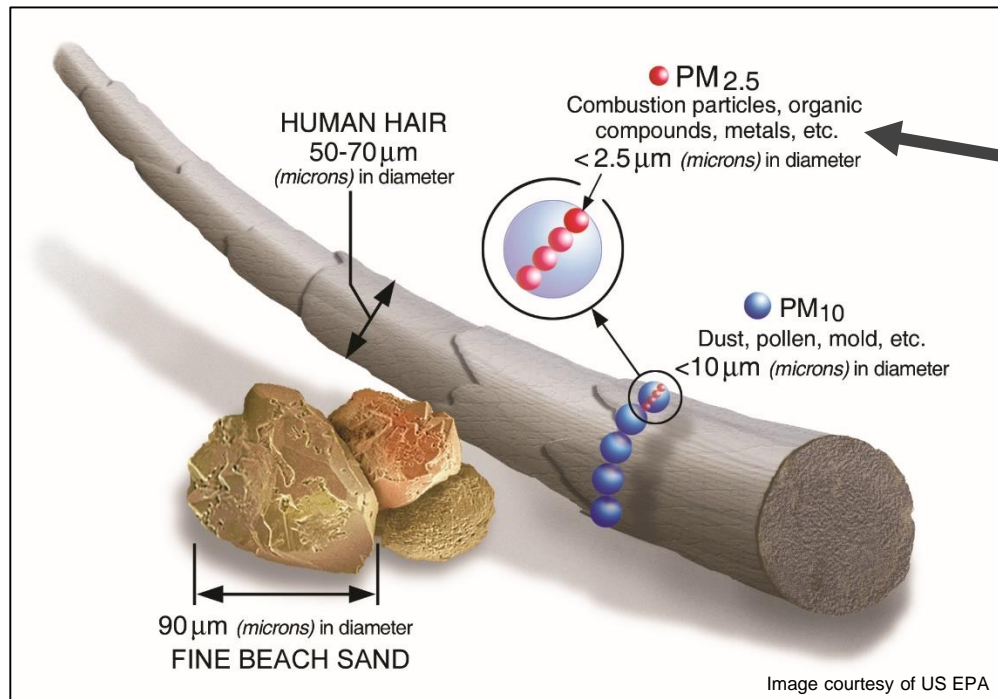
# NOx - route to increasing stringency





# PM: towards effective zero

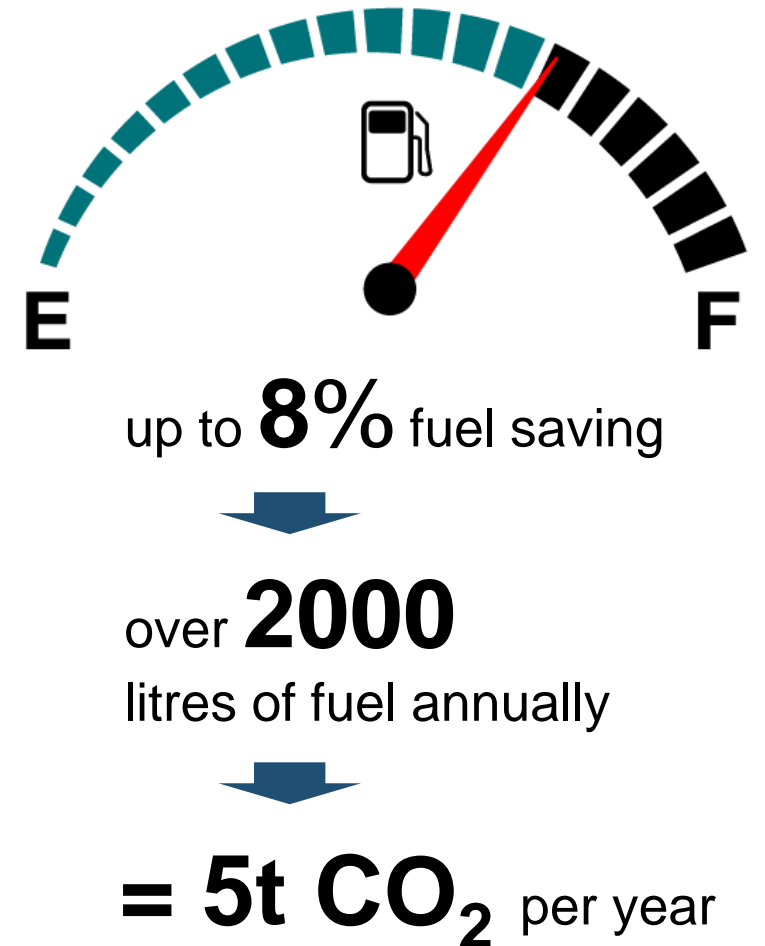
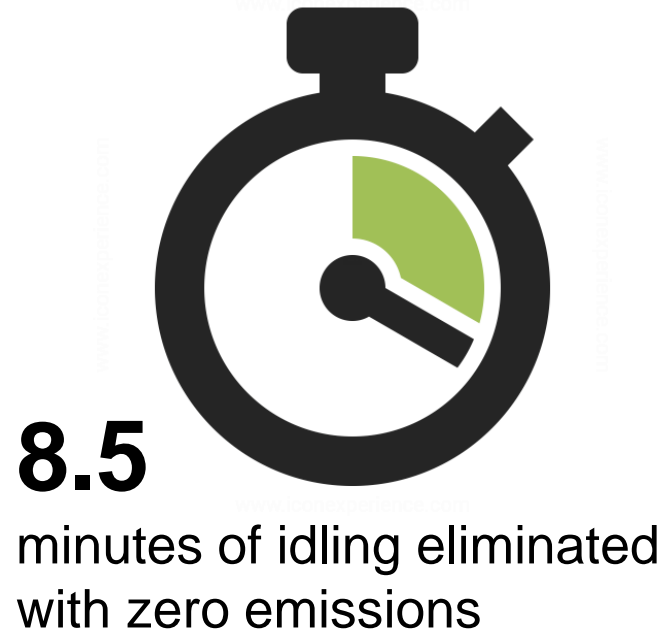
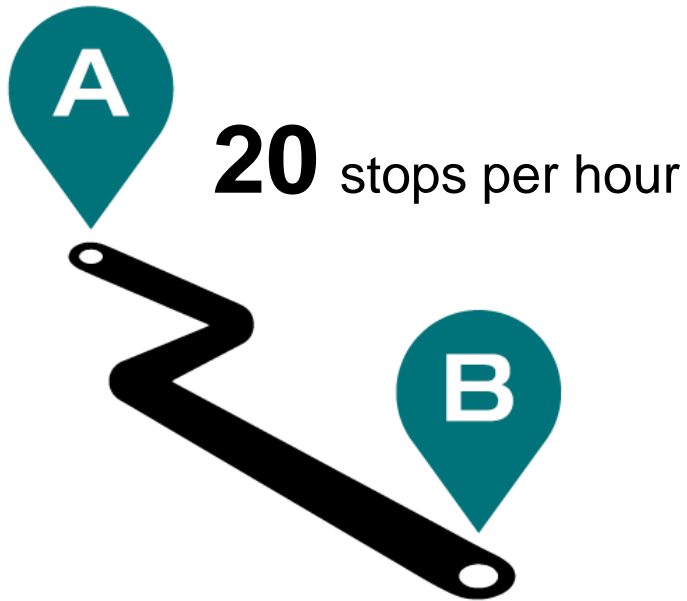
**PM 0.01 g/kWh** + **PN count  $6.0 \times 10^{11}$**  = **> 99%**  
of PM eliminated at Euro VI



PM 2.5	Fine particles	$\leq 2.5 \mu\text{m}$ microns diameter
Euro VI (PM 0.5)	Nanoparticles	$\leq 0.5 \mu\text{m}$ microns diameter

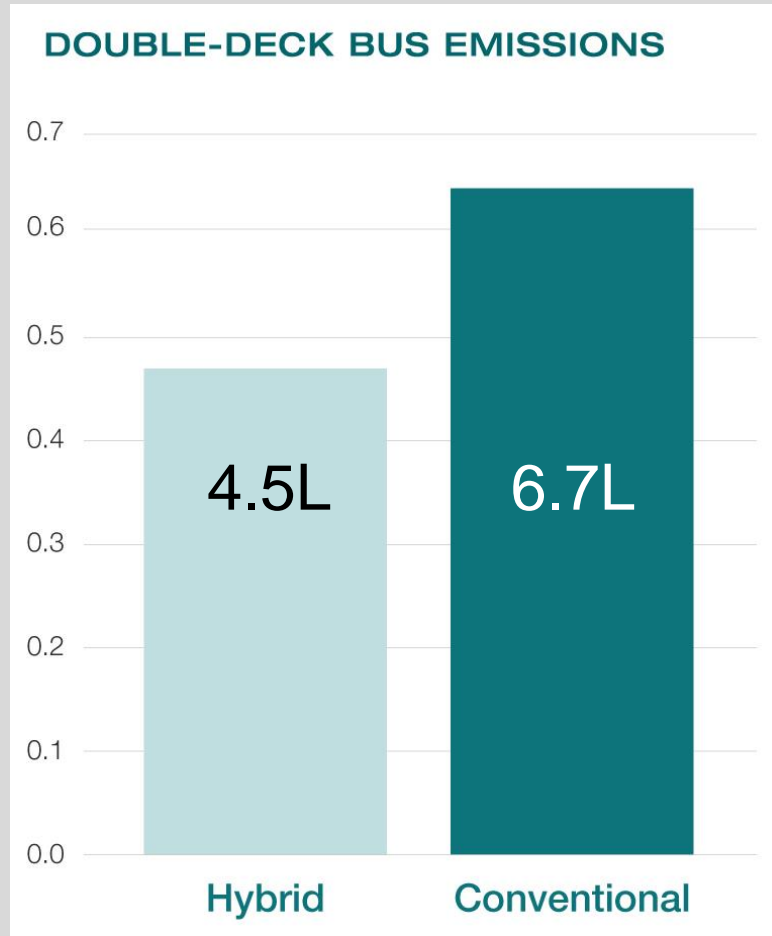
# Stop/Start savings

Non-hybrid diesel – London duty cycle

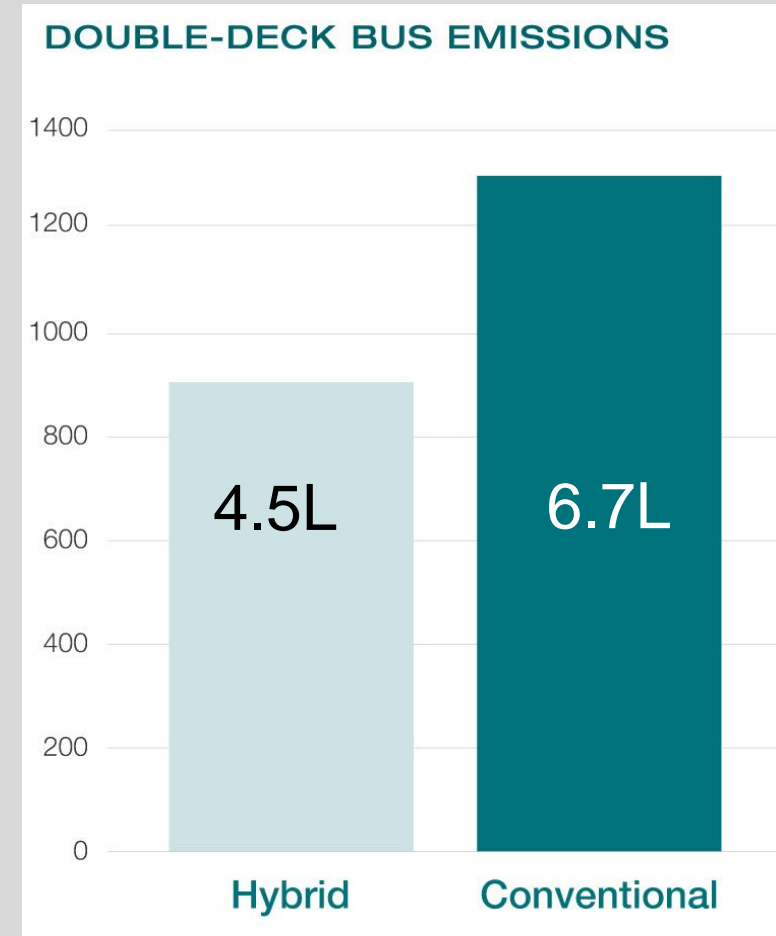


# Diesel-electric hybrid impact

**NOx**  
grams per  
kilometre



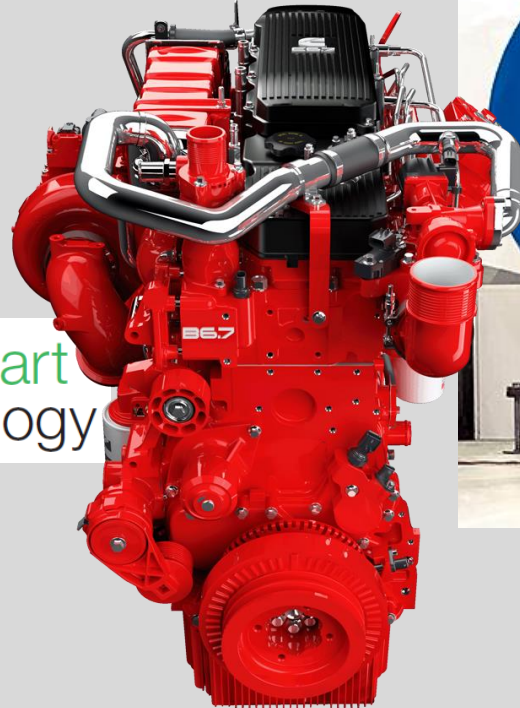
**CO2**  
grams per  
kilometre



Hybrid = **33%** typical emissions & fuel reduction

# Euro VI – ready to repower

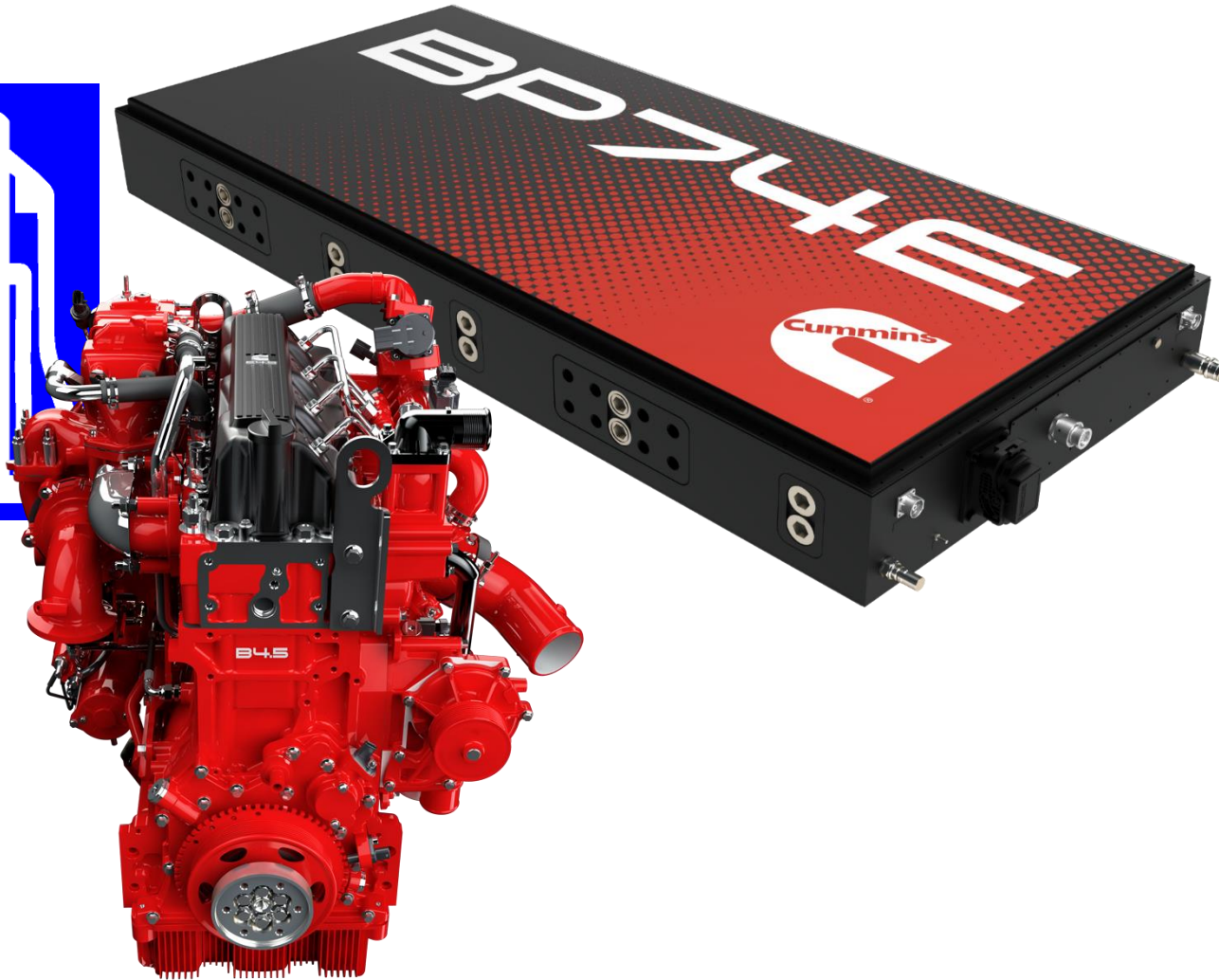
- Euro VI repower package
- Fully certified to Phase D
- Millbrook Special Vehicles



Stop-Start  
Technology



# Moving to energy diversity



- Air quality impact
- Vehicle cost
- Infrastructure
- Performance



**thank you**