

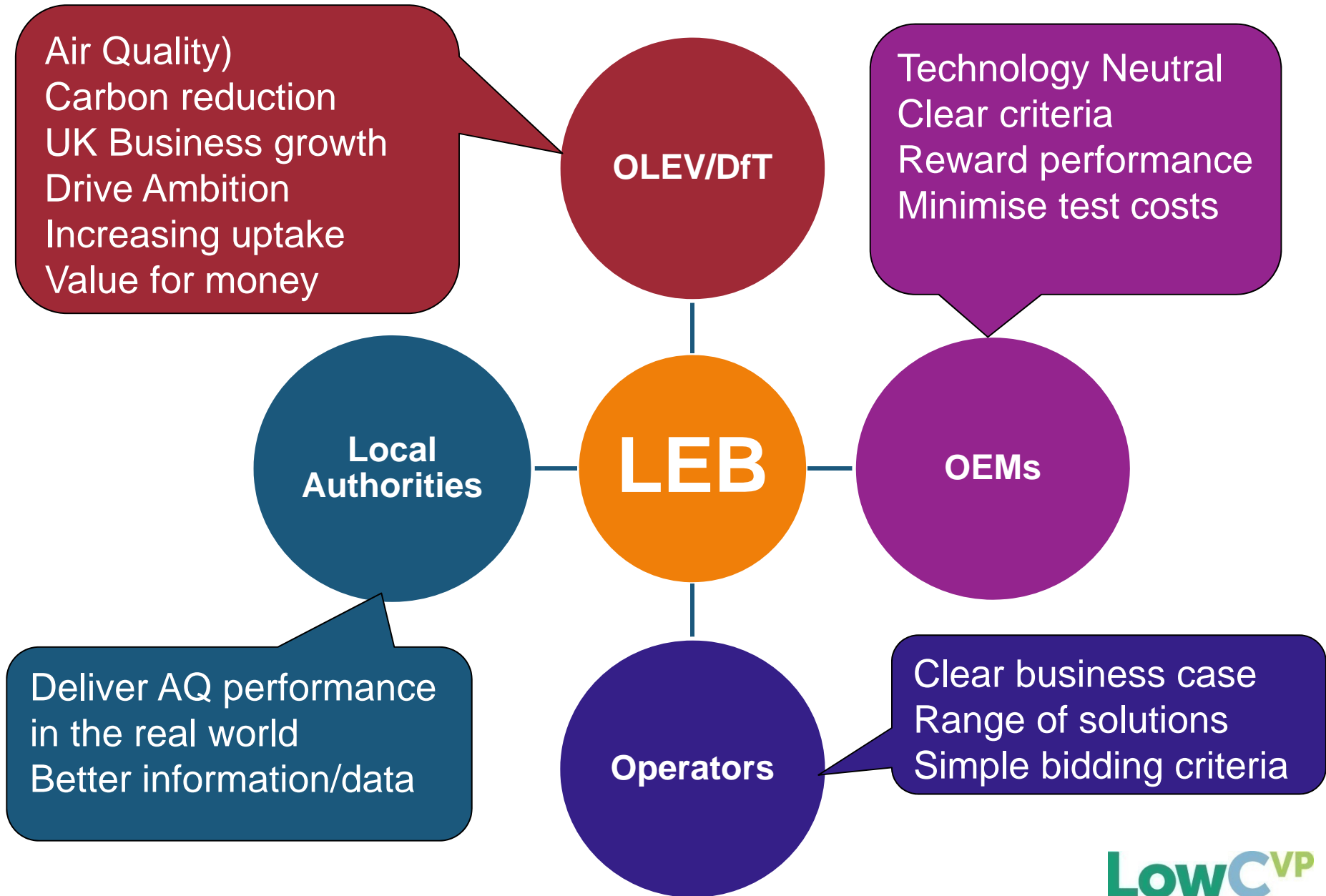


# Defining and supporting the 2015 Low Emission Bus (LEB) scheme

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# The multitude of desires



# The test process

The LCEB test process was originated in 1996 with Millbrook and London Transport buses!

## KEY IMPROVEMENTS IDENTIFIED

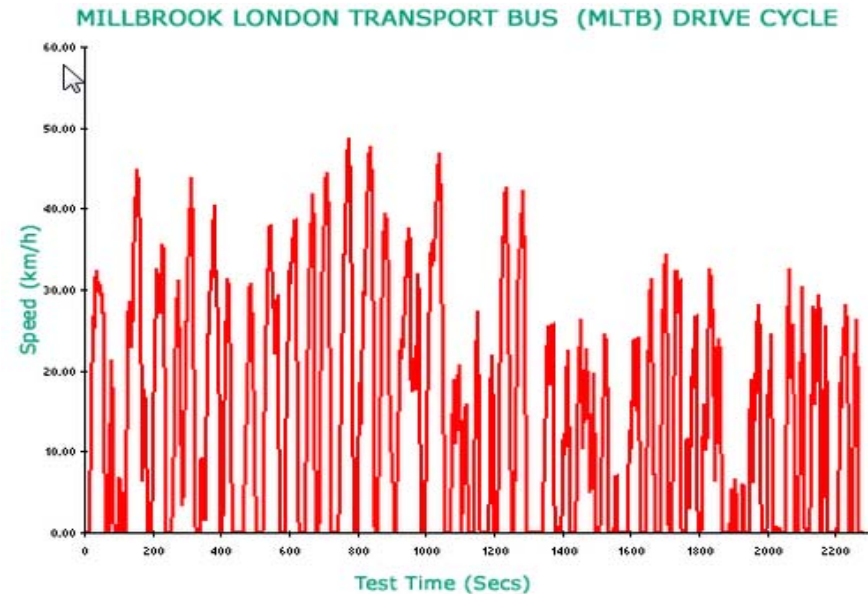
- Add a “Rural” phase to the cycle
- Consider the significant ancillary loads
- Ensure all bus types are tested and energy consumed is measured (Gas, Diesel, Hydrogen, Electricity)
- Create a process to measure the range of Electric and Zero emissions vehicle operation

- Revise the baseline from Euro III

- Report Air Quality data

## RETAIN THE UK LEADING POSITION

- Comprehensive WTW, GHG and Air Quality assessment
- Real-world bus specific cycle
- Cross-industry collaborative approach

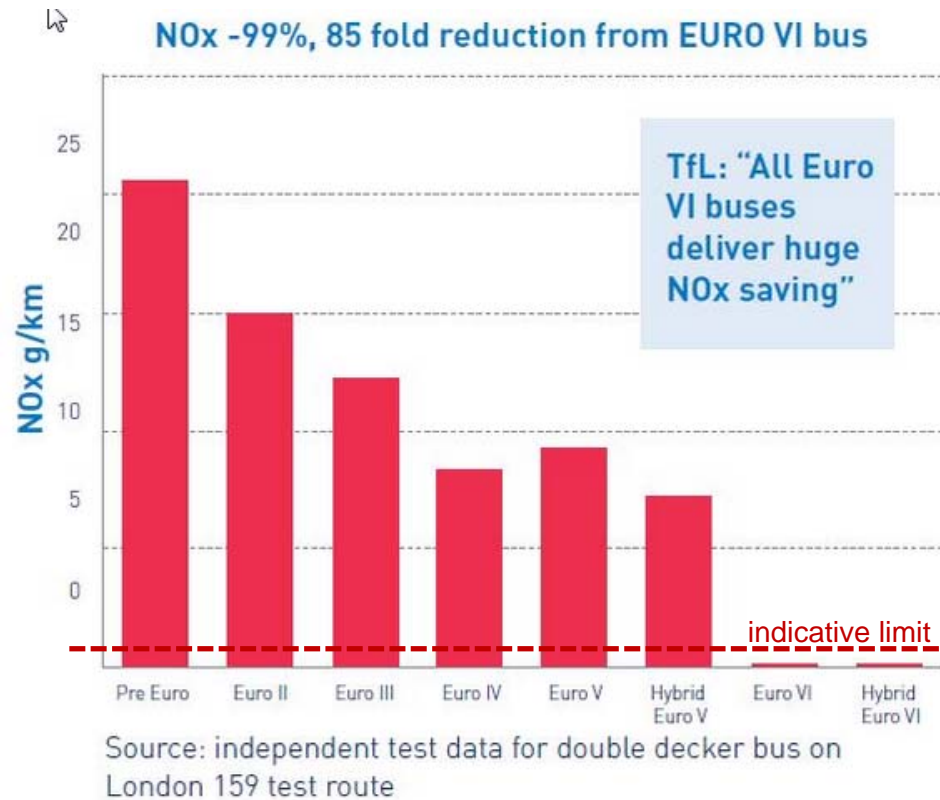


# Air Quality Emissions

Previous LCEB test did not require specific AQ performance, however in general the LCEB gave NOx around 10-15% lower than conventional Euro VI certified vehicles can be as low as 0.1g/km NOx on the test (lower than the Euro 6 Diesel van limit!) . But limited is data available.

*(Typical Euro V were 7 – 9 g/km, Euro III around 12g/km)*

**Requirement for LEB to be certified Euro VI and/or demonstrated to show NOx lower than approx 1g/km on Bus test cycle. Final value to be developed based on available data.**



**It is not viable to differentiate AQ emissions below Euro VI (or equivalent) levels reliably, so AQ improvement better than Euro VI should be stipulated to be via Zero Emissions operation**

# GHG (carbon equivalent)

Greenhouse gas emission from transport should include consideration of Methane (CH<sub>4</sub>) (significant potential from Gas powered vehicles) and Nitrous Oxide (N<sub>2</sub>O) (potential from Exhaust aftertreatment)

Global warming potential (GWP) identifies the greenhouse impact of each gas

CO<sub>2</sub> – 1

CH<sub>4</sub> – 21 (1gCH<sub>4</sub> equivalent to 21g CO<sub>2</sub>)

N<sub>2</sub>O – 310 (1gN<sub>2</sub>O equivalent to 310g CO<sub>2</sub>)

**For all technologies the full GHG impact should be measured to ensure that the LEB delivers both Air Quality AND Carbon equivalent reduction in a reasonable way.**

Applying any technology without considering both aspects can potentially lead to excessive specific emissions and unintended consequences

# Well-to-Wheel WTW

With the variety of energy sources now used for transport (Diesel, BioDiesel, CNG, Biomethane, Hydrogen, electricity, Ethanol etc etc ) each of which has a very different carbon impact in the Well to Tank phase, using a Well to Wheel approach ensure that carbon (or in the future AQ emissions) are not just displaced through the use of a LEB.

**LEB carbon benefits should be measured comprehensively on a complete Well-to-Wheel basis using standard factors and include all significant Greenhouse Gas (GHG) components.**



# Defining a LEB – Measurement and Funding Criteria

## Measurement

- The vehicle should be assessed over a **test cycle representative of UK bus** operation including that outside London.
- **Ancillary loads with a material impact** on the performance measures above, should be included in the assessment
- Technology **ambition should be rewarded** through increased funding for improved performance against the criteria above.
- Assessment and funding should be **technology neutral** as far as is possible
- Scheme should be **future proof and work with BSOG** and any revisions

## Local Air Quality

- A LEB must **meet Euro VI AQ emissions or equivalent** on the test cycle
- LEB performance should be progressively rewarded for increasing **capability of Zero Emission operation**

## Climate Change

- LEB performance should be progressively rewarded for increasing **reductions in WTW GHG** from the conventional vehicle

# The Low Carbon Vehicle Partnership

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## Connect | Collaborate | Influence

- ❑ **Connect:** With privileged access to information, you'll gain insight into low carbon vehicle policy development and into the policy process.
- ❑ **Collaborate:** You'll benefit from many opportunities to work – and network - with key UK and EU government, industry, NGO and other stakeholders
- ❑ **Influence:** You'll be able to initiate proposals and help to shape future low carbon vehicle policy, programmes and regulations



LowCVP is a partnership organisation with over 180 members with a stake in the low carbon road transport agenda.