Putting Euro VI at the heart of air quality

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Euro VI – improving air quality

- NOx: 0.46 g/kWh
- PM: 0.01 g/kWh

2013

mass emissions limit per unit of work in kilowatt-hours
Euro VI – going beyond emissions levels

Challenging emissions limits: NOx, PN, PM, HC, CO, NH3

- Compliance on alternative fuels
- Steady state and cold/hot transient test cycles
- On Board Diagnostics (emissions related fault lamps)
- Emissions useful life expectations
- NOx control anti-tampering [driver warning & inducement]
- Compliance on non-standard test conditions [Off cycle emissions]
- PEMS & In-service conformity
- Mandatory repair and maintenance information provision
- Certification, conformity and enforcement
- Euro VI
Euro VI – PEMS Useful Life

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

NOx grams per kilowatt-hour

around 50% below the Euro VI limit

Driver & Vehicle Standards Agency 2017
NOx on-road comparison

- 0.5 grams per kilometre
- 1.25 grams per kilometre
- 0.8 grams per kilometre
NOx - route to increasing stringency

EURO VI heavy duty vehicles

- Initial Implementation: JAN 2014 PHASE A
- Enhanced OBD stringency: SEPT 2015 PHASE B
- Increased focus on urban operation: JAN 2017 PHASE C
- SEPT 2019 PHASE D
- SEPT 21 [TBC] PHASE E

In-use cold start test & particle measurement

Real world NOx REDUCTION

Content, stringency & timing under development

EURO VII
PM: towards effective zero

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

<table>
<thead>
<tr>
<th>PM 2.5</th>
<th>Fine particles</th>
<th>≤ 2.5 μm microns diameter</th>
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</thead>
<tbody>
<tr>
<td>Euro VI (PM 0.5)</td>
<td>Nanoparticles</td>
<td>≤ 0.5 μm microns diameter</td>
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Image courtesy of US EPA
Stop/Start savings
Non-hybrid diesel – London duty cycle

20 stops per hour

8.5 minutes of idling eliminated with zero emissions

up to 8% fuel saving

over 2000 litres of fuel annually

= 5t CO₂ per year
Diesel-electric hybrid impact

Hybrid = 33% typical emissions & fuel reduction
Euro VI – ready to repower

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

- Air quality impact
- Vehicle cost
- Infrastructure
- Performance
thank you